イラン・イスラム共和国
エネルギー省

イラン国
政府系ビルのESCO導入にかかる
パイロット事業実施プロジェクト
業務完了報告書

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独立行政法人
国際協力機構（JICA）

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プロジェクト業務完了報告書

イラン国　政府系ビルの ESCO 導入に係るパイロット事業実施プロジェクト

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略語表

BHRC	Building and Housing Research Center：ビル住宅研究所
C/P	Counterpart personnel：カウンターパート
EE&C	Energy Efficiency and Conservation：省エネルギー
ESCO	Energy Service Company：ESCO（エスコ）事業会社
IFCO	Iran Fuel Conservation Company：イラン省燃料消費最適化機構
IPMVP	International Performance Measurement & Verification Protocol：国際パフォーマンス計測・検証プロトコル
IRESCO	Iran ESCO Association：イラン ESCO 協会
JAESCO	Japan Association of Energy Service Company：ESCO・エネルギーマネジメント推進協議会
JCC	Joint Coordination Committee：合同調整委員会
JICA	Japan International Cooperation Agency：独立行政法人国際協力機構
MoM	Minute of Meeting：協議議事録
MOE	Ministry of Energy：エネルギー省
MEAF	Ministry of Economic Affairs and Finance：経済財務省
MOP	Ministry of Petroleum：石油省
MPO	Management Planning Organization：管理計画庁
MRUD	Ministry of Road and Urban Development：道路都市開発省
M&V	Measurement and Verification：計測と検証
OIPEEE	Office for the Improvement of Productivity and Economy of Electricity and Energy：電力エネルギー生産性経済性改善局（エネルギー省）
PBO	Plan and Budget Organization (formerly MPO)計画予算庁（旧管理計画庁）
PEEEO	Planning and Economics of Electricity and Energy Office (formerly OIPEEE)電力エネルギー計画経済局（エネルギー省）（旧電力エネルギー生産性経済性改善局）
PDM	Project Design Matrix：事業要約表
PO	Plan of Operation：活動実施計画表
R/D	Record of Discussion：基本合意文書
SABA	Iran Energy Efficiency Organization：イラン省エネルギー機構
SATBA	Iran Renewable Energy and Energy Efficiency Organization(formerly SABA)イラン再エネ省エネ機構（旧イラン省エネルギー機構）
SUNA	Iran Renewable Energy Organization：イラン再生可能エネルギー機構

SPAC　　Presidential Deputy of Strategic Planning and Supervision：大統領府戦略的計画監督構

第 1 章 プロジェクトの概要

1.1 プロジェクトの背景・経緯

イラン国(以下「イ」国)は世界全体の石油埋蔵量の10.9%を保有する世界有数の産油国である。その豊富な石油を背景に、外貨収入の約8割は石油産品の輸出に依存しているが、国内での石油消費量も増加傾向にある。2010年度においてのセクター別のエネルギー消費割合は、住宅・業務部門が36%と最大であり、特に、業務部門・住宅部門に当たる一般建築物でのエネルギー消費が増えており、国全体のエネルギー総供給量の36%程度までのぼっているため、建物における省エネルギーの推進は、「イ」国エネルギー省の喫緊の課題となっている。

国際協力機構（JICA）は、「イ」国において技術協力プロジェクト「ビルの省エネルギー管理と関連法令整備のための調査」（2010年5月～2011年11月）(以下「アクションプラン調査」と呼ぶ。)を実施し、ビル分野の省エネルギー推進のためのロードマップ及びアクションプランの策定に係る支援を行った。アクションプラン調査の中で、ビル分野の省エネは、省エネ技術の導入に対する投資、省エネを検討する技術者（人材）が不足しているため、法令や基準を制定しても簡単に実行できるものではないことが確認され、資金調達を含め、一連の省エネルギー化のためのソリューションを提供するESCO(Energy Service Company)事業者の活用が有望であると特定された。

上述の背景から、「イ」国政府は我が国に対し、ESCO推進事業に係る技術協力プロジェクト「政府系ビルのESCO導入に係るパイロット事業実施プロジェクト」を要請した。

同要請に基づき、JICAは2013年2月に詳細計画策定調査を実施、2013年10月にRecord of Discussions(R/D)の署名・交換を行い、2014年1月から本プロジェクトが実施されるに至った。

1.2　プロジェクトの目的

本プロジェクトは、我が国の省エネルギー促進を促したESCO事業のノウハウおよびESCO事業推進のための政策、制度に関して「イ」国に技術協力、技術移転することを目的とする。

【成果1】: イラン国でのESCO事業推進のための体制の整備

【成果2】: 政府系ビルへのESCO導入に係るエネルギー省/ESCO協会の能力の強化

【成果 3】: 政府系ビルへの ESCO 導入に係る、検討・促進

【成果 4】: ESCO 導入に係る政策提言

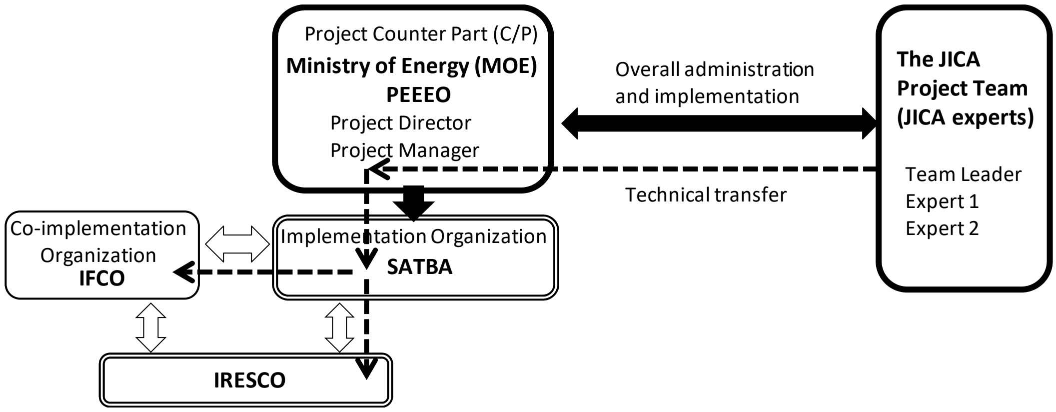
1.3 運営体制

1.3.1 カウンターパート及び実施機関

本プロジェクトのカウンターパート及び実施機関は以下のとおりである。

1) カウンターパート：エネルギー省電力エネルギー計画経済局(以下「MOE/PEEEO」[1])

2) 実施機関：イラン再生可能エネルギー省エネルギー機構(以下「SATBA」[2])



出典: JICA 専門家チームにより作成

図 1.1 プロジェクトの実施体制

MOE/PEEEOからProject DirectorとProject Managerが任命されている。実施機関となるSATBAは、エネルギー省(以下「MOE」)傘下の再生可能エネルギー並びに省エネルギー(以下、再エネ・省エネ)の推進機関であり、主に電気の再エネ・省エネの導入推進を目的としている。このほか、「イ」国では石油省 (以下「MOP」) 傘下のイラン省燃料消費最適化機構(以下「IFCO」)が熱の省エネルギー推進を目的とする機関であることから、IFCOを共同実施機関として、双方の有機的な連携を促し、電気及び熱の省エネルギーを包括的に推進する体制の構築を目指した。

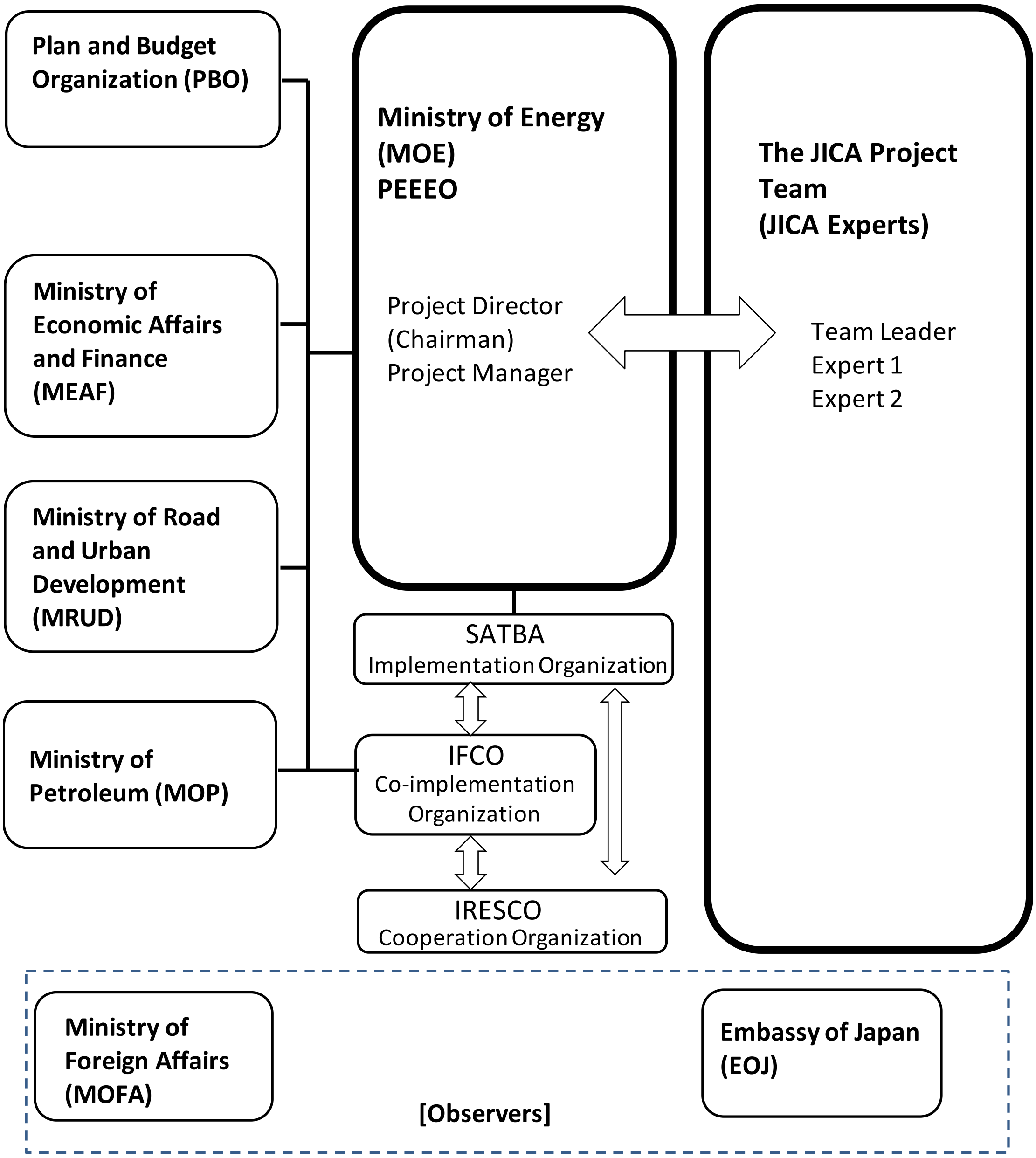
2012年6月に設立されたイランESCO協会(Iran ESCO Association、以下「IRESCO 」)は民間組織であるが、本プロジェクトではMOE、SATBA、IFCOを通じてIRESCOから協力を得るとともに、SATBAを通じて必要な技術移転、情報共有をIRESCOに対して行うことを目的とした。

[1] MOE/PEEEO は、技術協力プロジェクトの着手時は、MOE/OIPEEE (Office for the Improvement of Productivity and Economy of Electricity and Energy)であった。その後、MOE/RSEEO (Renewable development, Standard & Energy Efficiency Office)を経て、現在の組織(PEEEO)になっている。

[2] SATBA は、2017 年 1 月 1 日に組織改変により、イラン再生可能エネルギー機構(SUNA)とイラン省エネルギー機構(SABA)が合併して発足した機関である。

1.3.2 合同調整員会（Joint Coordinating Committee）の設置

本プロジェクトを実施するにあたり、多くの組織が省エネルギー推進に係ることから、MOE/ PEEEOの総局長を議長とする合同調整員会（以下、「JCC」）を図1.2のとおり設置した。[3]



出典: JICA 専門家チームにより作成

図 1.2 合同調整委員会(JCC)の構成

[3] Plan and Budget Organization (PBO)は、企画をつかさどる機関である。技術協力プロジェクトの当初はPresidential Deputy of Strategic Planning and Supervision (SPAC)であり、その後の組織改変で、Management and Planning Organization (MPO)を経て 2018 年 10 月時点では PBO となっている。

第 2 章 活動内容

2.1 活動概要

2.1.1 業務実施フロー

業務フローチャートは添付資料2のとおり。活動は、2フェーズに分けられ、第1フェーズの成果を確認しながら、第2フェーズへ移行した。

第1次契約期間（第1フェーズ）：2014年1月～2016年2月

第2次契約期間（第2フェーズ）：2016年4月～2018年12月

【成果3】に係る作業のうち、【S3-2】「ESCO事業者による政府系ビルのエネルギー診断」までが第1次契約期間内、【S3-3】「パイロット事業の計画策定の支援」から第2次契約期間で実施された活動である。

2.1.2 期待される成果

本プロジェクトの実施により期待される成果とその効果を得るための主な作業について表2.1に整理した。

表2.1 期待される成果と成果を達成するための主な作業

期待される成果	主な作業	
【成果 1】イランでの ESCO 事業の推進のための体制の整備	【S1-1】ESCO 事業の推進のための課題整理、施策検討	第1次契約期間
	【S1-2】ESCO 協会のための規則、ガイドライン整備のための技術支援	
	【S1-3】ESCO 事業の推進のための ESCO 協会の体制整備支援	
【成果 2】政府系ビルへの ESCO 導入に係る、エネルギー省/ESCO 協会の能力の強化	【S2-1】ESCO 導入に係る施策、マニュアルの検討および整備のための技術支援	
	【S2-2】ESCO 契約雛形等の整備のための技術支援	
	【S2-3】普及啓発・研修・能力の育成	
【成果 3】政府系ビルへの ESCO 導入に係る、検討・促進	【S3-1】政府系ビルのエネルギー診断対象サイト選定	
	【S3-2】ESCO 事業者による政府系ビルのエネルギー診断	
	【S3-3】パイロット事業の計画策定の支援	第2次契約期間
	【S3-4】ESCO 事業者の能力強化（ESCO 事業提案）	
	【S3-5】パイロット事業の実施	
	【S3-6】政府系ビルへの ESCO 導入に係る検討	
	【S3-7】パイロット事業のモニタリング（計測・検証）	
【成果 4】ESCO 導入に係る政策提言	【S4-1】ESCO 導入に係る課題整理	
	【S4-2】ESCO 事業（モニタリング等）に係る課題整理	
	【S4-3】ESCO 導入に係る政策提言	

出典: JICA 専門家チームにより作成

2.1.3 工程

本プロジェクト全体の工程は、図2.1に示す通りである。

- 第1次現地調査：2014年1月24日～2014年1月30日
- 第2次現地調査：2014年4月4日～2014年5月1日
- 第3次現地調査：2014年9月12日～2014年10月2日
- 第4次現地調査：2015年2月7日～2015年3月8日
- 第5次現地調査：2015年10月29日～2015年11月27日
- 第6次現地調査：2016年5月13日～2016年6月17日
- 第7次現地調査：2016年10月28日～2016年11月26日
- 第8次現地調査：2017年12月1日～2017年12月15日
- 第9次現地調査：2018年1月12日～2018年2月9日
- 第10次現地調査：2018年6月19日～2018年7月13日

なお、以下の要因により、パイロット事業の実施が遅れたことで、第2次契約期間の開始時に想定された工程から7ヶ月進捗が遅れることとなった。

- パフォーマンス保証を中心とするESCO事業独特のサービス内容と、「イ」国政府組織の調達・契約方式とのすり合わせに時間を要したこと。
- 契約担当部署を含むビル側の人事交代が頻繁に発生し、協議を繰り返す必要になったこと。
- ファンドによるESCO事業者への融資の審査に時間を要したこと。

2.1.4 PDM

本プロジェクトのPDM (Project Design Matrix)は添付資料1のとおりである。

PDMはプロジェクト実施期間中に3度変更され、最終版は第5回JCCにて承認された。

主な変更点は以下のとおりである。

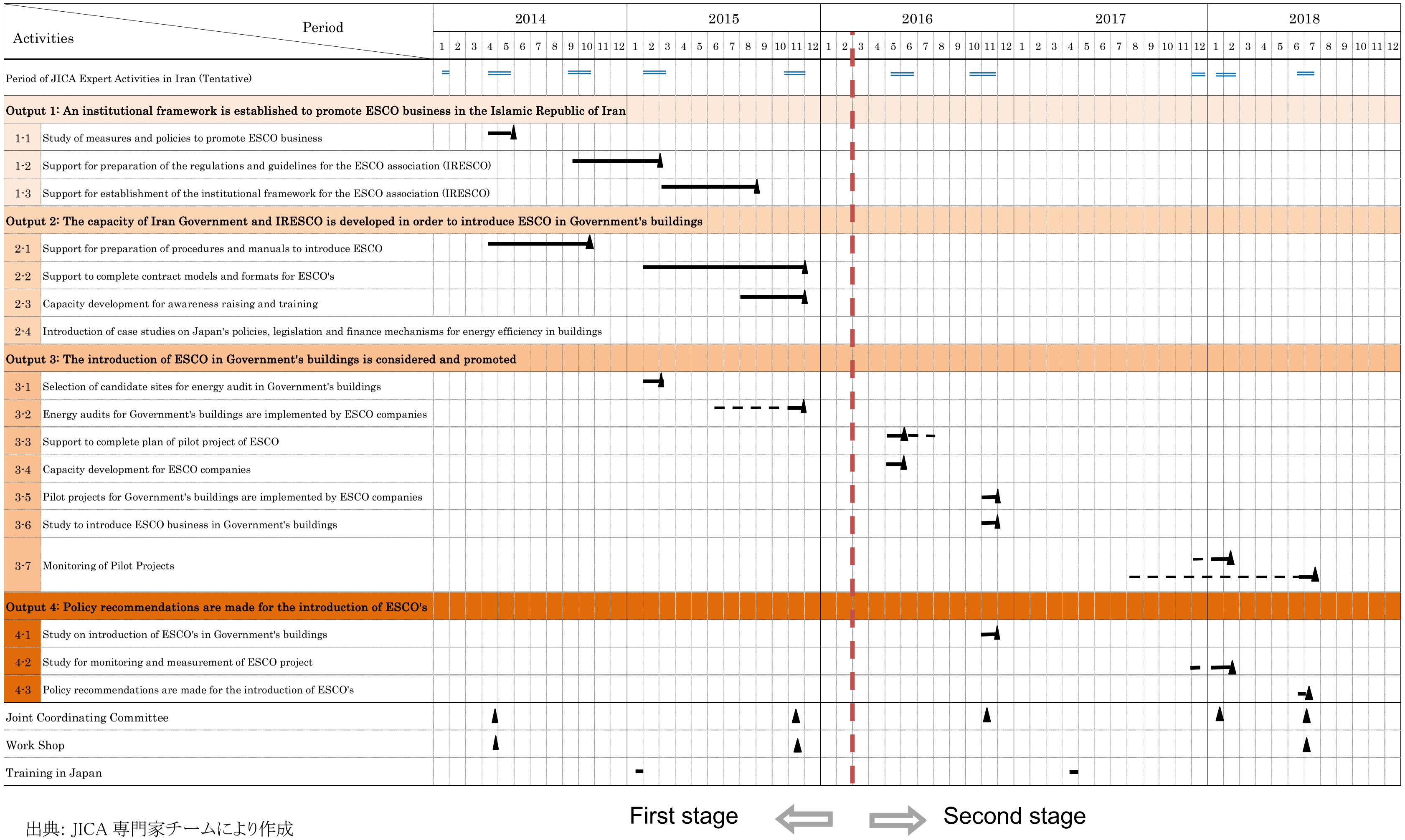
PDM1：パイロット事業の遅れの影響による全体工程延長

PDM2：指標を質的、量的に明確化し、評価時点の実態を反映

PDM3：上位目標の評価指標を修正

Plan of Operation Rev.3

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic Republic of Iran



出典: JICA 専門家チームにより作成

図 2.1　本プロジェクトの全体工程

2.2 成果 1:イランでの ESCO 事業推進のための体制の整備

2.2.1 ESCO事業推進のため課題整理、施策検討

「イ」国のESCO事業推進における課題についてSATBA及びIRESCOの主要会員からヒアリングし、ESCO事業推進のための現状の課題を整理し、課題に対する対応策について提案した。

表2.2 ESCO事業推進のための課題と対応策

立場	課題	対応策
ESCO事業者	金利が高いために、建設費を ESCO 事業者側が準備して複数年で投資回収する枠組みで ESCO を実施するのは困難。	パイロット事業ではビルオーナー(政府)が資金を準備する方式とする。 金利を補てんする仕組みについて、検討を促す。
ESCO事業者	エネルギー価格が安いために、エネルギー費用の削減を原資として投資費用を回収するのが困難。	現在のエネルギー価格は政府からの補助金により安い価格で消費者に販売されている。補助金を控除したエネルギー価格の採用を検討させる。
ESCO事業者	計測や検証は、機材が少なく、コストもかかる。	パイロット事業を通して、計測、検証の省力化を検討する。
SATBA	ESCO 事業を実施するための手順が分からない。	マニュアルの作成にて対応する
SATBA	省エネ診断をコンサル業務で実施してきたため、ESCO の検討ために無償で検討する風土がない	ESCO の検討の省力化について理解を促す。

出典: JICA 専門家チームにより作成

2.2.2 ESCO協会のための規則、ガイドライン整備のための技術支援

成果1に対する最も重要な活動は、ESCO協会のための体制、規則、ガイドライン整備支援であるが、IRESCOは民間団体という位置づけであることから、IRESCOに対しては、直接的な支援ではなく、MOEおよびSATBAを介した限定的な支援となる。JICA専門家チームは、限られた現地作業期間内で、必要かつ最大限の情報提供を行い、IRESCOはJICA専門家チームからの支援を受けながら、自ら規則、ガイドラインを整備する方針とした。

JICA専門家チームは、渡航の度にIRESCOの理事メンバーと意見交換を行い、日本におけるJAESCOの活動内容の紹介、JAESCOの規則やガイドラインについて説明した。

2.2.3 ESCO事業推進のためのESCO協会の体制整備支援

エネルギーサービス関連企業として「イ」国内で認識されているのが150事業者程度で

あるのに対し、IRESCOの会員は20企業足らずであり、会員数が少ないことが深刻な問題である。IRESCOに加盟していなくてもエネルギーサービス企業として活動可能であり、会費制であることから、IRESCOへの加盟による明確なメリットを提供できなければ、会員が増えないと思われる。しかし、十分な会員数が無ければ、行政としても業界を代表する組織と認識して協力関係を築くことにならない。

IRESCOは、2012年6月に設立され、MOE及びMOPが公認し、SPAC（現在のPBOにあたる組織）の下部に位置づけらけられていたが、財政面他でほとんど政府からの援助がなく純粋な民間団体として活動している。日本におけるJAESCOが、経済産業省の資源エネルギー庁と密接な関係をもち、財団法人省エネルギーセンターの区画の一部を使用するなどの優遇を受け、ESCO事業において活用しやすい省エネルギー改修補助金が設定されていたのと対照的である。

本プロジェクトで、協議・確認したIRESCOの活動内容と進捗を表2.3に示す。IRESCOは、ガイドラインその他の作成について着手している。また、政府機関との協調関係の重要性について理解し、活動内容に盛り込まれているが実際の活動には至っていない。

今後の課題として、IRESCOが十分な能力と体制を有するまで、政府機関との協力体制の構築が重要であると思われる。

表2.3 IRESCOの活動内容と進捗

大項目	中項目	小項目	進捗	担当者
1- 組織的メカニズムの確立	1-1 IRESCO の社会的役割の推進	1-1-1 協会の活動のための定款、資金計画、ガイドラインの制定	100%	Mr. Khosrow Shahi
		1-1-2 上記以外の文書の作成	100%	Mr. Kenari
		1-1-3 協会の役割を明示し、顧客に透明性のあるサービスを提供するための組織構築	100%	Mr. Najafi
		1-1-4 協会のホームページの作成	100%	Mr. Kenari
	1-2 協会の収入源の多様化	1-2-1 会員開拓　(会員を増やすための継続募集、広報活動、エネルギー分野で活躍している企業への入会勧誘など)	新規で 20 会員以上の入会	Mr. Safari 他の会員
		1-2-2 エネルギーサービス分野における国内及び国際会議での収入	最低 1 回の会議の開催	Mr. Najafi
	1-3 国内及び国際でのエネルギーサービス分野	1-3-1 協会の情報公開規定に基づく情報システムの確立、運用	100%	Mr. Khosrow Shahi
		1-3-2　エネルギーサービス事業の事例のデータベースの作成	100%	Mr. Kenari 他の会員
		1-3-3 会議やセミナーへの参加と開催	最低 2 回のセミナーの開催	理事会構成員
		1-3-4 展示会への積極的な参加	最低 2 回	理事会構成員
		1-3-5 季節ごとに講義を開催	最低 3 回	
		1-3-6 専門雑誌への投稿		Mr. Safari 他の会員
		1-3-7 国内でのエネルギーサービス分野で業界を代表する組織として、イラン規格機関と覚書の締結	100%	Mr. Mircham
		1-3-8 国内でのエネルギーサービス分野で業界を代表する組織として、イラン職業訓練機関と覚書の締結	100%	Mr. Kenari
		1-3-9 エネルギーサービス企業の識別やランキング、資格等の協力と援助	申請済	事務局
2- 政府機関や公的機関、政策決定機関との協力体制の構築	2-1 政府機関や政策決定機関との協力体制の構築	2-1-1 エネルギーサービス交渉や会議で民間部門の代表として発言	各イベント	理事会
		2-1-2 エネルギー管理とエネルギーサービスの分野での政府機関の意思決定への助言の提供	要請がある場合	理事会
		2-1-3 政府機関や公的機関、政策決定機関との協力体制の構築	要請がある場合	理事会
		2-1-4 エネルギー省及び SATBA とその傘下組織に緊密に計画策定	交渉に基づき	組織が判断
		2-1-5 石油省及び IFCO とその傘下組織に緊密に計画策定	交渉に基づき	組織が判断
		2-1-6 国会及び国会研究センターとの協力		組織が判断
		2-1-7 副大統領の戦略的計画とモニタリングとの協業		組織が判断
	2-2 他の組織との協力体制の構築	2-2-1 環境庁との協業		組織が判断
		2-2-2 自治体との情報共有や協力		組織が判断
		2-2-3 必要に応じて他の組織との協力		組織が判断
3- ESCO 市場の活性化、会員の能力強化	3-1 エネルギーサービス市場の開発	3-1-1 ビジネス環境を理解し、エネルギーサービスの開発を支援	産業/建築のいずれか 1 種	Mr. Shams, Mr. Bataie, Mr. Rezaie
		3-1-2 新しい機器や新しいツール、技術	10 程度のツールを協会ホームページに公開	Mr. Bataie
		3-1-3 個人の顧客及び政府当局にサービス提供するための優良 ESCO 事業者の紹介		理事会
	3-2 会員の能力強化	3-2-1 会員の権利と企業の利益の補助		理事会
		3-2-2 会議を通じて、専門的な知識や専門能力の開発		理事会
		3-2-3 プロジェクト、活動、技術についての情報提供		Mr. Kenari 他の会員
	3-3 会員間での連携の確立	3-3-1 専門委員会を結成し、協力のための下地を整える。	ワーキンググループの結成	

出典: IRESCO から受領資料(ペルシャ語)を翻訳

2.3 成果 2:政府系ビルへの ESCO 導入に係る、エネルギー省/ESCO 協会の能力強化

2.3.1 ESCO事業導入に係る施策、マニュアルの検討及び整備のための技術支援

政府機関がESCO事業を導入する際のガイドラインとなるESCO導入マニュアル(以下、「マニュアル」)の作成のための技術支援をした。

我が国のESCO推進協議会や地方自治体が作成しているマニュアルを参考とし、「イ」国側での導入手順、手続きを踏まえ、「イ」国側で主体的にマニュアルを作成した。

マニュアルの構成は表2.4の通り。

作成されたマニュアル(参考英訳)を技術協力成果品1に添付した。今後、パイロット事業の実施を通じて改訂され、ESCO事業の普及、啓蒙のために活用されることを期待する。

表2.4 ESCO導入マニュアルの構成

Contents
Abstract
Contracts based on Energy Efficiency
Finance of Contracts based on Energy Efficiency
Types of Contract and Project Services
Performance-based Agreements (Performance)
Non-performance-based Agreements (Non-performance)
Consulting Services
Details of Contracts of Energy Service Companies
Measurement and Verification
ESCO Contracts Components
Activities and Executable Projects by ESCO
Standard Service Description for Activity of Energy Service Companies
Standard Service Description for Activity of Energy Optimization Consulting Engineers Companies
Legal Provisions concerning Energy Service Companies

出典:「イ」国側で作成したマニュアル(ペルシャ語版)をもとに JICA 専門家チームにより参考英訳を作成

2.3.2 ESCO契約雛型等の整備のための技術支援

日本のESCO契約の事例をもとに事業リスクの分担方法などを紹介し、ESCO契約に規定する基本条項を整理した。一方、「イ」国で既に作成されていた2種類のESCO契約書の内容

を確認、日本のESCO標準契約書との相違点など指摘し、SATBAおよびIRESCOとESCO契約雛型の作成に向けて協議した。

本プロジェクトでは、日本のESCO標準契約書を参考とし、IRESCOが作成したESCO契約を改定(以下、ESCO雛型契約書)した。

ESCO雛型契約書の構成は表2.5の通り。パイロット事業の契約書として使用したが、今後「イ」国の事業環境等に適合させるため改定されるべきである。

作成されたESCO雛型契約書(参考英訳)を技術協力成果品2に添付した。

表2.5　ESCO雛形契約書の構成

Contents
Article 1: Object of Contract
Article 2: Contract Duration
Article 3: Value of Contract
Article 4: Employer and Contractor's Obligations
Article 5: No Assignment
Article 6: Guarantee
Article 7: Evaluating the amount of savings, surveying and certifying
Article 8: Maintenance
Article 9: Contract changes
Article 10: Insurance
Article 11: Training
Article 12: Suspension of the contract
Article 13: Termination of the contract
Article 14: Natural and unexpected events (Force majeure)
Article 15: Regulations governing the contract and disputes conciliation
Article 16: Notices

出典:「イ」国側で作成した ESCO 雛型契約書（ペルシャ語版）をもとに JICA 専門家チームにより参考英訳を作成

2.3.3　普及啓発・研修・能力の育成

本プロジェクトでは、ESCO事業者の能力育成およびESCO事業の普及啓発を目的に3回のワークショップを開催した。ワークショップの詳細は2.8節に後述のとおりである。第1回目のワークショップでは、日本のESCOの歴史や成功事例について紹介し、ビルの省エ

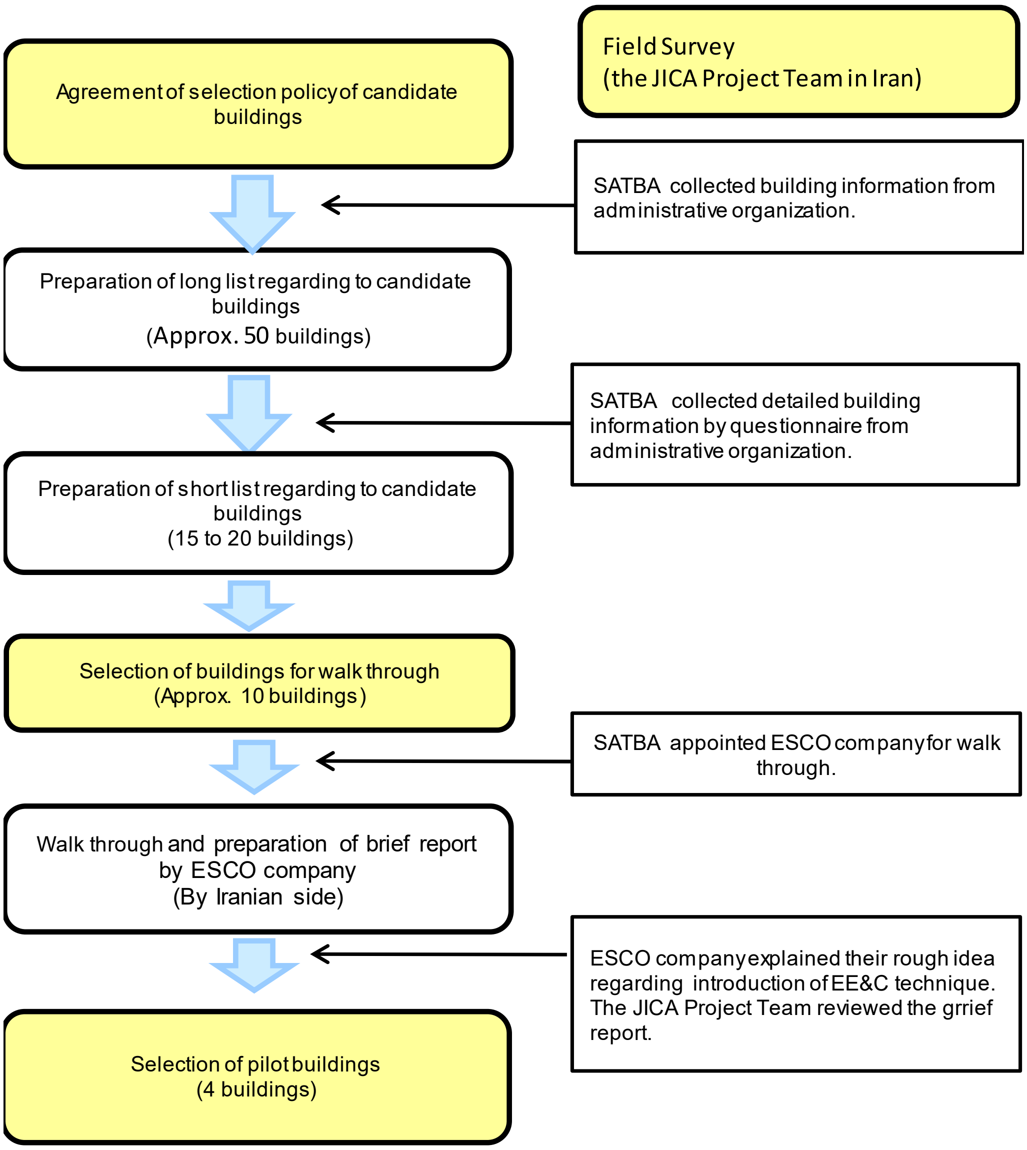
ネ推進をする上でのESCO事業の有用性について理解を得た。第2回目のワークショップでは、日本で提案されている新たなESCOの枠組みや金融枠組みについて紹介し、事業環境に応じてESCO事業のやり方を変更していくことの必要性について認識させた。第3回目のワークショップでは、パイロット事業で得られた知見、省エネ効果等について発表し、今後のESCO事業実施の課題に対する対応策を紹介した。

上記ワークショップ以外に、SATBAが本プロジェクトで作成されたESCO雛型契約書及びESCO事業導入マニュアルを使ってESCO事業者の能力向上の説明会を開催した。

2.4　成果 3:政府系ビルへの ESCO 導入に係る、検討・促進

2.4.1　政府系ビルのエネルギー診断対象サイト選定

ESCOパイロット事業は、第1フェーズで実施候補4施設を選定し、第2フェーズで2施設に対してパイロット事業を実施した。実施候補施設選定に至るまでの業務フローは図2.2の通りである。



出典: JICA 専門家チームにより作成

図 2.2　実施候補施設選定に至るまでの業務フロー

2.4.2 ESCO事業者による政府系ビルのエネルギー診断

第5次現地調査において、「イ」国側から提示された候補9施設のエネルギー調査結果に基づいて、7施設の現地視察を実施、かつ、エネルギー調査を行ったESCO事業者と協議し、ESCO事業の可能性について評価した。表2.6の通り、最終的には4施設を実施候補施設として「イ」国側に推奨した。

エネルギー調査で提案された省エネ手法と投資金額、既存のエネルギーデータの収集状況と計測検証のために今後必要とされるデータ、今後想定される課題などの観点から評価し、MOEおよびSATBAに説明した。

表2.6 候補施設選定のため現地視察した施設とその評価

現地視察施設	エネルギー調査実施ESCO事業者	ESCO事業の可能性	評価
経済財務省ビル	ASIA WATT	可能性あり	候補施設として推奨
テヘラン科学技術大学	Farayand Toseah Pooya	可能性あり	候補施設として推奨
MoE所有ビル	Isfahan Saman Energy	困難	推奨しない
テヘラン市第2地区区役所	Saman Energy Nafis	困難	推奨しない
テヘラン市第9地区区役所	Saman Energy Nafis	困難	推奨しない
テヘラン獣医大学	Terakit Omron Parsian	可能性あり	候補施設として推奨
テヘラン配電会社ビル	Pishrun Energy	可能性あり	候補施設として推奨

出典: JICA 専門家チームにより作成

上述の4施設のうちテヘラン配電会社と経済財務省ビルの2施設がパイロット事業実施施設として選定された。この2施設が選定された理由は、ビルオーナー側とESCO事業者側の両面から判断した。判断要因は以下の通りである。

- ESCO事業者が積極的な協力姿勢を示していたこと
- ESCO事業者がIRESCOの主要なメンバー(理事)でありESCO事業についてのリスク等を十分理解していること

・ ESCO計画書を作成し自らの責任で遂行する意思を示していたこと

・ テヘラン配電会社はMOEの傘下でありパイロット事業への協力が期待できること

・ 経済財務省は第1回本邦研修に参加しており、ESCO事業についての理解があり、かつ協力が期待できること

2.4.3 ESCOパイロット事業の計画策定の支援

JICA専門家チームは、上記に掲げたESCO導入可能性のある2ビルに対して、ESCO事業者がESCO計画を策定するにあたり、日本の事例、経験を踏まえ以下の点について、ESCO事業者と十分協議し、提案書の作成を支援した。

・ ベースラインと省エネ量算定の考え方

・ 省エネ手法の選定

・ 詳細診断の実施方法

・ 計測検証手法

ESCO事業者が作成したESCO提案書の概要は表2.7に示す通りである。

表2.7 ESCO提案の概要

施設名		経済財務省ビル	テヘラン配電会社ビル
削減額エネルギー量	電気（kWh）	750,000	176,000
	天然ガス（㎥）	10,000	49,170
削減額合計（百万 IRR）		1,653	362
投資費用（百万 IRR）		5,850	1,072
ESCOサービス期間（月）		43	67

出典: JICA 専門家チームにより作成

2.4.4 ESCO事業者の能力強化

JICA専門家チームは、アジアワット社(ASIA WATT)とピシュランエナジー社(Pishrun Energy)に対して契約の締結に至るまでの合意形成並びに書類作成について協力した。

(1) 契約書

ESCO契約書については、2.3.2で作成したESCO雛型契約書を採用することとし、ESCO事業におけるリスク分担について日本の事例を説明した。

結果として、経済財務省ビルのESCO事業ではESCO雛型契約書に基づいて契約が締結されたが、テヘラン配電会社ビルのESCO事業では、ビル関係者がESCO事業を十分に理解することが出来なかったため、ESCO雛型契約書を採用せず、既往のコンサル契約書に基づいて契約締結された。

(2) 契約交渉

当初は、施設選定後、詳細診断を実施して、3ヶ月程度で契約することを目論んでいたが、実際には選定されてから契約までに1年以上の期間を要した。

1) SATBA 同席による契約交渉

「イ」国で初めてのシェアード型ESCOであることから、SATBAがESCO事業者と共に、経済財務省担当者にESCO事業の概要やパイロット事業の意義、IRESCO雛型契約書の作成の経緯などについて説明するなどの契約交渉を行った。しかし、テヘラン配電会社ESCOでは、契約交渉時にSATBAによる支援が得られず、契約まで相当な時間を要することになった。

2) ESCO事業の認知度不足

ESCO事業自体が、認知されておらず、ビルオーナーにほとんど理解されていなかった。政府職員は、パイロット事業であっても、通常の契約手続きと同様に処理する認識であったために、入札に拠らない事業者選定や成果に応じて対価が支払われる契約などについて強い抵抗があった。

(3) 計測検証

JICA専門家チームは、アメリカでは計測検証をビルオーナーとESCO事業者以外の第3者が実施することが多いが、日本では計測検証をESCO事業者自らが行っていることについて説明した。第3者が計測検証をする場合には、客観的な分析結果が得られる反面、プロジェクトの詳細を理解しない分析や計測検証費用が嵩むリスクがあることを説明した。ただし、商習慣に関わる部分であるので、「イ」国側に判断をゆだねた。

結果として、経済財務省ビルのESCO事業では標準契約書に基づいて第3者が計測検証をすることとなり、テヘラン配電会社ビルのESCO事業ではESCO事業者が自ら実施することとなった。

(4) 省エネ削減効果の評価

計測検証の計算手順として、IPMVP(International Performance Measurement and Verification Protocol)が多く採用されているが、JICA専門家チームは「イ」国ではこの手順に従って計算するために必要なデータを準備するために、多くの計測器を追加で設置する必要が生じる恐れが高いことを助言した。そのため、日本のESCO事業では、IPMVPを理想としつつも、ビルオーナーとの交渉、合意により、簡易の計測検証方法が採用されることが多いことについて共有した。

ビル全体のエネルギー量のみを請求書のデータにより管理する方法は、ESCO事業に関係ない機器の増設や稼働時間の変更などの外乱要因を排除できないのでリスクが高いことについて説明した。そのため、出来るだけ、ESCO事業で導入した機器に関係する系統でのエネルギー削減を個別に試算して積み上げるのが望ましいことを指摘した。結果として、経済財務省ビル、テヘラン配電会社ビルの両パイロット事業ではIPMVPを概ね参照する方式で省エネ計算をすることになった。

2.4.5　ESCO事業の実施

経済財務省ビルとテヘラン配電会社の2施設でESCO契約が締結され、ESCOのパイロット事業が実施された。

(1) 経済財務省ビルESCO

1) 経済財務省ビルの概要

経済財務省ビルは、経済財務省の本部であり、述床面積約80,000 m2の建物である。経済財務省ビルのESCOの対象とした熱源設備を写真2.1に示す。

出典: JICA 専門家チームにより作成

写真2.1　経済財務省ビルの既設設備

2) 経済財務省ビルESCOの概要

経済財務省ビルへ提案された省エネ手法を表2.8に、導入された省エネ設備を写真2.2に示す。

表 2.8 経済財務省ビルに提案された省エネ手法

省エネ手法	投資費用 (百万 IRR)	削減額 (百万IRR/年)	段階
省エネ調査、計測	550	0	第1次契約 (締結済)
PLCによる冷温水ポンプの台数制御システムの導入	1,200	826	
冷却水ポンプの制御システムの導入	800	197	
運用改善	780	212	
FCU温度制御システムの導入	900	165	第2次契約 (未締結)
LED照明の導入	1,500	253	
計測検証費	120	0	
合計	5,850	1,653	-

出典: JICA 専門家チームにより作成

出典: JICA 専門家チームにより作成

写真2.2 経済財務省ビルに導入された省エネルギー設備

経済財務省ビルESCOは、随意契約に対する金額制限のために、2契約に分けることになり、現在は1契約のみ締結され、もう1契約は交渉中である。

経済財務省ESCOでは、ESCO契約締結後に計測器を用いて詳細診断を実施し、省エネ量

算定の根拠とした。

3)　経済財務省ビルESCOの経緯

経済財務省ビルESCOの施設選定から、工事完了までの経緯は以下の通りである。

- 施設選定：2016年5月
- 提案書提出：2016年11月
- 契約締結：2017年4月
- 詳細診断（計測）：契約締結から約3ヶ月間
- 工事完了：2018年1月（一部を除き）

ESCOサービスは、2017年9月から開始されている。(運用改善による省エネ)

(2) テヘラン配電会社ビルESCO

1)　テヘラン配電会社ビルの概要

テヘラン配電会社ビルは、述床面積約6,400 m2の建物である。テヘラン配電会社は、MOE傘下の国有企業である。

テヘラン配電会社ビルのESCOの対象とした熱源設備を写真2.3に示す。

出典: JICA 専門家チームにより作成

写真2.3 テヘラン配電会社ビルの既設設備

2)　テヘラン配電会社ビルESCOの概要

テヘラン配電会社ビルへ提案された省エネ手法を表2.9に示す。

テヘラン配電会社ビルESCOでは、提案書の提出前のウォークスルー調査で、計測器を設置して詳細な情報を得ていたために、契約締結後の詳細診断を省略した。

表 2.9 テヘラン配電会社ビルに提案された省エネ手法

省エネ手法	投資費用（百万 IRR）	削減額（百万IRR/年）
詳細診断費・設計費	210	0
チラー用スマートコントローラーの導入	82	8
チラー用電磁膨張弁の導入	110	6
就業時間後のチラー運転停止	188	194
就業時間後のボイラースタンバイ	188	60
ボイラー用インテリジェント制御システムの導入	12	74
ファンコイル用ポンプのインバータ制御	65	11
冷却塔ファンのインバータ制御	65	9
監視制御システムの導入	90	0
計測検証費	62	0
合計	1,072	362

出典: JICA 専門家チームにより作成

3) テヘラン配電会社ビルESCOの経緯

テヘラン配電会社ビルESCOの施設選定から、工事完了までの経緯は以下の通りである。

- 施設選定：2016年5月
- 提案書提出：2016年11月
- 契約締結：2017年7月
- 工事完了：2017年7月
- ESCOサービス開始：2017年8月

(3) ファンドの活用

パイロット事業の実施資金（初期投資費用）については、R/Dでの合意に基づき、MOEの予算にて実施するギャランティード型ESCOを想定していた。

ギャランティード型 ESCOは、顧客側がESCOプロジェクトの改修等に必要な初期投資に改修費を準備する方式であり、シェアード型ESCOはESCO事業者側がESCOプロジェクトの

初期に改修等に必要な初期投資費改修費を準備する方式である。シェアード型ESCOの初期投資改修費は、プロジェクト期間にESCO事業者に支払われるESCOサービス費の中から回収される。そのため、シェアード型ESCOの方が、ESCO事業者の負うリスクが高く、初期投資改修費を回収するまで契約が継続するのでプロジェクト期間が長くなる傾向がある。

パイロット事業の実施検討段階では、SATBAは、予算法12条に基づいて、資金調達できると考えていた。予算法12条は、2015年4月に制定され、省エネルギーにかかるプロジェクトのために活用できる年間1,000億USD並びに500兆IRRの予算規模の資金の確保を制定した法令である。利子が優遇されることが期待でき、省エネルギー対策の導入効果を重油の原油国際単価に基づいて算定してよいという点で利点があった。

しかし、活用するためには、関係省庁からの承認が必要であり、その手続きが煩雑であることが予想されたことから、「イ」国側は別の資金源として、MOE傘下の研究機関であるNiro Research Institute (NRI)が40%拠出している「Power Energy Industry Research and Technology Fund」を活用することとなった。ファンドの規模は、980億IRRであり、「イ」国の電力エネルギー分野に資するベンチャー企業への出資、SPC (特別目的会社) の設立、企業への貸付(金利10%を想定)などを目的として設立された。8人の審査員(MOE、SATBA、配電会社等)により案件を審査し、事業計画とともに申請後、審査は、最低1ヶ月を要するとのことであった。また、金利についてはMOE管轄のパイロット事業という位置づけで、10%よりも低い、低金利での融資の協力を依頼した。

結局、審査には相当な時間を要し、金利も10%以上であり、ESCO事業者にとって特に魅力のある融資条件ではなかった。テヘラン配電会社のESCO事業者は、このファンドの活用をあきらめ、自己資金にてプロジェクトを実施することになった。

2.4.6 政府系ビルへのESCO導入に係る検討

JICA専門家チームは、ビルオーナー、ESCO事業者の両者から、それぞれの視点からパイロットESCOの実施を通じて明らかになった課題についてヒアリングした。

JICA専門家チームは、ヒアリングを通して、課題について彼らに認識を明確にさせた上で、その課題と提案を第3回ワークショップ(2018年7月3日開催)にて発表し、関係機関およびESCO事業者に共有された。特に、MOEとSATBA、PBOの役割が重要であることが明らかとなった。

JICA専門家チームは、課題と提案を受けて、MOEとSATBA並びにPBOが果たすべき役割、ESCO事業普及に向けた活動について提案した。日本側からの提言については、第5回JCC(2018年7月10日開催)において関係機関に共有された。

2.4.7 パイロットプロジェクトのモニタリング

JICA専門家チームは、省エネ効果の視覚化並びにESCO事業の運用期間中の課題の特定のためにパイロットプロジェクトのモニタリングをした。

JICA専門家チームは、ESCO事業の導入の有用性の確認と省エネ効果の視覚化のために、ESCO会社が作成した計測検証報告書を分析した。さらに、JICA専門家チームは、ビルオーナーとESCO事業者からの一連のヒアリングにより、ESCO契約期間中に発生する課題について特定した。明らかになった課題については、5章に記載した。

2.5 成果 4:ESCO 導入に係る政策提言

JICA専門家チームは、パイロット事業の実施を通して課題を実施の主体であるビルオーナーとESCO事業者に認識させ、ワークショップでの意見交換を通してその課題と課題に対する対応要望をイラン政府関係者に共有させた。課題を共有させたうえで、イラン政府としての対応を検討させ、JCCの場で議論させた。

2.5.1 ESCO導入に係る課題整理

JICA専門家チームは、パイロット事業の開始前には、SATBA並びにESCO会社からのヒアリングを通して、以下の課題を想定していた。

・ ESCO事業者の事前評価制度

・ 既存の入札制度(ESCO会社の選定方法)

ただし、JICA専門家はパイロット事業ではこれらの解決を整備してから実施するのではなく、パイロット事業を特例措置として、これらの課題については将来的に対応することを提言していた。

しかし、パイロット事業を実際に実施したところ、上記のほかに以下の課題が出てきたため、パイロット事業の実施は大幅に遅れた。

・ 契約書の承認

・ ビルのオーナー並びに資金提供者の理解不足

・ 定期的な人事異動

・ 資金提供の審査の遅れ

これらの4課題については、パイロット事業の実施によって身をもって経験することで明らかになった。また、JICA専門家チームは、ESCO会社並びにビルオーナーの双方からヒアリングをし、問題点を浮き彫りにしたうえで、ワークショップでその知見と解決のための提案を共有するように依頼した。

2.5.2 ESCO事業(モニタリング等)に係る課題整理

ESCO事業は、契約期間が完了するまで、事業の前提条件の変化(運営時間の変更など)やそれに伴って当初に予定していた効果が未達になるなどのリスクがある。そのため、JICA専門家チームは、ESCO事業の実施中に発生する課題について、モニタリングした。

パイロット事業の実施によって、特に以下の課題が明らかになった。

・ 第三者による計測検証の必要性

・ ESCOサービス料の支払いがされない、遅延

JICA専門家チームは、ESCO会社並びにビルオーナーの双方からヒアリングをし、問題点を浮き彫りにしたうえで、ワークショップでその知見と解決のための提案を共有するように依頼した。

2.5.3 ESCO事業の導入を進めるための政策提言

上述の活動のまとめとして、JICA専門家チームはESCO事業の導入を進めるための政策提言を作成した。作成された提言は、第3回ワークショップ並びに第5回JCCを通して、関係者に共有された。

政策提言の詳細は、5章に記載した。

2.6 本邦研修

2.6.1 第1回本邦研修

「イ」国政府関係者を対象にESCO事業に係る政策および金融支援策について日本の事例を学ぶことを目的として、2015年1月19日～2015年1月24日に、第1回本邦研修を実施した。

参加者リストを表2.10、研修工程を表2.11に示す。今後、連携を取りながらESCO事業促進の枠組みを構築する展開するために、研修参加者は省エネルギーに係る関係省庁の管理職位者とした。パイロット事業実施段階における、JICA専門家チームから提言する予定の政策上の改善点の提案を受け入れる素地が整った。

表2.10 第1回本邦研修参加者の名前と所属、職位

S/N	名前	職位	所属
1	Mr. Effatnejad Reza	Deputy of General Director	MOE
2	Mr. Akbari Hamid	Master expert of energy efficiency in demand sector (Building and industry)	MOE
3	Ms. Bigdeli Somayeh	Expert	MOE
4	Mr. Akbarisayar Mohammad	Manager	SATBA
5	Mr. Sadeghi Nourbakhsh	Manager	SATBA
6	Ms. Paknejad Soodabeh	Councilor of Distributed Coordination Deputy in D.S.M	Tavanir (政府系電力会社)
7	Mr. Peyman Karimifard	Manager of Power System Analysis	Tavanir
8	Mr. Assadianahmadabad Ehesan	Expert	PBO
9	Mr. Mahmoud Hafezian	General Manager	MEAF (経済財務省)

出典: JICA 専門家チームにより作成

表2.11 研修工程

日付	時間	内容	組織
2015 年 1 月 19 日	10:00～11:30	規定ブリーフィング	
	11:30～12:30	プログラムオリエンテーション	JICA, 日本工営株式会社
	14:00～17:00	本邦 ESCO 事業者（JAESCO）との対話	JAESCO 国際協力委員会
2015 年 1 月 20 日	9:00～12:00	本邦金融機関との対話（JAESCO の加盟者）	三菱 UFJ リース株式会社
	14:00～17:00	国土交通省の省エネに係る政策、助成金等	国土交通省 住宅局 住宅生産課
2015 年 1 月 21 日	9:00～12:00	日本の省エネルギーセンターが ESCO 推進において果たした役割、イラン側との意見交換	一般財団法人 省エネルギーセンター 国際協力本部 国際人材育成センター
	14:00～17:00	環境省の温室効果ガス削減に係る政策、助成金等	環境省、地球環境局
2015 年 1 月 22 日	10:00～12:00	本邦 ESCO 事業の見学	横浜市立大学付属病院 ESCO
	14:00～17:00	東京都の省エネに係る政策、省エネ設備導入の補助金に関する対話等	東京都環境局
2015 年 1 月 23 日	9:30～11:30	評価会、修了式	JICA, 日本工営株式会社

出典: JICA 専門家チームにより作成

本邦ESCO事業者（JAESCO）との対話では、日本のESCOの黎明期から活動している2社、JFS及び日立製作所から、ESCO事例や導入を進めている新しいESCOスキーム、ESP(Energy Service Provider)などの事例について紹介があった。シェアード型ESCOにおいて、日本ではリース方式が主流であることの理由や、リース料率等についての質疑があった。

本邦金融機関との対話では、日本では省エネ投資の10%程度がリース案件であり積極的に活用されているが、歴史的な経緯やリースの重要性について示された。

本邦ESCO事業の見学では、事業の概要説明、施主である市立病院側から事業の留意点やメリットの説明があり、その後、実際の導入設備の見学をした。

国土交通省、環境省、東京都との対話では、各省庁の観点から準備された省エネルギー及び二酸化炭素削減のための政策、その背景、期待される効果、政策を推進するための補助制度などが紹介された。

研修期間は短かったものの以下の理由により、概ね研修の目的は達せられたものと評価できる。

a) 本邦の ESCO 事業の実務に精通した ESCO 事業者から、経験及び助言を得られたこと。

b) 金融の枠組みの準備の重要性について理解が促進されたこと。

c) 政策による先導の重要性の理解が促進されたこと。

第1回本邦研修前に自己評価が実施されており、理解度3が2名、理解度2が4名、評価なしが3名でった。しかし、本邦研修後、理解度5、4、3としたのはそれぞれ、2名、4名、1名に向上した。(評価5が最も高い評価であり、参加者が十分かつ深く理解したことがわかる)。特に、リースをはじめとした金融枠組みの重要性について、認識が深まった。研修員9名中4名が研修期間をやや短い、1名が短いと回答していた。

2.6.2 第2回本邦研修

「イ」国政府関係者および、ESCO事業者を対象にESCO事業の実施事例を通して、計測・検証方,4,5法、パフォーマンス保証、および省エネルギー技術について日本の事例を学ぶことを目的として、2017年4月15日～2017年4月27日に、第2回本邦研修を実施した。

参加者リストを表2.12、研修工程を表2.13に示す。ESCO事業の省エネルギーに係る関係省庁のマネージャークラスとESCO事業者が参加し、ESCO事業契約期間における計測・検証方法と日本の省エネルギー技術への理解により、今後のESCO事業の普及促進が期待できる。

表2.12 第2回本邦研修参加者の名前と所属、職位

S/N	Name	Job title	Organization
1	Mr. Mohammad Shafiezadeh	General Director	MOE
2	Mr. Rahim Azimi	Deputy of General Manager	MEAF
3	Mr. Alireza Abdollah Shirazi	Manager of ESCO Project	MOE
4	Mr. Mojtaba Gorbani	Expert of Economic Evaluation of Projects	MOE
5	Mr. Mohammad Khezeli	Expert of Projects	MOE
6	Mr. Saeed Amani	Office Manager of Energy Conservation in Building Department	SATBA
7	Mr. Amir Doudabinezhad	Deputy of Education and Energy Consumption Optimization	SATBA
8	Mr. Ehsan Assadian Ahmadabad	Expert of International Affairs	PBO
9	Ms. Maryam Namjoobaghini	Manager	Teheran Power Distribution Company
10	Mr. Tooraj Bathaie	Managing Director	Pishrun Energy Co.
11	Mr. Alimohmmad Mirshams	Managing Director	ASIA WATT Eng. Co.

出典: JICA 専門家チームにより作成

表2.13 研修工程

日付	時間	内容	組織
2017 年 4 月 17 日	10:00～12:30	規定ブリーフィング	JICA
	14:00～16:00	計測･検証方法の講義	日本工営株式会社
2017 年 4 月 18 日	9:00～11:00	JAESCO との対話	JAESCO
	13:00～16:30	現地見学 (計測･検証方法)	アズビル株式会社
2017 年 4 月 19 日	9:30～12:00	JASE-W との対話	JASE-W 旭硝子株式会社 川崎重工株式会社 新日鉄住金エンジニアリング株式会社
	14:00～15:30	経済産業省との対話	経済産業省資源エネルギー庁 省エネルギー･新エネルギー部 国際室
2017 年 4 月 20 日		大阪へ移動	
	14:00～16:00	大阪府との対話	大阪府住宅まちづくり部　公共建築室　設備課
2017 年 4 月 21 日	10:00～12:30	工場見学	ダイキン工業株式会社
	14:30～16:00	施設見学	大阪府立中央図書館
2017 年 4 月 24 日	9:30～11:30	京橋環境ステーション	高砂熱学工業株式会社
	14:00～16:00	ファイナンスに関する講義	三菱 UFJ リース株式会社
2017 年 4 月 25 日	9:20～11:00	現地見学(計測･検証方法)	東京ガスエンジニアリングソリューションズ株式会社
	13:30～15:00	評価会、終了式	JICA、日本工営株式会社

出典: JICA 専門家チームにより作成

出典: JICA 専門家チームにより作成

写真2.4 第2回本邦研修

計測・検証方法の講義では、ESCO事業と一般的な工事の違いは役務調達であること、省エネ量が保証されることであり、顧客とESCO事業者が共同で省エネを行うことが重要であることが示された。

計測・検証については、導入する省エネルギー手法により最適な方法を選定し、手間をかけないで実施することが重要であることが示された。

JAESCOとの対話では、省エネルギーを進めていく上でエネルギーマネジメントが重要であり、日本ではエネルギー政策によりエネルギーマネジメント支援サービスが提供されていることが示された。

JASE-Wとの対話では、JASE-Wの活動内容についての紹介、旭硝子より二重窓による省エネ方法の紹介、川崎重工業よりガスタービン、ガスエンジンコージェネレーションシステムの導入事例の紹介、新日鉄住金エンジニアリングよりオンサイトエネルギー供給事業の紹介があった。各社の導入事例、導入効果について活発な質疑が行われた。

経済産業省との対話では、日本におけるエネルギー消費傾向の推移とそれに対応する省エネルギー政策が示された。特に省エネ法の概要、トップランナー制度、補助金制度について、イ国側参加者から活発な質疑が行われた。

大阪府との対話では、ESCO事業の課題の整理や、導入実績、ESCO事業実施フロー等が紹介され、イ国側参加者からはESCO事業導入のきっかけや、ESCO事業者選定における総合評価方式についての質疑が行われた。

ファイナンスの講義では、イ国では電気や燃料に対して補助を行っているが、エネルギー効率のいい設備の導入に対して補助する方が効果的であること、特定の設備に特化したESCO事業を実施する方が、技術の蓄積が早く早期に事業が成り立つこと、ESCO事業における課題は資金であるため、国営のリース会社を設立することが、ESCO事業の拡大につながる事等が提案され、活発な質疑が行われた。

現地見学として、アズビル株式会社を訪問し、ESCO事業の事例の紹介、ベースラインの補正方法、省エネ保証が未達の場合のペナルティーの精算方法等、活発な質疑が行われた。

ダイキン工業を訪問し、「イ」国での空調設備の導入事例の紹介や、最新の空調設備、特にダイキン工業が開発したVRV（ビルマルチエアコン）について紹介された。

大阪府立中央図書館では、太陽光発電システム、照明のLED化、熱源システムの更新、空調用ポンプの運転制御について、実機を見学した。また、工事実施時の課題等についても紹介された。

京橋環境ステーションでは、本ビルの最先端の環境技術として、自然通風、外気冷房システムに関する紹介があり、実際の設備を見学しながら風の流れ等の説明が行われ、設備の運用方法や制御方法について活発な質疑が行われた。

三井記念病院では、エネルギーサービス契約の概要とコージェネレーション設備の効率的な運用方法が紹介された。また、実機を見学しながら、各設備の運転方法について活発な質疑が行われた。

研修実施後のアンケートでは、研修で得た日本の知識・経験は役に立つと思うかの問いについて、A評価が4名、B評価が2名、C評価が1名であり、研修は有効であったと考える。

2.7 合同調整委員会(JCC)への参加

本プロジェクトの実施に関係するステークホルダーを集めたJCCが計5回開催された。

2.7.1 第1回JCC

2014年4月16日に第1回JCCを開催した(Agendaおよび出席者名簿は添付資料6)。

Project DirectorであるMOE/ PEEEOのシャフィザデ局長からプロジェクト概要、JICAイラン事務所竹内所長からプロジェクト実施に至る経緯等の説明があり、JICA専門家チームからプロジェクトの目的、Work PlanおよびPDMについて説明し、本プロジェクト実施に係る各機関からの協力、参画を依頼した。

一方、「イ」国側各機関からは、省エネ活動およびESCO事業への取り組み状況について説明があり、「イ」国の省エネルギー政策における本プロジェクト位置付けを確認した。

Work PlanおよびPDMについてJCCにおいて合意形成された。

出典: JICA 専門家チームにより作成

写真2.5 第1回JCC

2.7.2 第2回JCC

第2回JCCが、2015年11月14日に開催された。(Agendaおよび出席者名簿は添付資料6)。

JICAイラン事務所佐藤所長からオープニングの挨拶、Project DirectorであるMOE/PEEEOのシャフィザデ局長からプロジェクト現状報告、SATBAのデュダビネジャド氏から第1次契約期間のプロジェクト成果の説明があった。専門家チームからESCO事業を推進する上での課題及び提案について説明した。

シャフィザデ局長から、特に、JICA専門家チームおよびESCO事業者のウォークスルー診断に基づきMOEとSATBAがパイロット事業の候補ビルの選定を進めていること、今後の事業の実施にあたって引き続きESCO事業者の助力を期待すること、MOEが責任機関として各省との調整をしていくことについて発言があった。IRESCOからは、パイロット事業に

対する協力をすること、ESCOに活用可能な低利子融資制度や補助金などの金融枠組みの構築が重要であることの発言があった。

また、PDM1 (PDM0の改訂案)、実施計画(PO :Plan of Operation)の改訂案が承認された。

2.7.3 第3回JCC

第3回JCCが、2016年11月8日に開催された。(Agendaおよび出席者名簿は添付資料6)。

Project DirectorであるMOE/PEEEOのシャフィザデ局長からプロジェクト現状報告、JICAイラン事務所佐藤所長からこれまでの協力に対するお礼と挨拶、SATBAのアクバリ氏からこれまでの活動内容を報告した。さらに、アクバリ氏から、2つのパイロット事業は、政府系ビルにおいてESCO事業が初めて実施されることから、施設側のESCO事業への理解、契約までの手続きなどに時間が掛かっているという説明があった。ESCO事業者からは、2つのパイロット事業の現状について説明があった。

ビル技術者協会のイスマイリ氏よりビル技術者協会の説明と省エネ分野での協力について発言があった。シャフィザデ局長より、今後のパイロット事業がスムーズに進む様、各関係者への協力をお願いするとの発言があった。

出典: JICA 専門家チームにより作成

写真2.6 第3回JCC

2.7.4 第4回JCC

第4回JCCが、2018年1月23日に開催された。(Agendaおよび出席者名簿は添付資料6)。

Project DirectorであるMOE/PEEEOのシャフィザデ局長からプロジェクト現状報告、JICAイラン事務所小林所長からこれまでの課題とさらなる協力の要請、ESCO事業者から2つのパイロット事業の現状と課題、MOEに対して積極的な介入を依頼する発言があった。

また、終了時評価チームから本プロジェクトの評価について説明があった。

MOE、JICAイラン事務所の2者により、MoM（添付資料6）を締結した。

出典：JICA 専門家チームにより作成

写真2.7　第4回JCC

2.7.5　　第5回JCC

第5回JCCが、2018年7月10日に開催された。(Agendaおよび出席者名簿は添付資料6)。

Project DirectorであるMOE/PEEEOのシャフィザデ局長から挨拶、JICAイラン事務所小林所長から今後のパイロット事業のフォローをMOEへ要請し、本プロジェクトにより「イ」国でのESCO事業の発展を期待する発言があった。

SATBAのアクバリ氏から2つのパイロット事業の進捗と達成状況、IRESCOのナジャフィ会長よりパイロット事業の課題と今後のパイロット事業のフォローの要請、ESCO事業者から2つのパイロット事業を通して、良かった点と課題について発言があった。

MOE/PEEEOのシラジ氏より、PDMの達成状況とESCO事業の推進に向けた提案、PBOのホセイニ氏よりESCO事業推進のためのPBOの役割について発言があった。

JICA専門家チームより2つのパイロット事業の課題の整理と日本での事例を踏まえた課題解決のための提案があった。

最後にシャフィザデ局長より、これまでのまとめと今後のESCO事業普及に向けて関係者への協力を依頼した。

出典：JICA 専門家チームにより作成

写真2.8　第5回JCC

2.8　ワークショップの開催

プロジェクト期間中に3回のワークショップを開催した。

2.8.1　第1回ワークショップ

表2.14の通り第1回ワークショップ開催した。（プレゼン資料は添付資料7）

出席者は75人。「イ」国側からは政府機関以外に民間のESCO事業者から63人参加、日本側は在イラン日本企業が6社参加した。

質疑応答では、活発な議論となり、ESCO事業への関心の高さ、および本プロジェクトへの期待の大きさが感じられた。本邦のESCO事業の成功事例における投資規模や資金の調達方法、ESCO事業者が投資をする方式で実施した場合のエネルギー削減費用の配分方法などが質問された。

表2.14　第1回ワークショップ

開催日	2014年4月22日
場所	SATBA施設内のプレゼンルーム
内容	a) History of ESCO (Energy Service COmpany) in Japan b) Supporting Program related ESCO and EE & C in Japan c) Introduction of Practice related ESCO in Japan
	

出典: JICA 専門家チームにより作成

2.8.2 第2回ワークショップ

表2.15の通り、第2回ワークショップを開催した。(プレゼン資料は添付資料7)

出席者は30人程度、日本の資金調達方法において金利やリース形式に関する質問があり、資金調達（高金利）が「イ」国のESCO事業推進の課題となっていることを改めて認識した。

表2.15 第2回ワークショップ

開催日	2015年11月23日
場所	SATBA施設内のプレゼンルーム
内容	a) Introduction of success practice and new ESCO scheme in Japan b) ESCO finance scheme in Japan
	

出典: JICA 専門家チームにより作成

2.8.3　第3回ワークショップ

表2.16の通り、第2回ワークショップを開催した。(プレゼン資料は添付資料7)

出席者は20人程度、パイロット事業を実施した2社のESCO事業者よりパイロット事業で得られた知見、パイロット事業の省エネ効果、「イ」国でESCO事業を実施するうえでの障害(バリア)について発表した。JICA専門家チームからは、パイロット事業を通じての課題、およびその課題に対する対応策の日本の事例を紹介した。

表2.16　第3回ワークショップ

開催日	2018年7月3日
場所	SATBA施設内のプレゼンルーム
内容	a) ESCO Project at Ministry of Economy Affairs and Finance Building b) A Review on Achievements and Challenges of ESCO Project In Building of Tehran Power Distribution Company c) Recommendation for Improvement of ESCO scheme in Iran (through finding on two pilot projects)
	

出典:JICA 専門家チームにより作成

第 3 章プロジェクト実施運営上の課題･工夫･教訓

3.1　運営上の課題

3.1.1 国内体制の閉鎖性

国内体制は、いまだ閉鎖的な部分もあり、カウンターパートからプロジェクト関係機関への連絡不足やカウンターパートから提供される情報が遅い(検閲)という問題がある。

また、JICA専門家チームがカウンターパート（MOE/PEEEO、SATBA）以外の機関と直接連絡、協議することを好ましく思っていないため、幅広な情報収集が困難である。

カウンターパートから提供される情報が検閲のため非常に時間がかかるうえ、資料のほとんどがペルシャ語であることから正確な情報を得るのに時間を要している。

3.1.2 ラマダン及びイランの新年

「イ」国は、イスラム圏であり、イスラム圏特有のラマダンおよびラマダン明け休暇があり、この時期は業務効率の低下が考えられる。また、「イ」国独自の暦(イラン暦)の新年にあたるノールーズ休暇(3月下旬)があり、この時期前後1ヶ月間の現地調査は避ける必要がある。

3.1.3 組織変更

2016年にMOEは、SABAをMOE傘下の別の組織、イラン再生可能エネルギー機構（以後、「SUNA」）と合併させる方針を決めた。新たな組織SATBAは、2017年1月1日付で最終的に設立が承認された。この組織変更が、本プロジェクトの後半の運営に大きな影響（進捗の遅れ）を与えた。

MOE内でも部局の再編は起きている。本プロジェクトのダイレクターとマネージャーが所属する、電気・エネルギー生産性経済性改善局は、電気・エネルギー計画経済局に再編された。さらに、JCCのメンバーである管理予算庁（以下、MPO）も、PBOに組織改編されている。

以上のような、C/P組織を含む、イラン側政府機関の組織改編、再編が本プロジェクトの実施プロセスの効率性を下げる要因となった。

3.2 工夫・教訓

3.2.1 現地アシスタントの活用

JICA専門家チームが現地にいない間のサポートとして、本業務に精通したアシスタントスタッフを雇用し、アシスタントスタッフを通じで進捗の確認や督促をした。

また、成果品の作成期限を早めに設定し、現地アシスタントを通して受領し、翻訳(受領する資料は通常ペルシャ語のため)することで対応した。

3.2.2 渡航時期の選定

1回の現地作業期間は2〜3週間であることからC/Pおよび実施機関等の関係機関との協議を最大限に出来る時期を選定する。現地渡航時期は、指示書に記載されている通り、イラン暦の新年にあたるノールーズの時期(3月下旬)を避けることに加え、イスラム圏特有のラマダンなどの宗教行事の時期を避けるよう計画した。

また、各要員の現地作業期間は、2〜3週間を限度とするが、派遣時期を少しずらすことにより、JICA専門家チームとして１ヶ月程度の現地作業期間を計画し、その期間に集中かつ効率的に作業を実施した。

3.2.3 MOEとの緊密な連携

SABAからSATBAへの組織改編に伴って、C/P機関の働きは目に見えて低下した。SATBAへの組織改変後の2017年12月の現地調査では、JICA専門家チームがC/PであるSATBAへの連絡、協議を申し入れたにも係らず、SATBAの担当職員は協議を受け入れなかった。

この技術協力プロジェクトを前に進めるために、JICA専門家チームは、MOEとの緊密な連携をするようにした。例えば、JICA専門家チームは、C/Pではなく直接MOEのプロジェクトマネージャーと連絡することで、パイロットプロジェクトの状況確認を行った。また、アジアワット社とピシュランエナジー社からの聞取りについては、SATBAを介さず直接連絡し、各パイロットプロジェクトの進捗や発生している課題について、直接MOEに報告した。

4 章 プロジェクトの達成状況

4.1 成果1

本技術協力プロジェクトに対する評価として、プロジェクト終了時評価が2018年1月11日から同26日まで実施され、JICAと「イ」国側メンバー合同で、評価報告書が（以下、評価報告書)が作成されている。

成果1 “イランでのESCOビジネス推進のための体制が強化される”について、2018年時点でのプロジェクト終了時評価時での達成状況と技術協力プロジェクト終了時の達成状況について、表4.1に示す。

全体としては、未達成（達成の見込みあり）となった。指標1.1は達成しているが、指標1.2は、達成が確認できなかった。主な理由は、プロジェクト終了時評価時点と変わらず、SABAからSATBAへの組織改編により、未だSATBAのESCO事業普及のための役割が明確になっていないためである。最終渡航まで、責任・役割分担の明確化の必要性を指摘したが、完了されなかった。

表4.1 成果1の達成状況

成果1 要約	達成状況	
	プロジェクト終了時評価時点 (2018 年 1 月)	終了時点達成状況 (2018 年 9 月)
イランでのESCOビジネス推進のための体制が強化される	未達成 （達成の見込みあり）	達成の見込みあり （JICA 協力期間後）
成果 1 指標	-	-
1.1. ESCO 協会の内規、ガイドラインが整備される。	達成済	達成済
1.2. ビルセクターESCO 事業普及のために関連組織 (エネルギー省/省エネ再エネ機構、石油省/燃料消費最適化機構、道路都市開発省/ビル建物研究所、ESCO 協会、経済計画省、計画予算局、金融機関等）の責任役割分担が明確化される	未達成 （達成の見込みあり）	達成の見込みあり （JICA 協力期間後）

出典:「政府系ビルの ESCO 導入にかかるパイロット事業実施プロジェクト終了時評価報告書」に基づいて、JICA 専門家チームにて作成

今後、MOEとPBOが参加するエネルギー評議会でESCO事業普及に係る関連組織と協議され、推進体制、責任・役割分担などが明確化されることを期待する。

4.2 成果2

成果2“官庁・自治体と、ESCO協会のESCO事業導入に関する知識、能力が強化される”について、2018年時点でのプロジェクト終了時評価時での達成状況と技術協力プロジェクト終了時の達成状況について、表4.2に示す。

全体としては、達成となった。プロジェクト終了時評価時点で達成が確認できなかった指標2.3は、最終渡航で、ワークショップが開催され、5以上の訓練、セミナーの実施が確認できたため、達成されたものと評価した。

表4.2 成果2の達成状況

成果2 要約	達成状況	
	プロジェクト終了時評価時点 (2018年1月)	終了時点達成状況 (2018年9月)
官庁・自治体と、ESCO協会のESCO事業導入に関する知識、能力が強化される	未達成 (達成の見込みあり)	達成済
成果2 指標	-	-
2.1. 官庁自治体向けESCO事業導入マニュアルが開発される。	達成済	達成済
2.2. パフォーマンス契約標準モデルが開発される。	達成済	達成済
2.3. ESCO事業に関する、5以上の訓練、セミナーが、MOE/SATBAによって実施される	未達成 (達成の見込みあり)	達成済

出典:「政府系ビルのESCO導入にかかるパイロット事業実施プロジェクト終了時評価報告書」に基づいて、JICA専門家チームにて作成

指標2.2の係るESCO標準契約書については、SATBAからPBOに対して承認申請中である。

ただし、いまだESCO事業に対する認知度は十分ではなく、ビルオーナーや資金提供者に対しては、今後も継続的な意識啓発が必要である。

4.3 成果 3

成果3 “ESCOビジネスの開発のためにESCOパイロット事業が、政府系ビルで実施される”について、2018年時点でのプロジェクト終了時評価時での達成状況と技術協力プロジェクト終了時の達成状況について、表4.3に示す。

全体としては、未達成（達成の見込みあり）となった。達成できていなかった指標3.5は、ESCO事業者からは3ヶ月間の実績報告書が提出されていたにも関わらず、SATBAではその分析ができていなかった。 指標3.6は、パイロット事業実施後1年経過しておらず、実績報告ができる状況ではなく、技術協力プロジェクト期間終了後に達成されることを期待する。

表4.3 成果3の達成状況

成果 3 要約	達成状況	
	プロジェクト終了時評価時点(2018 年 1 月)	終了時点達成状況(2018 年 9 月)
ESCO ビジネスの開発のために ESCO パイロット事業が、政府系ビルで実施される	達成の見込みあり（JICA 協力期間後）	達成の見込みあり（JICA 協力期間後）
成果 3 指標	-	-
3.1. 50 以上の ESCO 事業候補ビルが省エネ機構によって選択される。	達成済	達成済
3.2. 5つ以上の ESCO 事業者が、5カ所以上の候補ビルでウォークスルー省エネ診断を実施する。	達成済	達成済
3.3.事業提案書が、少なくとも 4 つの ESCO 事業者によって提出され、少なくとも 2 つの提案書がエネルギー省に承認される。	達成済	達成済
3.4.少なくとも 2 つのパイロット事業が開始される。	達成済	達成済
3.5.少なくとも、3 か月間の月間実績報告書(月間実績データ)が、ESCO 事業者によって提出され、(専門家の支援を受け)MOE/SATBA によって分析される。	達成の見込みあり	達成の見込みあり
3.6.少なくとも、2 つのパイロット事業で、1 年間の実績報告書が ESCO 事業者によって提出され、MOE/SATBA によって承認される。	達成の見込みあり（JICA 協力期間後）	達成の見込みあり（JICA 協力期間後）

出典:「政府系ビルの ESCO 導入にかかるパイロット事業実施プロジェクト終了時評価報告書」に基づいて、JICA 専門家チームにて作成

パイロット事業は、技術協力プロジェクト期間終了後もMOEが継続的にモニタリングし、その結果はJICAへ報告され、「イ」国側関係機関にも共有される。

4.4 成果 4

成果4 “ESCOビジネス普及のための政策提言が策定される。”について、2018年時点でのプロジェクト終了時評価時での達成状況と技術協プロジェクト終了時の達成状況について、表4.4に示す。

全体としては、未達成（達成の見込みあり）となった。達成できていなかった指標4.1は、2018年7月10日に開催された第5回JCCにいて関係者とJICA専門家チームからの提言が出されている。MOEは、政府の次期5ヵ年開発計画への提言の反映を望んでおり、技術協力プロジェクト期間終了後に達成されることが期待される。

表4.4 成果4の達成状況

成果 4　要約	達成状況	
	プロジェクト終了時評価時点 (2018 年 1 月)	終了時点達成状況 (2018 年 9 月)
ESCO ビジネス普及のための政策提言が策定される。	達成の見込みあり (JICA 協力期間後)	達成の見込みあり (JICA 協力期間後)
成果 4　指標	-	-
4.1 MOE/SATBA によって、提言と ESCO ビジネスモデルが、イラン政府の政策決定のために提出される	達成の見込みあり (JICA 協力期間後)	達成の見込みあり (JICA 協力期間後)

出典：「政府系ビルの ESCO 導入にかかるパイロット事業実施プロジェクト終了時評価報告書」に基づいて、JICA 専門家チームにて作成

今後、エネルギー評議会での協議、関係機関の責任・役割分担などが明確化された後に、MOEがESCOビジネス普及のための政策提言することを期待する。

4.5 プロジェクト目標

プロジェクト目標イランにおけるESCOビジネスモデルの確立が、政府機関とESCO協会の能力強化を通じて、促進されるについて、2018年時点でのプロジェクト終了時評価時での達成状況と技術協力プロジェクト終了時の達成状況について、表4.5に示す。

未達(達成の見込みあり)ではあるが、2つのパイロット事業での省エネ効果は、提案書時点で15%程度期待できるものであり、法的な整備など、事業環境が整えば、十分ビジネスとして成り立つ可能性があることが確認された。

表4.5 プロジェクト目標の達成状況

プロジェクト目標 要約	達成状況	
	プロジェクト終了時評価時点(2018 年 1 月)	終了時点達成状況(2018 年 9 月)
イランにおける ESCO ビジネスモデルの確立が、政府機関と ESCO 協会の能力強化を通じて、促進される。	達成の見込みあり(JICA 協力期間後)	達成の見込みあり(JICA 協力期間後)
プロジェクト目標 指標	-	-
少なくとも 2 つのパイロット事業で、ESCO ビジネスが成り立つだけの省エネ効果が実証される。	達成の見込みあり(JICA 協力期間後)	達成の見込みあり(JICA 協力期間後)

出典:「政府系ビルの ESCO 導入にかかるパイロット事業実施プロジェクト終了時評価報告書」に基づいて、JICA 専門家チームにて作成

パイロット事業実施後1年経過しておらず、事業の成果は検証できていないが、技術協力プロジェクト期間終了後もMOEが継続的にモニタリングし、その結果を検証することを期待する。

4.6 上位目標

本プロジェクトの上位目標の評価指標は、プロジェクトの実施を通じて表4.6の通り設定され、第5回JCCにて承認された。(添付資料1のPDM version3 参照)

表 4.6 本プロジェクトの上位目標の評価指標

上位目標	ビル部門の省エネルギーが政府系ビルへのESCO事業の導入を通して促進されること。
効果指標	✔ ESCO 事業を実施したビルにおいては、エネルギー消費量が少なくても 10%削減される ✔ 政府系ビルへの ESCO 事業が 2020 年から公式に導入される。

出典: JICA 専門家チームにて作成

第 5 章 政府系ビルへの ESCO 事業導入に向けての提言

5.1　パイロット事業の継続とモニタリング

5.1.1 パイロット事業

本プロジェクトでは、2つのパイロット事を実施中である。その2つのプロジェクトのESCO契約期間は、それぞれ43ヶ月、67ヶ月であり、2018年7月時点で実施されてから約1年しか経過していない。そのため、省エネ効果の検証が成されておらず、パイロット事業の成果が評価されていない。

表 5.1 パイロット事業の概要

	経済財務省ビルESCO	テヘラン配電会社ビルESCO
ESCO事業者	アジアワット社	ピシュランエナジー社
ESCO契約締結日	2017年4月12日	2017年7月18日
ESCO契約期間	43ヶ月	67ヶ月
2018年7月時点の課題	契約金額の上限制限により、契約が2つに分かれたが、2つ目の契約が未だに締結されない。	ベースラインが変更されたため、提案通りの省エネ効果が得られず、ESCO事業者へのサービス料が支払われていない。

出典: JICA 専門家チームにより作成

ESCO事業のモニタリング期間は最低2年必要である。2つのプロジェクト共に既にいくつかの課題が発見されている。既に解決された課題もあるが、未だ解決に至っていない問題があり、今もESCO事業者およびビルオーナーは、努力を続けている。

特に、以下2項目については、既にESCO会社が直面している問題であり、「イ」国側関係者による早期の解決案の提示が必要である。

・経済財務省ビルESCOの第二契約の締結

・配電会社ビルESCOの計測検証とサービス料（未払い）

パイロット事業で発見された以下のような課題は、今後、「イ」国でESCO事業を推進するためには解決しなければならない事案となる。パイロット事業は継続し、MOEおよびSATBAはパイロット事業を継続的にモニタリングする必要がある。

(1) ESCO事業者の審査

一般的に、「イ」国には公共事業の参画での事前審査としての格付けと認証制度がある。格付けと認証制度はサービス分野ごとに分類されているが、ESCO事業にかかる認証と格付けは設定されていない。ESCO事業者が適切な能力を有していても、政府系ビルでESCO事業を実施するためには、PBOからの認証が必要となる。

(2) ESCO契約書への公的な承認

一般的に、「イ」国では、公的機関と契約をするにあたって公的に承認された標準的な契約書があるが、ESCO事業にかかる分野では認証された標準契約書がない。パイロット事業では、本プロジェクトで作成したESCO雛型契約書を採用することとしたが、ESCO雛型契約書がPBOにより認証されていないことから、契約締結まで相当な時間を費やした。

経済財務省ビルESCOの場合、ビルオーナーは一時的な解決方法として、ESCO雛型契約書の採用に問題がないことをPBOに確認した。一方、テヘラン配電会社ESCOパイロット事業の場合、ビルオーナーが、PBOから認証されていないESCO雛型契約書の採用に同意しなかった。

(3) ESCO事業への金融的支援

一般的に、「イ」国の市場金利は14%程度である。シェアード型ESCOの場合、省エネ対策のための設備にかかる初期費用の資金は、ESCO事業者が負担しなければならないため、ESCO事業者が高いリスクを負わなければならない。ESCO事業者は初期投資費用の資金回収のために、長期のサービス契約を締結し、契約終了までの長期間、高金利付の資金を返済しなければならない。

パイロット事業で活用したファンドは、審査側のESCO事業の枠組みへの理解不足もあり、申請の提出から承認までに長い時間を要した。さらに、金利が10%と高く、ESCO事業にとって魅力的な金融支援のスキームではなかった。

経済財務省ビルESCOの場合、アジアワット社は資金借用の審査の遅れのため、契約が遅れ、設備導入も借入金入金後となった。テヘラン配電会社ビルESCOの場合、ピシュランエナジー社は、ESCOサービス開始に資金調達が間に合わないことから、ファンド資金の活用をあきらめ、自己資金の活用を選択した。

(4) ESCO事業の枠組みへの理解不足

SATBAはESCO事業者側に対して以前からESCO事業枠組みについての理解促進を継続的に行っており、ESCO事業者は、ESCO事業を十分理解している。しかし、もう一方の利害関係者であるビルオーナー側はESCO事業の枠組みについて未だ知識がないままである。ESCOの事業枠組みはビルオーナーにとって新しいものであり、ESCO事業を導入するビル

オーナーがESCO事業の枠組みについて理解しなければ、プロジェクトは契約締結に至らなくなる。

両パイロット事業とも、ESCO事業者は事業の枠組み、パイロット事業を実施することの意義について、繰り返し説明することを余儀なくされ、多くの時間が費やされた。

(5) 政府職員の定期異動

「イ」国でも、政府職員の定期異動が行われる。

経済財務省ビルESCOの場合、契約署名権者ならびに技術部門の責任者の人事異動のため、アジアワット社は契約交渉の出直しに直面した。テヘラン配電会社ビルESCOの場合、技術部門の責任者の人事異動のためピシュランエナジー社は契約交渉の出直しに直面した。つまり、両事業のESCO事業者は、担当者の異動の度にESCOの事業枠組みやESCO提案を再度説明することとなった。

(6) 入札制度（契約手続き）

一般的に、「イ」国では入札を経ないで随意契約で契約することを制限しているが、パイロット事業では、入札制度を活用せず、特例としてエネルギー診断調査を実施したESCO事業者と随意契約で実施することとした。

ESCO事業の枠組みは提案型であるため、入札条件となる明確な業務仕様と入札予定額の設定が出来ない。実際、ESCO事業で提供されるサービスの範囲は、可能性調査、設計、建設、計測検証にいたるまでと、上流から下流にまで及んでおり、それぞれのESCO事業者は省エネ対策を組み合わせて独自のESCO提案書を作成する。一方、随意契約の場合、1事業者が随意契約できる上限金額の制限が設定されている。経済財務省ビルESCOの場合、ESCO事業者は、随意契約で認められた契約金額内に納めるために、ESCO契約を2つ分割することとなった。しかし、1つの契約は締結されたが、残りの契約は締結されていない。

5.1.2 モニタリング

本プロジェクト終了後も2つのパイロット事業は継続される。

MOEおよびSATBAは、パイロット事業を継続的にモニタリングする。MOEおよびSATBAは、その結果をイラン側関係機関と共有し、課題および問題の解決のための対応策の検討、およびESCO事業推進に向けた環境整備を進めることが必要である。

(1) ESCO事業の促進にかかる民間セクターの組織化の不足

IRESCOは既に2008年に設立され、ESCO事業者側からのESCO事業の促進のための組織として活動している。しかしながら、IRESCOの会員企業数は少なく、労力と資金が限られているので、効果的に活動できていない。民間団体であるIRESCOに対して、「イ」国政

府から財政的な支援などなく公に認められておらず、ESCO事業の認知とともにIRECSOの地位向上が必要である。

(2) パイロット事業による成果の広報

ESCO事業者は、パイロット事業による効果などをIRESCOおよびESCO事業者と共有し、ESCO事業者の能力向上を図る必要がある。一方、ビルオーナーは、ESCO事業の事例として、パイロット事業の成果を広く広報し、ESCO事業への理解促進に努める必要がある。

(3) パイロット事業の継続と技術協力の必要性

パイロット事業が継続され、今後、新たに発見される課題について、「イ」国側で解決が困難である場合、JICAやJAESCOによる新たな技術協力も考えられる。モニタリング結果については、JICAへ報告する必要がある。

5.2 上位目標

5.2.1 上位目標の評価指標の設定

本プロジェクトの上位目標の評価指標は、プロジェクトの実施を通じて以下の通り設定された。（PDM version3 参照）

表 5.2 本プロジェクトの上位目標と上位目標の評価指標

上位目標	ビル部門の省エネルギーが政府系ビルへの ESCO 事業の導入を通して促進されること。
上位目標の評価指標	✔ ESCO 事業を実施したビルにおいては、エネルギー消費量が少なくても 10%削減される ✔ 政府系ビルへの ESCO 事業が 2020 年から公式に導入される。

出典: JICA 専門家チームにより作成

数値目標として、ESCO事業の導入による省エネ効果を10%と設定しているが、2つのパイロット事業の効果（提案書ベース）から判断すると十分達成可能な目標値である。

一方、政府系ビルへのESCO事業の本格導入時期を2年後の2020年と設定した。ESCO事業の実施には、法整備などの環境整備にある程度の時間が必要となることを踏まえ、2年後をターゲットとしている。

5.2.2 上位目標達成に向けて

上位目標の達成に向けて、先ず、「イ」国側が行う重要な活動は以下の通りである。

(1) パイロット事業のモニタリングと評価

パイロット事業のモニタリングとその評価については、上位目標達成のためには、最も重要な活動である。本技術協力プロジェクト終了後も、MOEおよびSATBAが責任を持ってパイロット事業のモニタリングを少なくとも1年は継続する必要がある。パイロット事業を実施しているESCO事業者は、パイロット事業による成果をビルオーナー、MOE、SATBAに報告、MOE、SATBAは、その成果を分析、評価し、ESCO事業推進に係る関係機関と共有しなければならない。

(2) ESCO事業推進のための体制と役割

SATBAの組織改変の影響もあり、ESCO事業推進のための関連機関の役割が明確になっていない。ESCO事業推進のため体制を早期に構築する必要がある。MOEはパイロット事業の実施を通じて、法的な環境整備の必要性とPBOの関与が必要であることを認識した。MOE、SATBA、PBOはエネルギー評議会で関係機関と協議し、ESCO事業推進のための体制と役割の明確化および法的な環境整備を進めていく必要がある。

5.3 政府系ビルへの ESCO 事業導入に向けての提言

5.3.1「イ」国側からの提案

第5回のJCCにおいて、「イ」国側（MOE、PBO、IRESCO）から本技術協力プロジェクトを通じて発見された課題に対して、その解決案として以下の提案があった。

- 政府がESCO事業者を評価、認証、格付する仕組みを構築する。
- PBOがESCO標準契約書を認証する。（SATBAは既にPBOに承認申請している。）
- MOEがESCO事業向けのESCO基金を設立する。
- SATBAが関係する政府機関に対してESCO事業スキームの啓蒙活動を行う。
- 政府がIRESCOを支援する仕組みを構築する。
- 政府内にESCO事業推進のためのワーキンググループを設置する。
- IRESCOがJAESCOと共同でESCOプロジェクトを実施する。（実証事業）
- MOEがJICAに継続的な支援と更なる技術協力プロジェクトを要請する。

5.3.1 JICA専門家チーム側からの提言

JICA専門家チームから「イ」国側からの提案を踏まえ、政府系ビルへのESCO事業導入に向けて以下を提言した。

- 関連機関（MOE、SATBA、IFCO、PBO、IRESCO）および政府系ビルの管理者（所有者および修繕課）へESCO事業スキームの認識向上のための啓蒙活動
- ESCO事業スキームの法的認可、法的な環境整備（PBOによるESCO標準契約書の認証、ESCO事業の入札制度の変更）
- 政府系ビルへのESCO事業導入の可能性調査の実施（年間50施設のエネルギー診断の実施、ESCO事業導入の候補施設の選定）
- ESCO事業への金融的支援策（エネルギー価格への補助金の見直し、低金利ローンの提供、ESCO事業への補助金、金利補填）

更にJICA専門家チームから、2年後のESCO事業導入に実現に向けた上記提案の実施スケジュール案が提示された。

活動	1年目	2年目	3年目	4年目	5年目
パイロット事業のモニタリング					
ESCO事業スキームの認識向上のための啓蒙活動					
ESCO事業スキームの法的認可、法的な環境整備					
ESCO事業導入の可能性調査					
ESCO事業への金融的支援策					
政府系ビルへのESCO事業導入					

出典: JICA 専門家チームにより作成

図5. 1　政府系ビルへのESCO事業導入に向けた実施スケジュール案

添付資料

1. PDM (PDM$_0$、PDM$_1$、PDM$_2$ および PDM$_3$)

2. 業務フローチャート (PO0、PO1 および PO2)

3. 詳細活動計画 (Work Plan of First Stage and Second Stage)

4. 専門家派遣実績

5. 研修受入実績（第 1 回および第 2 回）

6. JCC (第 1 回 JCC、第 2 回 JCC、第 3 回 JCC、第 4 回 JCC および第 5 回 JCC)

7. ワークショップ (第 1 回ワークショップ、第 2 回ワークショップおよび第 3 回ワークショップ)

添付資料 1

PDM

(PDM$_0$、PDM$_1$、PDM$_2$ および PDM$_3$)

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Energy Efficiency Organization (IEEO/SABA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SABA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: 2014-2017 (4.0 years)

Version 0
April 16, 2014

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	- Implementation and planning of ESCO to Government buildings are prepared. - XX% of Energy consumption in the building sector is reduced.	- Performance records of ESCO for Government buildings. - Energy consumption data in the building sector.	Finance incentive for ESCO shall be prepared by Iranian side.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	- ESCO pilot projects to Government buildings are implemented. - ESCO business model in Iran through the ESCO pilot projects is established.	- Performance contract and implementation document of the ESCO pilot projects. (May 2016) - Reports of monitoring and verification of the ESCO pilot projects. (Apr. 2017)	The budget for the ESCO pilot projects shall be allocated by the Iranian side.
Outputs: 1. An institution framework is established to promote ESCO business in Iran.	- Regulations and guidelines for the IRESCO are completed. - Roles and responsibilities to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) are identified.	- Regulations and guidelines for the IRESCO. (Feb. 2015) - An institution framework and rule to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) (Feb. 2015)	
2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings.	- Procedures and manual of introduction of ESCO to Government buildings is completed. - Performance contract models for ESCO are prepared. - Seminar and training for capacity building are conducted for IRESCO members by SABA and IFCO.	- Procedures and manual of introduction of ESCO to Government buildings. (Aug. 2015) - Performance contract models for ESCO. (Aug. 2015) - Records of seminar and training. (Aug. 2015)	The case studies of finance incentive schemes in Japan will be introduced in training course in Japan
3. The introduction of ESCO in Government's buildings is considered and promoted.	- Candidate buildings for ESCO pilot projects are selected by Iranian side. - Energy audit of ESCO planning for the candidate buildings are conducted by members of IRESCO. - Proposal and implementation plan for ESCO pilot project are prepared. - ESCO pilot projects to Government buildings are implemented. - Results of monitoring and verification of the ESCO pilot projects are reported. - Implementation plans to introduce ESCO for Government buildings are prepared.	- Short list of candidate buildings for ESCO pilot projects. (Feb. 2015) - Reports of energy audits of the candidate buildings. (Aug. 2015) - Proposal and implementation plan for ESCO pilot project. (Dec. 2015) - Results of monitoring and verification of the ESCO pilot projects. (May 2016) - Implementation plans to introduce ESCO for Government buildings. (Apr. 2017)	SABA and IFCO will be responsible for the result of monitoring and verification of the ESCO pilot projects.
4. Policy recommendations are made for the introduction of ESCOs	- ESCO business model in Iran through the ESCO pilot projects is established. - Policy and action plan to promote ESCO in building sector are prepared by MOE.	- Policy and action plan to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) (Nov. 2017)	

Activities:	Inputs (Means and Cost)	Pre-conditions
1. An institution framework is established to promote ESCO business in Iran. 1-1 Preparation and support for the institutional framework, regulations and guidelines for the establishment of ESCO association 2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings. 2-1 Preparation of procedures and manuals for the introduction of ESCOs 2-2 Preparation of contract models and formats for ESCOs 2-3 Capacity development for awareness raising and training 2-4 Introduction of case studies on Japan's policies, legislations and finance mechanisms for energy efficiency in buildings 3. The introduction of ESCO in Government's buildings is considered and promoted. 3-1 Capacity development for ESCO companies 3-2 Energy audits for Government's buildings by ESCO companies 3-3 Pilot projects are implemented by ESCO companies in order to introduce ESCO for Government's buildings 3-4 Monitoring of Pilot Projects 4. Policy recommendations are made for the introduction of ESCOs 4-1 Policy recommendations for the introduction of ESCO's	**The Japanese Side** A. Experts ・ Team Leader (ESCO Expert) / ESCO Framework ・ Energy Audit Engineer (Heat) ・ Energy Audit Engineer (Electricity) B. Training in Japan ・ ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. ・ Non **The Iranian Side:** A. Ministry of Energy: Project Counter Part ・ Project Director: General Director, Office for the Improvement of Productivity and Economy of Electricity and Energy (OIPEEE) ・ Project Manager: Head of Awareness & Training, OIPEEE B. SABA: Implementation Organization ・ Deputy of Demand Side Department ・ ESCO Department C. IFCO: Co-Implementation Organization D. IRESCO: Cooperation Organization **Joint Coordinating Committee(JCC)** A. Chairperson: ・ General Director of OIPEEE B. Member of Iranian Side ・ MOE ・ Presidential Deputy of Strategic Planning and Supervision (SPAC) ・ Ministry of Economy and Finance (MOEF) ・ Ministry of Petrol (MOP) ・ Ministry of Road and Urban Development (MRUD) ・ SABA ・ IFCO ・ IRESCO C. Member of Japanese side ・ JICA Experts ・ Representatives from JICA IRAN Office ・ Other personnel concerned to be assigned by request of other members D. Observer ・ Ministry of Foreign Affairs (MOFA) ・ Embassy of Japan (EoJ)	

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Energy Efficiency Organization (IEEO/SABA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SABA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: 2014-2018 (4.5 years)

Version 1
November 14, 2015

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	- Implementation and planning of ESCO to Government buildings are prepared. - XX% of Energy consumption in the building sector is reduced.	- Performance records of ESCO for Government buildings. - Energy consumption data in the building sector.	Finance incentive for ESCO shall be prepared by Iranian side.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	- ESCO pilot projects to Government buildings are implemented. - ESCO business model in Iran through the ESCO pilot projects is established.	- Performance contract and implementation document of the ESCO pilot projects. - Reports of monitoring and verification of the ESCO pilot projects.	The budget for the ESCO pilot projects shall be allocated by the Iranian side.
Outputs: 1. An institution framework is established to promote ESCO business in Iran.	- Regulations and guidelines for the IRESCO are completed. - Roles and responsibilities to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) are identified.	- Regulations and guidelines for the IRESCO. (Feb. 2015) - An institution framework and rule to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) (Feb. 2015)	
2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings.	- Procedures and manual of introduction of ESCO to Government buildings is completed. - Performance contract models for ESCO are prepared. - Seminar and training for capacity building are conducted for IRESCO members by SABA and IFCO.	- Procedures and manual of introduction of ESCO to Government buildings. (Jan. 2016) - Performance contract models for ESCO. (Jan. 2016) - Records of seminar and training. (Aug. 2015)	The case studies of finance incentive schemes in Japan will be introduced in training course in Japan
3. The introduction of ESCO in Government's buildings is considered and promoted.	- Candidate buildings for ESCO pilot projects are selected by Iranian side. - Energy audit of ESCO planning for the candidate buildings are conducted by members of IRESCO. - Proposal and implementation plan for ESCO pilot project are prepared. - ESCO pilot projects to Government buildings are implemented. - Results of monitoring and verification of the ESCO pilot projects are reported. - Implementation plans to introduce ESCO for Government buildings are prepared.	- Short list of candidate buildings for ESCO pilot projects. (Oct. 2015) - Reports of energy audits of the candidate buildings. (Jan. 2016) - Proposal and implementation plan for ESCO pilot project. (Jun 2016) - Results of monitoring and verification of the ESCO pilot projects. - Implementation plans to introduce ESCO for Government buildings.	SABA and IFCO will be responsible for the result of monitoring and verification of the ESCO pilot projects.
4. Policy recommendations are made for the introduction of ESCOs	- ESCO business model in Iran through the ESCO pilot projects is established. - Policy and action plan to promote ESCO in building sector are prepared by MOE.	- Policy and action plan to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO)	

Activities:	Inputs (Means and Cost)	Pre-conditions
1. An institution framework is established to promote ESCO business in Iran. 1-1 Preparation and support for the institutional framework, regulations and guidelines for the establishment of ESCO association 2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings. 2-1 Preparation of procedures and manuals for the introduction of ESCOs 2-2 Preparation of contract models and formats for ESCOs 2-3 Capacity development for awareness raising and training 2-4 Introduction of case studies on Japan's policies, legislations and finance mechanisms for energy efficiency in buildings 3. The introduction of ESCO in Government's buildings is considered and promoted. 3-1 Capacity development for ESCO companies 3-2 Energy audits for Government's buildings by ESCO companies 3-3 Pilot projects are implemented by ESCO companies in order to introduce ESCO for Government's buildings 3-4 Monitoring of Pilot Projects 4. Policy recommendations are made for the introduction of ESCOs 4-1 Policy recommendations for the introduction of ESCO's	**The Japanese Side** A. Experts • Team Leader (ESCO Expert) / ESCO Framework • Energy Audit Engineer (Heat) • Energy Audit Engineer (Electricity) B. Training in Japan • ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. • Non **The Iranian Side:** A. Ministry of Energy: Project Counter Part • Project Director: General Director, Office for the Improvement of Productivity and Economy of Electricity and Energy (OIPEEE) • Project Manager: Head of Awareness & Training, OIPEEE B. SABA: Implementation Organization • Deputy of Demand Side Department • ESCO Department C. IFCO: Co-Implementation Organization D. IRESCO: Cooperation Organization **Joint Coordinating Committee(JCC)** A. Chairperson: • General Director of OIPEEE B. Member of Iranian Side • MOE • Managing and Planning Organization (MPO) • Ministry of Economy and Finance (MOEF) • Ministry of Petrol (MOP) • Ministry of Road and Urban Development (MRUD) • SABA • IFCO • IRESCO C. Member of Japanese side • JICA Experts • Representatives from JICA IRAN Office • Other personnel concerned to be assigned by request of other members D. Observer • Ministry of Foreign Affairs (MOFA) • Embassy of Japan (EoJ)	

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Renewable Energy and Energy Efficiency Organization (SATBA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SATBA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: January 25, 2014-July 24, 2018 (54 months: JICA project period)

Version 2
January 22, 2018

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	-XXX.XXXX by 2023 (to be determined by the Project)	-XXX.XXXX (to be determined by the Project)	Policies on EE&C for the building sector are maintained.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve ESCO business.	Project completion report including the verification report of the pilot project. (by MOE/SATBA)	Recommendation formulated by the Project is reflected in energy policies and budget allocation.
Outputs: 1. An institutional framework to promote ESCO business in Iran is strengthened.	1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.	1.1. Project documents (Regulations and guidelines) 1.2. Project documents (*for example: demarcation table describing roles and responsibilities among organizations, after organizational restructuring)	
2. The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened..	2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed 2.2. Performance contract models for ESCO project are upgraded 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA	2.1. Project document (the manual) 2.2. Project document (the contract models) 2.3 Project documents (records of the trainings and seminars)	
3. The ESCO pilot projects are implemented in government's buildings for development of ESCO business..	3.1. More than 50 candidate buildings are selected by MOE/SATBA 3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA 3.4. At least, 2 ESCO pilot projects are launched 3.5. Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts) (*monthly performance data) 3.6. Performance reports including one-year performance activities are submitted by ESCOs for at least 2 pilot projects, and approved by MOE/SATBA (after JICA project period)	3.1. Project documents (for example: progress report of pilot projects) 3.2. Project documents (ditto) 3.3. Project documents (ditto) 3.4. Project documents (ditto) 3.5. Project documents (ditto) 3.6. Project documents (completion report)	Budget for pilot projects is secured and disbursed by MOE as planed
4. Policy recommendation for the promotion of ESCO business is formulated.	4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	4.1. Project Documents (for example: policy proposal paper)	

Activities:	**Inputs (Means and Cost)**	**Pre-conditions**
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran 1-2. To support IRESCO in preparing its internal guidelines 1-3. To give advice to IRESCO on strengthening intuitional capacity 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business. 2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran 2-4. To organize trainings and seminars for ESCOs and government organizations 2.5. To introduce policies, legislations and finance mechanisms for EE&C and ESCO project for building sector in Japan 3-1. To select the candidate buildings for energy audit 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs. 4-1. To review the project activities and results including seminars, manuals, performance of pilot projects 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period) 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government for decision making.	**The Japanese Side** A. Experts • Team Leader (ESCO Expert) / ESCO Framework • Energy Audit Engineer (Heat) • Energy Audit Engineer (Electricity) B. Training in Japan • ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. • Nill **The Iranian Side:** A. Ministry of Energy: Project Counterpart • Project Director: General Director, General Director, Planning and Economics of Electricity and Energy Office (PEEEO) • Project Manager: Head of International cooperation of PEEEO B. SATBA: Implementation Organization • (Deputy of Demand Side Department*) • (ESCO Department*) *name of department, position are provisional C. IFCO: Co-Implementation Organization D. (IRESCO: Cooperation Organization) **Joint Coordinating Committee(JCC)** A. Chairperson: • General Director of PEEEO B. Member of Iranian Side • MOE • Plan and Budget Organization (PBO) • Ministry of Economy and Finance (MOEF) • Ministry of Petrol (MOP) • Ministry of Road and Urban Development (MRUD) • SATBA • IFCO • IRESCO C. Member of Japanese side • JICA Experts • Representatives from JICA Iran Office • Other personnel concerned to be assigned by request of other members D. Observer • Ministry of Foreign Affairs (MOFA) • Embassy of Japan (EoJ)	

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Renewable Energy and Energy Efficiency Organization (SATBA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SATBA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: January 25, 2014-July 24, 2018 (54 months: JICA project period)

Version 3
July 10, 2018

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	ESCO for government buildings will be officially introduced from 2020. Building where is implemented ESCO will be reduced energy consumption at least 10%.	Implementation of ESCO for Government building Evaluate of performance of ESCO	Policies on EE&C for the building sector are maintained. Authorization by a legal institution for ESCO Scheme.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve ESCO business.	Project completion report including the verification report of the pilot project. (by MOE/SATBA)	Recommendation formulated by the Project is reflected in energy policies and budget allocation.
Outputs: 1. An institutional framework to promote ESCO business in Iran is strengthened.	1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.	1.1. Project documents (Regulations and guidelines) 1.2. Project documents (*for example: demarcation table describing roles and responsibilities among organizations, after organizational restructuring)	
2. The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened..	2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed 2.2. Performance contract models for ESCO project are upgraded 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA	2.1. Project document (the manual) 2.2. Project document (the contract models) 2.3 Project documents (records of the trainings and seminars)	
3. The ESCO pilot projects are implemented in government's buildings for development of ESCO business..	3.1. More than 50 candidate buildings are selected by MOE/SATBA 3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA 3.4. At least, 2 ESCO pilot projects are launched 3.5. Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts) (*monthly performance data) 3.6. Performance reports including one-year performance activities are submitted by ESCOs for at least 2 pilot projects, and approved by MOE/SATBA (after JICA project period)	3.1. Project documents (for example: progress report of pilot projects) 3.2. Project documents (ditto) 3.3. Project documents (ditto) 3.4. Project documents (ditto) 3.5. Project documents (ditto) 3.6. Project documents (completion report)	Budget for pilot projects is secured and disbursed by MOE as planed
4. Policy recommendation for the promotion of ESCO business is formulated.	4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	4.1. Project Documents (for example: policy proposal paper)	

Activities:	**Inputs (Means and Cost)**	**Pre-conditions**
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran 1-2. To support IRESCO in preparing its internal guidelines 1-3. To give advice to IRESCO on strengthening intuitional capacity 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business. 2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran 2-4. To organize trainings and seminars for ESCOs and government organizations 2.5. To introduce policies, legislations and finance mechanisms for EE&C and ESCO project for building sector in Japan 3-1. To select the candidate buildings for energy audit 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs. 4-1. To review the project activities and results including seminars, manuals, performance of pilot projects 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period) 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government for decision making.	**The Japanese Side** A. Experts • Team Leader (ESCO Expert) / ESCO Framework • Energy Audit Engineer (Heat) • Energy Audit Engineer (Electricity) B. Training in Japan • ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. • Nill **The Iranian Side:** A. Ministry of Energy: Project Counterpart • Project Director: General Director, General Director, Planning and Economics of Electricity and Energy Office (PEEEO) • Project Manager: Head of International cooperation of PEEEO B. SATBA: Implementation Organization • (Deputy of Demand Side Department*) • (ESCO Department*) *name of department, position are provisional C. IFCO: Co-Implementation Organization D. (IRESCO: Cooperation Organization) **Joint Coordinating Committee(JCC)** A. Chairperson: • General Director of PEEEO B. Member of Iranian Side • MOE • Plan and Budget Organization (PBO) • Ministry of Economy and Finance (MOEF) • Ministry of Petrol (MOP) • Ministry of Road and Urban Development (MRUD) • SATBA • IFCO • IRESCO C. Member of Japanese side • JICA Experts • Representatives from JICA Iran Office • Other personnel concerned to be assigned by request of other members D. Observer • Ministry of Foreign Affairs (MOFA) • Embassy of Japan (EoJ)	

添付資料 2

業務フローチャート

(PO0、PO1 および PO2)

Plan of Operation

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic Republic of Iran

No.	Activities \ Period	2014	2015	2016	2017
	Period of JICA Expert Activities in Iran (Tentative)				
Output 1: An institutional framework is established to promote ESCO business in the Islamic Republic of Iran					
1-1	Study of measures and policies to promote ESCO business				
1-2	Support for preparation of the regulations and guidelines for the ESCO association (IRESCO)				
1-3	Support for establishment of the institutional framework for the ESCO association (IRESCO)				
Output 2: The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government's buildings					
2-1	Support for preparation of procedures and manuals to introduce ESCO				
2-2	Support to complete contract models and formats for ESCO's				
2-3	Capacity development for awareness raising and training				
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in t		Training in Japan		
Output 3: The introduction of ESCO in Government's buildings is considered and promoted					
3-1	Selection of candidate sites for energy audit in Government's buildings				
3-2	Energy audits for Government's buildings are implemented by ESCO companies				
3-3	Support to complete plan of pilot project of ESCO				
3-4	Capacity development for ESCO companies				
3-5	Pilot projects for Government's buildings are implemented by ESCO companies				
3-6	Study to introduce ESCO business in Government's buildings				
3-7	Monitoring of Pilot Projects				
Output 4: Policy recommendations are made for the introduction of ESCO's					
4-1	Study on introduction of ESCO's in Government's buildings				
4-2	Study for monitoring and measurement of ESCO project				
4-3	Policy recommendations are made for the introduction of ESCO's				
	Joint Coordinating Committee				
	Work Shop				
	Training in Japan				

Plan of Operation Rev.1

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic Republic of Iran

Activities	Period: 2014 – 2018 (months 1–12 each year)
Period of JICA Expert Activities in Iran (Tentative)	
Output 1: An institutional framework is established to promote ESCO business in the Islamic Republic of Iran	
1-1	Study of measures and policies to promote ESCO business
1-2	Support for preparation of the regulations and guidelines for the ESCO association (IRESCO)
1-3	Support for establishment of the institutional framework for the ESCO association (IRESCO)
Output 2: The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government's buildings	
2-1	Support for preparation of procedures and manuals to introduce ESCO
2-2	Support to complete contract models and formats for ESCO's
2-3	Capacity development for awareness raising and training
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings
Output 3: The introduction of ESCO in Government's buildings is considered and promoted	
3-1	Selection of candidate sites for energy audit in Government's buildings
3-2	Energy audits for Government's buildings are implemented by ESCO companies
3-3	Support to complete plan of pilot project of ESCO
3-4	Capacity development for ESCO companies
3-5	Pilot projects for Government's buildings are implemented by ESCO companies
3-6	Study to introduce ESCO business in Government's buildings
3-7	Monitoring of Pilot Projects
Output 4: Policy recommendations are made for the introduction of ESCO's	
4-1	Study on introduction of ESCO's in Government's buildings
4-2	Study for monitoring and measurement of ESCO project
4-3	Policy recommendations are made for the introduction of ESCO's
Joint Coordinating Committee	
Work Shop	
Training in Japan	

Plan of Operation: The Project on Implementation of the Pilot Project to introduce ESCO to the Government's Buildings

Version 2 (January 22, 2018)

	Activities	Period	2014 (months 1–12)	2015 (months 1–12)	2016 (months 1–12)	2017 (months 1–12)	2018 (months 1–12)
	Period of JICA experts working in Iran	P / A					
	Output 1						
1-1	To summarize the issues and consider the measures for promotion of ESCO business in Iran	P / A					
1-2	To support IRESCO in preparing its internal guidelines	P / A					
1-3	To give advice to IRESCO on strengthening intuitional capacity	P / A					
1-4	To clarify roles and responsibilities of the stakeholders to promote ESCO business.	P / A					
	Output 2						
2-1	To develop a manual to introduce ESCO project for government organization buildings.	P / A					
2-2	To collect the existing contract models for ESCO project.	P / A					
2-3	To develop contract models for ESCO project in building sector in Iran	P / A					
2-4	To organize trainings and seminars for ESCOs and government organizations	P / A					
2-5	To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan	P / A					
	Output 3						
3-1	To select the candidate buildings for energy audit	P / A					
3-2	To supervise the energy audit with work through by ESCOs at the candidate buildings	P / A					
3-3	To support ESCOs in planning the pilot projects.	P / A					
3-4	To supervise and monitor the pilot projects implemented by ESCOs	P / A					
3-5	To analyse monthly performance data of pilot projects submitted by ESCOs .	P / A					
	Output 4						
4-1	To review the project activities and results including seminars, manuals, performance of pilot projects	P / A					
4-2	To abstract issues and identify possible measures to promote ESCO projects in Iran	P / A					
4-3	To submit the recommendation to the last JCC meeting (during the JICA project period)	P / A					
4-4	To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran	P / A					
4-5	To submit the recommendation to Iranian government. (after JICA project period)	P / A					
	JCC	P / A					
	Workshop	P / A					
	Training in Japan	P / A					

添付資料 3

詳細活動計画

(Work Plan of First Stage and Second Stage)

The Project
On
Implementation of Pilot Projects to Introduce ESCO for Government's Buildings
in
Islamic Republic of Iran

Work Plan of First stage

April 2014

NIPPON KOEI
Challenging mind, Changing dynamics

TABLE OF CONTENTS

Annex-1: Plan of Operation of the overall Project

Annex-2: Manning Schedule

Annex-3: Project Member List

1. Project Description

1.1 Background

The Islamic Republic of Iran produces approximately 4 million barrels per day and accounts for 10.9% of oil deposits in the entire world. But, in spite of depending largely on exports of oil for Iranian foreign currency earnings, general energy consumption occupies 44 % of general energy supply in the Islamic Republic Iran on fiscal year 2010, the amount of domestic consumption of oil has been increased. Energy consumption in the residential and commercial sector is the largest which accounts for 36%, followed by the transportation sector 26%, industrial sector 24%. Particularly, energy consumption of buildings classified as the residential and commercial sector have increased constantly. Promotion of Energy Efficiency & Conservation (EE & C) in the building sector is now the most immediate priority mission of Ministry of Energy in the Islamic Republic of Iran.

JICA implemented a development study for "Institutional Capacity Development on Energy Management in the Building Sector in the Islamic Republic of Iran" from 2010 to 2011 which supported the formulation of the roadmap and action plan to promote energy efficiency in buildings. In this study, it was identified that the ESCO framework is one of the effective measures for promoting EE &C in the building sector by a private sector by aprivate sector initiative. In addition, it was clarified that the policied and legistlations necessary to promote energy efficiency are being formulated such as the "Subsidy Reform Law" and the "Energy Consumption Pattern Reform Law" issued in Dec.2010 and Mar. 2011 respectively.

Under this circumstance, the Government of the Islamic Republic of Iran officially requested "the Project on Implementation of Pilot Projects to introduce ESCO for Government's buildings" to GOJ in July 2011. Under the support of JICA, this project is expected to provide knowledge and skills to promote ESCO system for Government's buildings in the Islamic Repubilc of Iran.

1.2 Goal and Purpose of the Project

EE &C in the building sector will be promoted through the introduction of ESCO for Government's buildings.

The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.

1.3 Outputs

Output 1: An institutional framework is established to promote ESCO business in the Islamic Republic of Iran.

Output 2: The capacity of the Government of the Islamic Republic of Iran and ESCO association is developed in order to introduce ESCO in Government's buildings.

Output 3: The introduction of ESCO in Government's buildings is considered and promoted.

Output 4: Policy recommendations are made for the introduction of ESCOs.

1.4 JICA Experts (Inputs)

The JICA Project Team (JICA experts) consists of the following three (3) experts:

Table 1-1 JICA Experts (JICA Project Team)

Name	Position
Tsutomu MORI	Team Leader, ESCO framework
Hideaki KUROKI	Energy audit engineer (Heat)
Yoichi KITA	Energy audit engineer (Electricity)

1.5 Implementation Schedule

The duration of the Project will be 48 months.

First stage: From January 2014 to September 2015

Second stage: From October 2015 to December 2017

The Plan of Operation of the overall Project is shown in Annex-1.

1.6 Implementation Structure

The project organization chart is as shown in Figure 1-1. The roles and assignments of related organizations are as follows;

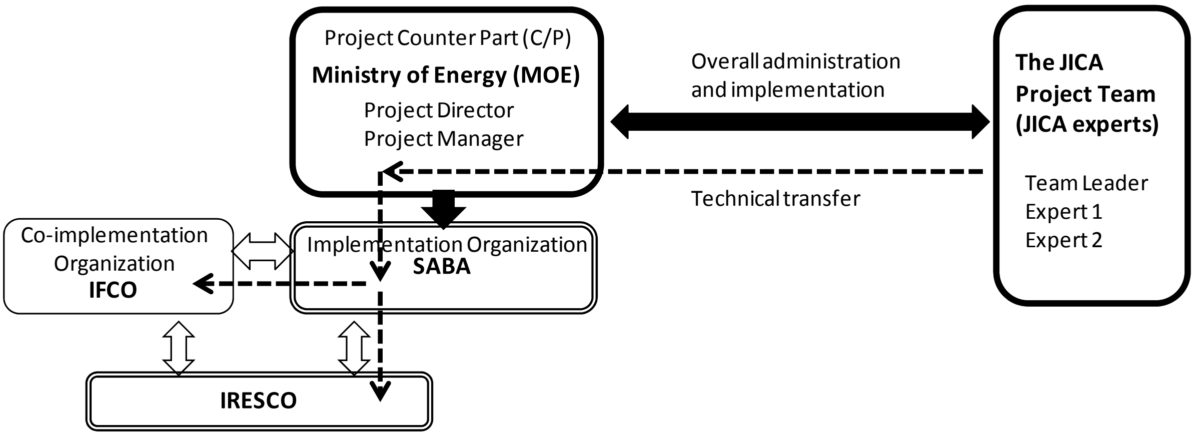


Figure 1-1 Project Organization Chart

(1) OIPEEE (Office for the Improvement of Productivity and Economy of Electricity and Energy) of MOE

OIPEEE will assign a Project Director to be responsible for overall administration and implementation of the Project.

OIPEEE will assign a Project Manager to be responsible to support managerial and technical issue of the Project.

(2) SABA(IEEO: Iran Energy Efficiency Organization)

SABA will be the implementation organization of the Project and assign a task team to work with JICA Project Team.

(3) IFCO (Iranian Fuel Conservation Organization)

IFCO will be the co-implementation organization of the Project and give necessary information in order to support the implementation of the Project.

(4) IRESCO (Association of Energy Service Companies of Iran)

IRESCO is fundamental for the success of the Project. IRESCO will cooperate in the implementation of the Project through SABA and IFCO.

(5) JICA Project Team (JICA Experts)

The JICA experts will give necessary technical guidance, advice and recommendations to MOE and SABA on any matters pertaining to the implementation of the Project.

1.7 Project Design Matrix (PDM)

The Project will be implemented joint work between JICA Project Team and SABA based on the project design matrix (PDM). The PDM of project index will be made agreement between JICA and MOE, and confirmed among the related organizations in Joint Coordinating Committee (hereinafter referred to as "JCC").

1.8 Joint Coordinating Committee (JCC)

JCC will be established in order to facilitate inter-organizational coordination. JCC will approve work plan, review overall progress, conduct monitoring and evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. The structure of JCC is as shown in Figure 1-2.

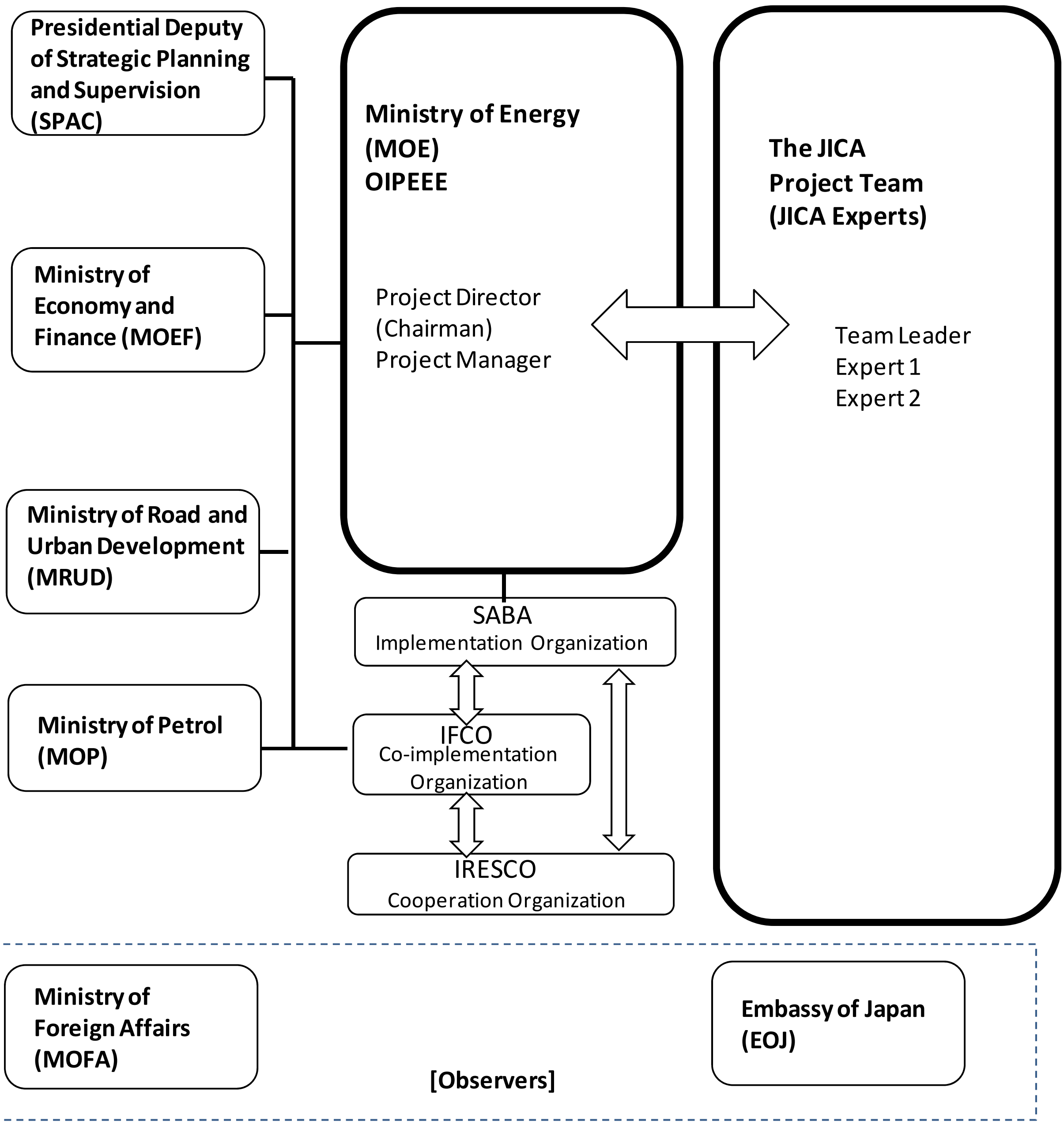


Figure 1-2 Structure of JCC

The schedule and agenda of JCC is as shown in Table 1-2.

Table 1-2 schedule and agenda of JCC

JCC	Time	Agenda
1st Committee	April 2014	- Agreement of Work Plan (First stage) - Confirmation of role of related organizations
2nd Committee	August 2015	- Report of output of the Work (First stage) - Candidate sites of ESCO pilot project - Budget of ESCO pilot project - Schedule and work plan of second stage
3rd Committee (At 2nd stage)	April 2016	- Agreement of Work Plan (Second stage) - ESCO pilot project
4th Committee (At 2nd stage)	May 2017	- Report of monitoring and verification of performance of the pilot project
5th Committee (At 2nd stage)	November 2017	- Report of output of the Work

2. Methodology for Implementation of Project

2.1 Activities for the Output 1

The schedule of activities for the output 1 is as shown in Figure 2-1.

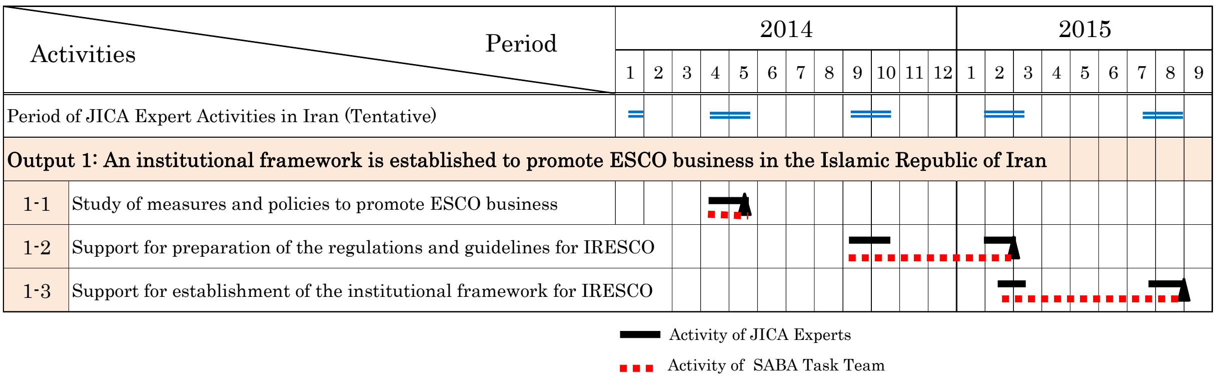


Figure 2-1 Schedule of activities for the output 1

(1) Activity 1-1: Study of measures and policies to promote ESCO business

The JICA Project Team will study measures and policies to promote ESCO business through interview survey for related organizations. The JICA Project Team will introduce the activities of ESCO association in Japan in the first work shop. The JICA Project Team will sort out priorities of IRESCO's activities under studying measures in Islamic Republic of Iran.

(2) Activity 1-2: Support for preparation of the regulations and guidelines for IRESCO

The regulations and guidelines of IRESCO are important for the activities to promote ESCO in Iran. The regulations and guidelines will be prepared by IRESCO with technical support by JICA Project Team.

(3) Activity 1-3: Support for establishment of the institutional framework for IRESCO

It is necessary and important to improve the system for promotion of ESCO in Iran. The JICA Project Team will support MOE, SABA and IRESCO to improve the system, policy and plan on the capacity development of the Project.

2.2 Activities for the Output 2

The schedule of activities for the output 2 is as shown in Figure 2-2.

Activities / Period		2014												2015								
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Period of JICA Expert Activities in Iran (Tentative)																						
Output 2: The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government buildings																						
2-1	Support for preparation of procedures and manuals to introduce ESCO																					
2-2	Support to complete contract models and formats for ESCO's																					
2-3	Capacity development for awareness raising and training																					
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings														Training in Japan							

Activity of JICA Experts

Activity of SABA Task Team

Figure 2-2 Schedule of activities for the output 2

(1) Activity 2-1: Support for preparation of procedures and manuals to introduce ESCO

The JICA Project Team will discuss with related organizations and the members of IRESCO about measures required promoting ESCO, and introducing experience and programs in Japan.

Two manuals to introduce ESCO in Iran will be prepared. One is a procedure on introduction ESCO for Government. Another is a procedure on implementation of ESCO for ESCO companies.

The manuals will be submitted to JICA as outputs of this activity at the end of the first stage.

ESCO manual prepared in this activity will be referred to implement the ESCO Pilot Projects, and revised through the implementation of the Pilot Projects.

(2) Activity 2-2: Support to complete contract models and formats for ESCO's

The JICA Project Team will support to prepare the ESCO's contract models and formats.

The ESCO's contract models will be submitted to JICA as outputs of this activity at the end of the first stage.

The ESCO's contract models prepared in this activity will be referred to implement the ESCO Pilot Projects, and revised through the implementation of the Pilot Projects.

(3) Activity 2-3: Capacity development for awareness raising and training

The ESCO manual and ESCO's contract models will be introduced for related organizations at the second work shop.

MOE and MOP will announce to owner of Government's buildings and municipalities. SABA and IRESCO will hold a seminar to develop capacity of ESCO companies.

(4) Activity 2-4: Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings

The establishing finance incentive is important to introduce and to promote ESCO in Iran. However, the financing environment in Iran is unique compared to that of Japan. Therefore, the case studies of finance incentive schemes in Japan will be introduced in training course in Japan. The necessary technology transfer will be implemented mainly as the training course.

2.3 Activities for the Output 3

The schedule of activities for the output 3 is as shown in Figure 2-3.

Activities / Period		2014												2015								
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Period of JICA Expert Activities in Iran (Tentative)																						
Output 3: The introduction of ESCO in Government buildings is considered and promoted																						
3-1	Selection of candidate sites for energy audit in Government buildings																					
3-2	Energy audits for Government buildings are implemented by ESCO companies																					
3-3	Support to complete plan of pilot project of ESCO																					
3-4	Capacity development for ESCO companies																					
3-5	Pilot projects for Government buildings are implemented by ESCO companies																					
3-6	Study to introduce ESCO business in Government buildings																					
3-7	Monitoring of Pilot Projects																					

Activities of Second Period
The activities will be started upon the confirmation with the outputs of the first period and the budget for the ESCO pilot project allocated by the Iranian side.

Activity of JICA Experts
Activity of SABA Task Team

Figure 2-3 Schedule of activities for the output 3

(1) Activity 3-1: Selection of candidate sites for energy audit in Government's buildings

MOE will prepare a long list of buildings for walk through as candidate sites of ESCO pilot projects. SABA will prepare necessary data for energy audit such as total floor area, building use, and major energy consumption equipments and monthly energy consumption data of the listed buildings.

Ten (10) buildings as candidate sites of ESCO pilot projects will be selected under discussion with MOE.

(2) Activity 3-2: Energy audits for Government's buildings are implemented by ESCO companies

ESCO companies will conduct the energy audit with walk through survey for ten (10) selected sites. The JICA Project Team will support the energy audit conducted by ESCO companies in order to transfer technology of the energy audit for ESCO planning.

The JICA Project Team will evaluate the feasibility of each building for ESCO project as collaborative work with ESCO companies for selecting three (3) buildings as ESCO candidate sites. The JICA Project Team and ESCO companies will estimate approximate cost for ESCO pilot projects.

The budget for ESCO pilot projects will be allocated by the Iranian side.

(3) Activity 3-3: Support to complete plan of pilot project of ESCO

The activity will be worked in the second stage.

(4) Activity 3-4: Support to complete plan of pilot project of ESCO

The activity will be worked in the second stage

(5) Activity 3-5: Pilot projects for Government's buildings are implemented by ESCO companies

The activity will be worked in the second stage

(6) Activity 3-6: Study to introduce ESCO business in Government's buildings

The activity will be worked in the second stage

(7) Activity 3-7: Monitoring of Pilot Projects

The activity will be worked in the second stage

2.4 Activities for the Output 4

The activities will be worked in the second stage with the monitoring of the ESCO pilot project.

3. Work Shop (W/S)

Total three (3) Work Shops will be hold in the Project. Outline of the work shop is as shown in Table 3-1. Two (2) W/Ss will be held in the first stage, and one (1) W/S will be held in the second stage.

Table 3-1 Outline of the work shop (Tentative)

Workshop	Time	Program
1st work shop	April 2014	- Legislation and finance support to promote ESCO in Japan - Activities and role of ESCO association in Japan
2nd work shop	August 2015	- ESCO manual and ESCO's contract models - Summary of energy audits for ten (10) sites - Monitoring and performance guarantee on ESCO
3rd work shop (At 2nd stage)	November 2017	- Results of monitoring on ESCO pilot projects - Policy recommendations for the introduction of ESCO's

4. Supporting from Iranian Side

Based on Record of Discussion that is agreed between Japan International Cooperation Agency (JICA) and the Islamic Republic of Iran on October 1st, 2013, the Iranian Government is kindly requested to provide the following supports to the JICA Project Team;

- Office room,
- Credentials or identification cards,
- Support in JICA Project Team travelling for site sruvey, and
- Other facilitation, if necessary.

5. Annex

- Annex-1: Plan of Operation of the overall Project
- Annex-2: Manning Schedule
- Annex-3: Project Member List

Annex

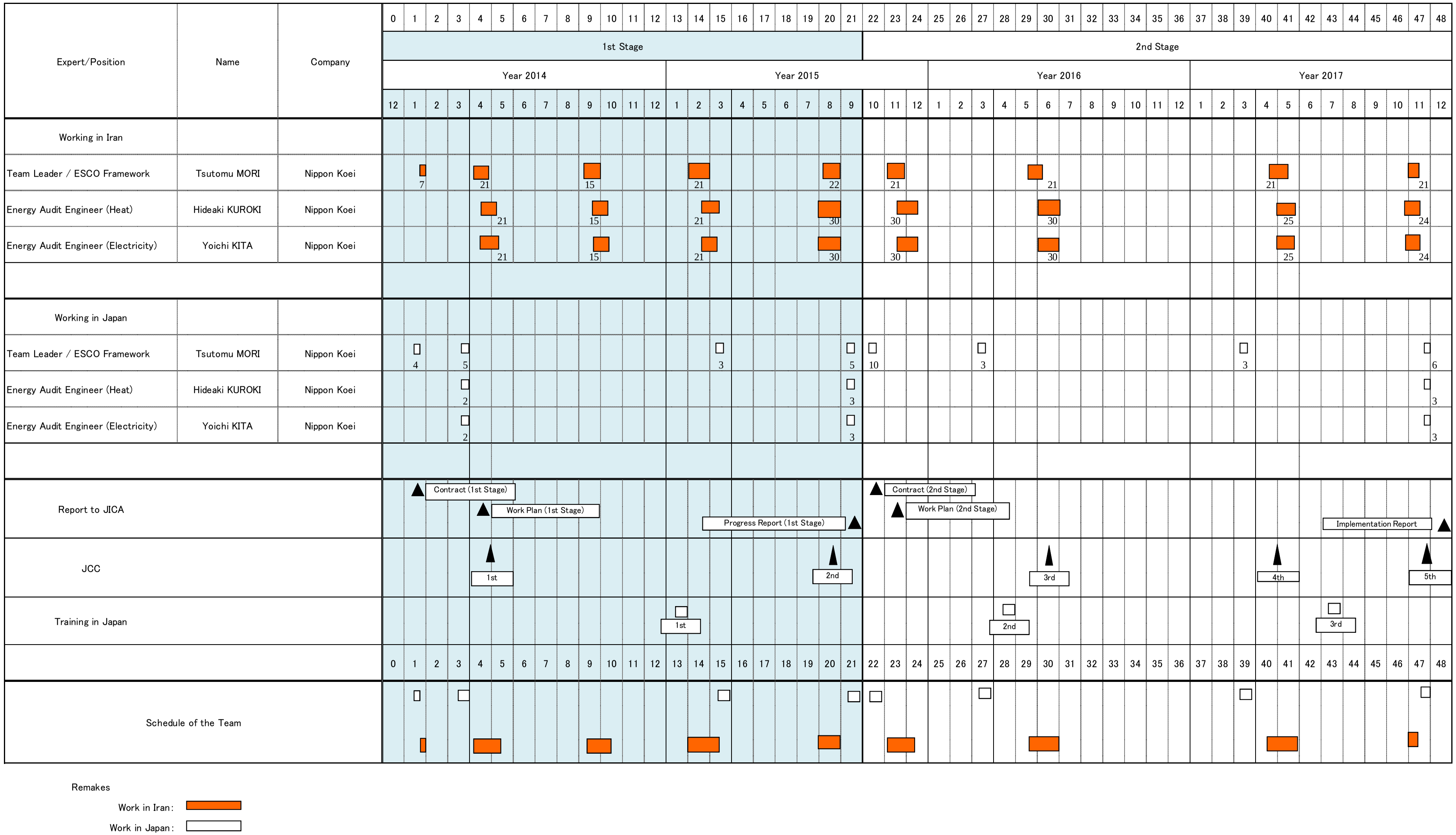
Plan of Operation

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic Republic of Iran

Period: 2014 – 2017 (months 1–12 per year)

No.	Activities
	Period of JICA Expert Activities in Iran (Tentative)
Output 1: An institutional framework is established to promote ESCO business in the Islamic Republic of Iran	
1-1	Study of measures and policies to promote ESCO business
1-2	Support for preparation of the regulations and guidelines for the ESCO association (IRESCO)
1-3	Support for establishment of the institutional framework for the ESCO association (IRESCO)
Output 2: The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government's buildings	
2-1	Support for preparation of procedures and manuals to introduce ESCO
2-2	Support to complete contract models and formats for ESCO's
2-3	Capacity development for awareness raising and training
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings (Training in Japan)
Output 3: The introduction of ESCO in Government's buildings is considered and promoted	
3-1	Selection of candidate sites for energy audit in Government's buildings
3-2	Energy audits for Government's buildings are implemented by ESCO companies
3-3	Support to complete plan of pilot project of ESCO
3-4	Capacity development for ESCO companies
3-5	Pilot projects for Government's buildings are implemented by ESCO companies
3-6	Study to introduce ESCO business in Government's buildings
3-7	Monitoring of Pilot Projects
Output 4: Policy recommendations are made for the introduction of ESCO's	
4-1	Study on introduction of ESCO's in Government's buildings
4-2	Study for monitoring and measurement of ESCO project
4-3	Policy recommendations are made for the introduction of ESCO's
	Joint Coordinating Committee
	Work Shop
	Training in Japan

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings in Islamic Rebublic of Iran



Project Member List

Name	Position of the Project	Organization
The JICA Project Team		
Tsutomu MORI	Team Leader / ESCO Framework	Nippon Koei Co., LTD.
Hideaki KUROKI	Energy Audit Engineer (Heat)	Nippon Koei Co., LTD.
Yoichi KITA	Energy Audit Engineer (Electricity)	Nippon Koei Co., LTD.
Behzad Yaghmaie	Assistant stuff	
MOE		
M. A. Shafiezadeh	Project Director	General Director of OIPEEE
A. Shirazi	Project Manger	Head of Awareness & Training, OIPEEE
SABA Project Team		
Amir Doudabi Nezhad	Project Responsible Person of SABA	Deputy of Demand Side Department
Mohammad Akbari	Team Leader	Manager of ESCO Department
Mahdi Hormozi	ESCO Expert	Engineer of ESCO Department
Ahmad R. Tavakkoli	Energy Saving Expert of Building	Engineer of Energy Conservation in Building Department
Mahdi Rafiei	Coordinator (Energy Saving Expert of Industry)	Engineer of Energy Conservation in Industries Department

The Project
On
Implementation of Pilot Projects to Introduce ESCO for Government's Buildings
in
Islamic Republic of Iran

Work Plan of Second stage

April 2016

NIPPON KOEI

Challenging mind, Changing dynamics

TABLE OF CONTENTS

1. Project Description

1.1 Background

The Islamic Republic of Iran (Iran) produces approximately 4 million barrels per day and accounts for 10.9% of oil deposits in the entire world. But, in spite of depending largely on exports of oil for Iranian foreign currency earnings, general energy consumption occupies 44 % of general energy supply in the Islamic Republic Iran on fiscal year 2010, the amount of domestic consumption of oil has been increased. Energy consumption in the residential and commercial sector is the largest which accounts for 36%, followed by the transportation sector 26%, industrial sector 24%. Particularly, energy consumption of buildings classified as the residential and commercial sector have increased constantly. Promotion of Energy Efficiency & Conservation (EE & C) in the building sector is now the most immediate priority mission of Ministry of Energy (MOE) in Iran.

Japan International Cooperation Agency (JICA) implemented a development study for "Institutional Capacity Development on Energy Management in the Building Sector in the Islamic Republic of Iran" from 2010 to 2011 which supported the formulation of the roadmap and action plan to promote energy efficiency in buildings. In this study, it was identified that the Energy Service Company (ESCO) framework is one of the effective measures for promoting EE &C in the building sector by a private sector by aprivate sector initiative. In addition, it was clarified that the policied and legistlations necessary to promote energy efficiency are being formulated such as the "Subsidy Reform Law" and the "Energy Consumption Pattern Reform Law" issued in Dec.2010 and Mar. 2011 respectively.

Under this circumstance, the Government of Iran (GOI) officially requested "the Project on Implementation of Pilot Projects to introduce ESCO for Government's buildings" to the Government of Japan (GOJ) in July 2011. Under the support of JICA, this project is expected to provide knowledge and skills to promote ESCO system for Government's buildings in Iran.

1.2 Goal and Purpose of the Project

EE &C in the building sector will be promoted through the introduction of ESCO for Government's buildings.

The establishment of ESCO business model is promoted through the capacity development of the GOI and ESCO association to promote ESCO businesses.

1.3 Outputs

Output 1: An institutional framework is established to promote ESCO business in Iran.

Output 2: The capacity of the GOI and ESCO association is developed in order to introduce ESCO in Government's buildings.

Output 3: The introduction of ESCO in Government's buildings is considered and promoted.

Output 4: Policy recommendations are made for the introduction of ESCOs.

1.4 JICA Experts (Inputs)

The JICA Project Team (JICA experts) consists of the following three (3) experts:

Table 1-1 JICA Experts (JICA Project Team)

Name	Position
Tsutomu MORI	Team Leader, ESCO framework
Hideaki KUROKI	Energy audit engineer (Heat)
Morio SAKAI	Energy audit engineer (Electricity)

1.5 Implementation Schedule

The duration of the Project will be 53 months.

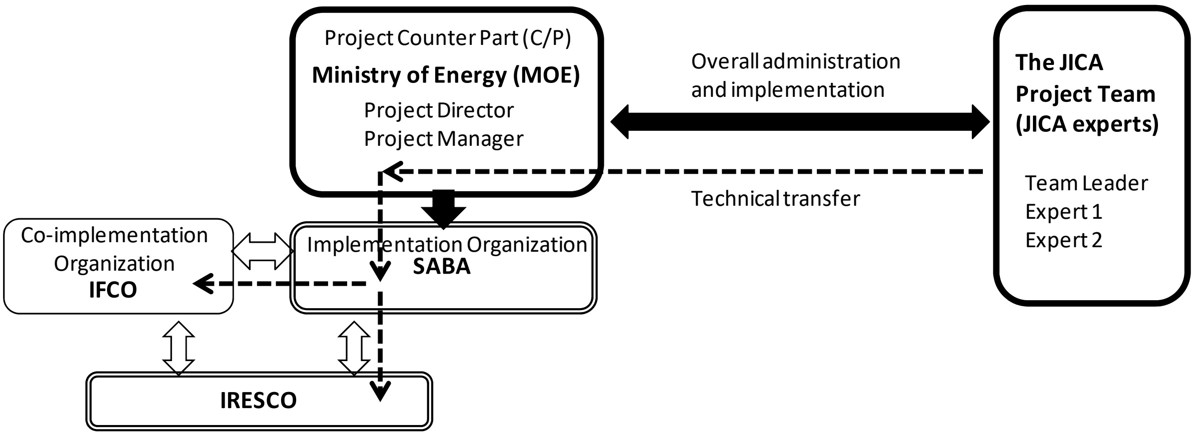
First stage: From January 2014 to February 2016 (Completed)

Second stage: From April 2016 to May 2018 (This phase)

The Plan of Operation of the overall Project is shown in Annex-1.

1.6 Implementation Structure

The project organization chart is as shown in Figure 1-1. The roles and assignments of related organizations are as follows;



Source: Prepared by the JICA Project Team

Figure 1-1 Project Organization Chart

(1) OIPEEE (Office for the Improvement of Productivity and Economy of Electricity and Energy) of MOE

OIPEEE will assign a Project Director to be responsible for overall administration and implementation of the Project.

OIPEEE will assign a Project Manager to be responsible to support managerial and technical issue of the Project.

(2) SABA(IEEO: Iran Energy Efficiency Organization)

SABA will be the implementation organization of the Project and assign a task team to work with JICA Project Team.

(3) IFCO (Iranian Fuel Conservation Organization)

IFCO will be the co-implementation organization of the Project and give necessary information in order to support the implementation of the Project.

(4) IRESCO (Association of Energy Service Companies of Iran)

IRESCO is fundamental for the success of the Project. IRESCO will cooperate in the implementation of the Project through SABA and IFCO.

(5) JICA Project Team (JICA Experts)

The JICA experts will give necessary technical guidance, advice and recommendations to MOE and SABA on any matters pertaining to the implementation of the Project.

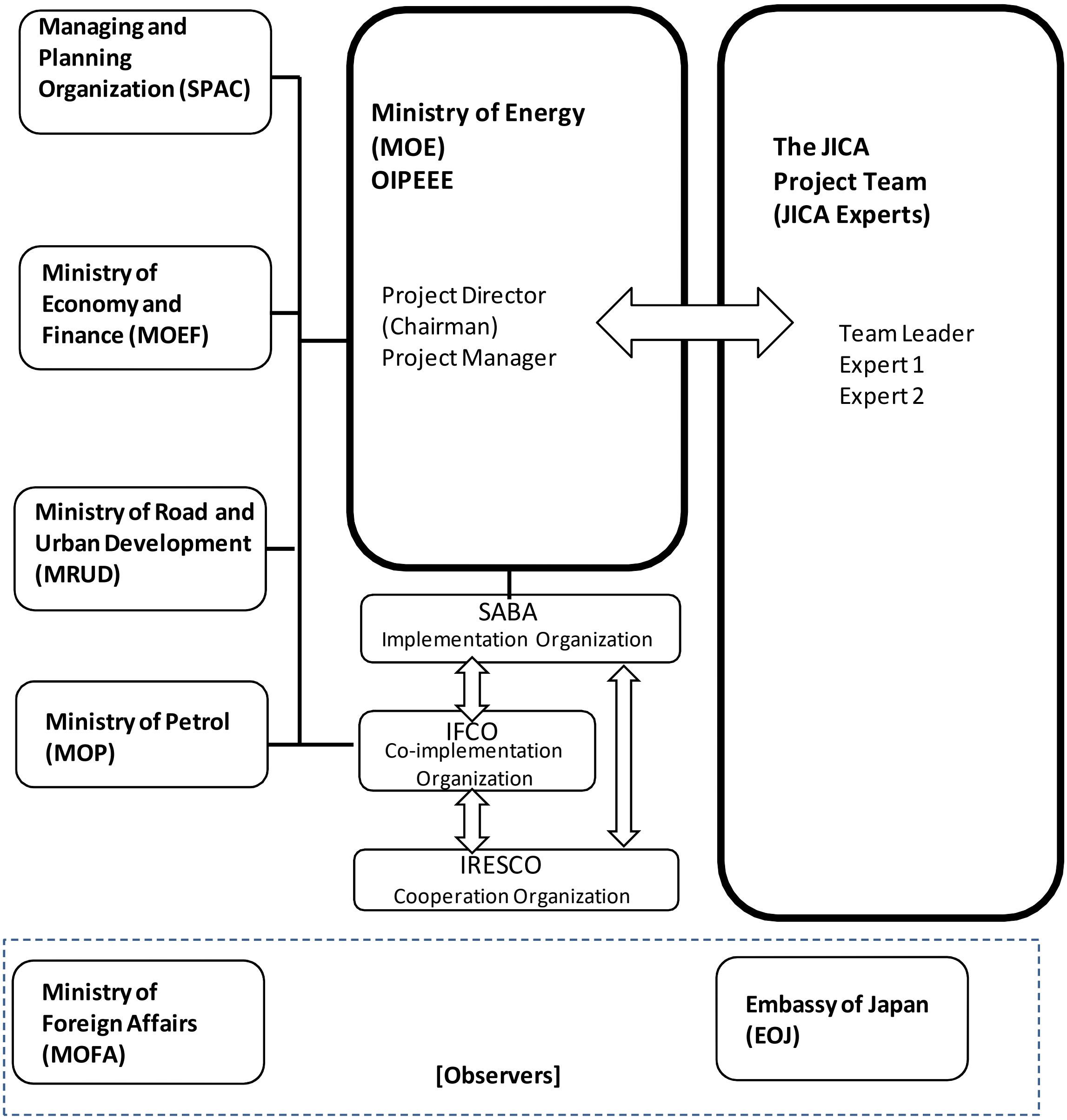
1.7 Project Design Matrix (PDM)

The Project will be implemented joint work between JICA Project Team and SABA based on the project design matrix (PDM). The original PDM of project index was made agreement between JICA and MOE in early time of the first stage, and confirmed among the related organizations in Joint Coordinating Committee (hereinafter referred to as "JCC") on 16th April, 2014.

Original PDM was amended on 14th November, 2015 as PDM version 1. PDM version 1 is shown in Annex-2.

1.8 Joint Coordinating Committee (JCC)

JCC was established in order to facilitate inter-organizational coordination in early time of the first stage. JCC may approve work plan, review overall progress, conduct monitoring and evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. The structure of JCC is as shown in Figure 1-2.



Source: Prepared by the JICA Project Team

Figure 1-2 Structure of JCC

The schedule and agenda of JCC is as shown in Table 1-2.

Table 1-2 schedule and agenda of JCC

JCC	Time	Agenda
1st Committee (At 1st stage)	April 2014 (Done)	- Agreement of Work Plan (First stage) - Confirmation of role of related organizations
2nd Committee (At 1st stage)	August 2015 (Done)	- Report of output of the Work (First stage) - Candidate sites of ESCO pilot project
3rd Committee	August 2016	- ESCO pilot project
4th Committee	August 2017	- Report of monitoring and verification of performance of the pilot project
5th Committee	November 2017	- Report of output of the Work

Source: Prepared by the JICA Project Team

2. Methodology for Implementation of Project

2.1 Activities for the Output 1

Activities for the Output 1 were already done in the first stage.

Items of activities for the Output 1 were shown as follows.

(1) Activity 1-1: Study of measures and policies to promote ESCO business
(2) Activity 1-2: Support for preparation of the regulations and guidelines for IRESCO
(3) Activity 1-3: Support for establishment of the institutional framework for IRESCO

2.2 Activities for the Output 2

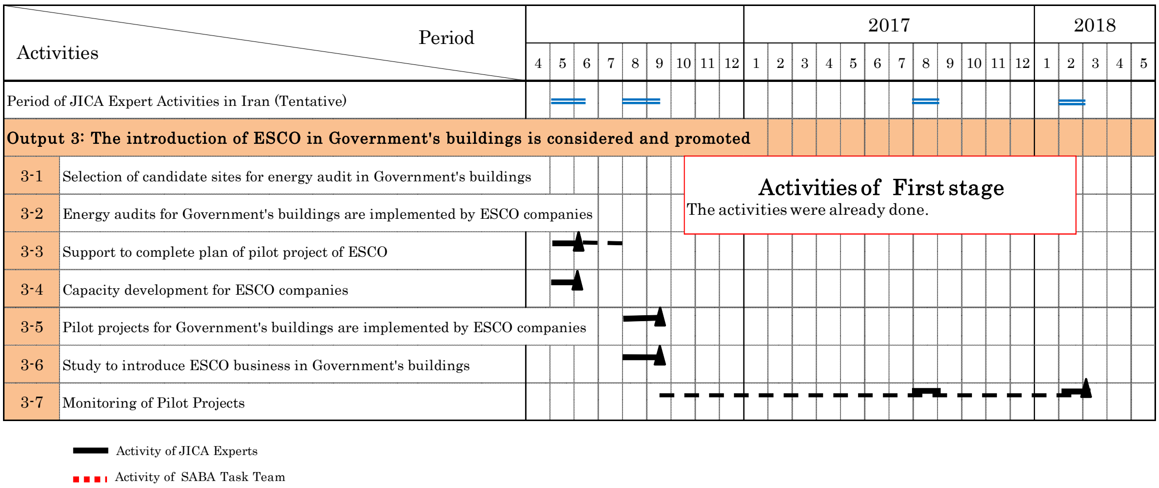
Activities for the Output 2 were already done in the first stage.

Items of activities for the Output 2 were shown as follows.

(1) Activity 2-1: Support for preparation of procedures and manuals to introduce ESCO
(2) Activity 2-2: Support to complete contract models and formats for ESCO's
(3) Activity 2-3: Capacity development for awareness raising and training
(4) Activity 2-4: Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings

2.3 Activities for the Output 3

The schedule of activities for the output 3 is as shown in Figure 2-1.



Source: Prepared by the JICA Project Team

Figure 2-1 Schedule of activities for the output 3

(1) Activity 3-1: Selection of candidate sites for energy audit in Government's buildings

Activity 3-1 was already done in the first stage.

(2) Activity 3-2: Energy audits for Government's buildings are implemented by ESCO companies

Activity 3-2 was already done in the first stage.

(3) Activity 3-3: Support to complete plan of pilot project of ESCO

ESCO companies will conduct detailed audit to few selected buildings as ESCO candidate sites and will prepare specific plan for implementation of the ESCO projects on them, in collaboration with the JICA Project Team. Especially, the JICA Project Team will support on the formulation of specific policies on ESCO business, e.g. performance guarantee, methodology of Measurement and Verification (M&V) for monitoring the ESCO project.

(4) Activity 3-4: Capacity development for ESCO companies

ESCO companies will prepare the ESCO proposals based on the complete plans of pilot project of ESCO mentioned in activity 3-3. SABA and member of IRESCO will act main role on the preparation. All of ESCO proposal will be shared to member of IRECO, in order to develop their capacity. Further, all of them will be submitted to JICA and MOE as deliverables by counterpart organization.

(5) Activity 3-5: Pilot projects for Government's buildings are implemented by ESCO companies

ESCO companies will implement the ESCO pilot project based on the ESCO proposal mentioned in activity 3-4. ESCO companies will present detail of ESCO proposal to building owners in order to share adequately understanding of ESCO pilot project. Especially, main items of ESCO business, e.g. guarantee performance, methodology of M&V for monitoring the ESCO project, risk allocation and share of benefit of ESCO project, will be committed between both of ESCO company and building owner under mutual consultation on the respective ESCO projects. Limited to completion of mentioned commitment, both of ESCO company and building owner will sign ESCO agreement.

The JICA Project Team will support both of ESCO company and building owner on the process of contract until completion of signing the contract, clarify the issues of introduction of ESCO project.

(6) Activity 3-6: Study to introduce ESCO business in Government's buildings

In parallel of implementation of ESCO pilot project, the JICA Project Team will study countermeasure to introduce ESCO business in Government's buildings as follows.

・Estimation of potential and scale of ESCO business market in Tehran city wise and in entire Iran.

・Preparation of long list of feasible buildings on ESCO business.

・Preparation of master plan of promotion of ESCO business (Schedule, Budget).

(7) Activity 3-7: Monitoring of Pilot Projects

Monitoring will be carried out around first anniversary of commencement of ESCO pilot project. The M&V will be implemented under reference of ESCO proposal by ESCO company. The JICA Project Team will verify benefit by implementation of ESCO pilot project through monitoring, and will consider standard monitoring protocols of ESCO project in Iran. These protocols will be compiled as proposal regarding monitoring methodology of ESCO project in Ian. Finally, mentioned proposal will be submitted to MOE as deliverables.

In Japan, guideline of International Performance Measurement and Verification Protocol (IPMVP) of United States (US) is referred as standard of monitoring.

Categorization of M&V defined by IPMVP is shown in Table 2-1.

Statistical data does not exist, and no measurement instrument is installed in almost of buildings in Iran. In such cased, it is difficult to adopt Options C, D, because these options require track record in long term in order to consider E&C potential. Therefore, it is desirable to adopt Options A, B in many cases.

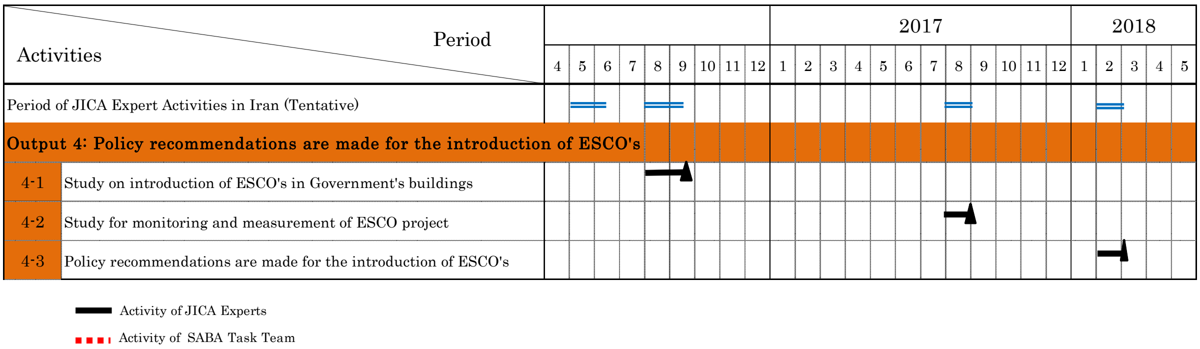
Table 2-1 Categorization of M&V defined by IPMVP

Scope	Option A (Retrofit Isolation with Key Parameter Measurement)	Option B (Retrofit Isolation with All Parameter Measurement)	Option C (Whole-Facility Measurement)	Option D (Calibrated Computer Simulation)
Baseline	Baseline will be set per each E&C counter measure. Option A can be applicable, limited to in case that all of following condition is met. ・load change of the system is not frequent. ・Operating time of the system is stable.	Baseline will be set per each E&C counter measure. Option B can be applicable in following cases ・load change of the system is not frequent. ・Operating time of the system is stable.	Baseline will be set as entire building. Formula to estimate should be developed through study of measurement record (almost three years) at prior to ESCO project.	Same as Option C or By computer simulation
Policy of M&V after introduction of E&C counter measures	By estimation, Operating hours multiples efficiency, e.g. catalog specification, measurement in short term.	Measurement of amount of energy consumption in each equipment in short term.	Baseline should be amended based on cause of variation and amount of energy saving should be evaluated by comparison between measured value and amended baseline. It means that imaginary energy consumption at prior to ESCO project as amended baseline will be calculated.	By computer simulation
Applicable E&C counter measures	・Replace to high efficiency lighting fixture ・Replace to CFL ・Introduction of lighting control system by moving sensor	・Introduction of pump and/or fan control system by VSD (Variable Speed Device) ・Replace to high efficiency distribution transformer ・Introduction of BEMS (Building Energy Management System) ・Introduction of CHP (Combined Heat and Power) ・Development of chilled and/or warm water system ・Development of HVAC control	・Introduction (affix) of heat insulation film on the window glaze ・Introduction of BEMS (Building Energy Management System) ・Introduction of control system of carbon dioxide concentration ・Development of HVAC control ・Development of heat source equipment control	・Change of HVAC system

Source : Prepared by the JICA Project Team

2.2 Activities for the Output 4

The schedule of activities for the output 4 is as shown in Figure 2-2.



Source: Prepared by the JICA Project Team

Figure 2-2 Schedule of activities for the output 4

(1) Activity 4-1: Study on introduction of ESCO’s Government’s buildings

The JICA Project Team will clarify the issues for the introduction of ESCO’s Government’s buildings in Iran and study countermeasures to dissolve them through experience of ESCO pilot project.

(2) Activity 4-2: Study for monitoring and measurement of ESCO project

The JICA Project Team will clarify the issues for monitoring and measurement of ESCO project in Iran, and study countermeasures to dissolve them through experience of ESCO pilot project.

(3) Activity 4-3: Policy recommendations are made for the introduction of ESCO’s

The JICA Project Team will suggest policy recommendations are made for the introduction of ESCO’s in Iran through experience of ESCO pilot project, some practices of ESCO project in Japan also.

3. Work Shop (W/S)

Total three (3) Work Shops will be hold in the Project. Outline of the work shop is as shown in Table 3-1. Two (2) W/Ss will be held in the first stage, and one (1) W/S will be held in the second stage.

Table 3-1 Outline of the work shop (Tentative)

Workshop	Time	Program
1st work shop (At 1st stage)	April 2014	- Legislation and finance support to promote ESCO in Japan - Activities and role of ESCO association in Japan
2nd work shop (At 1st stage)	November 2015	- Introduction of best practice of ESCO - Introduction of new ESCO scheme in Japan - Fund of ESCO business
3rd work shop	November 2017	- Results of monitoring on ESCO pilot projects

Source: Prepared by the JICA Project Team

4. Supporting from Iranian Side

Based on Record of Discussion that is agreed between Japan International Cooperation Agency (JICA) and the Islamic Republic of Iran on October 1st, 2013, the Iranian Government is kindly requested to provide the following supports to the JICA Project Team;

- Office room,
- Credentials or identification cards,
- Support in JICA Project Team travelling for site sruvey, and
- Other facilitation, if necessary.

5. Annex（omitted. all of hard copy of annexes are attached in attachment or deliverable.）

- Annex-1: Plan of Operation of the overall Project Rev.1
- Annex-2: Project Design Matrix (PDM) version 1
- Annex-3: Manning Schedule
- Annex-4: ESCO manual
- Annex-5: Model contract of ESCO

添付資料　4

専門家派遣実績

The project on Implementation of Pilot roject to Introduce ESCO for Government's Buildings in Islamid Republic of Iran

First Stage: months 1–27 (12/2013 – 2/2016); Second Stage: months 29–61 (4/2016 – 12/2018)

2014 | 2015 | 2016 | 2017 | 2018

FY2013 | FY2014 | FY2015 | FY2016 | FY2017 | FY2018

Expert/Position	Name	Company	Work periods	M/M in first stage Iran	M/M in first stage Japan	M/M in second stage Iran	M/M in second stage Japan	total Iran	total Japan
Team Leader/ESCO Framework	Tsutomu MORI	Nippon Koei	1/24-30 (7); 4/4-24 (21); 9/12-26 (15); 2/7-27 (21); 11/6-27 (22); 5/13-31 (19); 6/1-2 (2); 11/6-26 (21); 12/1-15 (15); 1/12-31 (20); 2/1 (1); 6/26-30 (5); 7/1-13 (13)	2.87		3.20		6.07	
ESCO/Energy Audit Engineer (Heat)	Hideaki KUROKI	Nippon Koei	4/11-30 (20); 5/1 (1); 9/18-30 (13); 10/1-2 (2); 2/16-28 (13); 3/1-8 (8); 10/29-31 (3); 11/1-27 (27); 5/19-31 (13); 6/1-17 (17); 10/28-30 (4); 11/1-26 (26); 6/19-30 (12); 7/1-13 (13)	2.90		2.83		5.73	
ESCO/Energy Audit Engineer (Electricity)	Yoichi KITA/ Morio SAKAI	Nippon Koei	4/11-30 (20); 5/1 (1); 9/18-30 (13); 10/1-2 (2); 2/16-28 (13); 3/1-8 (8); 10/29-31 (3); 11/1-27 (27); 5/19-31 (13); 6/1-17 (17); 10/28-30 (4); 11/1-26 (26); 1/20-31 (12); 2/1-9 (9); 6/19-30 (12); 7/1-13 (13)	2.90		3.53		6.43	
				8.67		9.56		18.23	
Team Leader/ESCO Framework	Tsutomu MORI	Nippon Koei	1/20-23 (4); 3/20, 3/24-27 (5); 3/16, 3/24-25 (3); 12/3, 4 (2); 1/8, 14, 21 (3); 4/4-5, 7-8, 11-15, 18 (10); 10/26-27, 31 (3); 8/5 (1)		0.85		0.70		1.55
ESCO/Energy Audit Engineer (Heat)	Hideaki KUROKI	Nippon Koei	3/20, 25 (2); 1/8, 14, 21 (3); 6/6-8, 11-15 (8); 7/17-20 (4)		0.25		0.60		0.85
ESCO/Energy Audit Engineer (Electricity)	Yoichi KITA/ Morio SAKAI	Nippon Koei	3/20, 25 (2); 12/2-4 (3); 7/19-20, 26, 30 (4); 8/1-3, 6, 13-16 (8)		0.25		0.60		0.85
					1.35		1.90		3.25
Total				8.67	1.35	9.56	1.90	18.23	3.25
				10.02		11.46		21.48	

Submission:
- Contract (First Stage)
- Work Plan (First Stage)
- Progress Report (First Stage)
- Contract (Scond Stage)
- Work Plan (Sconfd Stage)
- Completion REport

Legend:
Work in Iran:
Work in Japan:

添付資料　5

研修受入実績(第１回および第２回)

Detailed Plan for Training in Japan (Actual Record)

Name of Training　Training on counter part, The project on Implementation of Pilot roject to Introduce ESCO for Government's Buildings in Islamid Republic of Iran

Period　2015/1/18 to　2015/1/24　　Nos of Trainee　9　persons

Date	Time	Item of training	Lecturers and the person in charge			Lan.	Venue	Accom.
			Name	Organization or Company	Telephone			
18th, Jan, 2015	～	Arrival at Japan						JICA Tokyo
19th, Jan, 2015	10:00 ～ 11:30	Briefing				Eng.	JICA Tokyo	JICA Tokyo
	11:30 ～ 12:30	Orientation	Mr. Hiroshi SASAKI	JICA	03-5226-8069			
			Mr. Tsutomu MORI	Nippon Koei Co., Ltd.	03-5215-6889			
	14:00 ～ 17:00	Discussion with ESCO company （JAESCO）	Mr. Tetsuya MAEKAWA	International Affairs / Board, JAESCO	03-6371-2510	Jpn.	Nippon Koei	
20th, Jan, 2015	9:00 ～ 12:00	Discussion with ESCO Financer in Japan	Mr. Toshitaka NAGANO	Mitsubishi UFJ Lease & Finance	03-6865-3023	Jpn.	Nippon Koei	JICA Tokyo
	14:00 ～ 17:00	Policy and financial support for EE & C of building from MLIT	Mr. Harunobu MURAKAMI	Building Environment Office, Housing Bureau, Ministry of Land, Infrastructure, Transport and Tourism	03-5253-8940	Jpn.	Nippon Koei	
21st, Jan, 2015	9:00 ～ 12:00	The role what ECCJ has played in promoting ESCO in Japan, Discussion with ECCJ	Mr. Kazuhiko YOSHIDA	International Capacity Building Center for Energy Conservation, International Cooperation Division, The Energy Conservation Center, Japan	03-5439-9741	Jpn.	ECCJ	JICA Tokyo
	14:00 ～ 17:00	Policy and financial support for greenhouse gas reduction from MOE	Mr. Hiroki HATAKEYAMA	Ministry of the Environment	03-5521-8249	Jpn.	MOE	
22nd, Jan, 2015	10:00 ～ 12:00	Site visit	Mr. Tetsuya MAEKAWA	Yokohama City University Hospital	03-6371-2510	Jpn.	Site	JICA Tokyo
	14:00 ～ 17:00	Policy and financial support for promoting ESCO from Tokyo Metropolitan Government	Mr. Kenji YASUNO	Tokyo Metropolitan Government	03-5388-3501	Jpn.	Tokyo Metro.	
23rd, Jan, 2015	9:30 ～ 11:30	Wrap up meeting	Mr. Hiroshi SASAKI	JICA	03-5226-8069		JICA Tokyo	
			Mr. Tsutomu MORI	Nippon Koei Co., Ltd.	03-5215-6889			

Detailed Plan for Training in Japan (Actual Record)

Name of Training　Training on counter part, The project on Implementation of Pilot roject to Introduce ESCO for Government's Buildings in Islamid Republic of Iran

Period 2017/4/16 to 2017/4/26　　Nos of Trainee 11 persons

Date	Time			Item of training	Lecturers and the person in charge			Lan.	Venue	Accom.
					Name	Organization or Company	Telephone			
16th, Apr, 2017		～		Arrival at Japan						JICA Tokyo
17th, Apr, 2017	10:00	～	12:30	Briefing and Orientation				Eng.	JICA Tokyo	JICA Tokyo
	14:00	～	16:00	Lecture (M&V methodology)	Mr. Morio SAKAI	Nippon Koei Co., Ltd.	03-5215-6889	Jpn.		
18th, Apr, 2017	9:00	～	11:00	Discussion with ESCO Financer in Japan	Mr. Yukio FUSE	Japan Association of Energy Service Companies	03-3234-2228	Jpn.	JICA Tokyo	JICA Tokyo
	13:00	～	16:30	Factory tour	Mr. Tetsuya FUJITA	Azbil Corporation	03-6432-5114	Jpn.	Azbil Corporation	
19th, Apr, 2017	9:00	～	12:00	Discussion with JASE-W	Mr. Shigeru AMANO	Japanese Business Alliance Smart Energy Worldwide	03-5439-9765	Jpn.	Nippon Koei	JICA Tokyo
					Mr. Masaaki OKABE	Asahi Glass Co., LTD	050-3481-4370			
					Mr. Kazutoshi HATA	Kawasaki Heavy Industries, ltd.	03-3435-2579			
					Mr. Osamu SUZUKI	NIPPON STEEL & SUMIKIN ENGINEERING CO., LTD.	090-7214-5166			
	14:00	～	15:30	Discussion with METI	Mr. Kenji KATO	Ministry of Economy, Trade and Industry	03-3501-6289			
20th, Apr, 2017				Transfer from Tokyo to Osaka						Osaka Garden Palace
	14:00	～	16:00	Discussion with Osaka Prefecture	Mr. Naohisa TAKAYAMA	Osaka Prefecture	06-6210-9799	Jpn.	Osaka Prefecture	
21st, Apr, 2017	10:00	～	12:30	Site visit	Mr. Kiwamu INOUE	DAIKIN INDUSTRIES, Ltd.,	06-6359-2617	Jpn.	Site	Osaka Garden Palace
	14:00	～	16:30	Site visit	Mr. Naohisa TAKAYAMA	Osaka Prefecture	06-6210-9799	Jpn.	Site	
24th, Apr, 2017	10:00	～	12:00	Site visit	Mr. Kazuma FUJIMORI	Takasago Thermal Engineering Co., Ltd.	026-234-7117	Jpn.	Site	JICA Tokyo
	14:00	～	16:00	Lecture (Finance Mechanism)	Mr. Toshitaka NAGANO	Mitsubishi UFJ Lease & Finance Company Limited	03-6865-3023	Jpn.	Nippon Koei	
25th, Apr, 2017	9:20	～	11:00	Site visit	Mr. Tomo HOSHINO	Tokyo Gas Engineering Solutions Corporation	03-6452-8470	Jpn.	Site	JICA Tokyo
	13:30	～	15:00	Reporting and evaluation	Ms. Yukiko MAEDA	JICA	03-5226-6957	Jpn.	JICA Tokyo	
					Mr. Tsutomu MORI	Nippon Koei Co., Ltd.	03-5215-6889			

添付資料 6

JCC

(第 1 回 JCC、第 2 回 JCC、第 3 回 JCC、第 4 回 JCC および第 5 回 JCC)

Agenda of 1st Joint Coordinating Committee

April 16, 2014 (1393/ 1 /27)
Conference room, 7th Floor, Ministry of Energy

1. Opening speech 9:00 - 9:10
   Mr. Yasuto Takeuchi, Chief representative,
   Japan International Cooperation Agency (JICA) Iran Office
2. Summary of the project 9:10 - 9:30
   Mr. Mohammad Ali Shafiezadeh, General Director,
   Office for the Improvement of Productivity and Economy of Electricity and Energy(OIPEEE), Ministry of Energy
3. ESCO (Energy Service COmpany) 9:30 - 9:50
   Mr. Tsutomu Mori, Team Leader, JICA project team
4. PDM (Project Design Matrix) of this project 9:50 - 10:00
   Mr. Tsutomu Mori, Team Leader, JICA project team
5. Work plan of First stage 10:00 - 10:20
   Mr. Hideaki Kuroki, Expert (heat), JICA project team
6. Question and Answer 10:20 - 10:30

Attendance list at 1st Joint Coordinating Committee which was held on April 16, 2014.

No	Organization	department	Occupation	Name
1	Ministry of Energy	OIPEEE	General Director, ESCO Project Director	M.Ali.Shafiezadeh
2	Ministry of Energy	OIPEEE	Head of International Collaboration, ESCO Project Manager	Alireza Shirazi
3	Ministry of Energy	OIPEEE	Assistant Stuff	M.Ebrahim. Sardari
4	SABA	Industry Factor	Manager of ESCO Dep.	Mohammad Akbari
5	SABA	Industry	Engineer of ESCO Dep.	Mehdi Hormozi
6	Ministry of Petroleum	Energy Planning office	Energy Efficiency Expert	Ali Nowruzi
7	IFCO	Industry	Senior Expert	Morteza Golzadeh
8	IFCO	Industry Sector	Director	Mehdi Sharif
9	IFCO		Leader & Contract	S.M.Lajevardi
10	MRUD	Building code	Manager of Building code	Mohammad Khorramabadi
11	IRESCO	Board	Member of board	Tooraj Bataie
12	IRESCO	Board	Secretary	Ali.M.Mirshams
13	ECEO	Energy	Manager	A. Shirazpour
14	JICA Iran Office		Chief Representative	Yasuto Takeuchi
15	JICA Iran Office		Project Formulator	Misuto Odashima
16	JICA Iran Office		Program Officer	Ramin Maleki
17	JICA Project Team	Team Leader / ESCO	Expert	Tsutomu Mori
18	JICA Project Team	Energy Audit Engineer	Heat Expert	Hideaki Kuroki
19	JICA Project Team	Energy Audit Engineer	Electrical Expert	Yoichi Kita
20	JICA Project Team		Assistant Stuff	Behzad Yaghmaie
21	JICA Project Team		Interpreter	Mehdi Goudarzy
22	Embassy of Japan	Economic Cooperation	Second Secretary	Tomohiko Sakamoto

MINUTES OF MEETING

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY

AND

MINISTORY OF ENERGY

ON

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS

TO INTRODUCE ESCO

FOR

GOVERNMENT'S BUILDINGS IN THE ISLAMIC REPUBLIC OF IRAN

Tehran, April 21, 2014

Mr. Yasuto TAKEUCHI
Chief Representative
Iran Office
Japan International Cooperation Agency

Mr. M. A. SHAFIEZADEH
General Director of OIPEEE
Ministry of ENERGY
The Islamic Republic of Iran

Mr. Tsutomu MORI
Leader of JICA project team
Nippon Koei Co. Ltd.

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran (hereinafter referred to as "the Project") has been carried out based on the Record of Discussion (hereinafter referred to as "R/D") that was agreed between Japan International Cooperation Agency (hereinafter referred to as "JICA") and Ministry of Energy of Islamic Republic of Iran (hereinafter referred to as "MOE") in October 1, 2013.

The first Joint Coordinating Committee (hereinafter referred to as "JCC") was held on April 16, 2014. The attendance list is attached in Attachment 1.

The following topics have been presented and discussed:

1) Introduction of the Project
2) Introduction of ESCO business scheme
3) Explanation of Project Design Matrix version 0 (hereinafter referred to as "PDM_0") and Work Plan of the First Stage

Main points of the discussion are summarized below.

1) Agreement on PDM_0
   Based on the Project frame work, which is stipulated on the R/D, PDM_0 was developed and both Japanese side and Iranian side agreed the PDM_0 as attached in Attachment 2.

2) Confirmation of Work Plan of the First Stage
   Based on the R/D and PDM_0, Work Plan of the First Stage has been developed and both Japanese side and Iranian side agreed to implement the project along with this Work Plan.

ATTACHMENT

1. Attendance list
2. Project Design Matrix version 0 (PDM_0)
3. Work Plan of First Stage

Attachment-1

Attendance list at 1st Joint Coordinating Committee which was held on April 16, 2014.

No	Organization	department	Occupation	Name
1	Ministry of Energy	OIPEEE	General Director, ESCO Project Director	M.Ali.Shafiezadeh
2	Ministry of Energy	OIPEEE	Head of International Collaboration, ESCO Project Manager	Alireza Shirazi
3	Ministry of Energy	OIPEEE	Assistant Stuff	M.Ebrahim. Sardari
4	SABA	Industry Factor	Manager of ESCO Dep.	Mohammad Akbari
5	SABA	Industry	Engineer of ESCO Dep.	Mehdi Hormozi
6	Ministry of Petroleum	Energy Planning office	Energy Efficiency Expert	Ali Nowruzi
7	IFCO	Industry	Senior Expert	Morteza Golzadeh
8	IFCO	Industry Sector	Director	Mehdi Sharif
9	IFCO		Leader & Contract	S.M.Lajevardi
10	MRUD	Building code	Manager of Building code	Mohammad Khorramabadi
11	IRESCO	Board	Member of board	Tooraj Bataie
12	IRESCO	Board	Secretary	Ali.M.Mirshams
13	ECEO	Energy	Manager	A. Shirazpour
14	JICA Iran Office		Chief Representative	Yasuto Takeuchi
15	JICA Iran Office		Project Formulator	Misuto Odashima
16	JICA Iran Office		Program Officer	Ramin Maleki
17	JICA Project Team	Team Leader / ESCO	Expert	Tsutomu Mori
18	JICA Project Team	Energy Audit Engineer	Heat Expert	Hideaki Kuroki
19	JICA Project Team	Energy Audit Engineer	Electrical Expert	Yoichi Kita
20	JICA Project Team		Assistant Stuff	Behzad Yaghmaie
21	JICA Project Team		Interpreter	Mehdi Goudarzy
22	Embassy of Japan	Economic Cooperation	Second Secretary	Tomohiko Sakamoto

Attachment-2

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Energy Efficiency Organization (IEEO/SABA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SABA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: 2014-2017 (4.0 years)

Version 0
April 16, 2014

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	- Implementation and planning of ESCO to Government buildings are prepared. - XX% of Energy consumption in the building sector is reduced.	- Performance records of ESCO for Government buildings. - Energy consumption data in the building sector.	Finance incentive for ESCO shall be prepared by Iranian side.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	- ESCO pilot projects to Government buildings are implemented. - ESCO business model in Iran through the ESCO pilot projects is established.	- Performance contract and implementation document of the ESCO pilot projects. (May 2016) - Reports of monitoring and verification of the ESCO pilot projects. (Apr. 2017)	The budget for the ESCO pilot projects shall be allocated by the Iranian side.
Outputs: 1. An institution framework is established to promote ESCO business in Iran.	- Regulations and guidelines for the IRESCO are completed. - Roles and responsibilities to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) are identified.	- Regulations and guidelines for the IRESCO. (Feb. 2015) - An institution framework and rule to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) (Feb. 2015)	
2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings.	- Procedures and manual of introduction of ESCO to Government buildings is completed. - Performance contract models for ESCO are prepared. - Seminar and training for capacity building are conducted for IRESCO members by SABA and IFCO.	- Procedures and manual of introduction of ESCO to Government buildings. (Aug. 2015) - Performance contract models for ESCO. (Aug. 2015) - Records of seminar and training. (Aug. 2015)	The case studies of finance incentive schemes in Japan will be introduced in training course in Japan
3. The introduction of ESCO in Government's buildings is considered and promoted.	- Candidate buildings for ESCO pilot projects are selected by Iranian side. - Energy audit of ESCO planning for the candidate buildings are conducted by members of IRESCO. - Proposal and implementation plan for ESCO pilot project are prepared. - ESCO pilot projects to Government buildings are implemented. - Results of monitoring and verification of the ESCO pilot projects are reported. - Implementation plans to introduce ESCO for Government buildings are prepared.	- Short list of candidate buildings for ESCO pilot projects. (Feb. 2015) - Reports of energy audits of the candidate buildings. (Aug. 2015) - Proposal and implementation plan for ESCO pilot project. (Dec. 2015) - Results of monitoring and verification of the ESCO pilot projects. (May 2016) - Implementation plans to introduce ESCO for Government buildings. (Apr. 2017)	SABA and IFCO will be responsible for the result of monitoring and verification of the ESCO pilot projects.
4. Policy recommendations are made for the introduction of ESCOs	- ESCO business model in Iran through the ESCO pilot projects is established. - Policy and action plan to promote ESCO in building sector are prepared by MOE.	- Policy and action plan to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) (Nov. 2017)	

Activities:	Inputs (Means and Cost)	Pre-conditions
1. An institution framework is established to promote ESCO business in Iran. 1-1 Preparation and support for the institutional framework, regulations and guidelines for the establishment of ESCO association 2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings. 2-1 Preparation of procedures and manuals for the introduction of ESCOs 2-2 Preparation of contract models and formats for ESCOs 2-3 Capacity development for awareness raising and training 2-4 Introduction of case studies on Japan's policies, legislations and finance mechanisms for energy efficiency in buildings 3. The introduction of ESCO in Government's buildings is considered and promoted. 3-1 Capacity development for ESCO companies 3-2 Energy audits for Government's buildings by ESCO companies 3-3 Pilot projects are implemented by ESCO companies in order to introduce ESCO for Government's buildings 3-4 Monitoring of Pilot Projects 4. Policy recommendations are made for the introduction of ESCOs 4-1 Policy recommendations for the introduction of ESCO's	**The Japanese Side** A. Experts ・ Team Leader (ESCO Expert) / ESCO Framework ・ Energy Audit Engineer (Heat) ・ Energy Audit Engineer (Electricity) B. Training in Japan ・ ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. ・ Non **The Iranian Side:** A. Ministry of Energy: Project Counter Part ・ Project Director: General Director, Office for the Improvement of Productivity and Economy of Electricity and Energy (OIPEEE) ・ Project Manager: Head of Awareness & Training, OIPEEE B. SABA: Implementation Organization ・ Deputy of Demand Side Department ・ ESCO Department C. IFCO: Co-Implementation Organization D. IRESCO: Cooperation Organization **Joint Coordinating Committee(JCC)** A. Chairperson: ・ General Director of OIPEEE B. Member of Iranian Side ・ MOE ・ Presidential Deputy of Strategic Planning and Supervision (SPAC) ・ Ministry of Economy and Finance (MOEF) ・ Ministry of Petrol (MOP) ・ Ministry of Road and Urban Development (MRUD) ・ SABA ・ IFCO ・ IRESCO C. Member of Japanese side ・ JICA Experts ・ Representatives from JICA IRAN Office ・ Other personnel concerned to be assigned by request of other members D. Observer ・ Ministry of Foreign Affairs (MOFA) ・ Embassy of Japan (EoJ)	

Attachment-3

The Project On Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic Republic of Iran

Work Plan of First stage

April 2014

NIPPON KOEI

Challenging mind, Changing dynamics

TABLE OF CONTENTS

1. Project Description

1.1 Background

The Islamic Republic of Iran produces approximately 4 million barrels per day and accounts for 10.9% of oil deposits in the entire world. But, in spite of depending largely on exports of oil for Iranian foreign currency earnings, general energy consumption occupies 44 % of general energy supply in the Islamic Republic Iran on fiscal year 2010, the amount of domestic consumption of oil has been increased. Energy consumption in the residential and commercial sector is the largest which accounts for 36%, followed by the transportation sector 26%, industrial sector 24%. Particularly, energy consumption of buildings classified as the residential and commercial sector have increased constantly. Promotion of Energy Efficiency & Conservation (EE & C) in the building sector is now the most immediate priority mission of Ministry of Energy in the Islamic Republic of Iran.

JICA implemented a development study for "Institutional Capacity Development on Energy Management in the Building Sector in the Islamic Republic of Iran" from 2010 to 2011 which supported the formulation of the roadmap and action plan to promote energy efficiency in buildings. In this study, it was identified that the ESCO framework is one of the effective measures for promoting EE &C in the building sector by a private sector by aprivate sector initiative. In addition, it was clarified that the policied and legistlations necessary to promote energy efficiency are being formulated such as the "Subsidy Reform Law" and the "Energy Consumption Pattern Reform Law" issued in Dec.2010 and Mar. 2011 respectively.

Under this circumstance, the Government of the Islamic Republic of Iran officially requested "the Project on Implementation of Pilot Projects to introduce ESCO for Government's buildings" to GOJ in July 2011. Under the support of JICA, this project is expected to provide knowledge and skills to promote ESCO system for Government's buildings in the Islamic Repubilc of Iran.

1.2 Goal and Purpose of the Project

EE &C in the building sector will be promoted through the introduction of ESCO for Government's buildings.

The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.

1.3 Outputs

Output 1: An institutional framework is established to promote ESCO business in the Islamic Republic of Iran.

Output 2: The capacity of the Government of the Islamic Republic of Iran and ESCO association is developed in order to introduce ESCO in Government's buildings.

Output 3: The introduction of ESCO in Government's buildings is considered and promoted.

Output 4: Policy recommendations are made for the introduction of ESCOs.

1.4 JICA Experts (Inputs)

The JICA Project Team (JICA experts) consists of the following three (3) experts:

Table 1-1 JICA Experts (JICA Project Team)

Name	Position
Tsutomu MORI	Team Leader, ESCO framework
Hideaki KUROKI	Energy audit engineer (Heat)
Yoichi KITA	Energy audit engineer (Electricity)

1.5 Implementation Schedule

The duration of the Project will be 48 months.

First stage:	From January 2014 to September 2015
Second stage:	From October 2015 to December 2017

The Plan of Operation of the overall Project is shown in Annex-1.

1.6 Implementation Structure

The project organization chart is as shown in Figure 1-1. The roles and assignments of related organizations are as follows;

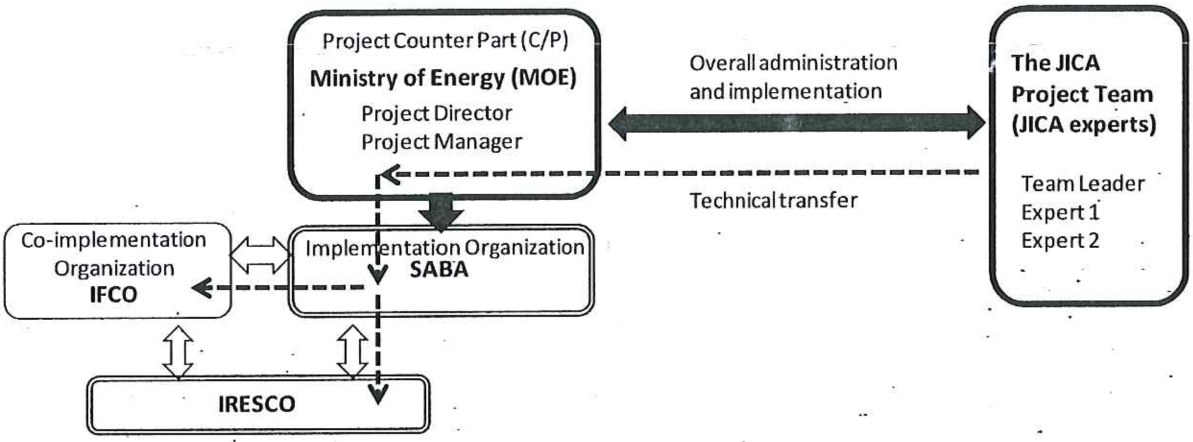


Figure 1-1 Project Organization Chart

(1) OIPEEE (Office for the Improvement of Productivity and Economy of Electricity and Energy) of MOE

OIPEEE will assign a Project Director to be responsible for overall administration and implementation of the Project.

OIPEEE will assign a Project Manager to be responsible to support managerial and technical issue of the Project.

(2) SABA(IEEO: Iran Energy Efficiency Organization)

SABA will be the implementation organization of the Project and assign a task team to work with JICA Project Team.

(3) IFCO (Iranian Fuel Conservation Organization)

IFCO will be the co-implementation organization of the Project and give necessary information in order to support the implementation of the Project.

(4) IRESCO (Association of Energy Service Companies of Iran)

IRESCO is fundamental for the success of the Project. IRESCO will cooperate in the implementation of the Project through SABA and IFCO.

(5) JICA Project Team (JICA Experts)

The JICA experts will give necessary technical guidance, advice and recommendations to MOE and SABA on any matters pertaining to the implementation of the Project.

1.7 Project Design Matrix (PDM)

The Project will be implemented joint work between JICA Project Team and SABA based on the project design matrix (PDM). The PDM of project index will be made agreement between JICA and MOE, and confirmed among the related organizations in Joint Coordinating Committee (hereinafter referred to as "JCC").

1.8 Joint Coordinating Committee (JCC)

JCC will be established in order to facilitate inter-organizational coordination. JCC will approve work plan, review overall progress, conduct monitoring and evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. The structure of JCC is as shown in Figure 1-2.

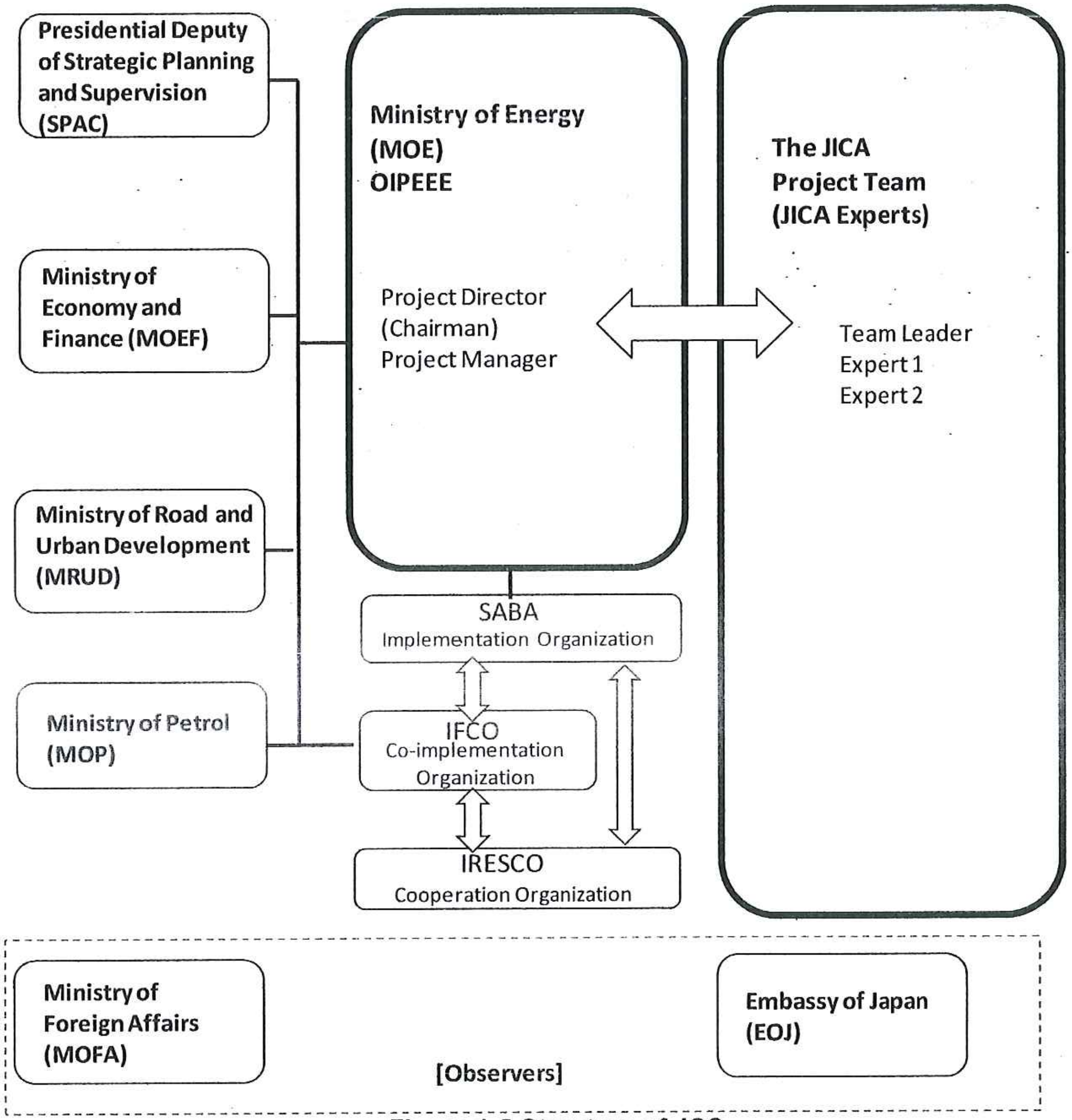


Figure 1-2 Structure of JCC

The schedule and agenda of JCC is as shown in Table 1-2.

Table 1-2 schedule and agenda of JCC

JCC	Time	Agenda
1st Committee	April 2014	- Agreement of Work Plan (First stage) - Confirmation of role of related organizations
2nd Committee	August 2015	- Report of output of the Work (First stage) - Candidate sites of ESCO pilot project - Budget of ESCO pilot project - Schedule and work plan of second stage
3rd Committee (At 2nd stage)	April 2016	- Agreement of Work Plan (Second stage) - ESCO pilot project
4th Committee (At 2nd stage)	May 2017	- Report of monitoring and verification of performance of the pilot project
5th Committee (At 2nd stage)	November 2017	- Report of output of the Work

2. Methodology for Implementation of Project

2.1 Activities for the Output 1

The schedule of activities for the output 1 is as shown in Figure 2-1.

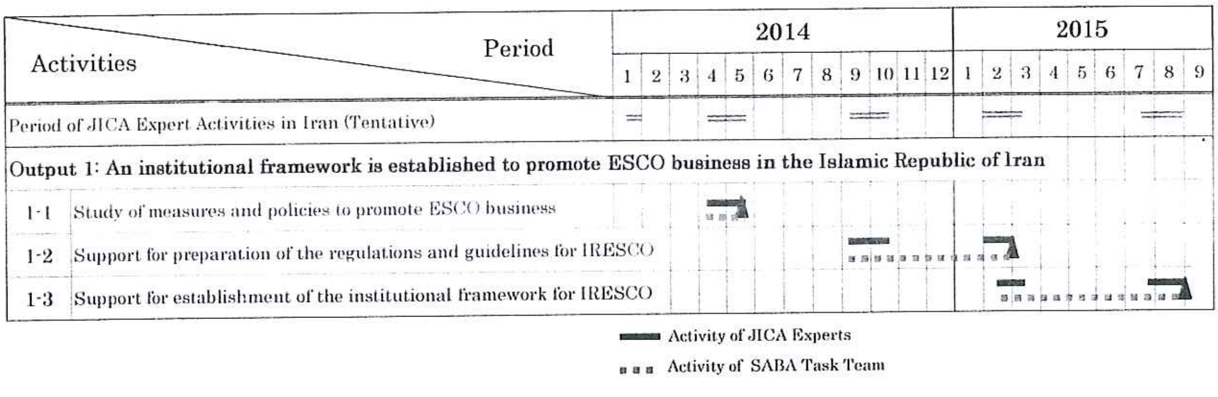


Figure 2-1 Schedule of activities for the output 1

(1) Activity 1-1: Study of measures and policies to promote ESCO business

The JICA Project Team will study measures and policies to promote ESCO business through interview survey for related organizations. The JICA Project Team will introduce the activities of ESCO association in Japan in the first work shop. The JICA Project Team will sort out priorities of IRESCO's activities under studying measures in Islamic Republic of Iran.

(2) Activity 1-2: Support for preparation of the regulations and guidelines for IRESCO

The regulations and guidelines of IRESCO are important for the activities to promote ESCO in Iran. The regulations and guidelines will be prepared by IRESCO with technical support by JICA Project Team.

(3) Activity 1-3: Support for establishment of the institutional framework for IRESCO

It is necessary and important to improve the system for promotion of ESCO in Iran. The JICA Project Team will support MOE, SABA and IRESCO to improve the system, policy and plan on the capacity development of the Project.

2.2 Activities for the Output 2

The schedule of activities for the output 2 is as shown in Figure 2-2.

Activities \ Period		2014												2015								
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Period of JICA Expert Activities in Iran (Tentative)																						
Output 2: The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government buildings																						
2-1	Support for preparation of procedures and manuals to introduce ESCO																					
2-2	Support to complete contract models and formats for ESCO's																					
2-3	Capacity development for awareness raising and training																					
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings														Training in Japan							

▬ Activity of JICA Experts

■■■ Activity of SABA Task Team

Figure 2-2 Schedule of activities for the output 2

(1) Activity 2-1: Support for preparation of procedures and manuals to introduce ESCO

The JICA Project Team will discuss with related organizations and the members of IRESCO about measures required promoting ESCO, and introducing experience and programs in Japan.

Two manuals to introduce ESCO in Iran will be prepared. One is a procedure on introduction ESCO for Government. Another is a procedure on implementation of ESCO for ESCO companies.

The manuals will be submitted to JICA as outputs of this activity at the end of the first stage.

ESCO manual prepared in this activity will be referred to implement the ESCO Pilot Projects and revised through the implementation of the Pilot Projects.

(2) Activity 2-2: Support to complete contract models and formats for ESCO's

The JICA Project Team will support to prepare the ESCO's contract models and formats.

The ESCO's contract models will be submitted to JICA as outputs of this activity at the end of the first stage.

The ESCO's contract models prepared in this activity will be referred to implement the ESCO Pilot Projects, and revised through the implementation of the Pilot Projects.

(3) Activity 2-3: Capacity development for awareness raising and training

The ESCO manual and ESCO's contract models will be introduced for related organizations at the second work shop.

MOE and MOP will announce to owner of Government's buildings and municipalities. SABA and IRESCO will hold a seminar to develop capacity of ESCO companies.

(4) Activity 2-4: Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings

The establishing finance incentive is important to introduce and to promote ESCO in Iran. However, the financing environment in Iran is unique compared to that of Japan. Therefore, the case studies of finance incentive schemes in Japan will be introduced in training course in Japan. The necessary technology transfer will be implemented mainly as the training course.

2.3 Activities for the Output 3

The schedule of activities for the output 3 is as shown in Figure 2-3.

Activities	Period	2014												2015								
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Period of JICA Expert Activities in Iran (Tentative)																						
Output 3: The introduction of ESCO in Government buildings is considered and promoted																						
3-1	Selection of candidate sites for energy audit in Government buildings																					
3-2	Energy audits for Government buildings are implemented by ESCO companies																					
3-3	Support to complete plan of pilot project of ESCO																					
3-4	Capacity development for ESCO companies																					
3-5	Pilot projects for Government buildings are implemented by ESCO companies																					
3-6	Study to introduce ESCO business in Government buildings																					
3-7	Monitoring of Pilot Projects																					

Activities of Second Period
The activities will be started upon the confirmation with the outputs of the first period and the budget for the ESCO pilot project allocated by the Iranian side.

▬ Activity of JICA Experts
▪▪▪ Activity of SABA Task Team

Figure 2-3 Schedule of activities for the output 3

(1) Activity 3-1: Selection of candidate sites for energy audit in Government's buildings

MOE will prepare a long list of buildings for walk through as candidate sites of ESCO pilot projects. SABA will prepare necessary data for energy audit such as total floor area, building use, and major energy consumption equipments and monthly energy consumption data of the listed buildings.

Ten (10) buildings as candidate sites of ESCO pilot projects will be selected under discussion with MOE.

(2) Activity 3-2: Energy audits for Government's buildings are implemented by ESCO companies

ESCO companies will conduct the energy audit with walk through survey for ten (10) selected sites. The JICA Project Team will support the energy audit conducted by ESCO companies in order to transfer technology of the energy audit for ESCO planning.

The JICA Project Team will evaluate the feasibility of each building for ESCO project as collaborative work with ESCO companies for selecting three (3) buildings as ESCO candidate sites. The JICA Project Team and ESCO companies will estimate approximate cost for ESCO pilot projects.

The budget for ESCO pilot projects will be allocated by the Iranian side.

(3) Activity 3-3: Support to complete plan of pilot project of ESCO

The activity will be worked in the second stage.

(4) Activity 3-4: Support to complete plan of pilot project of ESCO

The activity will be worked in the second stage

(5) Activity 3-5: Pilot projects for Government's buildings are implemented by ESCO companies

The activity will be worked in the second stage

(6) Activity 3-6: Study to introduce ESCO business in Government's buildings

The activity will be worked in the second stage

(7) Activity 3-7: Monitoring of Pilot Projects

The activity will be worked in the second stage

2.4 Activities for the Output 4

The activities will be worked in the second stage with the monitoring of the ESCO pilot project.

3. Work Shop (W/S)

Total three (3) Work Shops will be hold in the Project. Outline of the work shop is as shown in Table 3-1. Two (2) W/Ss will be held in the first stage, and one (1) W/S will be held in the second stage.

Table 3-1 Outline of the work shop (Tentative)

Workshop	Time	Program
1st work shop	April 2014	- Legislation and finance support to promote ESCO in Japan - Activities and role of ESCO association in Japan
2nd work shop	August 2015	- ESCO manual and ESCO's contract models - Summary of energy audits for ten (10) sites - Monitoring and performance guarantee on ESCO
3rd work shop (At 2nd stage)	November 2017	- Results of monitoring on ESCO pilot projects - Policy recommendations for the introduction of ESCO's

4. Supporting from Iranian Side

Based on Record of Discussion that is agreed between Japan International Cooperation Agency (JICA) and the Islamic Republic of Iran on October 1st, 2013, the Iranian Government is kindly requested to provide the following supports to the JICA Project Team;

- Office room,
- Credentials or identification cards,
- Support in JICA Project Team travelling for site sruvey, and
- Other facilitation, if necessary.

5. Annex

- Annex-1: Plan of Operation of the overall Project
- Annex-2: Manning Schedule
- Annex-3: Project Member List

Annex

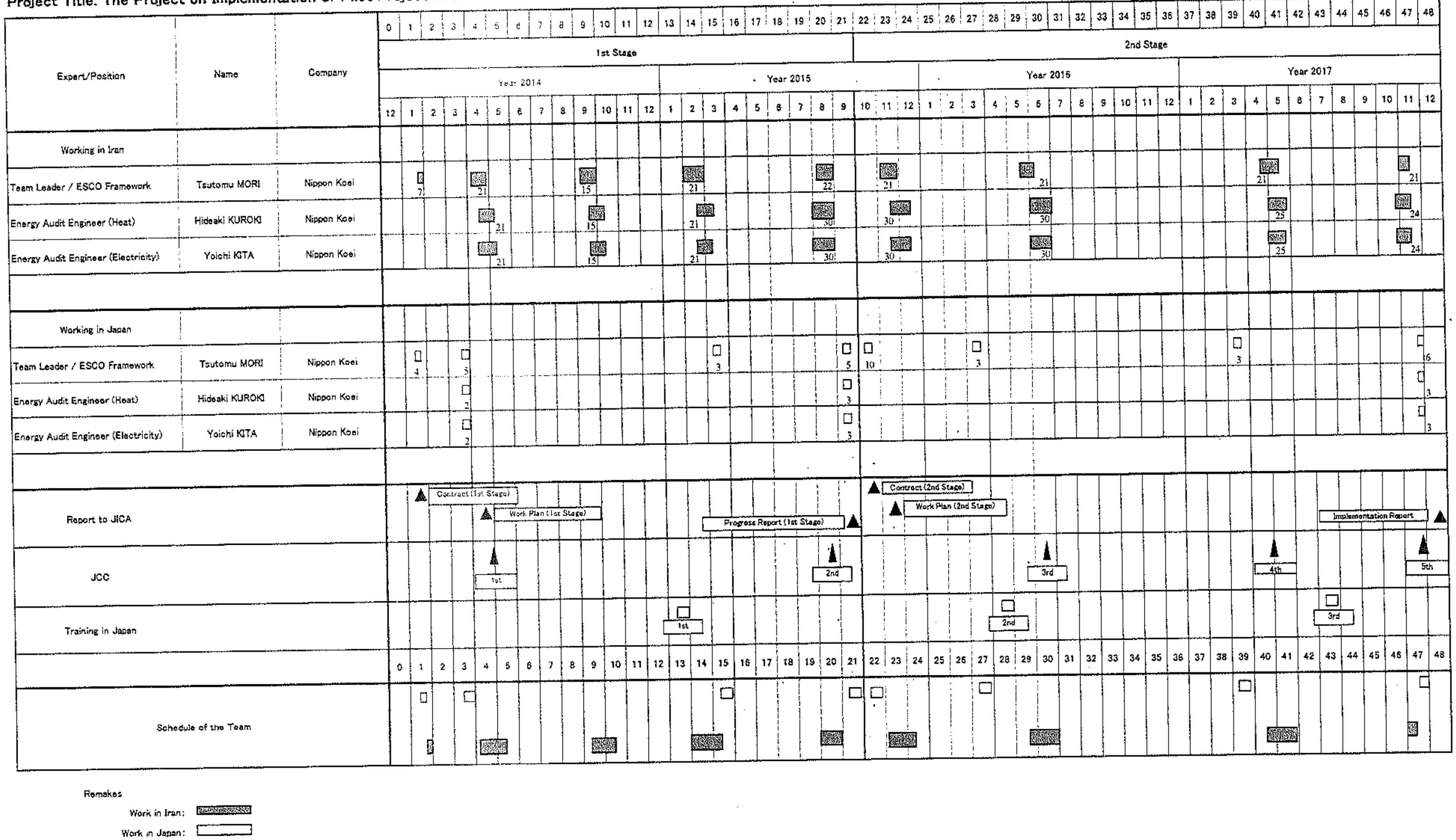
Annex-1

Plan of Operation

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic Republic of Iran

	Activities / Period	2014	2015	2016	2017
	Period of JICA Expert Activities in Iran (Tentative)				
Output 1: An institutional framework is established to promote ESCO business in the Islamic Republic of Iran					
1-1	Study of measures and policies to promote ESCO business				
1-2	Support for preparation of the regulations and guidelines for the ESCO association (IRESCO)				
1-3	Support for establishment of the institutional framework for the ESCO association (IRESCO)				
Output 2: The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government's buildings					
2-1	Support for preparation of procedures and manuals to introduce ESCO				
2-2	Support to complete contract models and formats for ESCO's				
2-3	Capacity development for awareness raising and training				
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings		Training in Japan		
Output 3: The introduction of ESCO in Government's buildings is considered and promoted					
3-1	Selection of candidate sites for energy audit in Government's buildings				
3-2	Energy audits for Government's buildings are implemented by ESCO companies				
3-3	Support to complete plan of pilot project of ESCO				
3-4	Capacity development for ESCO companies				
3-5	Pilot projects for Government's buildings are implemented by ESCO companies				
3-6	Study to introduce ESCO business in Government's buildings				
3-7	Monitoring of Pilot Projects				
Output 4: Policy recommendations are made for the introduction of ESCO's					
4-1	Study on introduction of ESCO's in Government's buildings				
4-2	Study for monitoring and measurement of ESCO project				
4-3	Policy recommendations are made for the introduction of ESCO's				
	Joint Coordinating Committee				
	Work Shop				
	Training in Japan				

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings in Islamic Rebublic of Iran



Annex-3

Project Member List

Name	Position of the Project	Organization
The JICA Project Team		
Tsutomu MORI	Team Leader / ESCO Framework	Nippon Koei Co., LTD.
Hideaki KUROKI	Energy Audit Engineer (Heat)	Nippon Koei Co., LTD.
Yoichi KITA	Energy Audit Engineer (Electricity)	Nippon Koei Co., LTD.
Behzad Yaghmaie	Assistant stuff	
MOE		
M. A. Shafiezadeh	Project Director	General Director of OIPEEE
A. Shirazi	Project Manger	Head of Awareness & Training, OIPEEE
SABA Project Team		
Amir Doudabi Nezhad	Project Responsible Person of SABA	Deputy of Demand Side Department
Mohammad Akbari	Team Leader	Manager of ESCO Department
Mahdi Hormozi	ESCO Expert	Engineer of ESCO Department
Ahmad R. Tavakkoli	Energy Saving Expert of Building	Engineer of Energy Conservation in Building Department
Mahdi Rafiei	Coordinator (Energy Saving Expert of Industry)	Engineer of Energy Conservation in Industries Department

Agenda of 2nd Joint Coordinating Committee

Date: November 14, 2015 (1394/ 8 / 23)

Venue: 13th Floor Conference room, Ministry of Energy

1. Opening speech 8:30 - 8:40

   Mr. Kohei Sato, Chief representative,

   Japan International Cooperation Agency (JICA) Iran Office

2. Progress of the project 8:40 - 8:50

   Mr. Mohammad Ali Shafiezadeh, General Director,

   Office for the Improvement of Productivity and Economy of Electricity and Energy(OIPEEE), Ministry of Energy

3. Result of the first stage and Plan of the second stage 8:50 - 9:10

   Mr. Doodabi Nejad, Deputy of Demand side department, SABA

4. Finding of issues for promotion of ESCO projects 9:10 - 9:40

   Mr. Tsutomu Mori, Team Leader, JICA project team

5. Question and Answer 9:40 - 10:00

Attendance list at 2st Joint Coordinating Committee which was held on November 14, 2015. (Iranian : 1394/ 8 / 23)

No	Organization	Department	Occupation	Name
1	Ministry of Energy	OIPEEE	General Director, ESCO Project Director	M.Ali.Shafiezadeh
2	Ministry of Energy	OIPEEE	Head of International Collaboration, ESCO Project Manager	Alireza Shirazi
3	Ministry of Energy	OIPEEE	Assistant Stuff	M.Ebrahim. Sardari
4	Ministry of Energy	Efficiency and economy and energy supply	Deputy of Improvement Center	Reza Effatnejad
5	SABA		Deputy of Demand side department	Amir Doodabi Nejad
6	SABA	Industry Factor	Manager of ESCO Dep.	Mohammad Akbari
7	SABA	Industry	Engineer of ESCO Dep.	Mehdi Hormozi
8	Planning Organization	International Division		Ehsan Assadian
9	Ministry of Economic Affairs and Finance		Deputy	Alireza Gheibi
10	NIOC	Office of Energy Planning	Head of the review demand and optimization	Ahmad Navid
11	IFCO		Advisor to executive manager	Abolfazl Mobini
12	Engineering Organization		Chairman of the expert group power	Soleiman Shirzadi
13	IRESCO	Board	Chairman of the Board	Gholamali Najafi
14	IRESCO	Board	Member of board	Tooraj Bataie
15	IRESCO	Board	Secretary	Alimohammad Mirshams
16	Embassy of Japan	Economic Cooperation	Second Secretary	Akira Noroda
17	JICA Iran Office		Chief Representative	Kohei Sato
18	JICA Iran Office		Project Formulation Adviser	Hiroyuki Takeuchi
19	JICA Iran Office		Program Officer	Sadoughi Zeinab
20	JICA Project Team	Team Leader / ESCO	Expert	Tsutomu Mori
21	JICA Project Team	Energy Audit Engineer	Heat Expert	Hideaki Kuroki
22	JICA Project Team	Energy Audit Engineer	Electrical Expert	Yoichi Kita
23	JICA Project Team		Assistant Stuff	Behzad Yaghmaie
24	JICA Project Team		Interpreter	Mehdi Goudarzy

MINUTES OF MEETING

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY

AND

MINISTORY OF ENERGY

ON

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS

TO INTRODUCE ESCO

FOR

GOVERNMENT'S BUILDINGS IN THE ISLAMIC REPUBLIC OF IRAN

Tehran, November 14th, 2015

Mr. Kohei SATO
Chief Representative
Iran Office
Japan International Cooperation Agency

Mr. M. A. SHAFIEZADEH
General Director of OIPEEE
Ministry of ENERGY
The Islamic Republic of Iran

Mr. Tsutomu MORI
Leader of JICA project team
Nippon Koei Co. Ltd.

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran (hereinafter referred to as "the Project") has been carried out based on the Record of Discussion (hereinafter referred to as "R/D) that was agreed between Japan International Cooperation Agency (hereinafter referred to as "JICA") and Ministry of Energy of Islamic Republic of Iran (hereinafter referred to as "MoE") in October 1, 2013.

The second JCC was held on November 14, 2015 as attached agenda. The attendance list is attached in Attachment 2.

The following topics have been presented and discussed:

1) Progress and result of the Project
2) Finding of Issues for Promotion of ESCO Project in Iran
3) Explanation of the Second Stage of the Project

Main points of the discussion are summarized below.

1) Agreement on PDM1
   Based on the PDM0 and change of situation, PDM1 was developed and both Japanese side and Iranian side agreed the PDM1 as attached in Attachment 3.

2) Confirmation of Plan of Operation of the overall Project rev. 1
   Based on the PDM1, Plan of Operation of the overall Project rev. 1 has been developed and both Japanese side and Iranian side agreed to implement the project along with Plan of Operation of the overall Project rev. 1.

ATTACHMENT

1. Agenda
2. Attendance list
3. Project Design Matrix version 1 (PDM1)
4. Plan of Operation of the overall Project rev.1

Attachment 1

Agenda of 2nd Joint Coordinating Committee

Date: November 14, 2015 (1394/ 8 / 23)
Venue: 13th Floor Conference room, Ministry of Energy

1. Opening speech 8:30 - 8:40
   Mr. Kohei Sato, Chief representative,
   Japan International Cooperation Agency (JICA) Iran Office

2. Progress of the project 8:40 - 8:50
   Mr. Mohammad Ali Shafiezadeh, General Director,
   Office for the Improvement of Productivity and Economy of Electricity and Energy(OIPEEE), Ministry of Energy

3. Result of the first stage and Plan of the second stage 8:50 - 9:10
   Mr. Doodabi Nejad, Deputy of Demand side department, SABA

4. Finding of issues for promotion of ESCO projects 9:10 - 9:40
   Mr. Tsutomu Mori, Team Leader, JICA project team

5. Question and Answer 9:40 - 10:00

Attachment 2

Attendance list at 2st Joint Coordinating Committee which was held on November 14, 2015. (Iranian : 1394/ 8 / 23)

No	Organization	Department	Occupation	Name
1	Ministry of Energy	OIPEEE	General Director, ESCO Project Director	M.Ali.Shafiezadeh
2	Ministry of Energy	OIPEEE	Head of International Collaboration, ESCO Project Manager	Alireza Shirazi
3	Ministry of Energy	OIPEEE	Assistant Stuff	M.Ebrahim. Sardari
4	Ministry of Energy	Efficiency and economy and energy supply	Deputy of Improvement Center	Reza Effatnejad
5	SABA		Deputy of Demand side department	Amir Doodabi Nejad
6	SABA	Industry Factor	Manager of ESCO Dep.	Mohammad Akbari
7	SABA	Industry	Engineer of ESCO Dep.	Mehdi Hormozi
8	Planning Organization	International Division		Ehsan Assadian
9	Ministry of Economic Affairs and Finance		Deputy	Alireza Gheibi
10	NIOC	Office of Energy Planning	Head of the review demand and optimization	Ahmad Navid
11	IFCO		Advisor to executive manager	Abolfazl Mobini
12	Engineering Organization		Chairman of the expert group power	Soleiman Shirzadi
13	IRESCO	Board	Chairman of the Board	Gholamali Najafi
14	IRESCO	Board	Member of board	Tooraj Bataie
15	IRESCO	Board	Secretary	Alimohammad Mirshams
16	Embassy of Japan	Economic Cooperation	Second Secretary	Akira Noroda
17	JICA Iran Office		Chief Representative	Kohei Sato
18	JICA Iran Office		Project Formulation Adviser	Hiroyuki Takeuchi
19	JICA Iran Office		Program Officer	Sadoughi Zeinab
20	JICA Project Team	Team Leader / ESCO	Expert	Tsutomu Mori
21	JICA Project Team	Energy Audit Engineer	Heat Expert	Hideaki Kuroki
22	JICA Project Team	Energy Audit Engineer	Electrical Expert	Yoichi Kita
23	JICA Project Team		Assistant Stuff	Behzad Yaghmaie
24	JICA Project Team		Interpreter	Mehdi Goudarzy

Attachment 3

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Energy Efficiency Organization (IEEO/SABA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SABA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: 2014-2018 (4.5 years)

Version 1
November 14, 2015

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	- Implementation and planning of ESCO to Government buildings are prepared. - XX% of Energy consumption in the building sector is reduced.	- Performance records of ESCO for Government buildings. - Energy consumption data in the building sector.	Finance incentive for ESCO shall be prepared by Iranian side.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	- ESCO pilot projects to Government buildings are implemented. - ESCO business model in Iran through the ESCO pilot projects is established.	- Performance contract and implementation document of the ESCO pilot projects. - Reports of monitoring and verification of the ESCO pilot projects.	The budget for the ESCO pilot projects shall be allocated by the Iranian side.
Outputs: 1. An institution framework is established to promote ESCO business in Iran.	- Regulations and guidelines for the IRESCO are completed. - Roles and responsibilities to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) are identified.	- Regulations and guidelines for the IRESCO. (Feb. 2015) - An institution framework and rule to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO) (Feb. 2015)	
2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings.	- Procedures and manual of introduction of ESCO to Government buildings is completed. - Performance contract models for ESCO are prepared. - Seminar and training for capacity building are conducted for IRESCO members by SABA and IFCO.	- Procedures and manual of introduction of ESCO to Government buildings. (Jan. 2016) - Performance contract models for ESCO. (Jan. 2016) - Records of seminar and training. (Aug. 2015)	The case studies of finance incentive schemes in Japan will be introduced in training course in Japan
3. The introduction of ESCO in Government's buildings is considered and promoted.	- Candidate buildings for ESCO pilot projects are selected by Iranian side. - Energy audit of ESCO planning for the candidate buildings are conducted by members of IRESCO. - Proposal and implementation plan for ESCO pilot project are prepared. - ESCO pilot projects to Government buildings are implemented. - Results of monitoring and verification of the ESCO pilot projects are reported. - Implementation plans to introduce ESCO for Government buildings are prepared.	- Short list of candidate buildings for ESCO pilot projects. (Oct. 2015) - Reports of energy audits of the candidate buildings. (Jan. 2016) - Proposal and implementation plan for ESCO pilot project. (Jun 2016) - Results of monitoring and verification of the ESCO pilot projects. - Implementation plans to introduce ESCO for Government buildings.	SABA and IFCO will be responsible for the result of monitoring and verification of the ESCO pilot projects.
4. Policy recommendations are made for the introduction of ESCOs	- ESCO business model in Iran through the ESCO pilot projects is established. - Policy and action plan to promote ESCO in building sector are prepared by MOE.	- Policy and action plan to promote ESCO business in Iran (MOE, SABA, IFCO and IRESCO)	

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Activities:

1. An institution framework is established to promote ESCO business in Iran.
1-1 Preparation and support for the institutional framework, regulations and guidelines for the establishment of ESCO association

2. The capacity of the Iranian Government and ESCO association is developed in order to ESCO in Government's buildings.
2-1 Preparation of procedures and manuals for the introduction of ESCOs
2-2 Preparation of contract models and formats for ESCOs
2-3 Capacity development for awareness raising and training
2-4 Introduction of case studies on Japan's policies, legislations and finance mechanisms for energy efficiency in buildings

3. The introduction of ESCO in Government's buildings is considered and promoted.
3-1 Capacity development for ESCO companies
3-2 Energy audits for Government's buildings by ESCO companies
3-3 Pilot projects are implemented by ESCO companies in order to introduce ESCO for Government's buildings
3-4 Monitoring of Pilot Projects

4. Policy recommendations are made for the introduction of ESCOs
4-1 Policy recommendations for the introduction of ESCO's
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Inputs (Means and Cost)
The Japanese Side
A. Experts
・ Team Leader (ESCO Expert) / ESCO Framework
・ Energy Audit Engineer (Heat)
・ Energy Audit Engineer (Electricity)
B. Training in Japan
・ ESCO Framework (policies, legislations and finance mechanisms)
C. Equipment etc.
・ Non

The Iranian Side:
A. Ministry of Energy: Project Counter Part
・ Project Director:
General Director, Office for the Improvement of Productivity and Economy of Electricity and Energy (OIPEEE)
・ Project Manager:
Head of Awareness & Training, OIPEEE
B. SABA: Implementation Organization
・ Deputy of Demand Side Department
・ ESCO Department
C. IFCO: Co-Implementation Organization
D. IRESCO: Cooperation Organization

Joint Coordinating Committee(JCC)
A. Chairperson:
・ General Director of OIPEEE
B. Member of Iranian Side
・ MOE
・ Managing and Planning Organization (MPO)
・ Ministry of Economy and Finance (MOEF)
・ Ministry of Petrol (MOP)
・ Ministry of Road and Urban Development (MRUD)
・ SABA
・ IFCO
・ IRESCO
C. Member of Japanese side
・ JICA Experts
・ Representatives from JICA IRAN Office
・ Other personnel concerned to be assigned by request of other members
D. Observer
・ Ministry of Foreign Affairs (MOFA)
・ Embassy of Japan (EoJ)
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Pre-conditions
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Plan of Operation Rev.1

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in Islamic

No.	Activities
	Period of JICA Expert Activities in Iran (Tentative)
Output 1	**An institutional framework is established to promote ESCO business in the Islamic Republic of Iran**
1-1	Study of measures and policies to promote ESCO business
1-2	Support for preparation of the regulations and guidelines for the ESCO association (IRESCO)
1-3	Support for establishment of the institutional framework for the ESCO association (IRESCO)
Output 2	**The capacity of Iran Government and IRESCO is developed in order to introduce ESCO in Government's buildings**
2-1	Support for preparation of procedures and manuals to introduce ESCO
2-2	Support to complete contract models and formats for ESCO's
2-3	Capacity development for awareness raising and training
2-4	Introduction of case studies on Japan's policies, legislation and finance mechanisms for energy efficiency in buildings
Output 3	**The introduction of ESCO in Government's buildings is considered and promoted**
3-1	Selection of candidate sites for energy audit in Government's buildings
3-2	Energy audits for Government's buildings are implemented by ESCO companies
3-3	Support to complete plan of pilot project of ESCO
3-4	Capacity development for ESCO companies
3-5	Pilot projects for Government's buildings are implemented by ESCO companies
3-6	Study to introduce ESCO business in Government's buildings
3-7	Monitoring of Pilot Projects
Output 4	**Policy recommendations are made for the introduction of ESCO's**
4-1	Study on introduction of ESCO's in Government's buildings
4-2	Study for monitoring and measurement of ESCO project
4-3	Policy recommendations are made for the introduction of ESCO's
	Joint Coordinating Committee
	Work Shop
	Training in Japan

Attachment 4

Agenda of 3rd Joint Coordinating Committee (Tentative)

Date: November 8, 2016 (1395/ 8 / 18)

Venue: 11th Floor Conference room, Ministry of Energy

1. Opening speech from Japan side (10:30 to 10:35)

   Japan International Cooperation Agency (JICA) Iran Office

   Representative, Iran office, JICA will participate.

2. Opening speech from Iran side (10:35 to 10:40)

   RSEEO, Ministry of Energy

3. Progress of the project and Schedule from now (10:40 to 10:55)

   SABA

4. Challenge and difficulty of the ESCO Pilot Project on the Tehran Electric Distribution Company (10:55 to 11:10)

   Pishran Energy

5. Challenge and difficulty of the ESCO Pilot Project on the Ministry of Finance (11:10 to 11:25)

   ASIA Watt

6. (Finding of issues for promotion of ESCO projects)

   JICA project team

Attendance list at 3rd Joint Coordinating Committee which was held on November 8, 2016. (Iranian：1394/ 8 / 18)

No	Organization	Department	Occupation	Name
1	Ministry of Energy	RSEEO	Director General, ESCO Project Director	M.Ali.Shafiezadeh
2	Ditto	Ditto	Head of International Collaboration, ESCO Project Manager	Alireza Shirazi
3	Ditto	Ditto		M. Kazemi
4	SABA		Deputy of Energy Efficiency in Demand Side	Amir Doodabi Nejad
5	Ditto	Industry Factor	Manager of ESCO Department	Mohammad Akbari
6	Ditto	Ditto		Mehdi Rafi
7	IFCO	Building Section		Ali Nooroozmanesh
8	Building Engineering Organization	Energy Committee	Director General of Committee	Mohammadreza Ismaeili
9	Ditto	Ditto	Member of Committee, Engineer (Isfahan section)	Ahmadreza Taheriasl
10	Ditto	Electricity Committee	Member of Committee	Soleiman Shirzadeh
11	Ditto	Ditto	Member of Committee	Bahram Chavoshi
12	Ditto	Mechanical Committee	Member of Committee	Asghar Shirazpoor
13	Ditto	Ditto	Member of Committee	Rasoul Bagherzadeh
14	Tehran Electrical Distribution Company	Energy department	Technical advisor	Amir Yaghooti
15	IRESCO	Board	Board Member of IRESCO /Chairman of Pishrun Energy	Tooraj Bataie
16	Ditto	Ditto	Board Member of IRESCO /Managing Director of ASIA WATT	Alimohammad Mirshams
17	JICA Head quarter	Industrial Development and Public Policy Department	Director, Team1 of Energy and Mining Group	Fuyuki Sagara
18	JICA Iran Office		Chief Representative	Kohei Sato
19	Ditto		Project Formulation Adviser	Yoshiko Yamanaka
20	Ditto		Senior Program Officer	Vahid Kheirolomour
21	JICA Project Team		Team Leader of JICA project team/ ESCO	Tsutomu Mori
22	Ditto		Member of JICA project team /Electrical Expert	Morio Sakai
23	Ditto		Member of JICA project team /Heat Expert	Hideaki Kuroki
24	Ditto		Assistant Stuff	Behzad Yaghmaie
25	Ditto		Interpreter	Amin Karimi

MINUTES OF MEETING

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY

AND

MINISTRY OF ENERGY

ON

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS

TO INTRODUCE ESCO

FOR

GOVERNMENT'S BUILDINGS IN THE ISLAMIC REPUBLIC OF IRAN

Tehran, November 22nd, 2016

佐藤公平

Mr. Kohei SATO
Chief Representative
Iran Office
Japan International Cooperation Agency

Mr. M. A. SHAFIEZADEH
General Director of RSEEO
Ministry of ENERGY
The Islamic Republic of Iran

Mr. Tsutomu MORI
Leader of JICA project team
Nippon Koei Co. Ltd.

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran (hereinafter referred to as "the Project") has been carried out based on the Record of Discussion (hereinafter referred to as "R/D) that was agreed between Japan International Cooperation Agency (hereinafter referred to as "JICA") and Ministry of Energy of Islamic Republic of Iran (hereinafter referred to as "MoE") in October 1, 2013.

The third JCC was held on November 8, 2016 as attached agenda. The attendance list is attached in Attachment 2.

The following topics have been presented and discussed.

1) Progress of the Project
2) Two ESCO pilot projects
3) Necessity of support by government policy

Main points of the discussion are summarized below.

1) Progress of the Project
   SABA reported past achievements and progress of the Project.
   a. ESCO model contract and ESCO guideline were prepared by the efforts both of SABA and ESCO companies.
   b. Two buildings, i.e. Ministry of Economic Affairs and Finance and Tehran Electric Distribution Company, were selected as the candidate buildings of the ESCO pilot project.
   c. SABA has made discussion with a fund named as Power Energy Industry Research & Technology Fund on finance for the ESCO pilot project.

2) Two ESCO pilot projects
   a. The case of Tehran Electric Distribution Company
      Pishrun Energy has submitted Tehran Electric Distribution Company of ESCO proposal. Pishrun Energy and Tehran Electric Distribution Company are under the discussion in order to make ESCO contract. Some technical issues regarding the methodology of M&V remain. The contract will be made within this month.
   b. The case of Ministry of Economic Affairs and Finance (MoEF)
      ASIA WATT has submitted MoEF of the ESCO proposal. ASIA WATT and MoEF are under the discussion in order to make ESCO contract. Almost barrier cleared through series of discussion. The contract will be made within this month.

3) Necessity of support by government policy
   The financial scheme is necessary for promotion of ESCO projects. So, Government of Iran must consider to introduce financial supports for promotion of ESCO projects with advice from JICA project team.

ATTACHMENT

1. Agenda
2. Attendance list

Attachment 1

Agenda of 3rd Joint Coordinating Committee

Date: November 8, 2016 (1395/ 8 / 18)

Venue: 7th Floor Conference room, Ministry of Energy

1. Opening speech from Iran side (10:30 to 10:35)
   RSEEO, Ministry of Energy

2. Opening speech from Japan side (10:35 to 10:40)
   Japan International Cooperation Agency (JICA) Iran Office
   Representative, Iran office, JICA will participate.

3. Progress of the project and Schedule from now (10:40 to 10:55)
   SABA

4. Challenge and difficulty of the ESCO Pilot Project on the Tehran Electric Distribution Company (10:55 to 11:10)
   Pishrun Energy

5. Challenge and difficulty of the ESCO Pilot Project on the Ministry of Economic Affairs and Finance (11:10 to 11:25)
   ASIA WATT

6. Finding of issues for promotion of ESCO projects
   JICA project team

7. Comment from building owner and engineering organization
   Tehran Electric Distribution Company, Engineering organization

Attachment 2

Attendance list at 3rd Joint Coordinating Committee which was held on November 8, 2016. (Iranian : 1394/ 8 / 18)

No	Organization	Department	Occupation	Name
1	Ministry of Energy	RSEEO	Director General, ESCO Project Director	M.Ali.Shafiezadeh
2	Ditto	Ditto	Head of International Collaboration, ESCO Project Manager	Alireza Shirazi
3	Ditto	Ditto		M. Kazemi
4	SABA		Deputy of Energy Efficiency in Demand Side	Amir Doodabi Nejad
5	Ditto	Industry Factor	Manager of ESCO Department	Mohammad Akbari
6	Ditto	Ditto		Mehdi Rafi
7	IFCO	Building Section		Ali Nooroozmanesh
8	Building Engineering Organization	Energy Committee	Director General of Committee	Mohammadreza Ismaeili
9	Ditto	Ditto	Member of Committee, Engineer (Isfahan section)	Ahmadreza Taheriasl
10	Ditto	Electricity Committee	Member of Committee	Soleiman Shirzadeh
11	Ditto	Ditto	Member of Committee	Bahram Chavoshi
12	Ditto	Mechanical Committee	Member of Committee	Asghar Shirazpoor
13	Ditto	Ditto	Member of Committee	Rasoul Bagherzadeh
14	Tehran Electrical Distribution Company	Energy department	Technical advisor	Amir Yaghooti
15	IRESCO	Board	Board Member of IRESCO /Chairman of Pishrun Energy	Tooraj Bataie
16	Ditto	Ditto	Board Member of IRESCO /Managing Director of ASIA WATT	Alimohammad Mirshams
17	JICA Head quarter	Industrial Development and Public Policy Department	Director, Team1 of Energy and Mining Group	Fuyuki Sagara
18	JICA Iran Office		Chief Representative	Kohei Sato
19	Ditto		Project Formulation Adviser	Yoshiko Yamanaka
20	Ditto		Senior Program Officer	Vahid Kheirolomour
21	JICA Project Team		Team Leader of JICA project team/ ESCO	Tsutomu Mori
22	Ditto		Member of JICA project team /Electrical Expert	Morio Sakai
23	Ditto		Member of JICA project team /Heat Expert	Hideaki Kuroki
24	Ditto		Assistant Stuff	Behzad Yaghmaie
25	Ditto		Interpreter	Amin Karimi

Agenda of 4th Joint Coordinating Committee

Date: January 23, 2018 (1396/ 11 / 3) at 10:00 AM
Venue: 13th Floor Conference room, Ministry of Energy

1. Opening speech from Iran side (10:00 to 10:05)
   Director General of PEEEO, Ministry of Energy
   ESCO Project Director,

2. Opening speech from Japan side (10:05 to 10:10)
   Japan International Cooperation Agency (JICA) Iran Office
   Representative, Iran office, JICA will participate.

3. Progress of the Project (10:10 to 10:15)
   Ministry of Energy
   ESCO Project Manager,

4. Implementation of the Pilot Project (10:15 to 10:25)
   SATBA

5. Progress of the ESCO Pilot Project on the Tehran Electric Distribution Company (10:25 to 10:35)
   Pishrun Energy

6. Progress of the ESCO Pilot Project on the Ministry of Economic Affairs and Finance (10:35 to 10:45)
   ASIA WATT

7. Finding of issues of the Project (10:45 to 10:55)
   JICA project team

8. Evaluation of the Project (10:55 to 11:15)
   JICA evaluation team

9. Comment (Q&A) from participants (11:15 to 11:25)

4 th JCC

Time and Date: 10:00AM-11:05 AM, 23 January 2018 03 Bahman 1396 in Persian calender

Venue: Meeting room on 13th floor, MOE

List of Participants

#	Name	Organization	Position
1	Mohammad Ali Shafizadeh	MOE	Direcotor General, PEEEO
2	Alireza Shirazi	MOE	Head of International Cooperation, PEEEO
3	Kambiz Rezapour	MOE	Director of Planning and Monitoring Division
4	Mohammad Akbari Sayyar	SATBA	Head of Industrial Management
5	Mehdi Rafiei	SATBA	Expert
6	Tooraj Bathaie	Pishrun Energy Co.	Chairman
7	Alimohammad Mirshams	Asia Watt Eng.Co.	Managing Director
8	Seyed Mahdi Hosseini	PBO	Expert of Energy Department
9	Kamran Nazari	MOEF	Head of Installation Dep.
10	Yukiharu Kobayashi	JICA Iran Office	Chief Representative
11	Yoshiko Yamanaka	JICA Iran Office	Project Formulation Advisor
12	Vahid Kheirolomour	JICA Iran Office	Senior Program Officer
13	Tsutomu Mori	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Leader
14	Morio Sakai	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Expert
15	Behzad Yaghmaie	JICA ESCO Project team	Assistant of JICA ESCO Project Team
16	Saeidreza Ettehadi	JICA ESCO Project Team	Interpreter of JICA ESCO Project Team
17	Hiroshi Ogawa	JICA Evaluation Mission (Haruno ESWorks LLC)	Evaluator (Representative partner)

MINUTES OF MEETINGS

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY

AND

MINISTRY OF ENERGY

ON

4th JOINT COORDINATION COMMITTEE

FOR

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS TO INTRODUCE ESCO FOR GOVERNMENT'S BUILDINGS IN THE ISLAMIC REPUBLIC OF IRAN

"The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in the Islamic Republic of Iran" (hereinafter referred to as "the Project"), which is implemented under the collaboration between Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Government of Iran, has conducted the 4th Joint Coordination Committee (hereinafter referred to as "JCC") on 23 January, 2018 in Tehran, for the purpose of reviewing the progress of the Project, discussing necessary future activities for accelerating the Project, and confirming the result of terminal evaluation.

As a result of the discussion, the both sides agreed on the matters referred to the document annexed hereto.

Tehran, 23 January 2018

小林雪治

Mr. Yukiharu KOBAYASHI
Chief Representative
JICA Iran Office

Mr. Mohammad Ali Shafizadeh,
General Director,
Planning and Economics of Electricity and Energy Office, Ministry of Energy,
The Islamic Republic of Iran

ANNEX

Implementation of the Terminal Evaluation

The Terminal Evaluation Team (hereinafter referred to as the "Team") jointly implemented the Terminal Evaluation Study from 13 to 22 January 2018. As a result of the study, the Team submitted the draft of Terminal Evaluation Report as Appendix 1. JICA and Iranian side confirm the content of the report, and the both sides agreed on the result of the Terminal Evaluation Study in principle. The report shall be finalized after approval of PBO (pending, to be determined)

The Team evaluated that the Project showed good performance in Relevance (High), in Effectiveness (Relatively High), in Impact (Average) and in Sustainability (Average), while it showed less Efficiency in implementation process (Relatively Low).

It was, therefore, concluded that the Project is likely to achieve its expected purpose without additional inputs form Japanese side and without extension of the project duration as authorized in the R/D amended by the M/M in February 2016.

In accordance with the recommendations made by the Team, the both sides understood and agreed as followed.

1. Modification of the Project Design Matrix (PDM) and Plan of Operation (PO)

Project Design Matrix (hereinafter referred to as "PDM") and Plan of Operation (hereinafter referred to as "PO") as Annex 2 and 3, are modified in order to make consistence with the actual situations, and clarify the Objectively Verifiable Indicators. Objective Verifiable Indicators and Means of Verification of the Overall Goal shall be discussed and agreed by the time of the final JCC.

2. Project Implementation Structure

SATBA shall take over the roles and responsibilities for the implementation of the Project shouldered by SABA. SATBA shall also have more active roles and wider responsibilities for day to day implementation of the project activities, while MOE shall concentrate on coordinating other ministries and organizations including JICA for overall implementation of the Project. When necessary, MOE shall conduct directly the project activities.

3. Project Period

The project period shall terminate on July 2018, in accordance with the Record of Discussions amended by the Minutes of Meeting dated 29 February, 2016. The Iranian side shall continuously implement the project activities even after project period, for the full completion of the project activities and for the achievement of the project purpose.

4. Remained Tasks

There are the remained tasks which shall be carried out for the completion of the Project and achievement of the Project Purpose including;

(1) Verification of performance of the pilot projects (in Output 3)

- This is the most important task to be carried out by Iranian organizations after the end of the project period.
- Therefore, Japanese experts should fully support the Iranian stakeholders including C/Ps, IRESCO, and ESCOs during the project period, which includes proposal of a verification protocol.

(2) Clarification of roles and responsibilities of the related organizations for promotion of ESCO projects (in Output 1)

- The clarification is one of the indispensable conditions for the effective promotion of ESCO project in building sector
- In particularly, roles and responsibilities of organizations after restructuring in MOE and SABA should be clarified, and work demarcation regarding promotion of ESCO project in building sector, among related organizations such as MOP/IFCO, MRUD, MOEF and IRESCO should be well considered.
- It is, therefore, suggested that official documents authorized by the Minister of Energy, which define the roles and responsibilities of every office/section in MOE and SATBA after organizational restructuring of each organization, should be shared by JCC for efficient and effective implementation of the Project.
- Financial roles and responsibilities should also be clarified. Therefore, possible financial source for ESCO project such as funds under MOE as well as other government organizations, and financial schemes in private banks possibly applicable for ESCO projects should be listed.

(3) Formulation of recommendation by the Project (in Output 4)

- It is expected that the recommendation should be useful for stakeholders in both of Iranian and Japanese sides in order to consider promotion of ESCO project as well as EE&C in building sector. Therefore, it should cover financial, institutional and technical issues for example;
  - ➢ Technical issues
    - ✧ Implementation of pilot project employing other saving solutions
  - ➢ Institutional issues
    - ✧ Action plan to development of qualified ESCOs though energy audits program which draft ESCO project proposal for all government buildings.
    - ✧ Awareness increasing programme (joint campaign by related authorities).
    - ✧ Continuous support for IRESCO to establish linkage to related authorities.
  - ➢ Financial issues
    - ✧ Financial incentive for ESCO and Building owner such as tax incentive
    - ✧ Establishment of ESCO funds
    - ✧ Interest subsidy to ESCO Project

- ✧ Incentives for ESCO companies through "Law for Removing the obstacles to competitive production and promoting the country's financial system"
- ✧ ESCO project awareness seminar for financial institutions including private banks

(4) Setting Objectively Verifiable Indicators at Overall Goal level in the PDM version 2.

- In order to evaluate further the Project after achievement of the Project Purpose, the Objective Verifiable Indicators should be set before the end of the project period.
- The indicators should be evaluable, which clearly describe quantity and/or quality of the status of EE&C in building sector with available data source.

5. Countermeasures to Accelerate the Project

The both sides agreed on the countermeasures to accelerate the Project during the remained project period as followed;

(1) Formulation of the list of detail activities for the remained tasks and reporting format

- In order to carry out the remained tasks, firstly, the Japanese experts and C/Ps should formulate the list of detail activities including names of C/Ps in charge and schedule for each activity. For this, JICA experts prepare a reporting format.

(2) Communication among the Project members

- In order to ensure to monitor the progress of activities until the end of project period, the Project members: MOE (project manager), SATBA (C/Ps team), JICA expert team should establish more effective and efficient ways of communication.
- SATBA should report progress of day to day operation through MOE at least weekly to JICA expert team until the end of project period when JICA experts are in Japan
- The progress of the two pilot projects is most important to be monitored for completion of the Project. The two ESCOs implementing pilot projects should have efficient communication channels to JICA experts when necessary

(3) Comprehensive support to ESCOs in the implementation of the pilot projects

- As nature of a pilot business project, two ESCOs have been facing with lot of difficulties. Not only engineering issue like verification methodology, but also other issues including recovery of payments, should be fully supported by JICA experts, C/Ps staff in MOE/SATBA and JCC members such as PBO.

END

Attachment 1: Joint Terminal Evaluation Report (draft)
Attachment 2: Agenda of 4th JCC
Attachment 3: Participants List of 4th JCC

JOINT TERMINAL EVALUATION REPORT

FOR

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS TO INTRODUCE ESCO FOR GOVERNMENT'S BUILDINGS IN ISLAMIC REPUBLIC OF IRAN

Ministry of Energy

and

Japan International Cooperation Agency

Tehran

Islamic Republic of Iran

23rd January 2018

小林雪治

Mr. Yukiharu KOBAYASHI Leader of the Japanese Evaluation Team Chief Representative, JICA Iran Office	Mr. Mohammad Ali Shafizadeh, General Director, Planning and Economics of Electricity and Energy Office, Ministry of Energy, The Islamic Republic of Iran

CONTENTS

Abbreviation

BHRC	Building and Housing Research Centre
C/P	Counterpart personnel
EE&C	Energy Efficiency and Conservation
ESCO	Energy Service Company
IFCO	Iran Fuel Conservation Company
IRR	Iranian Rial
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
kWh	Kilowatt hour
MM	Man Month
M/M	Minutes of Meeting
MOE	Ministry of Energy
MOEF	Ministry of Economy and Finance
MOP	Ministry of Petroleum
MPO	Management Planning Organization
MRUD	Ministry of Road and Urban Development
M&V	Measurement and Verification
NRI	Niroo Research Institute
OIPEEE	Office for the Improvement of Productivity and Economy of Electricity and Energy
OVI	Objectively Verifiable Indicator
PEEEO	Planning and Economics of Electricity and Energy Office (formerly OIPEEE)
PDM	Project Design Matrix
PO	Plan of Operation
PBO	Plan and Budget Organization (formerly MPO)
R/D	Record of Discussion
SABA	Iran Energy Efficiency Organization
SATBA	Iran Renewable Energy and Energy Efficiency Organization (formerly SABA)
SUNA	Iran Renewable Energy Organization

1. Introduction

1-1. Background of the Project

The Islamic Republic of Iran (hereafter referred to as the "Iran") is one of the world's most eminent oil-producing countries, producing four million barrels per day, which accounts for 10.9 percent of oil deposits in the entire world. However, general energy consumption occupies 44 percent of general energy supply in Iran. Efficient utilization of energy is becoming the key issue in terms of securing the volume of oil for export that brings economic growth to the country. The proportion of the energy consumption in residential sector is the largest, 33 percent, which is followed by 24 percent in transportation sector, 24 percent in industrial sector and eight percent in commercial sector. As the energy consumption in building sub-sector under residential and commercial sector has been increasing and reaches 40 percent of the total energy supply in Iran, Energy Efficiency and Conservation (hereafter referred to as "EE&C") in building sub-sector is now the most urgent issue tackled by Ministry of Energy.

JICA implemented Technical Cooperation Project: "Development study for institutional development on energy management sector in the Islamic Republic of Iran" (May 2010 – November 2011). That project developed the road map and the action plan for promotion of EE&C in building sub-sector, and concluded that the utilization ESCO could be feasible measure. Iran government strengthens EE&C promotion by setting series of laws and regulations such as Subsidy Rationalization Law (December 2011), Energy Consumption Pattern Reform Law (March 2011). Ministry of Energy, then, requested Japanese government for implementation of Technical Cooperation Project aiming capacity development for promotion of ESCO projects in government's buildings, and the record of discussion to launch the project was exchanged between JICA and Ministry of Energy in October 2013.

The project started at January 2014, and 3 Japanese experts have been dispatched to work together with Iranian counterpart personnel (hereafter referred to as "C/P") in order to assist the Iranian ESCO association, organize trainings and seminars for stakeholders in EE&C for building sector, implement ESCO pilot projects, and formulate policy recommendations for promotion of ESCO projects in Iran.

1-2. Objectives of the Terminal Evaluation

The Objectives of the Terminal Evaluation were as follows:

(1) To review the achievements and the implementation process of the Project, according to the Project Design Matrix (hereafter referred to as "PDM") and the Plan of Operation (hereafter referred to as "PO",

(2) To evaluate the overall performance of the Project according to the five evaluation criteria (Relevance, Effectiveness, Efficiency, Impacts and Sustainability),

(3) To provide/consider recommendation to the Project regarding the implementation plan and issues for the remaining project period, and

(4) To draw lessons learned from the Project to the similar type of project implemented in future.

1-3. Members of the Evaluation Team

1-3-1. Japanese side

Name	Designation	Title
Mr. Yukiharu KOBAYASHI	Leader	Chief Representative, JICA Iran office
Ms. Yoshiko YAMANAKA	Member (Evaluation Planning)	Project Formulation Advisor, JICA Iran office
Mr. Vahid Kheirolomour	Member (Evaluation Coordination)	Senior Program Officer, JICA Iran office
Mr. Hiroshi OGAWA	Member (Evaluation Analysis/EE&C)	Representative Partner, Haruno ESWorks LLC

1-3-2. Iranian side

Name	Designation	Title
Mahdi Husseini	Member	Energy Expert Plan and Budget Organization

1-4. Schedule of the Terminal Evaluation

The Study was conducted jointly from 13th January to 22nd January 2018. The detail schedule is shown Annex VI.

1-5. Methodology of the Terminal Evaluation

1-5-1. Process of the Terminal Evaluation

The Terminal Evaluation was conducted in two steps as follows:

(1) Step 1: Preliminary survey by members of Japanese side

The progress and achievement during the project period were preliminary surveyed. The members of Japanese side collected data and information through document reviews, questionnaires and interviews. Then, the Japanese members analysed performance of the Project.

(2) Step 2: Joint evaluation survey

Based on the results of the above step, the Evaluation team carried out further field investigation in the pilot building sites, and series of discussion for adequate evaluation of the Project. The team finally summarized the whole results in the Joint Evaluation Report (This report) for mutual understanding.

1-5-2. Evaluation Criteria

The Terminal Evaluation was conducted in accordance with the JICA's evaluation guideline which standardizes the Five Evaluation Criteria as follows:

(1) Relevance

Relevance refers to the validity of the Project Purpose and the Overall Goal in connection with the development policies of the Iranian government, assistance policy of the Japanese government and development needs of the beneficiaries.

(2) Effectiveness

Effectiveness refers to the extent to which the expected benefits of the Project have been achieved as planned. It also examines whether these benefits have been generated as a result of the Project.

(3) Efficiency

Efficiency refers to the productivity of the implementation process. It examines whether the Inputs of the Project have been efficiently converted into the Outputs of the Project.

(4) Impact

Impact refers to direct and indirect, positive and negative impacts caused by the implementation of the Project, including the extent to which the Overall Goal has been attained.

(5) Sustainability

Sustainability refers to the extent to which the Project can be further developed by the Iranian authorities, and the extent to which the benefit generated by the Project can be sustained under the national policies, technology, system and financial state.

2. Outline of the Project

The outline of the Project was formulated by the project formulation study in March 2013, and authorized in the Record of Discussion (hereafter referred to as "R/D") dated 1st October 2013. The initial PDM (version 0) was designed in the 1st Joint Coordination Committee (hereafter referred to as "JCC") meeting in April 2014. The revised PDM (version1) was developed in the 2nd JCC meeting in November 2015. The duration of the project period was amended to 54 months from 48 months by the Minutes of Meeting (hereafter referred to as "M/M") dated 29th February 2016. In order to clarify the Outputs and Activities, and to reflect the progress of the Project until December 2017, the PDM version 2 and PO version 2 for the terminal evaluation study were prepared of which outline is summarized below. (PDM version 2 and PO version 2 are attached in Annex I and II respectively.)

2-1. Overall Goals

Narrative summary
Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government building
Objective Verifiable Indicators
To be determined by the Project during JICA project period (by July 2018) *e.g. The ESCO projects are carried out at more than XX government buildings* ………… by 2023

2-2. Project Purpose

Narrative summary
The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.
Objective Verifiable Indicators
At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve

ESCO business.

2-3. Outputs and Activities

2-3-1. Output 1

Narrative summary
An institutional framework to promote ESCO business in Iran is strengthened.
Objective Verifiable Indicators
1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related organizations: MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.
Activities
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran. 1-2. To support IRESCO in preparing its internal guidelines. 1-3. To give advice to IRESCO on strengthening intuitional capacity. 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business.

2-3-2. Output 2

Narrative summary
The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.
Objective Verifiable Indicators
2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed. 2.2. Performance contract models for ESCO project are upgraded. 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA.
Activities
2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran. 2-4. To organize trainings and seminars for ESCOs and government organizations. 2-5. To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan.

2-3-3. Output 3

Narrative summary
The ESCO pilot projects are implemented in government's buildings for development of ESCO business.
Objective Verifiable Indicators
3.1. More than 50 candidate buildings are selected by MOE/SATBA.

3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA. 3.4. At least, 2 ESCO pilot projects are launched. 3.5 Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts). (* monthly performance data) 3.6. Performance reports including one-year performance activities are submitted for at least 2 pilot projects by ESCOs, and approved by MOE/SATBA. (after JICA project period.)
Activities
3-1. To select the candidate buildings for energy audit. 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings. 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs. 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs.

2-3-4. Output 4

Narrative summary
Policy recommendation for the promotion of ESCO business is formulated.
Objective Verifiable Indicators
4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period).
Activities
4-1. To review the project activities and results including seminars, manuals, performance of pilot projects. 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran. 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period). 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government. (after JICA project period)

2-4. Assumptions and Pre-condition

Pre-conditions
- Subsidies for energy prices for building sector are eliminated as the Iranian government planed. - Organizational restructuring in MOE and MOP does not affect adversely implementation of the Project.
Assumptions from Outputs to Project purpose
- Budget for pilot projects is secured and disbursed by MOE as planned.
Assumptions from Project purpose to Overall goals
- Recommendation formulated by the Project is reflected in energy policies and budget

allocation.
Assumptions for sustainability of Overall goals
- Policies on EE&C for the building sector are maintained.

3. Achievements and Implementation Process of the Project

3-1. Inputs to the Project

The Team has confirmed that the Project has provided the following inputs.

3-1-1. Inputs from the Japanese side

(1) Assignment of Japanese experts

The three (3) Japanese experts in charge of ESCO/ESCO policy, Energy audit engineer (Heat) and Energy audit engineer (Electricity) have been assigned by the time of the Terminal Evaluation of which total man-months (hereafter referred to as "MMs") is 16.56 MMs.

The total MMs of the Japanese expert working in Iran is 14.56MMs, which accounts for 30% of the total duration of the Project implementation up to December 2017.

Table 3-1-1-1. Assignment of Japanese experts

	Period	Planed MMs	Actual MMs
Work in Iran	The 1st period (Jan.2014 - Feb.2016)	8.66	8.66
	The 2nd period (Mar.2016 -May. 2018)	10.06	5.90 (as of Dec.2017)
	Sub-total	18.72	14.56 (as of Dec.2017)
Work in Japan	The 1st period (Jan.2014 - Feb.2016)	1.35	1.35
	The 2nd period (Mar.2016 -May. 2018)	1.40	0.65 (as of Dec.2017)
	Sub-total	2.75	2.00 (as of Dec.2017)
	Total	21.47	16.56 (as of Dec.2017)

(Source: Japanese expert team)

(2) Counterpart training in Japan

Two times of the training were completed. In total, 20 persons attended the training in Japan. The list of participants is attached in Annex IV

(3) Financial support for local costs

No financial support for local costs such as for organizing seminars was planned.

(4) Equipment

No equipment was planned to be provided.

3-1-2. Inputs from Iranian side

(1) Assignment of counterparts' personnel and administrative personnel

Two officials in Ministry of Energy have been assigned as a project director and a project manager respectively. Five officials in SATBA have been assigned as C/Ps. The list of the officials is attached in Annex III.

(2) Office space and facilities for the Project

Working space for Japanese experts was arranged in the building of SABA, and the utilities such as electricity, water, air conditioning, and foods for the experts were provided until organizational restructuring of SABA. As of December 2017, the arrangement was pending. MOE/SATBA was preparing such arrangement once again.

(3) Financial support to the Project.

From the beginning of the project period up to December 2017, in total, 150,000,000 Iranian Rial (hereafter referred to as "IRR") has been allocated and disbursed to the operation of the Project from the SATBA. Apart from for the operation of the Project, SABA/SATBA expensed 1,100,000,000 IRR for EE&C related activities including energy audits, organizing trainings and seminars. The detail is summarized the table below.

Table 3-1-2-1. Expenditure by SABA/SATBA to the Project and EE&C

Items	Amount (IRR)
For the operation of the Project	150,000,000
Organizing Workshops	40,000,000
Preparation of Pilot project (such as for energy audit)	30,000,000
Support for the experts	80,000,000
For other EE&C related activities	1,100,000,000
Energy audit, Trainings, etc (2014-2017)	-

(Source: SATBA)

3-2. Achievement of Outputs

The Project has implemented its activities as per the plan (stated in the PDM and PO version 2). The Team reviewed the progress of the Project activities and the achievement of the Outputs as followed.

3-2-1. Output 1

Status: Not yet achieved (likely to be achieved)

- Output1 was considered not yet to be achieved because one of the Objective Verifiable Indicator (hereafter referred to as "OVI") has not yet been realized.
- Although the activities 1-1, 1-2 and 1-3 were completed as planned, the activity 1-4 shown delay.

Narrative summary	Status
An institutional framework to promote ESCO business in Iran is strengthened.	Not yet achieved (likely to be achieved)

Objective Verifiable Indicators	Status
1.1. Regulations and guidelines in the IRESCO are upgraded.	Achieved
1.2. Roles and responsibilities of the related organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector_are clarified	Not yet achieved (likely to be achieved)
Activities	**Status**
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran	Completed
1-2. To support IRESCO in preparing its internal guidelines	Completed
1-3. To give advice to IRESCO on strengthening intuitional capacity	Completed
1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business.	Not yet completed (likely to be completed)

- According to the interviews to the executives in IRESCO, advices provided by JICA experts were useful for them to upgrade their regulations and to consider how to develop the association.
- The delay in the activity 1-4 was caused mainly because;
  - The organizational restructuring in MOE and SABA took place during project period, and
  - The activity was not clearly planed in PDM/PO version 0 and version 1.
- It was reported by C/Ps that the internal organizational structure in SATBA would be finalized before coming Iranian new year, i.e. the middle of March 2018.

3-2-2 Output 2

Status: Likely to be achieved

- Output 2 was considered to be likely to be achieved because two (2) OVIs have been realized and other is going to be achieved.
- The activities 2-1, 2-2、 2-3 and 2-5 were completed.
- Another workshop in the activity 2-4 is going to be organized before the end of the project period.

Narrative summary	Status
The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.	Likely to be achieved
Objective Verifiable Indicators	**Status**
2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed.	Achieved
2.2. Performance contract models for ESCO project are upgraded.	Achieved
2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA.	Likely to be achieved

Activities	Status
2-1. To develop a manual to introduce ESCO project for government organization buildings.	Completed
2-2. To collect the existing contract models for ESCO project.	Completed
2-3. To develop contract models for ESCO project in building sector in Iran.	Completed
2-4. To organize trainings and seminars for ESCOs and government organizations.	Not yet completed (on going likely to be completed)
2-5. To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan.	Completed

- The 30-page manual was developed, which explains, a type of services in ESCO project, contact types, meaning of performance-based contract, a way of measurement and verification, etc. (2-1)
- Four (4) examples of ESCO contract document were collected: 1) A standard ESCO contract model introduced by Ministry of Economy, Trade and Industry, Japan, 2) One used in ESCO business project in industrial sector in Iran, 3) One dealing with ESCO project in USA, and 4) One which IRESCO got from one of their member. After comparative analysis on these examples, C/Ps developed the contract model. (2-2, 2-3)
- As of December 2017, five (5) seminars/workshops were organized as listed below. The Project is going to organize one more seminar before the end of the project period.

Table 3-2-2-1. Seminar/Workshop organized during the Project period

	Date	Title	Number of participant	Remarks
1	15/03/2014	Workshop on JICA ESCO project	30	
2	22/04/2014	1st JICA workshop	55	90* including project staff
3	23/11/2015	2nd JICA workshop	80	Presented in Power system conference at SATBA
4	15/04/2016	Workshop on JICA ESCO project	15	
5	10/05/2017	ESCO fund seminar	60	

(Source: Project)

3-2-3. Output 3

Status: Not yet achieved (likely to be achieved)

- Output 3 was considered not yet to be achieved because two of the OVIs have not yet been realized.
- The activities 3-1, 3-2 and 3-3 were completed during the 1st half of the project implementation period.

- It was confirmed that activity 3-4 was completed at the timing of this evaluation study.
- The activity 3-5 is likely to be carried out after one year because the pilot projects have already started.

Narrative summary	Status
The ESCO pilot projects are implemented in government's buildings for development of ESCO business.	Not yet achieved
Objective Verifiable Indicators	**Status**
3.1. More than 50 candidate buildings are selected by MOE/SATBA	Achieved
3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs.	Achieved
3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA	Achieved
3.4. At least, 2 ESCO pilot projects are launched	Achieved
3.5 Monthly performance reports are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts)	Not yet achieved (likely to be achieved)
3.6. Performance reports including one-year performance activities are submitted for at least 2 pilot projects by ESCOs, and approved by MOE/SATBA (after JICA project period)	Not yet achieved (likely to be achieved)
Activities	**Status**
3-1. To select the candidate buildings for energy audit	Completed
3-2. To supervise the energy audit with work-through by ESCOs at the candidate buildings	Completed
3-3. To support ESCOs in planning the pilot projects.	Completed
3-4. To supervise and monitor the pilot projects implemented by ESCOs	Not yet completed (on going)
3-5. To analyse monthly performance data of pilot projects submitted by ESCOs.	Not yet completed (to be started)

- Firstly, C/Ps in SATBA gathered 100 buildings information, and made the long list. (3-1)
- Considering size, age, owner of buildings, about 15 building were selected as candidates for walk-through energy audit. Finally, C/Ps, Japanese experts and six (6) ESCOs conducted that energy audit at seven (7) buildings. (3-2)
- Four (4) ESCOs supported by C/Ps in SATBA, submitted ESCO proposals. Two (2) proposals out of four (4) were finally approved by SATBA.(3-3)
- At the timing of the Study, 2 pilot projects have already started and been monitored. (3-4)
- In pilot ESCO projects, the result of measurement of energy consumption is supposed to be reported. Japanese experts and C/Ps have been preparing for analysis of the data. (3-5)

3-2-4. Output 4

Status: Not yet achieved (likely to be achieved)

- Output 4 was considered not yet to be achieved because the OVI has not yet been realized.
- The activity 4-1 has been conducting, while the activities 4-2, 4-3 and 4-4 are going to be carried out.

Narrative summary	Status
Policy recommendation for the promotion of ESCO business is formulated.	Not yet achieved
Objective Verifiable Indicators	**Status**
Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	Not yet achieved
Activities	**Status**
4-1. To review the project activities and results including seminars, manuals, performance of pilot projects	Not yet completed (on going)
4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran	Not yet completed (on going)
4-3. To submit the recommendation to the last JCC meeting (during the JICA project period)	Not yet completed (to be started)
4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran.	Not yet completed (to be started)
4-5. To submit the recommendation to Iranian government. (after JICA project period)	Not yet completed (to be started)

3-3. Achievement of the Project Purpose (Prospect)

Status: Not yet achieved (likely to be achieved)

- Project purpose was considered not yet to be achieved because the OVI has not yet been realized.
- It was considered, however, that the Project Purpose is going to be achieved because two pilot projects have already started.

Narrative summary	Status
The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	Not yet achieved (likely to be achieved)
Objective Verifiable Indicators	**Status**
At least 2 ESCO pilot projects demonstrate energy saving to ensure economic viability of ESCO business.	Not yet achieved (likely to be achieved)

3-4. Achievement of the Overall Goals (Prospect)

Status: (not evaluated by this study)

- It was considered that proper OVIs must be set up by the Project by June 2018.

Narrative summary	Status
Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	(not evaluated)
Objective Verifiable Indicators	**Status**
To be determined by the Project during JICA project period *e.g. The ESCO projects are carried out at more than XX government buildings …………* by 2023	(not evaluated)

3-5. Implementation Process

3-5-1. Joint Coordination Committee

The Joint Coordination Committee (hereafter referred to as "JCC") was established based on the R/D in October 2013. The JCC consists of 10 members: Ministry of Energy (hereafter referred to as "MOE"), Plan and Budget Organization (hereafter referred to as "PBO": formerly Management and Planning Office), Ministry of Economy and Finance (hereafter referred to as "MOEF"), Ministry of Petroleum (hereafter referred to as "MOP"), Ministry of Road and Urban Development (hereafter referred to as "MRUD"), Renewal Energy and Energy Efficiency Organization (hereafter referred to as "SATBA"; formerly Iran Energy Efficiency Organization (hereafter referred to as "SABA")), Iran Fuel Efficiency Organization (hereafter referred to as "IFCO"), Iran ESCO association (hereafter referred to as "IRESCO", JICA Iran office and JICA expert team.

The JCC meetings were organized three times for approval of annual work plan of the Project, monitoring and evaluation of the progress of the Project: the 1st JCC meeting was on 21st April 2014, the 2nd meeting was on 14th November 2015 and the 3rd meeting was on 22nd November 2016.

3-5-2. Communication among Iranian project members and stake holders

The Project Director and the Project Manager work in the office of Ministry of Energy, while other C/Ps are stationed in the office of SATBA, their own organization. Two offices are far each other, so the most of communication are done through mobile phone.

According to the interviews by the evaluation study team (hereafter referred to as the "Team") to the C/Ps in MOE and SATBA offices, they maintained to communicate each other at least weekly to share progress of the Project. They increased their communications such face-to-face meetings particularly when JICA experts came to work in Iran.

The team found that there were few regular communications between the project team members in MOE/SABA and other related organizations including IFCO, co-implementing organization of the Project, and PBO, a member of JCC, which has responsibilities for regulating procurement procedure of government organizations, and therefore, is highly related to introduction of ESCO project to government buildings.

3-5-3. Communication between Iranian project members and Japanese experts team

As summarized in 3-1-1, Japanese expert team had worked in Iran for 30% of the project duration. The Team interviewed both Japanese expert and Iranian project members respectively, how they communicated each other when Japanese experts were not in Iran.

The Team found that they communicated each other regularly, however, their assessments on efficiency to disclose and share information among members in SABA, MOE and Japanese experts, were different each other. That implied there could be some difficulties for timely information sharing in the project implementation process.

On the other, in order to remove language barrier among Persian-English-Japanese, a local staff who can manage both Persian and Japanese has been assigned by Japanese expert team. The Team observed that contributed to improvement of communications.

4. Evaluation based on Five Criteria

4-1. Relevance

Relevance of the Project is **High**

4-1-1. Relevance to Iranian policies

Energy consumption and improving energy intensity have been one of the top concerns in Iranian national policies. The 5th Five-year Development Plan, a national master development plan for Iranian government, clearly indicated nationalizing energy and electricity consumption in the Article 135. Energy Consumption Pattern Reform Law (2011) also mentioned that related authorities should approve regulations to support ESCOs in the Article 17. The Article 12 of the Law "Elimination of Competitive Production Barriers and Improvement of Financial System" mentioned to put one of the top priorities of energy efficiency on building sector.

4-1-2. Relevance to Japanese aid policy

The latest aid policy of Japanese government to Iran has three target areas: 1) Economic and social infrastructure development, 2) Sustainable development, and 3) Improvement of regional and international relationship with foreign countries. The Project is regarded as one of the interventions for global warming mitigation under the second area above.

4-1-3. Needs among stakeholders

According to the views suggested by the stakeholders of the Project including IRESCO and C/Ps, the planed components of the Project such as the ESCO introduction manual, the performance contract model met with their needs. The implementation of the pilot project provided indispensable experiences for all stakeholders to understand and promote ESCO business as well as ESCO project.

4-2. Effectiveness

Effectiveness of the Project is **Relatively High**

4-2-1. Important assumptions from Output level to Project Purpose level

There are two types of contract in an ESCO project; Guaranteed Savings (hereafter referred to as "GS") type, and Shared Savings (hereafter referred to as "SS") type. In GS type contract, a building owner is responsible for financing energy saving interventions such as an introduction of facilities and equipment, while in SS type contract, an ESCO is required to finance them. Consequently, a building owner should take risk when energy reduction does not take place as planed in GS type contract, while an ESCO should do it in SS type contract.

The important assumption "Budget for pilot projects is secured and disbursed by MOE as planed" was stated between the Output level to the Project Purpose level in PDM version 2. According to the interview to the Japanese expert, at the beginning of the project period, a contract type to be applied to the ESCO pilot project was thought to be a GS type, although there weren't deep discussion and clear consensus about it among the project members.

On the one hand, if GS type is applied to the pilot project, i.e. MOE, instead of a building owner, finances facilities and equipment as a pilot activity, it seems to be smooth in implementation of the Project, because stakeholders don't need to negotiate much about who prepare budget and share risks. This might be a one of the reasons GS type was considered to be applied to the pilot project at the beginning of the project period.

On the other hand, if SS type is taken for the pilot project, it seems to be challenging trial for real business because it attracts more building owners. It brings, however, harder implementation of the Project.

In fact, MOE/SATBA decided to apply SS type contract to the pilot projects, using the fund from Niroo Research Institute, which is one of the organization under MOE. The Team understood that the arrangement was not planed initially, however, it was worthy trial for the Project. This improved effectiveness of the Project, even it brought certain delay in the pilot project.

4-2-2. Hindering factors to the implementation of the pilot project

The Team also found the progress of the pilot projects was delayed by other reasons.

MOE/SABA selected two candidates of the pilot projects by the middle of 2016. A process until closing a contract between ESCO and building owner did not proceed as expected.

According to the information provided by the ESCOs, there were lot of issues they faced during that process, the main of which are summarized as follows.

(1) Frequent personnel replacement at the management level of the buildings.

As same as ESCO business practice in the world, in the pilot project, ESCOs needed to explain what ESCO business is and propose how much benefit is produced to several sections and different levels of decision makers in the client building such as the general affair department/contract department, and the section manager/director of departments. In both of the pilot projects, ESCOs faced frequent personnel replacement among the decision makers, and they had to repeat to explain and propose same things when such replacement took place. In fact, the decision maker in top management level was replaced three times in the building of MOEF which was one of the reasons why it took more than one year until closing the contract.

(2) Energy facility operation staffs in the pilot buildings who have poor energy saving knowledge

A building which is targeted as ESCO project usually has its own facility operation staffs. From the initial phase of ESCO project: to measure energy consumption on site for baseline information, to the actual project phase: to reduce energy consumption as contracted, an ESCO needs to get support and understanding from such staff. In the pilot buildings, there were facility staffs having long experience to operate and maintain facilities without professional knowledge on energy saving. It took longer time for the ESCOs, accordingly, to persuade the staffs to accept energy measurement and to operate properly as instructed by ESCOs.

(3) Incompatibility between the Iranian government procurement procedure and ESCO business

As commonly seen in many countries, procurement of products and services by government organizations should follow standardized procedure with standardized contract document. In Iran, such standard procedure and format are introduced to the government owned buildings including those of the pilot projects.

Firstly, competitive tendering is mandatory when government organization procures something from private company, which was incompatible for the pilot project. Because it was arranged that only one ESCO could submit proposal to the building owner.

In an ESCO business, a total amount paid from building owner to ESCO is changeable according to an amount of energy saved. Therefore, the total amount to be paid is unknown at the timing of closing the contract. Measurement and verification of energy consumption is also unique step to finalize the payable price in ESCO business. However, the existing procurement contract documents in Iran, which are designed and authorized by PBO, could not be able to clearly handle those figures. Therefore, the C/Ps in SATBA and the ESCO staffs modified the contract document again and again until getting consensus with the officials in charge in the pilot buildings.

The team understood these are the main issues which affected effectiveness of the Project. The first issue looked unavoidable to the ESCOs, so they can be excused for delay, while the second issue was considered as good opportunity for ESCOs to get familiar with handling such facility staff. The third issue was necessary steps to develop practical ESCO contract model which can accelerate promotion of ESCO project in Iran.

4-3. Efficiency

Efficiency of the Project is **Relatively Low (Less efficiency in the implementation process)**

The study team found some delay in the Project Activities comparing to the plan summarized in POs, which resulted in delay of the achievement of the Outputs. The Team understand there was less efficiency in the implementation process between the Inputs/Activity to the Outputs. The main reason is explained as follows.

4-3-1. Pre-conditions from Inputs/Activity level to Output level

Several organizational restructurings took place in Iranian government organizations since the Project started.

The pre-condition in the PDM versions 2 says "Organizational restructuring in MOE and MOP does not affect adversely implementation of the Project." In fact, this condition was not satisfied.

In 2016, MOE decided that SABA would be merged with Renewable Energy Organization (hereafter referred to as "SUNA"), one of the organization under MOE. The integration of the two organizations into the new organization, SATBA, was finally approved by the Iranian authority on 1st January 2017. As a result, as of December 2017, the internal organizational structure in SATBA has not yet finalized to manage ESCO project related activities. That significantly affected implementation in the second half of the Project.

Internal restructuring in MOE also took place during the project period. The Office for the Improvement of Productivity and Economy of Electricity and Energy (hereafter referred to as "OIPEEE"), which the Project Director and the Project Manager belonged to, was re-organized as the Planning and Economics of Electricity and Energy Office (hereafter referred to as "PEEEO"). Besides, MBO, one of the JCC members was restructured too, and it has become PBO.

The team concluded that these organizational restructuring in the government organizations caused less efficiency in the Project implementation. These were unavoidable events for the Project. The Team understood the Project can be excused for the delay.

4-4. Impact

Impact of the Project is **Average (provisional judgement)**

4-4-1. Prospect of achievement of Overall Goals

Although the establishment of the ESCO business model is highly expected to contribute to EE&C in the building sector in Iran, the Team could not evaluate that possible impact due to lack of data to analyse it properly.

4-4-2. Other impacts

According to the summary reports on the counterpart training in Japan, most of the participants expressed their high satisfaction with the trainings. However, the Team found that there wasn't any formal opportunity to share the data, information and experiences obtained during the trainings with other officials who did not attend the training.

Based on the above, the Team provisionally concluded the Impact of the Project is average.

4-5. Sustainability

Sustainability of the Project is **Average**

4-5-1. Technical aspects

As long as the two ESCOs implementing the pilot projects concerned, they have enough experiences of energy service for industrial/building sector. According to the views of Japanese experts, their engineering knowledge, technical skills for energy savings reach to the level to provide professional services. Through the site visit to the pilot project buildings, the Team observed the services provided by ESCOs, and confirmed the expert's view. At the timing of this evaluation study, they didn't have sufficient experience on the ESCO project in building sector, the Team judged the ESCOs will be gradually able to carry out necessary services, as they will be involved in the actual ESCO projects in building sector.

4-5-2. Organizational aspects

SABA was the implementing organization in the Project because it had the roles for trainings and energy audit programme for improvement of energy efficiency in both of industrial and building sectors. Assuming SATBA takes over those roles and secures similar budget allocation, the Team thought sustainability of organizational aspects could maintained. In fact, as summarized in the table 3-1-2-1, the total budget allocated to trainings and energy audits for energy service companies from 2014 to 2017 was 1,100,000,000 IRR which was more than 7 times as large as what was allocated to the Project.

4-5-3. Pre-condition as institutional aspects

As reported in the JICA study: "Development study for institutional development on energy management sector in the Islamic Republic of Iran (2010-2011)" market energy prices in Iran before 2010 was quite lower than other countries due to the subsidies. The Subsidy Rationalization Law, effective from December 2011, clearly mentioned that the subsidies in market energy prices including the electricity tariff should be eliminated. This is the reason that the pre-condition: "Subsidies for energy prices for building sector are eliminated as the Iranian government planed." was set in PDM version 2.

Elimination of the subsidies in electricity tariff is one of the crucial conditions to ensure sustainability of the effects of the Project, in short, the establishment of ESCO business in Iran. The data set on electricity tariff applied to the pilot project buildings was provided by SATBA, which is summarized in the table below.

Table 4-5-3-1. Electricity tariff applied to the pilot project building

Year	Base tariff (IRR/month)	Tariff based on consumption (IRR / kWh)	
2010	30,000	normal hours (07 : 00 - 19 : 00)	1,000.0
		peak hours (19 : 00 - 23 : 00)	2,000.0
		low load hours (23 : 00 - 7 : 00)	500.0
2011-12	30,000	normal hours (07 : 00 - 19 : 00)	1,100.0

		peak hours (19 : 00 - 23 : 00)	2,200.0
		low load hours (23 : 00 - 7 : 00)	550.0
2013-15	44,640	normal hours (07 : 00 - 19 : 00)	1,637.0
		peak hours (19 : 00 - 23 : 00)	3,274.0
		low load hours (23 : 00 - 7 : 00)	818.5
2016	49,104	normal hours (07 : 00 - 19 : 00)	1,801.0
		peak hours (19 : 00 - 23 : 00)	3,602.0
		low load hours (23 : 00 - 7 : 00)	900.0

(Source: SATBA)

Comparing the base tariff in 2010 and 2011-12, they were the same price, while it increased to 44,640 IRR in 2013-2015 and 49,104 in 2016. The tariff based on consumption showed also similar trend. For example, the tariff for the normal hours was 1,000 IRR in 2010, and in 2011-12 it slightly increased to 1,100 IRR. Then it went up to 1,637 IRR in 2013-15, and reached 1,801 IRR in 2016. The subsidy looks to be eliminated nominally.

However, once inflation is considered, it is difficult to judge the subsidy in electricity tariff has been eliminated as the law had mentioned.

The table below shows the inflation rate from 2010 to 2016. During this period, Iran faced serious inflation till 2014. As a result, the general market prices in 2016 increased by 235.1% from 2010, which was much higher than the increase of the electric tariff.

Table 4-5-3-2 inflation (GDP deflator) in Iran

	2010	2011	2012	2013	2014	2015	2016
Annual %	15.6	23.7	24.0	35.6	10.8	0.4	1.6
Aggregated % (Y2010=100)	100.0	123.7	153.4	208.0	230.5	231.4	235.1

(Source: the study team based on WB statistics: https://data.worldbank.org/indicator)

If the subsidy on the electricity tariff is not eliminated sufficiently, the potential of ESCO business in building sector in Iran definitely shrinks.

Based on the consideration above, the team concluded the Sustainability of the Project is average.

5. Conclusion

In conclusion, The Project showed good performance in Relevance <High>, in Effectiveness <Relatively High>, in Impact <Average> and in Sustainability <Average>, while it showed less efficiency in the implementation process (i.e. Efficiency is <Relatively Low>).

It was, therefore, concluded that the Project is likely to achieve its expected purpose without additional inputs form Japanese side and without extension of the project duration as authorized in the R/D amended by the M/M in February 2016.

6. Recommendation and Lessons learned

6-1. Recommendations

6-1-1. Project period and completion of the Project

- Both of Iranian and Japanese sides have agreed that the project period is going to end at July 2018, which had been authorized by the both sides in the R/D amended by the M/M in February 2016.
- Both of Iranian and Japanese sides have fully understood and agreed that the Project activities must be continuously implemented by the Iranian side even after the end of the project period, until all of the tasks remained are completed.
- Both of Iranian and Japanese sides have fully understood that the Project shall complete when the completion of the project activities is reported to the related organizations which belong to JCC.
- As for the activities that JICA planned to conduct after the completion of the pilot projects, described in Plan of Operation Rev. 1 (authorized by the 2nd JCC on 18th November 2015), JICA shall not conduct those activities before the end of the project period which was agreed by the M/M on 29th February 2016.
- After termination of the project period in July 2018, MOE shall ensure to conduct all remained activities including supporting ESCOs in implementation of the two pilot projects in order to achieve the Project Purpose.
- After completion of the two pilot projects, MOE shall compile and validate the data collected from the two pilot projects, and make the completion report.
- After receiving the completion report, JICA shall inspect it in serious and sincere manner.
- Based on the result of the inspection, JICA shall consider further cooperation when MOE requests it.

6-1-2. Clarification of the Project implementation structure for completion of the Project

- SATBA should take over the roles and responsibilities for the implementation of the Project shouldered by SABA.
- SATBA should also have more active roles and wider responsibilities for day to day implementation of the project activities, while MOE should concentrate on coordinating other ministries and organizations including JICA for overall implementation of the Project.
- It is suggested that official documents, authorized by the Minister of Energy, which define the roles and responsibilities of every office/section in MOE and SATBA after organizational restructuring of each organization, should be shared by JCC for efficient and effective implementation of the Project.
- It is expected that other organization such as IFCO, MOEP, PBO and IRESCO should be more involved to the implementation of the Project, particularly in formulation of the policy recommendation.

6-1-3. Tasks remained

- Both of Iranian and Japanese sides have fully understood and agreed that there are the tasks remained for the completion of the Project and achievement of the Project purpose, which include;

(1) Verification of performance of the pilot projects (in Output 3)

- This is the most important task to be carried out by Iranian organizations after the end of the project period.
- Therefore, Japanese experts should fully support the Iranian stakeholders including C/Ps, IRESCO, ESCOs during the project period, which includes a proposal of a verification protocol.

(2) Clarification of roles and responsibilities of the related organizations for promotion of ESCO projects (in Output 1)

- The clarification is one of the indispensable conditions for the effective promotion of ESCO project in building sector.
- In particularly, roles and responsibilities of organizations after restructuring in MOE and SABA should be clarified, and work demarcation regarding promotion of ESCO project in building sector, among related organizations such as MOP/IFCO, MRUD, MOEP and IRESCO should be well considered.
- Financial roles and responsibilities should also be clarified. Therefore, possible financial source for ESCO project such as funds under MOE as well as other government organizations, and financial schemes in private banks applicable for ESCO projects should be listed.

(3) Formulation of recommendation by the Project (in Output 4)

- It is expected that the recommendation should be useful for stakeholders in both of Iranian and Japanese sides in order to consider promotion of ESCO project as well as EE&C in building sector.
- Therefore, it should cover financial, institutional and technical issues for example;
  - ➢ Technical issue
    - ✧ Implementation of pilot project employing other saving solutions
  - ➢ Institutional issues
    - ✧ Action plan to development of qualified ESCOs though energy audits program which draft ESCO project proposal for all government buildings.
    - ✧ Awareness increasing programme (joint campaign by related authorities).
    - ✧ Continuous support for IRESCO to establish linkage to related authorities.
  - ➢ Financial issues
    - ✧ Financial incentive for ESCO and Building owner such as tax incentive.
    - ✧ Establishment of ESCO funds
    - ✧ Interest subsidy to ESCO Project
    - ✧ Incentives for ESCO companies through "Law for Removing the obstacles to competitive production and promoting the country's financial system"
    - ✧ ESCO project awareness seminar for financial institutions including private banks

6-1-4. Formulation of the list of detail activities for the remained tasks and reporting format

- In order to carry out the remained tasks, firstly, the Japanese experts and C/Ps should formulate the list of detail activities including names of C/Ps in charge and schedule for each activity. For this JICA experts prepare a reporting format.

6-1-5. Communication among the Project members

- In order to ensure to monitor the progress of activities until the end of the project period, the Project members: MOE (project manager), SATBA (C/Ps team), JICA expert team should establish more effective and efficient ways of communication.
- SATBA should report progress of day to day operation directly and at least weekly to JICA expert team until the end of project period when JICA experts are in Japan.
- The progress of the two pilot projects is most important to be monitored for completion of the Project. The two ESCOs implementing pilot projects should have efficient communication channels to JICA experts when necessary.

6-2. Lessons Learned

6-2-1. Project Implementation Structure/Organizing Project Team (for Iranian side)

- For smooth implementation of a cooperation project, it is ideal that a project director, a project manager and other C/Ps should be appointed from a single organization.
- When such an arrangement is difficult, alternatively, each member of a project team should be clearly assigned with role and responsibility to carry out project activities by every organization to which the member belongs.
- It is expected that a sense of ownership of a project should be developed through such organizational and personnel arrangement.

6-2-2. Coordination among ministries (for Iranian side)

- In order to ensure efficient and effective implementation and maximize benefit generated by a cooperation project, related ministries and organizations should cooperate more. For that purpose, a coordination mechanism such as JCC should be established and utilized actively.

6-2-3. Information sharing in stakeholders after training in Japan (for Iranian side)

- In order to increase impact from C/P training in Japan, information, knowledge and experiences obtained through the training by participants should be shared among Iranian stake holders.
- It is, therefore, expected that a workshop should be organized by Iranian organizations to present the results of the trainings by participants after they come back from Japan.

Title of the Project : **The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings**
Implementing Agencies : **Ministry of Energy(MOE), Iran Renewable Energy and Energy Efficiency Organization (SATBA), Iran Fuel Conservation Organization (IFCO)**
Target Groups : **Staff of MOE, SATBA, IFCO and members of Iran ESCO association (IRESCO)**
Target Area : **The Islamic Republic of Iran**
Project Period : **25.01.2014 -24.07.2018 (54 months: JICA project period)**

January 22,2018 version 2

Summary	Objective Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goals: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	-XXX.XXXX by 2023 *(to be determined by the Project)*	-XXX.XXXX *(to be determined by the Project)*	- Policies on EE&C for the building sector are maintained.
Project Purpose The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	1. At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve ESCO business.	1.Project completion report including the verification report of the pilot project. (by MOE/SATBA)	- Recommendation formulated by the Project is reflected in energy policies and budget allocation
Outputs 1. An institutional framework to promote ESCO business in Iran is strengthened.	1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related	1.1. Project documents (Regulations and guidelines) 1.2. Project documents	

	organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.	(*for example: demarcation table describing roles and responsibilities among organizations, after organizational restructuring)	
2. The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.	2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed 2.2. Performance contract models for ESCO project are upgraded 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA	2.1. Project document (the manual) 2.2. Project document (the contract models) 2.3 Project documents (records of the trainings and seminars)	
3. The ESCO pilot projects are implemented in government's buildings for development of ESCO business.	3.1. More than 50 candidate buildings are selected by MOE/SATBA 3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA 3.4. At least, 2 ESCO pilot projects are launched 3.5. Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts) (*monthly performance data) 3.6. Performance reports including one-year	3.1. Project documents (for example: progress report of pilot projects) 3.2. Project documents (ditto) 3.3. Project documents (ditto) 3.4. Project documents (ditto) 3.5. Project documents (ditto) 3.6. Project documents	- Budget for pilot projects is secured and disbursed by MOE as planed

	performance activities are submitted by ESCOs for at least 2 pilot projects, and approved by MOE/SATBA (after JICA project period)	(completion report)	
4. Policy recommendation for the promotion of ESCO business is formulated.	4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	4.1. Project Documents (for example: policy proposal paper)	

Activities:	**Inputs**	**Pre-conditions**
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran 1-2. To support IRESCO in preparing its internal guidelines 1-3. To give advice to IRESCO on strengthening intuitional capacity 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business. 2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran 2-4. To organize trainings and seminars for ESCOs and government organizations 2.5. To introduce policies, legislations and finance mechanisms for EE&C and ESCO project for building	**Japanese Side:** A.Experts ・ Team Leader (ESCO Expert) / ESCO Framework ・ Energy Audit Engineer (Heat) ・ Energy Audit Engineer (Electricity) B.Training in Japan ・ ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. ・ Nill **Iranian Side:** A.Ministry of Energy(MOE): Project Counterpart ・Project Director: General Director, Planning and Economics of Electricity and Energy Office (PEEEO) ・ Project Manager: Head of International cooperation of PEEEO B.SATBA: Implementation Organization	- Subsidies for energy prices for building sector are eliminated as the Iranian government planed. - Organizational restructuring in MOE and MOP does not affect adversely implementation of the Project.

sector in Japan 3-1. To select the candidate buildings for energy audit 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs. 4-1. To review the project activities and results including seminars, manuals, performance of pilot projects 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period) 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government for decision making.	• (Deputy of Demand Side Department*) • (ESCO Department*) **name of department, position are provisional* C.IFCO: Co-Implementation Organization D.(IRESCO: Cooperation Organization) **<u>Joint Coordinating Committee(JCC)</u>** A. Chairperson: • General Director of PEEEO B. Member of Iranian Side • MOE • Plan and Budget Organization (PBO) • Ministry of Economy and Finance (MOEF) • Ministry of Petroleum (MOP) • Ministry of Road and Urban Development (MRUD) • SATBA • IFCO • IRESCO C. Member of Japanese side • JICA Experts • Representatives from JICA Iran Office • Other personnel concerned to be assigned by request of other members D. Observer • Ministry of Foreign Affairs (MOFA) • Embassy of Japan (EoJ)	

Plan of Operation version 2: The Project on Implementation of the Pilot Project to introduce ESCO to the Government's Buildings

	Activities	Period	2014	2015	2016	2017	2018
			1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
	Period of JICA experts working in Iran	P / A					
	Output 1						
1-1	To summarize the issues and consider the measures for promotion of ESCO business in Iran	P / A					
1-2	To support IRESCO in preparing its internal guidelines	P / A					
1-3	To give advice to IRESCO on strengthening intuitional capacity	P / A					
1-4	To clarify roles and responsibilities of the stakeholders to promote ESCO business.	P / A					
	Output 2						
2-1	To develop a manual to introduce ESCO project for government organization buildings.	P / A					
2-2	To collect the existing contract models for ESCO project.	P / A					
2-3	To develop contract models for ESCO project in building sector in Iran	P / A					
2-4	To organize trainings and seminars for ESCOs and government organizations	P / A					
2-5	To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan	P / A					
	Output 3						
3-1	To select the candidate buildings for energy audit	P / A					
3-2	To supervise the energy audit with work through by ESCOs at the candidate buildings	P / A					
3-3	To support ESCOs in planning the pilot projects.	P / A					
3-4	To supervise and monitor the pilot projects implemented by ESCOs	P / A					
3-5	To analyse monthly performance data of pilot projects submitted by ESCOs .	P / A					
	Output 4						
4-1	To review the project activities and results including seminars, manuals, performance of pilot projects	A					
4-2	To abstract issues and identify possible measures to promote ESCO projects in Iran	P / A					
4-3	To submit the recommendation to the last JCC meeting (during the JICA project period)	P / A					
4-4	To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran.	P / A					
4-5	To submit the recommendation to Iranian government. (after JICA project period)	P / A					

Iranian Counterpart personnel

	Name	Position in the Project	Organization
	M. A. Shafiezadeh	Project Director	General Director of OIPEEE, MOE* General Director of PEEEO, MOE
	A. Shirazi	Project Manger	Head of Awareness & Training, OIPEEE, MOE* Head of International Cooperation, PEEEO, MOE
	Amir Doudabi Nezhad	Project Responsible Person	Deputy of Demand Side Department, SABA (-----------,-----------, SATBA)**
	Mohammad Akbari	Iraian Team Leader	Manager of ESCO Department, SABA (-----------,-----------, SATBA)**
	Mahdi Hormozi	ESCO Expert	Engineer of ESCO Department, SABA (-----------,-----------, SATBA)**
	Ahmad R. Tavakkoli	Energy Saving Expert of Building	Energy Conservation in Building Department, SABA (-----------,-----------, SATBA)**
	Mahdi Rafiei	Coordinator / Energy Saving Expert of Industry	Energy Conservation in Industries Department, SABA (-----------,-----------, SATBA)**

* The initial title and organization are in upper line. Those after organizational restructuring are stated in lower line
* The internal organizational structure in SATBA has not yet been finalized after organizational restructuring (As of December 2017)

Japanese Expert

	Name	Position in the Project	Organization
	Tsutomu MORI	Team leader/ESCO Promotion	Nippon Koei Co.,LTD
	Morio SAKAI	Energy Audit Expert (Electricity Engineer)	Nippon Koei Co.,LTD
	Hedeaki KUROKI	Energy Audit Expert (Heat Enginner)	Nippon Koei Co.,LTD

The first training in Japan (19.01.2015-24.01.2015)

	Name	Position	Organization
1	Mr. Effatnejad Reza	Deputy of General Director Electricity and Energy Affair	MOE
2	Mr. Akbari Hamid	Master expert of energy efficiency in demand sector (Building& industry)	MOE
3	Ms. Bigdeli Somayeh	Expert	MOE
4	Mr. Akbarisayar Mohammad	Manager Electricity and Energy Affair	SABA
5	Mr. Sadeghi Nourbakhsh	Manager	SABA
6	Ms. Paknejad Soodabeh	Councilor of Distributed Coordination Deputy in D.S.M	Tavanir
7	Mr. Peyman Karimifard	Manager of Power System Analysis	Tavanir
8	Mr. Assadianahmadabad Ehesan	Expert	MPO
9	Mr. Mahmoud Hafezian	General Manager	MOEF

The second training in Japan (16.04.2016-26.04.2016)

	Name	Position	Organization
1	Mr. Mohammad Shafiezadeh	General Director, Electricity and Energy Affaires	MOE
2	Mr. Rahim Azimi	Deputy of General Manager, Finane and Building	MOEF
3	Mr. Alireza Abdollah Shirazi	Manager of ESCO Project, Electricity and Energy Affaires	MOE
4	Mr. Mojtaba Gorbani	Expert of Economic Evaluation of Projects Electricity and Energy Affaires	MOE
5	Mr. Mohammad Khezeli	Expert of Projects Electricity and Energy Affaires	MOE
6	Mr. Saeed Amani	Office Manager of Energy Conservation in Building Department	SABA
7	Mr. Amir Doudabinezhad	Deputy of Education and Energy Consumption Optimization	SABA
8	Mr. Ehsan Assadian Ahmadabad	Expert of International Affairs	PBO
9	Ms. Maryam Namjoobaghini	Manager Energy consumption management	GT EPDC
10	Mr. Tooraj Bathaie	Managing Director	Pishrun Energy Co.
11	Mr. Alimohmmad Mirshams	Managing Director	ASIA WATT Eng. Co.

Schedule of Joint Terminal Evaluation Study

			AM	PM	Remarks
1	13/1/2018	Sat	Data analysis	Kick off team meeging at JICA office, interview IRESCO	
2	14/1/2018	Sun	Kick off team meeging with stakeholders at MOE	Interview SATBA (at MOE) Interview MOE	PBO joined
3	15/1/2018	Mon	Meeting with MOE (PDM revision)	Data analysis JICA office	
4	16/1/2018	Tue	Meeting with MOE (PDM revision)	Interview SATBA/ESCOs	PBO joined at SATBA
5	17/1/2018	Wed	Data collection at SATBA	Meeting with BCRC	
6	18/1/2018	Thu	Data analysis	Data analysis	
7	19/1/2018	Fri	Report writing	Report writing	
8	20/1/2018	Sat	TEDC pilot site	Meeting with IFCO	PBO joined at TEDC
9	21/1/2018	Sun	MOEF pilot site	Report writing	PBO joined at MOEF
10	22/1/2018	Mon	Report writing	Meeting with MOE & data collection	
11	23/1/2018	Tue	(Report at JCC)	(Report writing)	

Joint Terminal Evaluation Report Annex VI :List of meeting participant/interviewee during study

List of Participants/ Interviewees date: Jan 13, 2018 time: 14:00-17:00, Venue: IRESCO

#	Name	Position	Organization
1	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
2	Amir Jamali Moghaddam	Member of Board	Asia Watt Eng.Co.
3	Ali Mohammad Mirshams	Managing Director	Asia Watt Eng.Co.
4	Tooraj Bathaei	Managing Director	Pishrun Energy Co.
5	Gholamali Najafi	Chief of Board	IRESCO
6	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
7	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
8	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
9	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 14, 2018 time: 9:00-11:00, Venue: MOE

#	Name	Position	Organization
1	Hamed Houri Jafari	Energy Manager	IFCO
2	Alireza Moradi	Energy Expert Engineer	IFCO
3	Anahita Karimi	Energy Expert Engineer	TEDC
4	Shahab Alborzi	Energy Expert Engineer	TEDC
5	Mahdi Hosseini	Energy Expert	PBO
6	Alimohammad Mirshams	Managing Director	Asia Watt Eng.Co.
7	Kamran Nazari Radsani	Head of Installation Dep.	MOEF
8	Rahim Azimi	Installation Manager	MOEF
9	Mehdi Rafiei	Expert	SATBA
10	Mohammad Akbari	Head of Industrial Management	SATBA
11	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
12	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
13	Dr. Kari Behrouz	Head of Energy Dept.	BHRC
14	Tooraj Bathaei	Managing Director	Pishrun Energy
15	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
16	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
17	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
18	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
19	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 14, 2018 time: 12:00-13:00, Venue: MOE

#	Name	Position	Organization
1	Mohammad Akbari	Head of Industrial Management	SATBA
2	Mehdi Rafiei	Expert	SATBA
3	Hiroshi OGAWA	Presentative Partner	Haruno ESWorks LLC
4	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 14, 2018 time: 14:00-15:00, Venue: MOE

#	Name	Position	Organization
1	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
4	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
5	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 15, 2018 time: 9:00-11:00 Venue: MOE

#	Name	Position	Organization
1	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
4	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
5	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
6	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
7	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 16, 2018 time: 9:00-11:00 Venue: MOE

#	Name	Position	Organization
1	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
4	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
5	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
6	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
7	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 16, 2018 time: 14:00-15:30 Venue: SATBA

#	Name	Position	Organization
1	Ali Mohammad Mirshams	Managing Director	Asia Watt Eng.Co.
2	Tooraj Bathaei	Managing Director	Pishrun Energy Co.
3	Maryam Shekari	M&V monitoring manager	Pishrun Energy Co.
4	Mehdi Rafiei	Expert	SATBA
5	Mohammad Akbari	Head of Industrial Management	SATBA
6	Mahdi Hosseini	Energy Expert	PBO
7	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
8	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
9	Behzad Yagmaie	Translator	AJTC

Joint Terminal Evaluation Report Annex VI :List of meeting participant/interviewee during study

List of Participants/ Interviewees date: Jan 17, 2018 time: 10:00-12:00 Venue: SATBA

#	Name	Position	Organization
1	Mohammad Akbari	Head of Industrial Management	SATBA
2	Mehdi Rafiei	Expert	SATBA
3	Hiroshi OGAWA	Presentative Partner	Haruno ESWorks LLC
4	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
5	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 17, 2018 time: 14:00-14:40 Venue: BHRC

#	Name	Position	Organization
1	Dr. Kari Behrouz	Head of Energy Dept.	BHRC
2	Mahdieh Abravesh	expert	BHRC
3	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
4	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
5	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 20, 2018 time: 9:00-12:00 Venue: TEDC

#	Name	Position	Organization
1	Tooraj Bathaei	Managing Director	Pishrun Energy Co.
2	Maryam Shekari	M&V monitoring manager	Pishrun Energy Co.
3	Meysam Parvarese	Mechanical engineer	Pishrun Energy Co.
4	Amir Navidi	Engineer	TEDC
5	Benhoor Sahari	Master of DSM	TEDC
6	Ensieh Rostami	Master of DSM	TEDC
7	Anahita Karimi	Energy Expert Engineer	TEDC
8	Hosjatollah Pouyafar	Maneger of HC	TEDC
9	Shahab Alborzi	Energy Expert Engineer	TEDC
10	Masoud Azizi	Depty of Customer service	TEDC
11	A.A. Yaghooti	Deputy director of engineering	TEDC
12	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
13	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
14	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
15	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 20, 2018 time: 14:00-15:00 Venue: IFCO

#	Name	Position	Organization
1	Mohsen Mohammadi	Planning head	IFCO
2	Hamed HourinJafari	Energy manager	IFCO
3	M.R.Khattati	Director, Industrial section	IFCO
4	Mortteza Golzadeh	Assistant of vice president	IFCO
5	Alireza Moradi	Expert energy engineer	IFCO
6	Mohammad.Mirzaei	Manager deputy of Energy Conservation in building sector	IFCO
7	Youssefi Passandy	Consultor	IFCO
8	Aghil barati	Senior Expert, R&D	IFCO
9	M.R.Eslamii	Senior Expert, building	IFCO
10	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
11	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
12	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 21, 2018 time: 9:30-11:45 Venue: MOEF

#	Name	Position	Organization
1	Ali Mohammad Mirshams	Managing Director	Asia Watt Eng.Co.
2	Pooria Orouji	R&D manager	Asia Watt Eng.Co.
3	S.M.Hosseini	Mechanical Engineer	MOEF
4	Vahid Tahmuseri	Engineer	MOEF
5	Salmani Zabiholah	Director general, personnel service & supporting	MOEF
6	Rahim Azimi	Installation Manager	MOEF
7	Kamran Nazari Radsani	Head of Installation Dep.	MOEF
8	Mahdi Hosseini	Energy Expert	PBO
9	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
10	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
11	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
12	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
13	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 22, 2018 time: 15:30- 18:00 Venue: MOE

#	Name	Position	Organization
1	M.A. Shafiezadeh	General Director PEEEO	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
4	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
5	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
6	Morio SAKAI	ESCO Project Expert	Nippon Koei Co.,LTD
7	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
8	Behzad Yagmaie	ESCO Project Assistant	AJTC

Agenda of 4th Joint Coordinating Committee

Date: January 23, 2018 (1396/ 11 / 3) at 10:00 AM

Venue: 13th Floor Conference room, Ministry of Energy

1. Opening speech from Iran side (10:00 to 10:05)
   Director General of PEEEO, Ministry of Energy
   ESCO Project Director,

2. Opening speech from Japan side (10:05 to 10:10)
   Japan International Cooperation Agency (JICA) Iran Office
   Representative, Iran office, JICA will participate.

3. Progress of the Project (10:10 to 10:15)
   Ministry of Energy
   ESCO Project Manager,

4. Implementation of the Pilot Project (10:15 to 10:25)
   SATBA

5. Progress of the ESCO Pilot Project on the Tehran Electric Distribution Company (10:25 to 10:35)
   Pishrun Energy

6. Progress of the ESCO Pilot Project on the Ministry of Economic Affairs and Finance (10:35 to 10:45)
   ASIA WATT

7. Finding of issues of the Project (10:45 to 10:55)
   JICA project team

8. Evaluation of the Project (10:55 to 11:15)
   JICA evaluation team

9. Comment (Q&A) from participants (11:15 to 11:25)

4 th JCC

Time and Date: 10:00AM-11:05 AM, 23 January 2018 03 Bahman 1396 in Persian calender

Venue: Meeting room on 13th floor, MOE

List of Participants

#	Name	Organization	Position
1	Mohammad Ali Shafizadeh	MOE	Direcotor General, PEEEO
2	Alireza Shirazi	MOE	Head of International Cooperation, PEEEO
3	Kambiz Rezapour	MOE	Director of Planning and Monitoring Division
4	Mohammad Akbari Sayyar	SATBA	Head of Industrial Management
5	Mehdi Rafiei	SATBA	Expert
6	Tooraj Bathaie	Pishrun Energy Co.	Chairman
7	Alimohammad Mirshams	Asia Watt Eng.Co.	Managing Director
8	Seyed Mahdi Hosseini	PBO	Expert of Energy Department
9	Kamran Nazari	MOEF	Head of Installation Dep.
10	Yukiharu Kobayashi	JICA Iran Office	Chief Representative
11	Yoshiko Yamanaka	JICA Iran Office	Project Formulation Advisor
12	Vahid Kheirolomour	JICA Iran Office	Senior Program Officer
13	Tsutomu Mori	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Leader
14	Morio Sakai	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Expert
15	Behzad Yaghmaie	JICA ESCO Project team	Assistant of JICA ESCO Project Team
16	Saeidreza Ettehadi	JICA ESCO Project team	Interpreter of JICA ESCO Project Team
17	Hiroshi Ogawa	JICA Evaluation Mission (Haruno ESWorks LLC)	Evaluator (Representative partner)

Agenda of 5th Joint Coordinating Committee

Date: Tuesday, 10 July 2018

Venue: 13th Floor Conference Room, Ministry of Energy

10:00 – 10:05	Opening Speech from Iranian side (Mr. M. Shafiezadeh, General Director, Ministry of Energy)
10:05 – 10:10	Opening Speech from Japanese side (Mr. Y. Kobayashi, Chief Representative, JICA)
10:10 – 10:30	Progress and achievement of the project (representative, SATBA) *Issue and countermeasure through experience of pilot project*
10:30 – 10:45	Opinion from ESCO company side against entire project (Representative, IRESCO)
10:45 – 11:05	Achievement of PDM and promotion for ESCO business by Government of Iran in the future (representative, MoE) *Policy, target, schedule, responsibility for ESCO promotion*
11:05 – 11:20	Role of promotion for ESCO business (Representative, PBO) *Financial support, standard contract document, mitigation of restriction on government body*
11:20 – 11:35	Recommendation from Japan experience (Mr. T. Mori, JICA Expert Team)
11:35 – 11:45	Wrap up of project (Mr. M. Shafiezadeh, General Director, Ministry of Energy)

5th JCC

Time and Date: 10:00AM-12:00AM, 10 July 2018

Venue: Meeting room on 13th floor, MOE

List of Participants

#	Name	Organization	Position
1	Mohammad Ali Shafizadeh	MOE	Direcotor General, PEEEO
2	Alireza Shirazi	MOE	Head of International Cooperation, PEEEO
3	Kambiz Rezapour	MOE	Director of Planning and Monitoring Division
4	Mohammad Akbari Sayyar	SATBA	Head of Industrial Management
5	Gholamali NAJAFI	IRESCO	Chairman of the board
6	Tooraj Bathaie	Pishrun Energy Co.	Chairman
7	Alimohammad Mirshams	Asia Watt Eng.Co.	Managing Director
8	Seyed Mahdi Hosseini	PBO	Expert of Energy Department
9	Ehsan Assadian Ahmadabad	PBO	Expert of International Affairs
10	Yukiharu Kobayashi	JICA Iran Office	Chief Representative
11	Yoshiko Yamanaka	JICA Iran Office	Project Formulation Advisor
12	Vahid Kheirolomour	JICA Iran Office	Senior Program Officer
13	Tsutomu Mori	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Leader
14	Morio Sakai	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Expert
15	Kuroki Hideaki	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Expert
16	Behzad Yaghmaie	JICA ESCO Project team	Assistant of JICA ESCO Project Team
17	Saeidreza Ettehadi	JICA ESCO Project Team	Interpreter of JICA ESCO Project Team

MINUTES OF MEETINGS

BETWEEN

JAPAN INTERNATIONAL COOPERATION AGENCY

AND

MINISTRY OF ENERGY

ON

5th JOINT COORDINATION COMMITTEE

FOR

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS TO INTRODUCE ESCO FOR GOVERNMENT'S BUILDINGS IN THE ISLAMIC REPUBLIC OF IRAN

"The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings in the Islamic Republic of Iran" (hereinafter referred to as "the Project"), which has been implemented under the collaboration between the Japan International Cooperation Agency (hereinafter referred to as "JICA") and the Government of Iran, has conducted the 5th and the final Joint Coordination Committee (hereinafter referred to as "JCC") on 10th July, 2018 in Tehran. The purpose of JCC is to review final achievement throughout the Project, and to discuss necessary future actions for sustainable expansion of ESCO service in Iran.

As a result of the discussion, the both sides agreed on the matters referred to the document annexed hereto.

Tehran, 2018

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Chief Representative
Iran Office
Japan International Cooperation Agency

Mr. M. A. SHAFIEZADEH
General Director of RSEEO
Ministry of ENERGY
The Islamic Republic of Iran

Mr. Tsutomu MORI
Leader of JICA project team
Nippon Koei Co. Ltd.

ANNEX

1. Request form Japan Side

JICA and JICA experts strongly requested Iran side as follows. MOE agreed to them.

- To carry out all of task remained as per agreement on fourth (4th) JCC
- To monitor two pilot projects at least one year after termination of the Project
- To support ESCOs and building owners for solving problems in two pilot projects respectively
- To report progress and situation of the two of pilot projects to JICA periodically
- To share information to stakeholders of the Project, e.g. IFCO, MOEAF

2. Confirmation of Achievement of the Project

(1) Overall Goal of the Project

MOE and JICA confirmed that "Objectively Verifiable Indicators" at Overall Goal level is set as follows.

- ESCO for government buildings will be officially introduced from 2020.
- Building where is implemented ESCO will be reduced energy consumption at least 10%.

(2) Follow up of Terminal Evaluation

The terminal evaluation was conducted upon both JICA and Iranian side in January 2018. The evaluation report show in Attachment 5 pointed out remained tasks to be carried out for the completion of the Project and achievement of the Project Purpose as follows;

1) Verification of performance of the pilot projects (in Output 3)
   This is the most important task to be carried out by Iranian organizations after termination of the Project. MOE and SATBA should monitor the pilot projects continuously at least one year. ESCOs should report the performance of the pilot project to building owner, MOE and SATBA on regular basis. MOE and SATBA should analyze and evaluate the report, and share with stakeholders of the Projects.
2) Clarification of roles and responsibilities of the related organizations for promotion of ESCO projects (in Output 1)
   Roles and responsibilities of the related organizations for promotion of ESCO projects has not been clarified. Overall structure for promotion of ESCO business is under consideration. MOE recognized necessity of involvement of PBO as legal institution coordinator though the Project. MOE, SATBA and PBO will discuss with other related organizations in Energy Council and take necessary measures based on the decision of Council.
3) Formulation of recommendation by the Project (in Output 4)
   Stakeholders of the Project shared issues and proposed recommendation found through the Project at third (3rd) Work Shop and fifth (5th) JCC. MOE and SATBA will formulate institution for

ESCO promotion based on the recommendation mentioned below 6.

4) Setting Objectively Verifiable Indicators at Overall Goal level in the PDM version 2.
MOE set the objectively verifiable Indicators" at Overall Goal level. Stakeholders of the Project confirmed the indicators and approved the revised PDM as version 3.

3. Actions to be Implemented by MOE after Termination of the Project

MOE and JICA confirmed the achievement of the Project and remained task to be implemented after the Project termination as Attachment 6. MOE agreed that MOE and SATBA would carry out monitoring after termination of the Project to ensure that all the activities shall be completed, and report to JICA and share with related organizations.

4. Confirmation of the Implementation Structure after Termination of the Project

MOE and JICA confirmed that MOE, SATBA and PBO are all responsible to manage, execute all activities of promotion of ESCO project. MOE, SATBA and PBO will discuss with other related organizations in Energy Council.

5. Barrier to implementing ESCO Project in Iran

Some barriers for implementation of ESCO project in Iran were found through the process of ESCO pilot projects as follows.

(1) Procedure to ESCO contract signing

The pilot projects had taken a long time since submitting the proposal to signing of ESCO. The reasons for taking time were as follows.

- ESCO companies were required to explain the ESCO business, their ESCO proposal and ESCO contract to staffs of several sections in the client building. The staffs had poor understanding about ESCO and the key person had been moved during the contract negotiation period.
- In general, service contracts between ESCO and governmental bodied must use standard contract authorized by PBO. While the model contract for the pilot projects has been prepared by SATBA and IRESCO in the first stage of the Project, it has not authorized by PBO.

(2) Restriction on contract amount limit

In the pilot project, ESCO companies were selected under the negotiated contract, not open bidding procedure. In the case of the pilot project conducted in MOEAF building, the ESCO contract had to be divided into two contracts due to the issue of the restriction on contract amount limitation according to the regulation on the negotiated contract.

(3) Verification of ESCO performance

ESCO company is obliged to measure the amount of energy saving reduced by ESCO and periodically report it. Also, since its energy saving is guaranteed by ESCO company, it is necessary to verify the amount of energy saving. In the case of MOEAF building, they ask the third-party consultant to verify the report of ESCO company. Meanwhile, the distribution company building does not ask a third-party consultant, and it is doing its own verification. Therefore, it takes time to verify. The ESCO company has not received payment of the ESCO service fee yet. If building owner cannot accept the result performed by ESCO company, it is required that a third-party judgement.

Measure and verification (M&V) protocol for ESCO is very important to implement ESCO. Regarding the problem of verification of ESCO performance in the case of the distribution company building, JICA experts made discussion with IRESCO and ESCO company on the problem of M&V during this site survey. At that time, JICA experts provided the examples of M&V in Japan that responded to similar problems and advised the countermeasures for the problems of M&V of the pilot projects. JICA experts have advised IRESCO to propose the M&V protocol suitable for Iran ESCO to SATBA based on the discussion.

6. Recommendation for Further Promotion of ESCO Project in Iran

Recommendation for further promotion of ESCO project in Iran is presented by the presentation of MOE, PBO, IRESCO and JICA experts as follows.

(1) Recommendation from Iran side

- The government should establish a mechanism to evaluate and certify the ESCO company.
- PBO should approve ESCO model contract.
  PBO has already formed a working group with all Iranian stakeholders such as MOE, PBO, MOP, SATBA, IFCO, IRESCO and relevant organizations to review all existing contracts including the contract that has been prepared in ESCO project, in order to be provided a unique contract for approval.
- PBO should establish ESCO fund for finance support to ESCO.
- SATBA should conduct awareness of ESCO scheme to related organizations.
- The government should support IRESCO.
- A working group for promotion ESCO should be established in the government.
- IRESCO has an intention to implement a joint ESCO project with JAESCO.
- MOE would like to request additional technical cooperation project from JICA for continuous support.

(2) Recommendation from Japan side

- Awareness of ESCO scheme for government and government's building owner
- Authorization by a legal institution for ESCO scheme
- Study of ESCO potential of Government's buildings
- Provision of financial support to ESCO

Detail of recommendation is described in attachment 4.

END

Attachment 1: Agenda of 5th Joint Coordinating Committee
Attachment 2: List of Participants (5th Joint Coordination Committee)
Attachment 3: PDM version 3
Attachment 4: Recommendation for Further Promotion of ESCO Project in Iran by JICA experts
Attachment 5: Terminal Evaluation Report
Attachment 6: Confirmation of Achievement of PDM

Attachment 1

Agenda of 5th Joint Coordinating Committee

Date: Tuesday, 10 July 2018

Venue: 13th Floor Conference Room, Ministry of Energy

10:00 – 10:05	Opening Speech from Iranian side (Mr. M. Shafiezadeh, General Director, Ministry of Energy)
10:05 – 10:10	Opening Speech from Japanese side (Mr. Y. Kobayashi, Chief Representative, JICA)
10:10 – 10:30	Progress and achievement of the project (representative, SATBA) *Issue and countermeasure through experience of pilot project*
10:30 – 10:45	Opinion from ESCO company side against entire project (Representative, IRESCO)
10:45 – 11:05	Achievement of PDM and promotion for ESCO business by Government of Iran in the future (representative, MoE) *Policy, target, schedule, responsibility for ESCO promotion*
11:05 – 11:20	Role of promotion for ESCO business (Representative, PBO) *Financial support, standard contract document, mitigation of restriction on government body*
11:20 – 11:35	Recommendation from Japan experience (Mr. T. Mori, JICA Expert Team)
11:35 – 11:45	Wrap up of project (Mr. M. Shafiezadeh, General Director, Ministry of Energy)

Attachment 2

5th JCC

Time and Date: 10:00AM-12:00AM, 10 July 2018

Venue: Meeting room on 13th floor, MOE

List of Participants

#	Name	Organization	Position
1	Mohammad Ali Shafizadeh	MOE	Direcotor General, PEEEO
2	Alireza Shirazi	MOE	Head of International Cooperation, PEEEO
3	Kambiz Rezapour	MOE	Director of Planning and Monitoring Division
4	Mohammad Akbari Sayyar	SATBA	Head of Industrial Management
5	Gholamali NAJAFI	IRESCO	Chairman of the board
6	Tooraj Bathaie	Pishrun Energy Co.	Chairman
7	Alimohammad Mirshams	Asia Watt Eng.Co.	Managing Director
8	Seyed Mahdi Hosseini	PBO	Expert of Energy Department
9	Ehsan Assadian Ahmadabad	PBO	Expert of International Affairs
10	Yukiharu Kobayashi	JICA Iran Office	Chief Representative
11	Yoshiko Yamanaka	JICA Iran Office	Project Formulation Advisor
12	Vahid Kheirolomour	JICA Iran Office	Senior Program Officer
13	Tsutomu Mori	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Leader
14	Morio Sakai	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Expert
15	Kuroki Hideaki	JICA ESCO Project team (Nippon Koei. Co.,LTD)	ESCO Project Expert
16	Behzad Yaghmaie	JICA ESCO Project team	Assistant of JICA ESCO Project Team
17	Saeidreza Ettehadi	JICA ESCO Project Team	Interpreter of JICA ESCO Project Team

Project Title: The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings
Implementing Agency: Ministry of Energy (MOE), Iran Renewable Energy and Energy Efficiency Organization (SATBA), Iranian Fuel Conservation Organization (IFCO)
Target Group: Staff of MOE, SATBA, and IFCO, and Members of Iran ESCO Association (IRESCO)
Project Site: The Islamic Republic of Iran
Project Period: January 25, 2014-July 24, 2018 (54 months: JICA project period)

Version 3
July 10, 2018

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Overall Goal: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	ESCO for government buildings will be officially introduced from 2020. Building where is implemented ESCO will be reduced energy consumption at least 10%.	Implementation of ESCO for Government building Evaluate of performance of ESCO	Policies on EE&C for the building sector are maintained. Authorization by a legal institution for ESCO Scheme.
Project Purpose: The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve ESCO business.	Project completion report including the verification report of the pilot project. (by MOE/SATBA)	Recommendation formulated by the Project is reflected in energy policies and budget allocation.
Outputs: 1. An institutional framework to promote ESCO business in Iran is strengthened.	1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.	1.1. Project documents (Regulations and guidelines) 1.2. Project documents (*for example: demarcation table describing roles and responsibilities among organizations, after organizational restructuring)	
2. The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened..	2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed 2.2. Performance contract models for ESCO project are upgraded 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA	2.1. Project document (the manual) 2.2. Project document (the contract models) 2.3 Project documents (records of the trainings and seminars)	
3. The ESCO pilot projects are implemented in government's buildings for development of ESCO business..	3.1. More than 50 candidate buildings are selected by MOE/SATBA 3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA 3.4. At least, 2 ESCO pilot projects are launched 3.5. Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts) (*monthly performance data) 3.6. Performance reports including one-year performance activities are submitted by ESCOs for at least 2 pilot projects, and approved by MOE/SATBA (after JICA project period)	3.1. Project documents (for example: progress report of pilot projects) 3.2. Project documents (ditto) 3.3. Project documents (ditto) 3.4. Project documents (ditto) 3.5. Project documents (ditto) 3.6. Project documents (completion report)	Budget for pilot projects is secured and disbursed by MOE as planed
4. Policy recommendation for the promotion of ESCO business is formulated.	4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	4.1. Project Documents (for example: policy proposal paper)	

Activities:	Inputs (Means and Cost)	Pre-conditions
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran 1-2. To support IRESCO in preparing its internal guidelines 1-3. To give advice to IRESCO on strengthening intuitional capacity 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business. 2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran 2-4. To organize trainings and seminars for ESCOs and government organizations 2.5. To introduce policies, legislations and finance mechanisms for EE&C and ESCO project for building sector in Japan 3-1. To select the candidate buildings for energy audit 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs. 4-1. To review the project activities and results including seminars, manuals, performance of pilot projects 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period) 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government for decision making.	**The Japanese Side** A. Experts ・ Team Leader (ESCO Expert) / ESCO Framework ・ Energy Audit Engineer (Heat) ・ Energy Audit Engineer (Electricity) B. Training in Japan ・ ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. ・ Nill **The Iranian Side:** A. Ministry of Energy: Project Counterpart ・ Project Director: General Director, General Director, Planning and Economics of Electricity and Energy Office (PEEEO) ・ Project Manager: Head of International cooperation of PEEEO B. SATBA: Implementation Organization ・ (Deputy of Demand Side Department*) ・ (ESCO Department*) *name of department, position are provisional C. IFCO: Co-Implementation Organization D. (IRESCO: Cooperation Organization) **Joint Coordinating Committee(JCC)** A. Chairperson: ・ General Director of PEEEO B. Member of Iranian Side ・ MOE ・ Plan and Budget Organization (PBO) ・ Ministry of Economy and Finance (MOEF) ・ Ministry of Petrol (MOP) ・ Ministry of Road and Urban Development (MRUD) ・ SATBA ・ IFCO ・ IRESCO C. Member of Japanese side ・ JICA Experts ・ Representatives from JICA Iran Office ・ Other personnel concerned to be assigned by request of other members D. Observer ・ Ministry of Foreign Affairs (MOFA) ・ Embassy of Japan (EoJ)	

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran

Recommendation for Further Promotion of ESCO Project in Iran

July 10, 2014
JICA Project Team

Recommendations

1. Awareness of ESCO Scheme for Government and Gov's Building Owner
2. Authorization by a Legal Institution for ESCO Scheme
3. Study of ESCO Potential of Gov's Buildings
4. Provision of Financial Support to ESCO

Awareness of ESCO Scheme for Government and Gov's Building Owner

- Understanding of ESCO Scheme for Government
  MoE (SATBA), PBO, IFCO

- Awareness of ESCO Scheme for Gov's Building Owner
  SATBA, IRESCO
  Building Owner
  (Contract, account and maintenance section)

3

Authorization by a Legal Institution for ESCO Scheme

- Authorization of Model Contract for ESCO by PBO
  The model contract has been published on the website of SATBA.

- Change of Contract Procedure of ESCO
  Tendering system
  Restricted contract price
  Long term contract

4

Study of ESCO Potential of Gov's Buildings

- Energy Audit of Gov's Buildings (50-100 sites per year)
  SATBA consign energy audit to ESCO company.
  The results are announced to ESCO companies.

- Selection of Candidate buildings to introduce ESCO
  ESCO company propose ESCO plan based on the result of energy audit.

5

Provision of Financial Support to ESCO

- Effective Use of Reformed Subsidy to Energy Price
  Investment to energy efficiency and conservation (EE&C) in Iran
  - Promotion of ESCO

- Provision of financial support to ESCO
  Establishment of ESCO fund (low interest loan)
  Subsidy to ESCO project (no-repayment)
  Reimbursement of interest to ESCO company

6

Implementation Schedule of Promotion of ESCO

	Year 1	Year 2	Year 3	Year 4	Year 5
Monitoring of Pilot Project					
Awareness of ESCO Scheme for Government and Gov's Building Owner					
Authorization by a Legal Institution for ESCO Scheme					
Study of ESCO Potential of Gov's Buildings					
Provision of financial support to ESCO					
Implementation ESCO for Government's Buildings					

JOINT TERMINAL EVALUATION REPORT

FOR

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS TO INTRODUCE ESCO FOR GOVERNMENT'S BUILDINGS IN ISLAMIC REPUBLIC OF IRAN

Ministry of Energy

and

Japan International Cooperation Agency

Tehran

Islamic Republic of Iran

23rd January 2018

小林雪治

Mr. Yukiharu KOBAYASHI Leader of the Japanese Evaluation Team Chief Representative, JICA Iran Office	Mr. Mohammad Ali Shafizadeh, General Director, Planning and Economics of Electricity and Energy Office, Ministry of Energy, The Islamic Republic of Iran

CONTENTS

Abbreviation

BHRC	Building and Housing Research Centre
C/P	Counterpart personnel
EE&C	Energy Efficiency and Conservation
ESCO	Energy Service Company
IFCO	Iran Fuel Conservation Company
IRR	Iranian Rial
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
kWh	Kilowatt hour
MM	Man Month
M/M	Minutes of Meeting
MOE	Ministry of Energy
MOEF	Ministry of Economy and Finance
MOP	Ministry of Petroleum
MPO	Management Planning Organization
MRUD	Ministry of Road and Urban Development
M&V	Measurement and Verification
NRI	Niroo Research Institute
OIPEEE	Office for the Improvement of Productivity and Economy of Electricity and Energy
OVI	Objectively Verifiable Indicator
PEEEO	Planning and Economics of Electricity and Energy Office (formerly OIPEEE)
PDM	Project Design Matrix
PO	Plan of Operation
PBO	Plan and Budget Organization (formerly MPO)
R/D	Record of Discussion
SABA	Iran Energy Efficiency Organization
SATBA	Iran Renewable Energy and Energy Efficiency Organization (formerly SABA)
SUNA	Iran Renewable Energy Organization

1. Introduction

1-1. Background of the Project

The Islamic Republic of Iran (hereafter referred to as the "Iran") is one of the world's most eminent oil-producing countries, producing four million barrels per day, which accounts for 10.9 percent of oil deposits in the entire world. However, general energy consumption occupies 44 percent of general energy supply in Iran. Efficient utilization of energy is becoming the key issue in terms of securing the volume of oil for export that brings economic growth to the country. The proportion of the energy consumption in residential sector is the largest, 33 percent, which is followed by 24 percent in transportation sector, 24 percent in industrial sector and eight percent in commercial sector. As the energy consumption in building sub-sector under residential and commercial sector has been increasing and reaches 40 percent of the total energy supply in Iran, Energy Efficiency and Conservation (hereafter referred to as "EE&C") in building sub-sector is now the most urgent issue tackled by Ministry of Energy.

JICA implemented Technical Cooperation Project: "Development study for institutional development on energy management sector in the Islamic Republic of Iran" (May 2010 – November 2011). That project developed the road map and the action plan for promotion of EE&C in building sub-sector, and concluded that the utilization ESCO could be feasible measure. Iran government strengthens EE&C promotion by setting series of laws and regulations such as Subsidy Rationalization Law (December 2011), Energy Consumption Pattern Reform Law (March 2011). Ministry of Energy, then, requested Japanese government for implementation of Technical Cooperation Project aiming capacity development for promotion of ESCO projects in government's buildings, and the record of discussion to launch the project was exchanged between JICA and Ministry of Energy in October 2013.

The project started at January 2014, and 3 Japanese experts have been dispatched to work together with Iranian counterpart personnel (hereafter referred to as "C/P") in order to assist the Iranian ESCO association, organize trainings and seminars for stakeholders in EE&C for building sector, implement ESCO pilot projects, and formulate policy recommendations for promotion of ESCO projects in Iran.

1-2. Objectives of the Terminal Evaluation

The Objectives of the Terminal Evaluation were as follows:

(1) To review the achievements and the implementation process of the Project, according to the Project Design Matrix (hereafter referred to as "PDM") and the Plan of Operation (hereafter referred to as "PO",

(2) To evaluate the overall performance of the Project according to the five evaluation criteria (Relevance, Effectiveness, Efficiency, Impacts and Sustainability),

(3) To provide/consider recommendation to the Project regarding the implementation plan and issues for the remaining project period, and

(4) To draw lessons learned from the Project to the similar type of project implemented in future.

1-3. Members of the Evaluation Team

1-3-1. Japanese side

Name	Designation	Title
Mr. Yukiharu KOBAYASHI	Leader	Chief Representative, JICA Iran office
Ms. Yoshiko YAMANAKA	Member (Evaluation Planning)	Project Formulation Advisor, JICA Iran office
Mr. Vahid Kheirolomour	Member (Evaluation Coordination)	Senior Program Officer, JICA Iran office
Mr. Hiroshi OGAWA	Member (Evaluation Analysis/EE&C)	Representative Partner, Haruno ESWorks LLC

1-3-2. Iranian side

Name	Designation	Title
Mahdi Husseini	Member	Energy Expert Plan and Budget Organization

1-4. Schedule of the Terminal Evaluation

The Study was conducted jointly from 13th January to 22nd January 2018. The detail schedule is shown Annex VI.

1-5. Methodology of the Terminal Evaluation

1-5-1. Process of the Terminal Evaluation

The Terminal Evaluation was conducted in two steps as follows:

(1) Step 1: Preliminary survey by members of Japanese side

The progress and achievement during the project period were preliminary surveyed. The members of Japanese side collected data and information through document reviews, questionnaires and interviews. Then, the Japanese members analysed performance of the Project.

(2) Step 2: Joint evaluation survey

Based on the results of the above step, the Evaluation team carried out further field investigation in the pilot building sites, and series of discussion for adequate evaluation of the Project. The team finally summarized the whole results in the Joint Evaluation Report (This report) for mutual understanding.

1-5-2. Evaluation Criteria

The Terminal Evaluation was conducted in accordance with the JICA's evaluation guideline which standardizes the Five Evaluation Criteria as follows:

(1) Relevance

Relevance refers to the validity of the Project Purpose and the Overall Goal in connection with the development policies of the Iranian government, assistance policy of the Japanese government and development needs of the beneficiaries.

(2) Effectiveness

Effectiveness refers to the extent to which the expected benefits of the Project have been achieved as planned. It also examines whether these benefits have been generated as a result of the Project.

(3) Efficiency

Efficiency refers to the productivity of the implementation process. It examines whether the Inputs of the Project have been efficiently converted into the Outputs of the Project.

(4) Impact

Impact refers to direct and indirect, positive and negative impacts caused by the implementation of the Project, including the extent to which the Overall Goal has been attained.

(5) Sustainability

Sustainability refers to the extent to which the Project can be further developed by the Iranian authorities, and the extent to which the benefit generated by the Project can be sustained under the national policies, technology, system and financial state.

2. Outline of the Project

The outline of the Project was formulated by the project formulation study in March 2013, and authorized in the Record of Discussion (hereafter referred to as "R/D") dated 1st October 2013. The initial PDM (version 0) was designed in the 1st Joint Coordination Committee (hereafter referred to as "JCC") meeting in April 2014. The revised PDM (version1) was developed in the 2nd JCC meeting in November 2015. The duration of the project period was amended to 54 months from 48 months by the Minutes of Meeting (hereafter referred to as "M/M") dated 29th February 2016. In order to clarify the Outputs and Activities, and to reflect the progress of the Project until December 2017, the PDM version 2 and PO version 2 for the terminal evaluation study were prepared of which outline is summarized below. (PDM version 2 and PO version 2 are attached in Annex I and II respectively.)

2-1. Overall Goals

Narrative summary
Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government building
Objective Verifiable Indicators
To be determined by the Project during JICA project period (by July 2018) *e.g. The ESCO projects are carried out at more than XX government buildings* ………… by 2023

2-2. Project Purpose

Narrative summary
The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.
Objective Verifiable Indicators
At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve

ESCO business.

2-3. Outputs and Activities

2-3-1. Output 1

Narrative summary
An institutional framework to promote ESCO business in Iran is strengthened.
Objective Verifiable Indicators
1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related organizations: MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.
Activities
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran. 1-2. To support IRESCO in preparing its internal guidelines. 1-3. To give advice to IRESCO on strengthening intuitional capacity. 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business.

2-3-2. Output 2

Narrative summary
The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.
Objective Verifiable Indicators
2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed. 2.2. Performance contract models for ESCO project are upgraded. 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA.
Activities
2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran. 2-4. To organize trainings and seminars for ESCOs and government organizations. 2-5. To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan.

2-3-3. Output 3

Narrative summary
The ESCO pilot projects are implemented in government's buildings for development of ESCO business.
Objective Verifiable Indicators
3.1. More than 50 candidate buildings are selected by MOE/SATBA.

3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA. 3.4. At least, 2 ESCO pilot projects are launched. 3.5 Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts). (* monthly performance data) 3.6. Performance reports including one-year performance activities are submitted for at least 2 pilot projects by ESCOs, and approved by MOE/SATBA. (after JICA project period.)
Activities
3-1. To select the candidate buildings for energy audit. 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings. 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs. 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs.

2-3-4. Output 4

Narrative summary
Policy recommendation for the promotion of ESCO business is formulated.
Objective Verifiable Indicators
4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period).
Activities
4-1. To review the project activities and results including seminars, manuals, performance of pilot projects. 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran. 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period). 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government. (after JICA project period)

2-4. Assumptions and Pre-condition

Pre-conditions
- Subsidies for energy prices for building sector are eliminated as the Iranian government planed. - Organizational restructuring in MOE and MOP does not affect adversely implementation of the Project.
Assumptions from Outputs to Project purpose
- Budget for pilot projects is secured and disbursed by MOE as planned.
Assumptions from Project purpose to Overall goals
- Recommendation formulated by the Project is reflected in energy policies and budget

allocation.
Assumptions for sustainability of Overall goals
- Policies on EE&C for the building sector are maintained.

3. Achievements and Implementation Process of the Project

3-1. Inputs to the Project

The Team has confirmed that the Project has provided the following inputs.

3-1-1. Inputs from the Japanese side

(1) Assignment of Japanese experts

The three (3) Japanese experts in charge of ESCO/ESCO policy, Energy audit engineer (Heat) and Energy audit engineer (Electricity) have been assigned by the time of the Terminal Evaluation of which total man-months (hereafter referred to as "MMs") is 16.56 MMs.

The total MMs of the Japanese expert working in Iran is 14.56MMs, which accounts for 30% of the total duration of the Project implementation up to December 2017.

Table 3-1-1-1. Assignment of Japanese experts

	Period	Planed MMs	Actual MMs
Work in Iran	The 1st period (Jan.2014 - Feb.2016)	8.66	8.66
	The 2nd period (Mar.2016 -May. 2018)	10.06	5.90 (as of Dec.2017)
	Sub-total	18.72	14.56 (as of Dec.2017)
Work in Japan	The 1st period (Jan.2014 - Feb.2016)	1.35	1.35
	The 2nd period (Mar.2016 -May. 2018)	1.40	0.65 (as of Dec.2017)
	Sub-total	2.75	2.00 (as of Dec.2017)
	Total	21.47	16.56 (as of Dec.2017)

(Source: Japanese expert team)

(2) Counterpart training in Japan

Two times of the training were completed. In total, 20 persons attended the training in Japan. The list of participants is attached in Annex IV

(3) Financial support for local costs

No financial support for local costs such as for organizing seminars was planned.

(4) Equipment

No equipment was planned to be provided.

3-1-2. Inputs from Iranian side

(1) Assignment of counterparts' personnel and administrative personnel

Two officials in Ministry of Energy have been assigned as a project director and a project manager respectively. Five officials in SATBA have been assigned as C/Ps. The list of the officials is attached in Annex III.

(2) Office space and facilities for the Project

Working space for Japanese experts was arranged in the building of SABA, and the utilities such as electricity, water, air conditioning, and foods for the experts were provided until organizational restructuring of SABA. As of December 2017, the arrangement was pending. MOE/SATBA was preparing such arrangement once again.

(3) Financial support to the Project.

From the beginning of the project period up to December 2017, in total, 150,000,000 Iranian Rial (hereafter referred to as "IRR") has been allocated and disbursed to the operation of the Project from the SATBA. Apart from for the operation of the Project, SABA/SATBA expensed 1,100,000,000 IRR for EE&C related activities including energy audits, organizing trainings and seminars. The detail is summarized the table below.

Table 3-1-2-1. Expenditure by SABA/SATBA to the Project and EE&C

Items	Amount (IRR)
For the operation of the Project	150,000,000
Organizing Workshops	40,000,000
Preparation of Pilot project (such as for energy audit)	30,000,000
Support for the experts	80,000,000
For other EE&C related activities	1,100,000,000
Energy audit, Trainings, etc (2014-2017)	-

(Source: SATBA)

3-2. Achievement of Outputs

The Project has implemented its activities as per the plan (stated in the PDM and PO version 2). The Team reviewed the progress of the Project activities and the achievement of the Outputs as followed.

3-2-1. Output 1

Status: Not yet achieved (likely to be achieved)

- Output1 was considered not yet to be achieved because one of the Objective Verifiable Indicator (hereafter referred to as "OVI") has not yet been realized.
- Although the activities 1-1, 1-2 and 1-3 were completed as planned, the activity 1-4 shown delay.

Narrative summary	Status
An institutional framework to promote ESCO business in Iran is strengthened.	Not yet achieved (likely to be achieved)

Objective Verifiable Indicators	Status
1.1. Regulations and guidelines in the IRESCO are upgraded.	Achieved
1.2. Roles and responsibilities of the related organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified	Not yet achieved (likely to be achieved)
Activities	**Status**
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran	Completed
1-2. To support IRESCO in preparing its internal guidelines	Completed
1-3. To give advice to IRESCO on strengthening intuitional capacity	Completed
1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business.	Not yet completed (likely to be completed)

- According to the interviews to the executives in IRESCO, advices provided by JICA experts were useful for them to upgrade their regulations and to consider how to develop the association.
- The delay in the activity 1-4 was caused mainly because;
  - The organizational restructuring in MOE and SABA took place during project period, and
  - The activity was not clearly planed in PDM/PO version 0 and version 1.
- It was reported by C/Ps that the internal organizational structure in SATBA would be finalized before coming Iranian new year, i.e. the middle of March 2018.

3-2-2 Output 2

Status: Likely to be achieved

- Output 2 was considered to be likely to be achieved because two (2) OVIs have been realized and other is going to be achieved.
- The activities 2-1, 2-2、 2-3 and 2-5 were completed.
- Another workshop in the activity 2-4 is going to be organized before the end of the project period.

Narrative summary	Status
The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.	Likely to be achieved
Objective Verifiable Indicators	**Status**
2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed.	Achieved
2.2. Performance contract models for ESCO project are upgraded.	Achieved
2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA.	Likely to be achieved

Activities	Status
2-1. To develop a manual to introduce ESCO project for government organization buildings.	Completed
2-2. To collect the existing contract models for ESCO project.	Completed
2-3. To develop contract models for ESCO project in building sector in Iran.	Completed
2-4. To organize trainings and seminars for ESCOs and government organizations.	Not yet completed (on going likely to be completed)
2-5. To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan.	Completed

- The 30-page manual was developed, which explains, a type of services in ESCO project, contact types, meaning of performance-based contract, a way of measurement and verification, etc. (2-1)
- Four (4) examples of ESCO contract document were collected: 1) A standard ESCO contract model introduced by Ministry of Economy, Trade and Industry, Japan, 2) One used in ESCO business project in industrial sector in Iran, 3) One dealing with ESCO project in USA, and 4) One which IRESCO got from one of their member. After comparative analysis on these examples, C/Ps developed the contract model. (2-2, 2-3)
- As of December 2017, five (5) seminars/workshops were organized as listed below. The Project is going to organize one more seminar before the end of the project period.

Table 3-2-2-1. Seminar/Workshop organized during the Project period

	Date	Title	Number of participant	Remarks
1	15/03/2014	Workshop on JICA ESCO project	30	
2	22/04/2014	1st JICA workshop	55	90* including project staff
3	23/11/2015	2nd JICA workshop	80	Presented in Power system conference at SATBA
4	15/04/2016	Workshop on JICA ESCO project	15	
5	10/05/2017	ESCO fund seminar	60	

(Source: Project)

3-2-3. Output 3

Status: Not yet achieved (likely to be achieved)

- Output 3 was considered not yet to be achieved because two of the OVIs have not yet been realized.
- The activities 3-1, 3-2 and 3-3 were completed during the 1st half of the project implementation period.

- It was confirmed that activity 3-4 was completed at the timing of this evaluation study.
- The activity 3-5 is likely to be carried out after one year because the pilot projects have already started.

Narrative summary	Status
The ESCO pilot projects are implemented in government's buildings for development of ESCO business.	Not yet achieved
Objective Verifiable Indicators	**Status**
3.1. More than 50 candidate buildings are selected by MOE/SATBA	Achieved
3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs.	Achieved
3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA	Achieved
3.4. At least, 2 ESCO pilot projects are launched	Achieved
3.5 Monthly performance reports are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts)	Not yet achieved (likely to be achieved)
3.6. Performance reports including one-year performance activities are submitted for at least 2 pilot projects by ESCOs, and approved by MOE/SATBA (after JICA project period)	Not yet achieved (likely to be achieved)
Activities	**Status**
3-1. To select the candidate buildings for energy audit	Completed
3-2. To supervise the energy audit with work-through by ESCOs at the candidate buildings	Completed
3-3. To support ESCOs in planning the pilot projects.	Completed
3-4. To supervise and monitor the pilot projects implemented by ESCOs	Not yet completed (on going)
3-5. To analyse monthly performance data of pilot projects submitted by ESCOs.	Not yet completed (to be started)

- Firstly, C/Ps in SATBA gathered 100 buildings information, and made the long list. (3-1)
- Considering size, age, owner of buildings, about 15 building were selected as candidates for walk-through energy audit. Finally, C/Ps, Japanese experts and six (6) ESCOs conducted that energy audit at seven (7) buildings. (3-2)
- Four (4) ESCOs supported by C/Ps in SATBA, submitted ESCO proposals. Two (2) proposals out of four (4) were finally approved by SATBA.(3-3)
- At the timing of the Study, 2 pilot projects have already started and been monitored. (3-4)
- In pilot ESCO projects, the result of measurement of energy consumption is supposed to be reported. Japanese experts and C/Ps have been preparing for analysis of the data. (3-5)

3-2-4. Output 4

Status: Not yet achieved (likely to be achieved)

- Output 4 was considered not yet to be achieved because the OVI has not yet been realized.
- The activity 4-1 has been conducting, while the activities 4-2, 4-3 and 4-4 are going to be carried out.

Narrative summary	Status
Policy recommendation for the promotion of ESCO business is formulated.	Not yet achieved
Objective Verifiable Indicators	**Status**
Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	Not yet achieved
Activities	**Status**
4-1. To review the project activities and results including seminars, manuals, performance of pilot projects	Not yet completed (on going)
4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran	Not yet completed (on going)
4-3. To submit the recommendation to the last JCC meeting (during the JICA project period)	Not yet completed (to be started)
4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran.	Not yet completed (to be started)
4-5. To submit the recommendation to Iranian government. (after JICA project period)	Not yet completed (to be started)

3-3. Achievement of the Project Purpose (Prospect)

Status: Not yet achieved (likely to be achieved)

- Project purpose was considered not yet to be achieved because the OVI has not yet been realized.
- It was considered, however, that the Project Purpose is going to be achieved because two pilot projects have already started.

Narrative summary	Status
The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	Not yet achieved (likely to be achieved)
Objective Verifiable Indicators	**Status**
At least 2 ESCO pilot projects demonstrate energy saving to ensure economic viability of ESCO business.	Not yet achieved (likely to be achieved)

3-4. Achievement of the Overall Goals (Prospect)

Status: (not evaluated by this study)

- It was considered that proper OVIs must be set up by the Project by June 2018.

Narrative summary	Status
Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	(not evaluated)
Objective Verifiable Indicators	**Status**
To be determined by the Project during JICA project period *e.g. The ESCO projects are carried out at more than XX government buildings …………* by 2023	(not evaluated)

3-5. Implementation Process

3-5-1. Joint Coordination Committee

The Joint Coordination Committee (hereafter referred to as "JCC") was established based on the R/D in October 2013. The JCC consists of 10 members: Ministry of Energy (hereafter referred to as "MOE"), Plan and Budget Organization (hereafter referred to as "PBO": formerly Management and Planning Office), Ministry of Economy and Finance (hereafter referred to as "MOEF"), Ministry of Petroleum (hereafter referred to as "MOP"), Ministry of Road and Urban Development (hereafter referred to as "MRUD"), Renewal Energy and Energy Efficiency Organization (hereafter referred to as "SATBA"; formerly Iran Energy Efficiency Organization (hereafter referred to as "SABA")), Iran Fuel Efficiency Organization (hereafter referred to as "IFCO"), Iran ESCO association (hereafter referred to as "IRESCO", JICA Iran office and JICA expert team.

The JCC meetings were organized three times for approval of annual work plan of the Project, monitoring and evaluation of the progress of the Project: the 1st JCC meeting was on 21st April 2014, the 2nd meeting was on 14th November 2015 and the 3rd meeting was on 22nd November 2016.

3-5-2. Communication among Iranian project members and stake holders

The Project Director and the Project Manager work in the office of Ministry of Energy, while other C/Ps are stationed in the office of SATBA, their own organization. Two offices are far each other, so the most of communication are done through mobile phone.

According to the interviews by the evaluation study team (hereafter referred to as the "Team") to the C/Ps in MOE and SATBA offices, they maintained to communicate each other at least weekly to share progress of the Project. They increased their communications such face-to-face meetings particularly when JICA experts came to work in Iran.

The team found that there were few regular communications between the project team members in MOE/SABA and other related organizations including IFCO, co-implementing organization of the Project, and PBO, a member of JCC, which has responsibilities for regulating procurement procedure of government organizations, and therefore, is highly related to introduction of ESCO project to government buildings.

3-5-3. Communication between Iranian project members and Japanese experts team

As summarized in 3-1-1, Japanese expert team had worked in Iran for 30% of the project duration. The Team interviewed both Japanese expert and Iranian project members respectively, how they communicated each other when Japanese experts were not in Iran.

The Team found that they communicated each other regularly, however, their assessments on efficiency to disclose and share information among members in SABA, MOE and Japanese experts, were different each other. That implied there could be some difficulties for timely information sharing in the project implementation process.

On the other, in order to remove language barrier among Persian-English-Japanese, a local staff who can manage both Persian and Japanese has been assigned by Japanese expert team. The Team observed that contributed to improvement of communications.

4. Evaluation based on Five Criteria

4-1. Relevance

Relevance of the Project is **High**

4-1-1. Relevance to Iranian policies

Energy consumption and improving energy intensity have been one of the top concerns in Iranian national policies. The 5th Five-year Development Plan, a national master development plan for Iranian government, clearly indicated nationalizing energy and electricity consumption in the Article 135. Energy Consumption Pattern Reform Law (2011) also mentioned that related authorities should approve regulations to support ESCOs in the Article 17. The Article 12 of the Law "Elimination of Competitive Production Barriers and Improvement of Financial System" mentioned to put one of the top priorities of energy efficiency on building sector.

4-1-2. Relevance to Japanese aid policy

The latest aid policy of Japanese government to Iran has three target areas: 1) Economic and social infrastructure development, 2) Sustainable development, and 3) Improvement of regional and international relationship with foreign countries. The Project is regarded as one of the interventions for global warming mitigation under the second area above.

4-1-3. Needs among stakeholders

According to the views suggested by the stakeholders of the Project including IRESCO and C/Ps, the planed components of the Project such as the ESCO introduction manual, the performance contract model met with their needs. The implementation of the pilot project provided indispensable experiences for all stakeholders to understand and promote ESCO business as well as ESCO project.

4-2. Effectiveness

Effectiveness of the Project is **Relatively High**

4-2-1. Important assumptions from Output level to Project Purpose level

There are two types of contract in an ESCO project; Guaranteed Savings (hereafter referred to as "GS") type, and Shared Savings (hereafter referred to as "SS") type. In GS type contract, a building owner is responsible for financing energy saving interventions such as an introduction of facilities and equipment, while in SS type contract, an ESCO is required to finance them. Consequently, a building owner should take risk when energy reduction does not take place as planed in GS type contract, while an ESCO should do it in SS type contract.

The important assumption "Budget for pilot projects is secured and disbursed by MOE as planed" was stated between the Output level to the Project Purpose level in PDM version 2. According to the interview to the Japanese expert, at the beginning of the project period, a contract type to be applied to the ESCO pilot project was thought to be a GS type, although there weren't deep discussion and clear consensus about it among the project members.

On the one hand, if GS type is applied to the pilot project, i.e. MOE, instead of a building owner, finances facilities and equipment as a pilot activity, it seems to be smooth in implementation of the Project, because stakeholders don't need to negotiate much about who prepare budget and share risks. This might be a one of the reasons GS type was considered to be applied to the pilot project at the beginning of the project period.

On the other hand, if SS type is taken for the pilot project, it seems to be challenging trial for real business because it attracts more building owners. It brings, however, harder implementation of the Project.

In fact, MOE/SATBA decided to apply SS type contract to the pilot projects, using the fund from Niroo Research Institute, which is one of the organization under MOE. The Team understood that the arrangement was not planed initially, however, it was worthy trial for the Project. This improved effectiveness of the Project, even it brought certain delay in the pilot project.

4-2-2. Hindering factors to the implementation of the pilot project

The Team also found the progress of the pilot projects was delayed by other reasons.

MOE/SABA selected two candidates of the pilot projects by the middle of 2016. A process until closing a contract between ESCO and building owner did not proceed as expected.

According to the information provided by the ESCOs, there were lot of issues they faced during that process, the main of which are summarized as follows.

(1) Frequent personnel replacement at the management level of the buildings.

As same as ESCO business practice in the world, in the pilot project, ESCOs needed to explain what ESCO business is and propose how much benefit is produced to several sections and different levels of decision makers in the client building such as the general affair department/contract department, and the section manager/director of departments. In both of the pilot projects, ESCOs faced frequent personnel replacement among the decision makers, and they had to repeat to explain and propose same things when such replacement took place. In fact, the decision maker in top management level was replaced three times in the building of MOEF which was one of the reasons why it took more than one year until closing the contract.

(2) Energy facility operation staffs in the pilot buildings who have poor energy saving knowledge

A building which is targeted as ESCO project usually has its own facility operation staffs. From the initial phase of ESCO project: to measure energy consumption on site for baseline information, to the actual project phase: to reduce energy consumption as contracted, an ESCO needs to get support and understanding from such staff. In the pilot buildings, there were facility staffs having long experience to operate and maintain facilities without professional knowledge on energy saving. It took longer time for the ESCOs, accordingly, to persuade the staffs to accept energy measurement and to operate properly as instructed by ESCOs.

(3) Incompatibility between the Iranian government procurement procedure and ESCO business

As commonly seen in many countries, procurement of products and services by government organizations should follow standardized procedure with standardized contract document. In Iran, such standard procedure and format are introduced to the government owned buildings including those of the pilot projects.

Firstly, competitive tendering is mandatory when government organization procures something from private company, which was incompatible for the pilot project. Because it was arranged that only one ESCO could submit proposal to the building owner.

In an ESCO business, a total amount paid from building owner to ESCO is changeable according to an amount of energy saved. Therefore, the total amount to be paid is unknown at the timing of closing the contract. Measurement and verification of energy consumption is also unique step to finalize the payable price in ESCO business. However, the existing procurement contract documents in Iran, which are designed and authorized by PBO, could not be able to clearly handle those figures. Therefore, the C/Ps in SATBA and the ESCO staffs modified the contract document again and again until getting consensus with the officials in charge in the pilot buildings.

The team understood these are the main issues which affected effectiveness of the Project. The first issue looked unavoidable to the ESCOs, so they can be excused for delay, while the second issue was considered as good opportunity for ESCOs to get familiar with handling such facility staff. The third issue was necessary steps to develop practical ESCO contract model which can accelerate promotion of ESCO project in Iran.

4-3. Efficiency

Efficiency of the Project is **Relatively Low (Less efficiency in the implementation process)**

The study team found some delay in the Project Activities comparing to the plan summarized in POs, which resulted in delay of the achievement of the Outputs. The Team understand there was less efficiency in the implementation process between the Inputs/Activity to the Outputs. The main reason is explained as follows.

4-3-1. Pre-conditions from Inputs/Activity level to Output level

Several organizational restructurings took place in Iranian government organizations since the Project started.

The pre-condition in the PDM versions 2 says "Organizational restructuring in MOE and MOP does not affect adversely implementation of the Project." In fact, this condition was not satisfied.

In 2016, MOE decided that SABA would be merged with Renewable Energy Organization (hereafter referred to as "SUNA"), one of the organization under MOE. The integration of the two organizations into the new organization, SATBA, was finally approved by the Iranian authority on 1st January 2017. As a result, as of December 2017, the internal organizational structure in SATBA has not yet finalized to manage ESCO project related activities. That significantly affected implementation in the second half of the Project.

Internal restructuring in MOE also took place during the project period. The Office for the Improvement of Productivity and Economy of Electricity and Energy (hereafter referred to as "OIPEEE"), which the Project Director and the Project Manager belonged to, was re-organized as the Planning and Economics of Electricity and Energy Office (hereafter referred to as "PEEEO"). Besides, MBO, one of the JCC members was restructured too, and it has become PBO.

The team concluded that these organizational restructuring in the government organizations caused less efficiency in the Project implementation. These were unavoidable events for the Project. The Team understood the Project can be excused for the delay.

4-4. Impact

<u>Impact of the Project is **Average (provisional judgement)**</u>

4-4-1. Prospect of achievement of Overall Goals

Although the establishment of the ESCO business model is highly expected to contribute to EE&C in the building sector in Iran, the Team could not evaluate that possible impact due to lack of data to analyse it properly.

4-4-2. Other impacts

According to the summary reports on the counterpart training in Japan, most of the participants expressed their high satisfaction with the trainings. However, the Team found that there wasn't any formal opportunity to share the data, information and experiences obtained during the trainings with other officials who did not attend the training.

Based on the above, the Team provisionally concluded the Impact of the Project is average.

4-5. Sustainability

<u>Sustainability of the Project is **Average**</u>

4-5-1. Technical aspects

As long as the two ESCOs implementing the pilot projects concerned, they have enough experiences of energy service for industrial/building sector. According to the views of Japanese experts, their engineering knowledge, technical skills for energy savings reach to the level to provide professional services. Through the site visit to the pilot project buildings, the Team observed the services provided by ESCOs, and confirmed the expert's view. At the timing of this evaluation study, they didn't have sufficient experience on the ESCO project in building sector, the Team judged the ESCOs will be gradually able to carry out necessary services, as they will be involved in the actual ESCO projects in building sector.

4-5-2. Organizational aspects

SABA was the implementing organization in the Project because it had the roles for trainings and energy audit programme for improvement of energy efficiency in both of industrial and building sectors. Assuming SATBA takes over those roles and secures similar budget allocation, the Team thought sustainability of organizational aspects could maintained. In fact, as summarized in the table 3-1-2-1, the total budget allocated to trainings and energy audits for energy service companies from 2014 to 2017 was 1,100,000,000 IRR which was more than 7 times as large as what was allocated to the Project.

4-5-3. Pre-condition as institutional aspects

As reported in the JICA study: "Development study for institutional development on energy management sector in the Islamic Republic of Iran (2010-2011)" market energy prices in Iran before 2010 was quite lower than other countries due to the subsidies. The Subsidy Rationalization Law, effective from December 2011, clearly mentioned that the subsidies in market energy prices including the electricity tariff should be eliminated. This is the reason that the pre-condition: "Subsidies for energy prices for building sector are eliminated as the Iranian government planed." was set in PDM version 2.

Elimination of the subsidies in electricity tariff is one of the crucial conditions to ensure sustainability of the effects of the Project, in short, the establishment of ESCO business in Iran. The data set on electricity tariff applied to the pilot project buildings was provided by SATBA, which is summarized in the table below.

Table 4-5-3-1. Electricity tariff applied to the pilot project building

Year	Base tariff (IRR/month)	Tariff based on consumption (IRR / kWh)	
2010	30,000	normal hours (07 : 00 - 19 : 00)	1,000.0
		peak hours (19 : 00 - 23 : 00)	2,000.0
		low load hours (23 : 00 - 7 : 00)	500.0
2011-12	30,000	normal hours (07 : 00 - 19 : 00)	1,100.0

		peak hours (19 : 00 - 23 : 00)	2,200.0
		low load hours (23 : 00 - 7 : 00)	550.0
2013-15	44,640	normal hours (07 : 00 - 19 : 00)	1,637.0
		peak hours (19 : 00 - 23 : 00)	3,274.0
		low load hours (23 : 00 - 7 : 00)	818.5
2016	49,104	normal hours (07 : 00 - 19 : 00)	1,801.0
		peak hours (19 : 00 - 23 : 00)	3,602.0
		low load hours (23 : 00 - 7 : 00)	900.0

(Source: SATBA)

Comparing the base tariff in 2010 and 2011-12, they were the same price, while it increased to 44,640 IRR in 2013-2015 and 49,104 in 2016. The tariff based on consumption showed also similar trend. For example, the tariff for the normal hours was 1,000 IRR in 2010, and in 2011-12 it slightly increased to 1,100 IRR. Then it went up to 1,637 IRR in 2013-15, and reached 1,801 IRR in 2016. The subsidy looks to be eliminated nominally.

However, once inflation is considered, it is difficult to judge the subsidy in electricity tariff has been eliminated as the law had mentioned.

The table below shows the inflation rate from 2010 to 2016. During this period, Iran faced serious inflation till 2014. As a result, the general market prices in 2016 increased by 235.1% from 2010, which was much higher than the increase of the electric tariff.

Table 4-5-3-2 inflation (GDP deflator) in Iran

	2010	2011	2012	2013	2014	2015	2016
Annual %	15.6	23.7	24.0	35.6	10.8	0.4	1.6
Aggregated % (Y2010=100)	100.0	123.7	153.4	208.0	230.5	231.4	235.1

(Source: the study team based on WB statistics: https://data.worldbank.org/indicator)

If the subsidy on the electricity tariff is not eliminated sufficiently, the potential of ESCO business in building sector in Iran definitely shrinks.

Based on the consideration above, the team concluded the Sustainability of the Project is average.

5. Conclusion

In conclusion, The Project showed good performance in Relevance <High>, in Effectiveness <Relatively High>, in Impact <Average> and in Sustainability <Average>, while it showed less efficiency in the implementation process (i.e. Efficiency is <Relatively Low>).

It was, therefore, concluded that the Project is likely to achieve its expected purpose without additional inputs form Japanese side and without extension of the project duration as authorized in the R/D amended by the M/M in February 2016.

6. Recommendation and Lessons learned

6-1. Recommendations

6-1-1. Project period and completion of the Project

- Both of Iranian and Japanese sides have agreed that the project period is going to end at July 2018, which had been authorized by the both sides in the R/D amended by the M/M in February 2016.
- Both of Iranian and Japanese sides have fully understood and agreed that the Project activities must be continuously implemented by the Iranian side even after the end of the project period, until all of the tasks remained are completed.
- Both of Iranian and Japanese sides have fully understood that the Project shall complete when the completion of the project activities is reported to the related organizations which belong to JCC.
- As for the activities that JICA planned to conduct after the completion of the pilot projects, described in Plan of Operation Rev. 1 (authorized by the 2nd JCC on 18th November 2015), JICA shall not conduct those activities before the end of the project period which was agreed by the M/M on 29th February 2016.
- After termination of the project period in July 2018, MOE shall ensure to conduct all remained activities including supporting ESCOs in implementation of the two pilot projects in order to achieve the Project Purpose.
- After completion of the two pilot projects, MOE shall compile and validate the data collected from the two pilot projects, and make the completion report.
- After receiving the completion report, JICA shall inspect it in serious and sincere manner.
- Based on the result of the inspection, JICA shall consider further cooperation when MOE requests it.

6-1-2. Clarification of the Project implementation structure for completion of the Project

- SATBA should take over the roles and responsibilities for the implementation of the Project shouldered by SABA.
- SATBA should also have more active roles and wider responsibilities for day to day implementation of the project activities, while MOE should concentrate on coordinating other ministries and organizations including JICA for overall implementation of the Project.
- It is suggested that official documents, authorized by the Minister of Energy, which define the roles and responsibilities of every office/section in MOE and SATBA after organizational restructuring of each organization, should be shared by JCC for efficient and effective implementation of the Project.
- It is expected that other organization such as IFCO, MOEP, PBO and IRESCO should be more involved to the implementation of the Project, particularly in formulation of the policy recommendation.

6-1-3. Tasks remained

- Both of Iranian and Japanese sides have fully understood and agreed that there are the tasks remained for the completion of the Project and achievement of the Project purpose, which include;

(1) Verification of performance of the pilot projects (in Output 3)

- This is the most important task to be carried out by Iranian organizations after the end of the project period.
- Therefore, Japanese experts should fully support the Iranian stakeholders including C/Ps, IRESCO, ESCOs during the project period, which includes a proposal of a verification protocol.

(2) Clarification of roles and responsibilities of the related organizations for promotion of ESCO projects (in Output 1)

- The clarification is one of the indispensable conditions for the effective promotion of ESCO project in building sector.
- In particularly, roles and responsibilities of organizations after restructuring in MOE and SABA should be clarified, and work demarcation regarding promotion of ESCO project in building sector, among related organizations such as MOP/IFCO, MRUD, MOEP and IRESCO should be well considered.
- Financial roles and responsibilities should also be clarified. Therefore, possible financial source for ESCO project such as funds under MOE as well as other government organizations, and financial schemes in private banks applicable for ESCO projects should be listed.

(3) Formulation of recommendation by the Project (in Output 4)

- It is expected that the recommendation should be useful for stakeholders in both of Iranian and Japanese sides in order to consider promotion of ESCO project as well as EE&C in building sector.
- Therefore, it should cover financial, institutional and technical issues for example;
  - ➢ Technical issue
    - ✧ Implementation of pilot project employing other saving solutions
  - ➢ Institutional issues
    - ✧ Action plan to development of qualified ESCOs though energy audits program which draft ESCO project proposal for all government buildings.
    - ✧ Awareness increasing programme (joint campaign by related authorities).
    - ✧ Continuous support for IRESCO to establish linkage to related authorities.
  - ➢ Financial issues
    - ✧ Financial incentive for ESCO and Building owner such as tax incentive.
    - ✧ Establishment of ESCO funds
    - ✧ Interest subsidy to ESCO Project
    - ✧ Incentives for ESCO companies through "Law for Removing the obstacles to competitive production and promoting the country's financial system"
    - ✧ ESCO project awareness seminar for financial institutions including private banks

6-1-4. Formulation of the list of detail activities for the remained tasks and reporting format

- In order to carry out the remained tasks, firstly, the Japanese experts and C/Ps should formulate the list of detail activities including names of C/Ps in charge and schedule for each activity. For this JICA experts prepare a reporting format.

6-1-5. Communication among the Project members

- In order to ensure to monitor the progress of activities until the end of the project period, the Project members: MOE (project manager), SATBA (C/Ps team), JICA expert team should establish more effective and efficient ways of communication.
- SATBA should report progress of day to day operation directly and at least weekly to JICA expert team until the end of project period when JICA experts are in Japan.
- The progress of the two pilot projects is most important to be monitored for completion of the Project. The two ESCOs implementing pilot projects should have efficient communication channels to JICA experts when necessary.

6-2. Lessons Learned

6-2-1. Project Implementation Structure/Organizing Project Team (for Iranian side)

- For smooth implementation of a cooperation project, it is ideal that a project director, a project manager and other C/Ps should be appointed from a single organization.
- When such an arrangement is difficult, alternatively, each member of a project team should be clearly assigned with role and responsibility to carry out project activities by every organization to which the member belongs.
- It is expected that a sense of ownership of a project should be developed through such organizational and personnel arrangement.

6-2-2. Coordination among ministries (for Iranian side)

- In order to ensure efficient and effective implementation and maximize benefit generated by a cooperation project, related ministries and organizations should cooperate more. For that purpose, a coordination mechanism such as JCC should be established and utilized actively.

6-2-3. Information sharing in stakeholders after training in Japan (for Iranian side)

- In order to increase impact from C/P training in Japan, information, knowledge and experiences obtained through the training by participants should be shared among Iranian stake holders.
- It is, therefore, expected that a workshop should be organized by Iranian organizations to present the results of the trainings by participants after they come back from Japan.

Attachment 5

Joint Terminal Evaluation Report Annex I: Project Design Matrix

Title of the Project : **The Project on Implementation of Pilot Project to Introduce ESCO for Government's Buildings**
Implementing Agencies : **Ministry of Energy(MOE), Iran Renewable Energy and Energy Efficiency Organization (SATBA), Iran Fuel Conservation Organization (IFCO)**
Target Groups : **Staff of MOE, SATBA, IFCO and members of Iran ESCO association (IRESCO)**
Target Area : **The Islamic Republic of Iran**
Project Period : **25.01.2014 -24.07.2018 (54 months: JICA project period)**

January 22,2018 version 2

Summary	Objective Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goals: Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government buildings.	-XXX.XXXX by 2023 *(to be determined by the Project)*	-XXX.XXXX *(to be determined by the Project)*	- Policies on EE&C for the building sector are maintained.
Project Purpose The establishment of ESCO business model is promoted through the capacity development of the Government of the Islamic Republic of Iran and ESCO association to promote ESCO businesses.	1. At least 2 ESCO pilot projects demonstrate energy saving and energy efficiency to achieve ESCO business.	1.Project completion report including the verification report of the pilot project. (by MOE/SATBA)	- Recommendation formulated by the Project is reflected in energy policies and budget allocation
Outputs 1. An institutional framework to promote ESCO business in Iran is strengthened.	1.1. Regulations and guidelines in the IRESCO are upgraded. 1.2. Roles and responsibilities of the related	1.1. Project documents (Regulations and guidelines) 1.2. Project documents	

	organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified.	(*for example: demarcation table describing roles and responsibilities among organizations, after organizational restructuring)	
2. The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.	2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed 2.2. Performance contract models for ESCO project are upgraded 2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA	2.1. Project document (the manual) 2.2. Project document (the contract models) 2.3 Project documents (records of the trainings and seminars)	
3. The ESCO pilot projects are implemented in government's buildings for development of ESCO business.	3.1. More than 50 candidate buildings are selected by MOE/SATBA 3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs. 3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA 3.4. At least, 2 ESCO pilot projects are launched 3.5. Monthly performance reports* are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts) (*monthly performance data) 3.6. Performance reports including one-year	3.1. Project documents (for example: progress report of pilot projects) 3.2. Project documents (ditto) 3.3. Project documents (ditto) 3.4. Project documents (ditto) 3.5. Project documents (ditto) 3.6. Project documents	- Budget for pilot projects is secured and disbursed by MOE as planed

	performance activities are submitted by ESCOs for at least 2 pilot projects, and approved by MOE/SATBA (after JICA project period)	(completion report)	
4. Policy recommendation for the promotion of ESCO business is formulated.	4.1. Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	4.1. Project Documents (for example: policy proposal paper)	

Activities: 1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran 1-2. To support IRESCO in preparing its internal guidelines 1-3. To give advice to IRESCO on strengthening intuitional capacity 1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business. 2-1. To develop a manual to introduce ESCO project for government organization buildings. 2-2. To collect the existing contract models for ESCO project. 2-3. To develop contract models for ESCO project in building sector in Iran 2-4. To organize trainings and seminars for ESCOs and government organizations 2.5. To introduce policies, legislations and finance mechanisms for EE&C and ESCO project for building	**Inputs** **Japanese Side:** A.Experts ・ Team Leader (ESCO Expert) / ESCO Framework ・ Energy Audit Engineer (Heat) ・ Energy Audit Engineer (Electricity) B.Training in Japan ・ ESCO Framework (policies, legislations and finance mechanisms) C. Equipment etc. ・ Nill **Iranian Side:** A.Ministry of Energy(MOE): Project Counterpart ・Project Director: General Director, Planning and Economics of Electricity and Energy Office (PEEEO) ・ Project Manager: Head of International cooperation of PEEEO B.SATBA: Implementation Organization	**Pre-conditions** - Subsidies for energy prices for building sector are eliminated as the Iranian government planed. - Organizational restructuring in MOE and MOP does not affect adversely implementation of the Project.

sector in Japan 3-1. To select the candidate buildings for energy audit 3-2. To supervise the energy audit with work through by ESCOs at the candidate buildings 3-3. To support ESCOs in planning the pilot projects. 3-4. To supervise and monitor the pilot projects implemented by ESCOs 3-5. To analyse monthly performance data of pilot projects submitted by ESCOs. 4-1. To review the project activities and results including seminars, manuals, performance of pilot projects 4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran 4-3. To submit the recommendation to the last JCC meeting (during the JICA project period) 4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran. 4-5. To submit the recommendation to Iranian government for decision making.	• (Deputy of Demand Side Department*) • (ESCO Department*) **name of department, position are provisional* C.IFCO: Co-Implementation Organization D.(IRESCO: Cooperation Organization) **<u>Joint Coordinating Committee(JCC)</u>** A. Chairperson: • General Director of PEEEO B. Member of Iranian Side • MOE • Plan and Budget Organization (PBO) • Ministry of Economy and Finance (MOEF) • Ministry of Petroleum (MOP) • Ministry of Road and Urban Development (MRUD) • SATBA • IFCO • IRESCO C. Member of Japanese side • JICA Experts • Representatives from JICA Iran Office • Other personnel concerned to be assigned by request of other members D. Observer • Ministry of Foreign Affairs (MOFA) • Embassy of Japan (EoJ)	

Attachment 5

Plan of Operation version 2: The Project on Implementation of the Pilot Project to introduce ESCO to the Government's Buildings

Activities		Period	2014	2015	2016	2017	2018
	Period of JICA experts working in Iran	P / A					
Output 1							
1-1	To summarize the issues and consider the measures for promotion of ESCO business in Iran	P / A					
1-2	To support IRESCO in preparing its internal guidelines	P / A					
1-3	To give advice to IRESCO on strengthening intuitional capacity	P / A					
1-4	To clarify roles and responsibilities of the stakeholders to promote ESCO business.	P / A					
Output 2							
2-1	To develop a manual to introduce ESCO project for government organization buildings.	P / A					
2-2	To collect the existing contract models for ESCO project.	P / A					
2-3	To develop contract models for ESCO project in building sector in Iran	P / A					
2-4	To organize trainings and seminars for ESCOs and government organizations	P / A					
2-5	To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan	P / A					
Output 3							
3-1	To select the candidate buildings for energy audit	P / A					
3-2	To supervise the energy audit with work through by ESCOs at the candidate buildings	P / A					
3-3	To support ESCOs in planning the pilot projects.	P / A					
3-4	To supervise and monitor the pilot projects implemented by ESCOs	P / A					
3-5	To analyse monthly performance data of pilot projects submitted by ESCOs .	P / A					
Output 4							
4-1	To review the project activities and results including seminars, manuals, performance of pilot projects	A					
4-2	To abstract issues and identify possible measures to promote ESCO projects in Iran	P / A					
4-3	To submit the recommendation to the last JCC meeting (during the JICA project period)	P / A					
4-4	To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran.	P / A					
4-5	To submit the recommendation to Iranian government. (after JICA project period)	P / A					

Attachment 5

Iranian Counterpart personnel

	Name	Position in the Project	Organization
	M. A. Shafiezadeh	Project Director	General Director of OIPEEE, MOE* General Director of PEEEO, MOE
	A. Shirazi	Project Manger	Head of Awareness & Training, OIPEEE, MOE* Head of International Cooperation, PEEEO, MOE
	Amir Doudabi Nezhad	Project Responsible Person	Deputy of Demand Side Department, SABA (----------,----------, SATBA)**
	Mohammad Akbari	Iraian Team Leader	Manager of ESCO Department, SABA (----------,----------, SATBA)**
	Mahdi Hormozi	ESCO Expert	Engineer of ESCO Department, SABA (----------,----------, SATBA)**
	Ahmad R. Tavakkoli	Energy Saving Expert of Building	Energy Conservation in Building Department, SABA (----------,----------, SATBA)**
	Mahdi Rafiei	Coordinator / Energy Saving Expert of Industry	Energy Conservation in Industries Department, SABA (----------,----------, SATBA)**

* The initial title and organization are in upper line. Those after organizational restructuring are stated in lower line
* The internal organizational structure in SATBA has not yet been finalized after organizational restructuring (As of December 2017)

Japanese Expert

	Name	Position in the Project	Organization
	Tsutomu MORI	Team leader/ESCO Promotion	Nippon Koei Co.,LTD
	Morio SAKAI	Energy Audit Expert (Electricity Engineer)	Nippon Koei Co.,LTD
	Hedeaki KUROKI	Energy Audit Expert (Heat Enginner)	Nippon Koei Co.,LTD

Attachment 5

Joint Terminal Evaluation Report Annex IV : List of participant, C/P training in Japan

The first training in Japan (19.01.2015-24.01.2015)

	Name	Position	Organization
1	Mr. Effatnejad Reza	Deputy of General Director Electricity and Energy Affair	MOE
2	Mr. Akbari Hamid	Master expert of energy efficiency in demand sector (Building& industry)	MOE
3	Ms. Bigdeli Somayeh	Expert	MOE
4	Mr. Akbarisayar Mohammad	Manager Electricity and Energy Affair	SABA
5	Mr. Sadeghi Nourbakhsh	Manager	SABA
6	Ms. Paknejad Soodabeh	Councilor of Distributed Coordination Deputy in D.S.M	Tavanir
7	Mr. Peyman Karimifard	Manager of Power System Analysis	Tavanir
8	Mr. Assadianahmadabad Ehesan	Expert	MPO
9	Mr. Mahmoud Hafezian	General Manager	MOEF

The second training in Japan (16.04.2016-26.04.2016)

	Name	Position	Organization
1	Mr. Mohammad Shafiezadeh	General Director, Electricity and Energy Affaires	MOE
2	Mr. Rahim Azimi	Deputy of General Manager, Finane and Building	MOEF
3	Mr. Alireza Abdollah Shirazi	Manager of ESCO Project, Electricity and Energy Affaires	MOE
4	Mr. Mojtaba Gorbani	Expert of Economic Evaluation of Projects Electricity and Energy Affaires	MOE
5	Mr. Mohammad Khezeli	Expert of Projects Electricity and Energy Affaires	MOE
6	Mr. Saeed Amani	Office Manager of Energy Conservation in Building Department	SABA
7	Mr. Amir Doudabinezhad	Deputy of Education and Energy Consumption Optimization	SABA
8	Mr. Ehsan Assadian Ahmadabad	Expert of International Affairs	PBO
9	Ms. Maryam Namjoobaghini	Manager Energy consumption management	GT EPDC
10	Mr. Tooraj Bathaie	Managing Director	Pishrun Energy Co.
11	Mr. Alimohmmad Mirshams	Managing Director	ASIA WATT Eng. Co.

Attachment 5

Schedule of Joint Terminal Evaluation Study

			AM	PM	Remarks
1	13/1/2018	Sat	Data analysis	Kick off team meeging at JICA office, interview IRESCO	
2	14/1/2018	Sun	Kick off team meeging with stakeholders at MOE	Interview SATBA (at MOE) Interview MOE	PBO joined
3	15/1/2018	Mon	Meeting with MOE (PDM revision)	Data analysis JICA office	
4	16/1/2018	Tue	Meeting with MOE (PDM revision)	Interview SATBA/ESCOs	PBO joined at SATBA
5	17/1/2018	Wed	Data collection at SATBA	Meeting with BCRC	
6	18/1/2018	Thu	Data analysis	Data analysis	
7	19/1/2018	Fri	Report writing	Report writing	
8	20/1/2018	Sat	TEDC pilot site	Meeting with IFCO	PBO joined at TEDC
9	21/1/2018	Sun	MOEF pilot site	Report writing	PBO joined at MOEF
10	22/1/2018	Mon	Report writing	Meeting with MOE & data collection	
11	23/1/2018	Tue	(Report at JCC)	(Report writing)	

Joint Terminal Evaluation Report Annex VI :List of meeting participant/interviewee during study

List of Participants/ Interviewees date: Jan 13, 2018 time: 14:00-17:00, Venue: IRESCO

#	Name	Position	Organization
1	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
2	Amir Jamali Moghaddam	Member of Board	Asia Watt Eng.Co.
3	Ali Mohammad Mirshams	Managing Director	Asia Watt Eng.Co.
4	Tooraj Bathaei	Managing Director	Pishrun Energy Co.
5	Gholamali Najafi	Chief of Board	IRESCO
6	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
7	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
8	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
9	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 14, 2018 time: 9:00-11:00, Venue: MOE

#	Name	Position	Organization
1	Hamed Houri Jafari	Energy Manager	IFCO
2	Alireza Moradi	Energy Expert Engineer	IFCO
3	Anahita Karimi	Energy Expert Engineer	TEDC
4	Shahab Alborzi	Energy Expert Engineer	TEDC
5	Mahdi Hosseini	Energy Expert	PBO
6	Alimohammad Mirshams	Managing Director	Asia Watt Eng.Co.
7	Kamran Nazari Radsani	Head of Installation Dep.	MOEF
8	Rahim Azimi	Installation Manager	MOEF
9	Mehdi Rafiei	Expert	SATBA
10	Mohammad Akbari	Head of Industrial Management	SATBA
11	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
12	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
13	Dr. Kari Behrouz	Head of Energy Dept.	BHRC
14	Tooraj Bathaei	Managing Director	Pishrun Energy
15	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
16	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
17	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
18	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
19	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 14, 2018 time: 12:00-13:00, Venue: MOE

#	Name	Position	Organization
1	Mohammad Akbari	Head of Industrial Management	SATBA
2	Mehdi Rafiei	Expert	SATBA
3	Hiroshi OGAWA	Presentative Partner	Haruno ESWorks LLC
4	Behzad Yagmaie	Translator	AJTC

Joint Terminal Evaluation Report Annex VI :List of meeting participant/interviewee during study

List of Participants/ Interviewees date: Jan 14, 2018 time: 14:00-15:00, Venue: MOE

#	Name	Position	Organization
1	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
4	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
5	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 15, 2018 time: 9:00-11:00 Venue: MOE

#	Name	Position	Organization
1	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
4	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
5	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
6	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
7	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 16, 2018 time: 9:00-11:00 Venue: MOE

#	Name	Position	Organization
1	Kambiz Rezapour	Director of Planning and Monitoring Division	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
4	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
5	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
6	Tetsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
7	Behzad Yagmaie	Translator	AJTC

List of Participants/ Interviewees date: Jan 16, 2018 time: 14:00-15:30 Venue: SATBA

#	Name	Position	Organization
1	Ali Mohammad Mirshams	Managing Director	Asia Watt Eng.Co.
2	Tooraj Bathaei	Managing Director	Pishrun Energy Co.
3	Maryam Shekari	M&V monitoring manager	Pishrun Energy Co.
4	Mehdi Rafiei	Expert	SATBA
5	Mohammad Akbari	Head of Industrial Management	SATBA
6	Mahdi Hosseini	Energy Expert	PBO
7	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
8	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
9	Behzad Yagmaie	Translator	AJTC

Joint Terminal Evaluation Report Annex VI :List of meeting participant/interviewee during study

List of Participants/ Interviewees date: Jan 17, 2018 time: 10:00-12:00 Venue: SATBA

#	Name	Position	Organization
1	Mohammad Akbari	Head of Industrial Management	SATBA
2	Mehdi Rafiei	Expert	SATBA
3	Hiroshi OGAWA	Presentative Partner	Haruno ESWorks LLC
4	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
5	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 17, 2018 time: 14:00-14:40 Venue: BHRC

#	Name	Position	Organization
1	Dr. Kari Behrouz	Head of Energy Dept.	BHRC
2	Mahdieh Abravesh	expert	BHRC
3	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
4	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
5	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 20, 2018 time: 9:00-12:00 Venue: TEDC

#	Name	Position	Organization
1	Tooraj Bathaei	Managing Director	Pishrun Energy Co.
2	Maryam Shekari	M&V monitoring manager	Pishrun Energy Co.
3	Meysam Parvarese	Mechanical engineer	Pishrun Energy Co.
4	Amir Navidi	Engineer	TEDC
5	Benhoor Sahari	Master of DSM	TEDC
6	Ensieh Rostami	Master of DSM	TEDC
7	Anahita Karimi	Energy Expert Engineer	TEDC
8	Hosjatollah Pouyafar	Maneger of HC	TEDC
9	Shahab Alborzi	Energy Expert Engineer	TEDC
10	Masoud Azizi	Depty of Customer service	TEDC
11	A.A. Yaghooti	Deputy director of engineering	TEDC
12	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
13	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
14	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
15	Behzad Yagmaie	ESCO Project Assistant	AJTC

Joint Terminal Evaluation Report Annex VI :List of meeting participant/interviewee during study

List of Participants/ Interviewees date: Jan 20, 2018 time: 14:00-15:00 Venue: IFCO

#	Name	Position	Organization
1	Mohsen Mohammadi	Planning head	IFCO
2	Hamed HourinJafari	Energy manager	IFCO
3	M.R.Khattati	Director, Industrial section	IFCO
4	Mortteza Golzadeh	Assistant of vice president	IFCO
5	Alireza Moradi	Expert energy engineer	IFCO
6	Mohammad.Mirzaei	Manager deputy of Energy Conservation in building sector	IFCO
7	Youssefi Passandy	Consultor	IFCO
8	Aghil barati	Senior Expert, R&D	IFCO
9	M.R.Eslamii	Senior Expert, building	IFCO
10	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
11	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
12	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 21, 2018 time: 9:30-11:45 Venue: MOEF

#	Name	Position	Organization
1	Ali Mohammad Mirshams	Managing Director	Asia Watt Eng.Co.
2	Pooria Orouji	R&D manager	Asia Watt Eng.Co.
3	S.M.Hosseini	Mechanical Engineer	MOEF
4	Vahid Tahmuseri	Engineer	MOEF
5	Salmani Zabiholah	Director general, personnel service & supporting	MOEF
6	Rahim Azimi	Installation Manager	MOEF
7	Kamran Nazari Radsani	Head of Installation Dep.	MOEF
8	Mahdi Hosseini	Energy Expert	PBO
9	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
10	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
11	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
12	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
13	Behzad Yagmaie	ESCO Project Assistant	AJTC

List of Participants/ Interviewees date: Jan 22, 2018 time: 15:30- 18:00 Venue: MOE

#	Name	Position	Organization
1	M.A. Shafiezadeh	General Director PEEEO	MOE
2	Alireza Shirazi	Head of International Cooperation, PEEEO	MOE
3	Yoshiko Yamanaka	Project Formulation Advisor	JICA Iran Office
4	Vahid Kheirolomour	Senior Program Officer	JICA Iran Office
5	Tsutomu MORI	ESCO Project Leader	Nippon Koei Co.,LTD
6	Morio SAKAI	ESCO Project Expert	Nippon Koei Co.,LTD
7	Hiroshi OGAWA	Representative Partner	Haruno ESWorks LLC
8	Behzad Yagmaie	ESCO Project Assistant	AJTC

THE PROJECT ON IMPLEMENTATION OF PILOT PROJECTS TO INTRODUCE ESCO FOR GOVERNMENT'S BUILDINGS IN ISLAMIC REPUBLIC OF IRAN

Achievements and Implementation Process of the Project

The Team reviewed the progress of the Project activities and the achievement of the Outputs as followed.

Overall Goals

Narrative summary
Energy Efficiency and Conservation in the building sector will be promoted through the introduction of ESCO for Government building
Objective Verifiable Indicators
・ ESCO for government buildings will be officially introduced from 2020. ・ Building where is implemented ESCO will be reduced energy consumption at least 10%.

10% of reduction target was set based on two pilot projects.

Output 1

Narrative summary	Status
An institutional framework to promote ESCO business in Iran is strengthened.	Likely to be achieved
Objective Verifiable Indicators	Status
1.1. Regulations and guidelines in the IRESCO are upgraded.	Achieved
1.2. Roles and responsibilities of the related organizations MOE/SATBA, MOP/IFCO, MRUD/BHRC, IRESCO, MOEF, PBO, financial institutions, to promote ESCO project in building sector are clarified	Not achieved MOE/SATBA and PBO will discuss with other related organizations in Energy Council.
Activities	**Status**
1-1. To summarize the issues and consider the measures for promotion of ESCO business in Iran	Completed
1-2. To support IRESCO in preparing its internal guidelines	Completed
1-3. To give advice to IRESCO on strengthening intuitional capacity	Completed
1-4. To clarify roles and responsibilities of the stakeholders to promote ESCO business.	Not clarified MOE/SATBA and PBO will discuss with other related organizations in Energy Council.

Output 2

Narrative summary	Status
The knowledge and capacity of the government organizations including local authorities and IRESCO for introduction of ESCO projects are strengthened.	Likely to be achieved
Objective Verifiable Indicators	**Status**
2.1. A manual for introduction of ESCO project for government organizations and local authorities is developed	Achieved
2.2. Performance contract models for ESCO project are upgraded.	Achieved
2.3. More than 5 trainings and seminars regarding ESCO project are organized by MOE/SATBA	Achieved
Activities	**Status**
2-1. To develop a manual to introduce ESCO project for government organization buildings.	Completed
2-2. To collect the existing contract models for ESCO project.	Completed
2-3. To develop contract models for ESCO project in building sector in Iran	Completed
2-4. To organize trainings and seminars for ESCOs and government organizations	Completed and to be continued by SATBA SATBA will be responsible for training for government organizations
2-5. To introduce policies, legislations, and finance mechanisms for EE&C and ESCO project for building sector in Japan	Completed

Table 3-2-2-1. Seminar/Workshop organized during the Project period

	Date	Title	Number of participant	Remarks
1	15/03/2014	Workshop on JICA ESCO project	30	
2	22/04/2014	1st JICA workshop	55	90* including project staff
3	23/11/2015	2nd JICA workshop	80	Presented in Power system conference at SATBA
4	15/04/2016	Workshop on JICA ESCO project	15	
5	10/05/2017	ESCO fund seminar	60	
6	03/07/2018	3rd JICA workshop	50	Report of performance of ESCO pilot projects

Output 3

Narrative summary	Status
The ESCO pilot projects are implemented in government's buildings for development of ESCO business.	Likely to be achieved
Objective Verifiable Indicators	**Status**
3.1. More than 50 candidate buildings are selected by MOE/SATBA	Achieved
3.2. Energy Audit with walk-through is conducted at more than 5 candidate buildings by more than 5 ESCOs.	Achieved
3.3. Proposals of ESCO pilot project are submitted by at least 4 ESCOs and at least 2 are approved by MOE/SATBA	Achieved
3.4. At least, 2 ESCO pilot projects are launched	Achieved
3.5 Monthly performance reports are submitted at least 3 times by ESCO, and analyzed by MOE/SATBA (supported by JICA experts)	Likely to be achieved ESCO submitted monthly performance report. MOE/SATBA will review the report.
3.6. Performance reports including one-year performance activities are submitted for at least 2 pilot projects by ESCOs, and approved by MOE/SATBA (after JICA project period)	Not achieved ESCO will prepare the report of one-year performance activities. MOE/SATBA will approve the report after verification.
Activities	**Status**
3-1. To select the candidate buildings for energy audit	Completed
3-2. To supervise the energy audit with work-through by ESCOs at the candidate buildings	Completed
3-3. To support ESCOs in planning the pilot projects.	Completed
3-4. To supervise and monitor the pilot projects implemented by ESCOs	On-going MOE/SATBA should monitor the pilot projects continuously at least one year.
3-5. To analyse monthly performance data of pilot projects submitted by ESCOs.	Not completed MOE and SATBA should analyze and evaluate the report, and share with stakeholders of the Projects.

Output 4

Narrative summary	Status
Policy recommendation for the promotion of ESCO business is formulated.	Not Achieved MoE and PBO will discuss with other related organizations in energy council.
Objective Verifiable Indicators	**Status**
Policy recommendation and ESCO business model submitted by MOE/SATBA to Iranian government for decision making (after JICA project period)	Not Achieved MOE/SATBA and PBO will discuss with other related organizations in Energy Council.
Activities	**Status**
4-1. To review the project activities and results including seminars, manuals, performance of pilot projects	Implemented at 3rd WS MOE and SATBA should monitor the pilot projects continuously at least one year.
4-2. To abstract issues and identify possible measures to promote ESCO projects in Iran	Recommended by MOE/SATBA and JICA experts at WS and JCC.
4-3. To submit the recommendation to the last JCC meeting (during the JICA project period)	Recommended by MOE/SATBA and JICA experts at WS and JCC.
4-4. To formulate a policy recommendation for promotion of ESCO projects in building sector in Iran.	Recommended by MOE/SATBA MOE/SATBA and PBO will discuss with other related organizations in Energy Council.
4-5. To submit the recommendation to Iranian government. (after JICA project period)	MOE will make policy recommendations to Iranian government in the future.

添付資料 7

ワークショップ

(第 1 回ワークショップ、第 2 回ワークショップおよび
第 3 回ワークショップ)

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran

Outline of the Project

ESCO Business Promotion in Japan

April 22, 2014
JICA Project Team

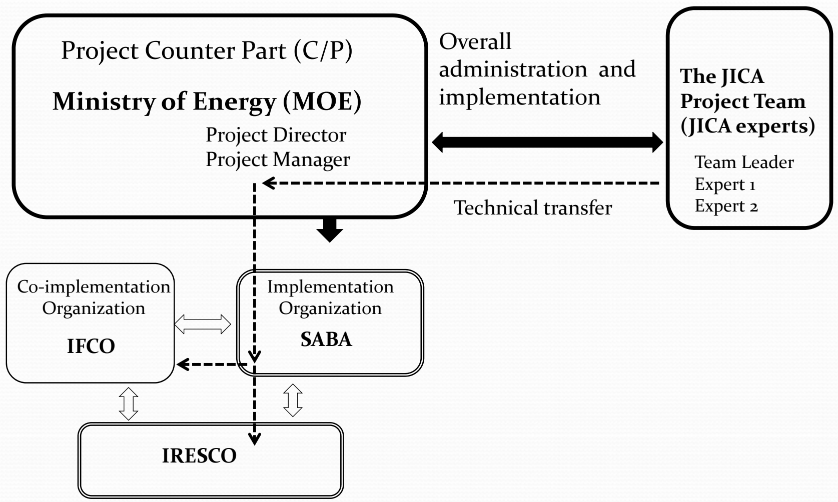
Outline of the Project

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran

Goal of the Project

EE&C in the building sector will be promoted through the introduction of ESCO for Government buildings.

Organization of the Project Operation



JICA Experts

Name	Position
Tsutomu MORI	Team Leader, ESCO framework
Hideaki KUROKI	Energy audit engineer (Heat)
Yoichi KITA	Energy audit engineer (Electricity)

Activities of the Project

- Implementation of pilot ESCO projects for Government's buildings

- ESCO model contracts
- Manuals and procedures to introduce ESCO
- Capacity development

Recommendations to promote ESCO business in Iran

ESCO Business Promotion in Japan

Background of ESCO business in Japan

1996 Start of study on ESCO business at ESCO committee in EECJ under METI

1998 Preparation of ESCO model contract

1999 Developing a guideline of measuring, verification for monitoring of ESCO

1999 Establishment of Japan ESCO Association by 16 members

2001 1st ESCO Project for Government's facility in Osaka

Background of ESCO business in Japan

2001 ESCO promotion plan in National Energy Efficiency and Conservation Policy

2003 Start of subsidy program for ESCO PJT by Energy Authority (1/3 of total PJT cost)

2004 Preparation of ESCO implementation guideline for government sector

2006 Start of awards program for good practice ESCO PJTs

Action Plan for ESCO Promotion in Japan

I. Policy and Action Plan

II. Support for developing ESCO market

III. Establishment of ESCO Association

IV. Capacity development

V. Promotion and awareness campaign

VI. ESCO implementation for government's buildings

Action Plan for ESCO Promotion in Japan

I. Policy and Action Plan

(Cabinet, METI, Resources and Energy Agency)

- Act on Promotion of Global Warming Countermeasures
- Act on Relational Use of Energy
- Action Plan for Energy Efficiency and Conservation (EE&C)
- Target of ESCO promotion in (EE&C)

Action Plan for ESCO Promotion in Japan

II. Support for developing ESCO market

(METI, Resources and Energy Agency, EECJ)

- Study of the market of ESCO business
- Feasibility Study of ESCO
- Supporting Programs for ESCO Promotion
- Implementation of the Pilot Project

Action Plan for ESCO Promotion in Japan

III. Establishment of ESCO Association

(METI, Resources and Energy Agency)

- Japan Association of ESCO(JAESCO)
- Advancement of ESCO Association

Action Plan for ESCO Promotion in Japan

IV. Capacity development

(METI, Resources and Energy Agency)

- Developing a guideline of measuring and verification for monitoring of ESCO PJT
- Preparation of ESCO model contract

Action Plan for ESCO Promotion in Japan

V. Promotion and awareness campaign

(ECCJ, JAESCO)

- Seminar of ESCO business for facility owner
- Presentation at Exhibitions
- Awards program for good practice ESCO PJTs

Action Plan for ESCO Promotion in Japan

VI. ESCO implementation for government's buildings

(METI, MLIT, Municipality)

- Preparation of ESCO implementation guideline for government sector
- Feasibility Study for ESCO in government sector
- Amendment of public procurement law

Japan Association of ESCO (JAESCO)

Government

↑ Recommendation of measures to promote ESCO business

JAESCO

Member Companies

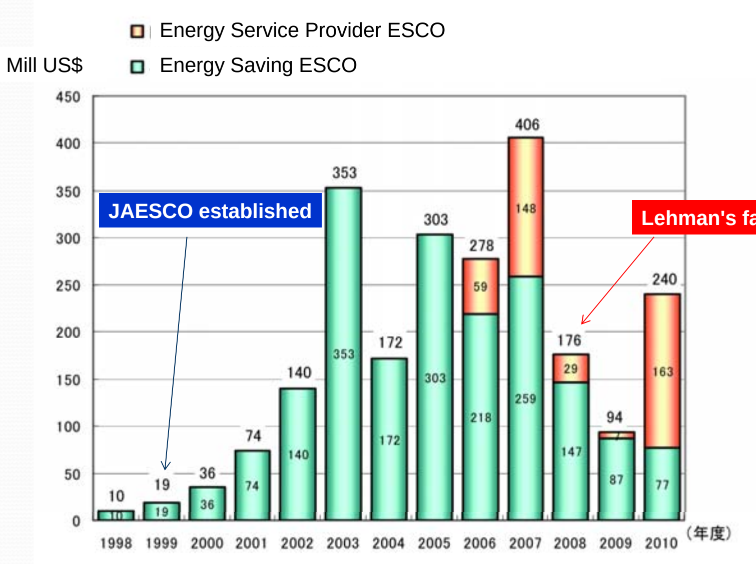
Number of Member Companies: 97 (as of 2014.03)

Financing Company: 5

↓ Promotion of ESCO business

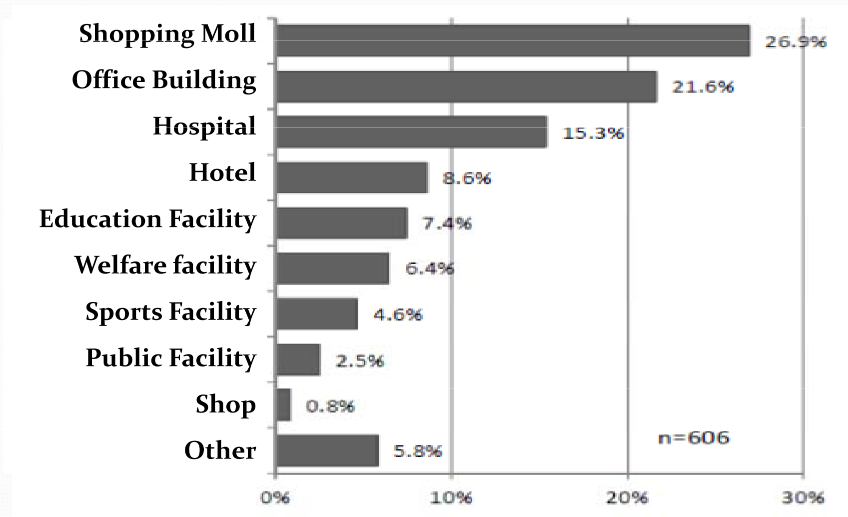
ESCO Market

ESCO Market in Japan (1998-2010)



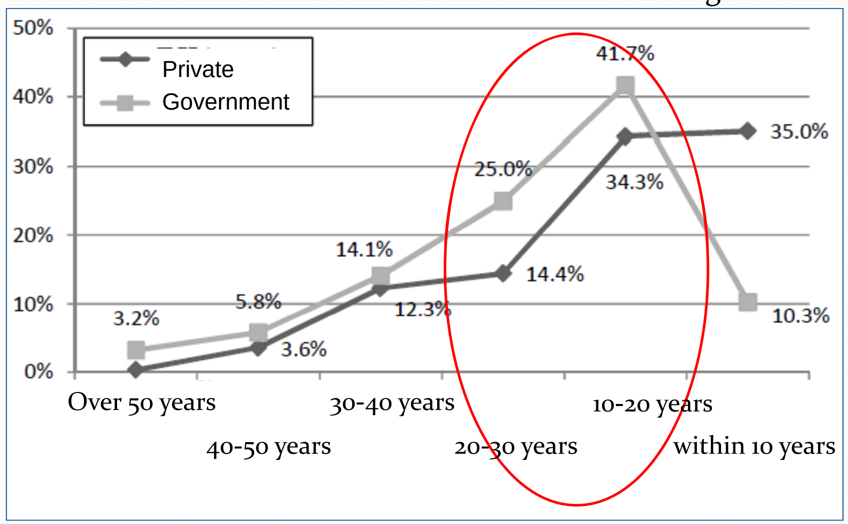
ESCO Market in Japan (2010)

Building Sector



ESCO Market in Japan (2010)

Building Sector



Next Presentations

Supporting Program related ESCO and EE&C in Japan

By Mr. Kita

Introduction of Practices related ESCO in Japan

By Mr. Kuroki

Supporting Program related ESCO and EE&C in Japan

ESCO Support

→（Legal framework）
→（Financial support）
→（Others）

Basic Act on Energy Policy（1/2）

・Formula of a basic plan on energy supply and demand
・To promote measures on energy supply and demand on a long-term, comprehensive and systematic basis by laying down the basic policy

Basic Act on Energy Policy（2/2）

1. Securing of stable supply
2. Environmental suitability
3. Utilization of market mechanisms
4. Responsibilities of the State
5. Responsibilities of local public entities
6. Responsibilities of business operators
7. Role of citizens
8. Mutual cooperation
9. Basic Energy Plan
10. Promotion of international cooperation
11. Dissemination of knowledge regarding energy

Development of the Strategic Energy Plan (1/2)

- Strategic Energy Plan is formulated in order to promote measures on energy supply and demand on a long-term, comprehensive and systematic basis.
- Strategic Energy Plan is based on "Basic Act on Energy Policy" Article 12 concluded in June, 2002

1. Basic policy about the measures
2. The measure that it is long-term and should take generally and premeditatedly
3. Research and development
4. Others

Development of the Basic Energy Plan (2/2)

2. Measures that should be taken in relation to energy supply and demand on a long-term, comprehensive and systematic basis

(1) Promotion of measures for Energy Demand

〔1〕Promotion of energy-saving measures and Formation of the economy, the social structure of the resources saving type

(a) **Measures for** business operations and civilian sectors

- **Energy demand management by using "Act on the Rational Use of Energy" and/or ESCO business**

(b) Measures in the transportation sector

(c) Measures in the industrial sector

(d) **cross-sectional** sector

〔2〕Load leveling measures

Environmental consideration contract law (1/3)

The Law concerning the Promotion of Contracts Considering Reduction of Emissions of Greenhouse Gases and Others by the State and Other Entities

Contracts for procurement of products and services lessen the environmental impact

Green Contract law was established in 2007 to promote a green contract.

Environmental consideration contract law (2/3)

Article 5 (basic policy)

2. Basic policy defines the following matters

3) Energy efficiency improving project (ESCO services promise the performance of recovery of the cost for investment for EE&C project by savings of electricity, fuel etc.

Environmental consideration contract law (2/3)

[Main point of contract for Energy efficiency improving project]

1. Introduction of ESCO projects
(1) Need for Energy efficiency improving project
(2) how to use this commentary document
(3) ESCO project
2. Introduction planning
(1) Introduction procedure for ESCO projects (Planning stage)
(2) Long-term operation plan
(3) Feasibility study of ESCO project
(4) Judgment of the propriety of the ESCO projects
(5) Procedure for budget for ESCO projects
(6) Bidding plan for ESCO project
3. Selection of ESCO Business Operator

ESCO Support (Financial support)

→ Subsidy
→ Loans (long-term, low-interest)
→ Interest subsidies
→ Tax break system by Depreciation, etc.

Support for ESCO business in 2003

● Energy use rationalization company Subsidy program [12,300 million yen]

● House, building high efficiency energy system introduction promotion Subsidy program [13,400 million yen]

Energy use rationalization company Subsidy program

Control: Ministry of Economy, Trade and Industry
Budget: 31 billion yen (2013)
Object: Industry, latest energy saving facilities introduction assistance rate, the supporting range of the field of duties: Within 1/3, the facilities cost of construction (facilities repair costs, measurement costs)
Ceiling: 5 billion yen/
A target company: The building masters who perform energy saving repair business (including an ESCO company, a lease company, the energy service company)

Building energy saving promotion subsidy program

Control: Ministry of Land, Infrastructure and Transport
Object: Building (non-house)
Assistance rate: Within 1/3, the construction cost of construction (skeleton repair costs, facilities repair costs, measurement costs)
Ceiling: The company which is targeted for 50 million yen (as for the expense required for house facilities to 25 million yen): As for the building masters performing energy saving repair business, it is requirements of the business (including an ESCO company, a lease company, the energy service company)
Requirements：①～⑤

Loans (long term, low interest)

Financing system name: Environment and Energy measures fund
Enforcer: Japan Finance Corporation
Target project：Energy efficient facilities introduction PJ. (including the person to lease the facilities concerned by ESCO business, and to rent):
Interest rate: 1.0% - 2.0% a year up to 270 million yen
1.65% - 2.65% a year of more than 270 million yen

Interest subsidies

◆Target business
Energy use rationalization-related specific facilities including the fund interest supply money (the 510 million yen (H21) year)
(1) Target business
I supply it with Toshiko to assume the financing for the following energy-saving measures allied enterprises a low interest.
①Energy saving measures business
・Business to affect the energy saving of the building which is necessary for achievement of plan that the installers such as an office building, a department store, the hotel make based on the energy saving method
②Energy saving promotion business according to the industrial section
・Business (things identified for energy use efficiency 10% improvement or an approval business plan) that reduction of energy equivalent to than 100 kl of annual crude oil conversion is enabled
③Building energy saving promotion business
・Repair business to contribute to an energy saving performance gain (limited to ESCO business, ESP business.)
(2) Supporting target person, private company
Interest supply rate, 1.0%

Tax break system by Depreciation, etc.

[corporation tax / income tax]
When I do the acquisition of energy saving faciliti es and offer it for one of business, I apply the spe cial measurement of repayment (special deprecia tion) or 5% of tax credit immediately (as for the b uilding, 3% of constructs)

Resources for the energy saving

→ Structure of special account for Energy
(Accounts for supply and demand of energy)
527 billion yen（2010）

→ Structure of special account for Energy
(Accounts for promotion of power)
346 billion yen（2010）

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran

Introduction of experience related ESCO implementation in Japan

April 22, 2014
JICA Project Team

Agenda

1. Best Practice in ESCO Gov's Bldg. in Japan
2. Difference between Gov and Private
3. Procedure of ESCO for Gov's Bldgs. in Japan
4. Manual in ESCO for Gov's Bldgs. in Japan

Best Practice in ESCO for Gov's Bldg. in Japan

- **Name of Building:** Osaka medical center and Research Institute for Matemal and Child Health
- **Construction year:** October, 1981
- **ESCO Implementation year:** April, 2002
- **Summary of building:**

Building Usage	Hospital
Number of bed	363 beds
Number of Stuff	634 persons
Floor area	36,000m2

- **Energy consumption:**

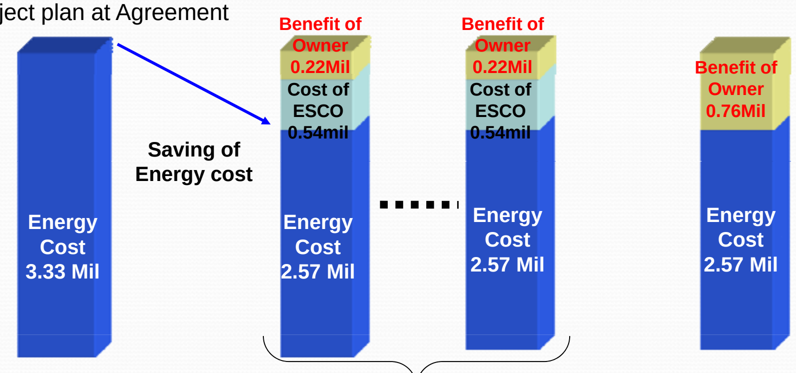
Electric	10,698,000kWh(annual)
Natural Gas	2,113,000Nm3(annual)
Water	159,000m3(annual)

(in average during 3 years from FY1998 to FY 2000)

- **Energy cost:** 3.3 3million USD (1USD=100JPY)

Best Practice in ESCO for Gov's Bldg. in Japan

Project plan at Agreement



ESCO Contract for 12 years

Target Cost Reduction	0.76Mil USD annual
Actual Cost Reduction	0.94Mil USD annual (average until 11th years)
	10.3Mil USD total(until 11th years)
Target Energy reduction	24.8%
Actual Energy reduction	20.6%

Best Practice in ESCO for Gov's Bldg. in Japan

Their challenge;

1. No experience

   (1)New business model,

   (2)In addition, biding framework on governmental body

2. Existing law and act

   (1)Construction industry Act,

   (2)Circular Notice (prohibition for progressive payment to governmental body)

Best Practice in ESCO for Gov's Bldg. in Japan

Their fruits;

1. Existing law and act

   Clarification of Legal interpretation,

   "ESCO is Service business"

2. Manual

   Guideline (Procedure)

   Standard Contract

Difference between Gov and Private

At First Government, Then Private;

In order to develop new business model, through implementation of pilot project, obtaining knowledge about measures.

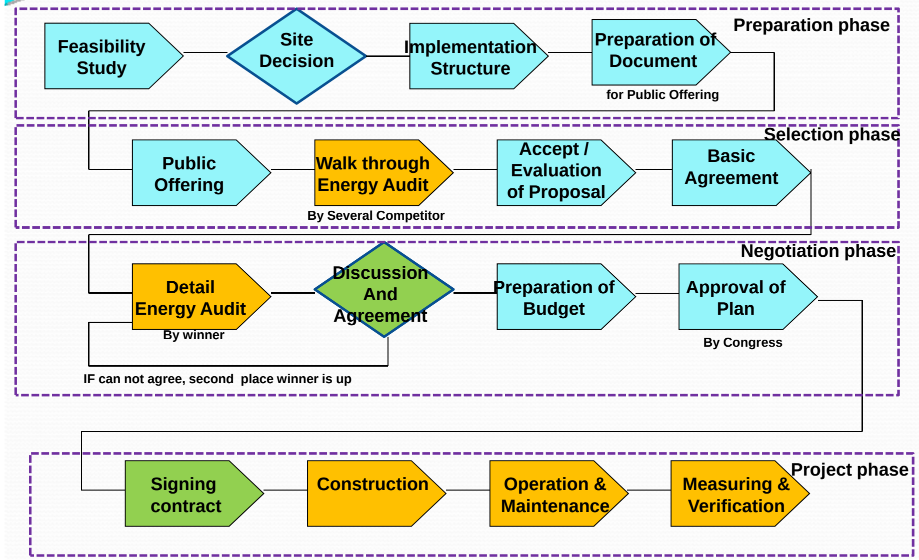
Advantage of Gov.	Disadvantage of Gov.
1.Risk acceptable 2.Sharing knowledge	1.Cumbersome procedure

Procedure of ESCO for Gov's Bldgs. in Japan

Public offering Proposal, as alternative to bid;

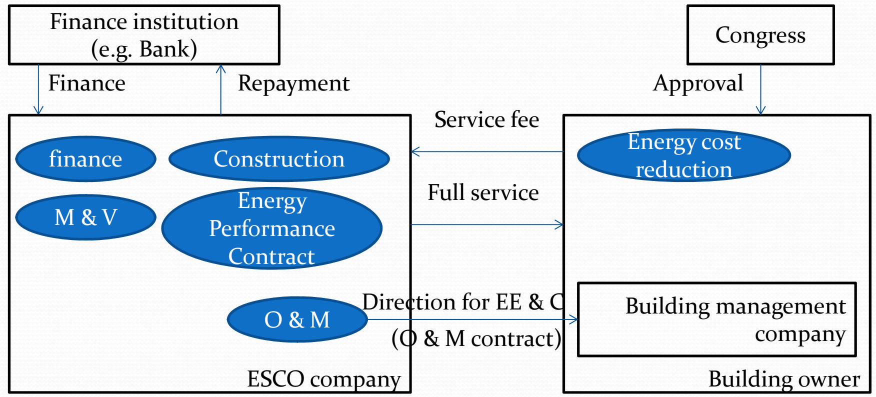
	Proposal in Japan	Bidding in Japan
Participate	Submitting proposal according to field finding on walk through	Submitting bid value according to bid document
Evaluation Policy	Evaluating entire proposal	Evaluating just cost
EE & C Design	Doing design after proposal competition	Done
Budget	Promised procurement	Prepared due to design
Advantage	The most desirable proposal is acceptable. It is possible to modify proposal due to field finding.	Easy procedure, because it is conventional method.
Disadvantage	Cumbersome procedure	Limitation by budget It is impossible to modify bidding value . Difficult Energy Performance Contract

Procedure in ESCO for Gov's Bldgs. in Japan



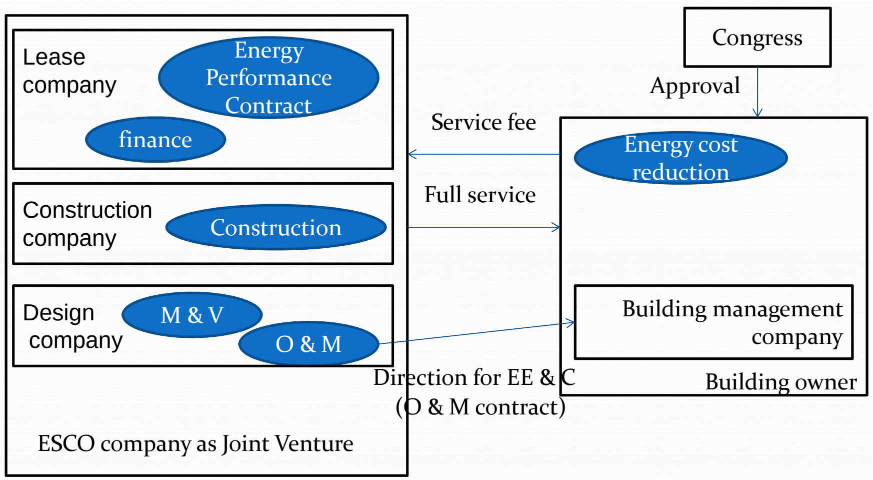
Procedure in ESCO for Gov's Bldgs. in Japan

Basic Scheme



Procedure in ESCO for Gov's Bldgs. in Japan

Example scheme



Procedure in ESCO for Gov's Bldgs. in Japan

Evaluation of Proposal

Not only cost, evaluating proposal from multiple points

Item (abstract for sample)	Evaluation value(example)	Weight coefficient
Energy Reduction	Scored 5 point to best proposal, then scored proportional value to others	5
CO_2 Reduction	Ditto	5
Sum of owner's gain during life cycle of ESCO equipment	Ditto	5
Feasibility of using building during construction period	Scored on a 1 to 5 basis, and scored 5 point to excellent proposal	4
Reliability to financial plan	Ditto	4
Reliability to technical view	Ditto	4
Attention to safety	Ditto	4

⋮ Sub-score in each item =Evaluation value x Weight coefficient

Procedure in ESCO Gov's for Bldgs. in Japan

Risk allocation

At each period during ESCO service, variable risk occur

Period	Item (abstract for sample)	Case	Owner	ESCO
Common	Shortage of ESCO performance	Shortage of agreed ESCO performance in contract		a
	Stop or Postpone of Project	By owner side reason	a	
		By ESCO side reason		a
	Alteration of social institution	Law and Act, Approval, Tax	a	a
Design	Force Majeure	Disaster	a	b
	Price alteration	Deflation and inflation rapidly	a	a
	Design alteration	By owner side reason	a	
		By ESCO side reason		a
Construction	Restitution to a third party	Incident, Invading right and possession		a
	Construction postpone	By owner side reason	a	
		By ESCO side reason		a

a: duty taker, b: partially duty taker

Manual in ESCO for Gov's Bldgs. in Japan

Guideline (document of reviewed procedure)

1. What is ESCO?
2. Difference between ESCO and conventional construction
3. Procedure
4. ESCO scheme
5. Subsidy
6. Risk allocation

Manual in ESCO for Gov's Bldgs. in Japan

Standard contract

1. Summary of contract
2. Obligation both owner and contractor
3. Baseline, Modification of Baseline
4. Effect of ESCO implementation
5. Account methodology of ESCO fee
6. Invoice and Payment
7. Possession transfer
8. Limitation and Prohibition, Rescission

Manual in ESCO Gov's for Bldgs. in Japan

Energy management plan (attached contract)

Special instruction, as different condition at Each project

Item	Main contents
1. ESCO equipment	Install location, Specification, Number
2. Baseline	Building usage, Floor area, Person in number, Operation hour, Operation season, Operation temperature
3. Methodology of O & M	Scope, Operation hour, Operation season, Operation temperature, Maintenance cycle, Case of out of order
4. Methodology of M & V	Measuring point, methodology, amendment

Thank you, Your attention！

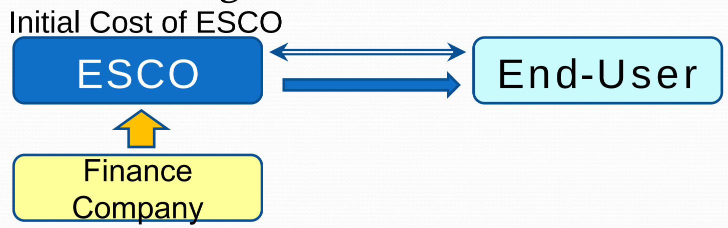
The Project on Implementation of Pilot Projects
to Introduce ESCO for Government's Buildings
In the Islamic Republic of Iran

ESCO Finance Scheme in Japan

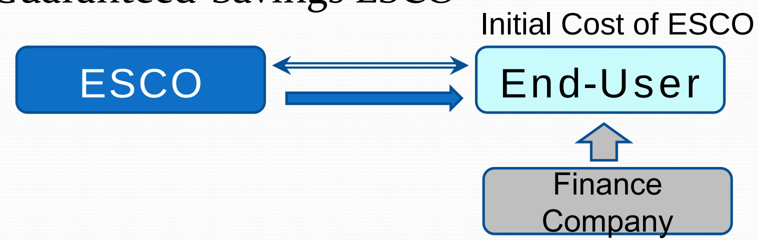
November 23, 2015
JICA Project Team

ESCO

Shared-Savings ESCO



Guaranteed-Savings ESCO



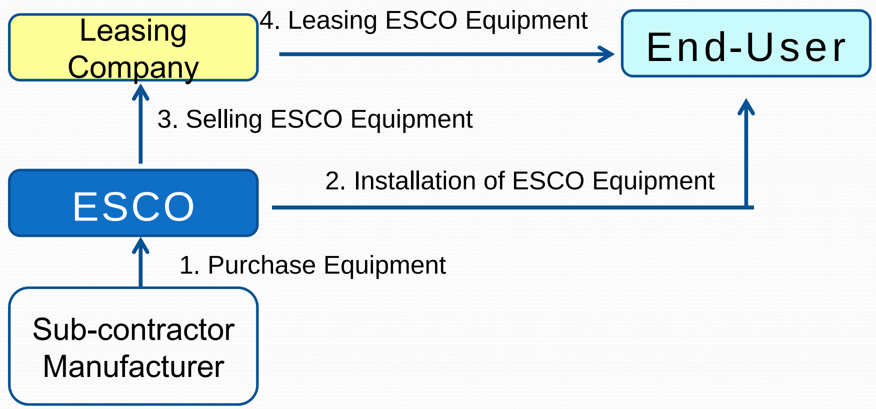
Finance for ESCO

1. Corporate Finance

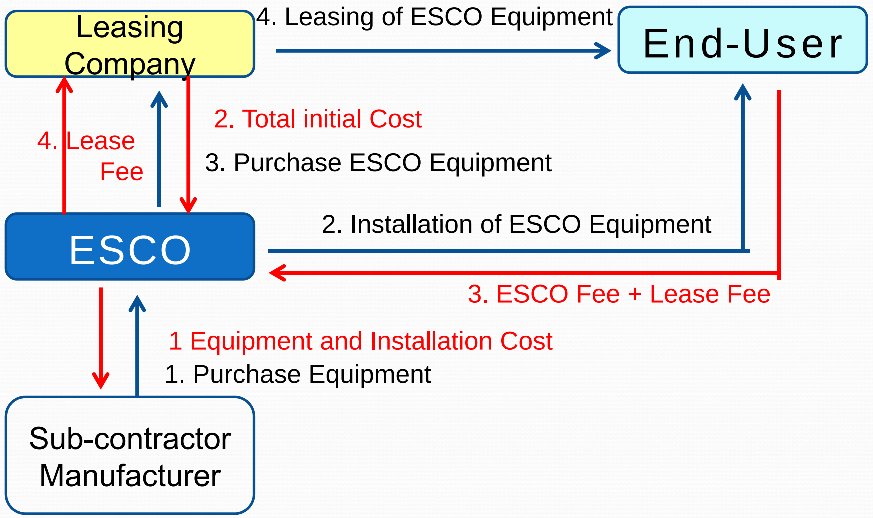
2. Project Finance

3. Leasing

Finance for ESCO (Leasing Scheme)



Finance for ESCO (Leasing Scheme)



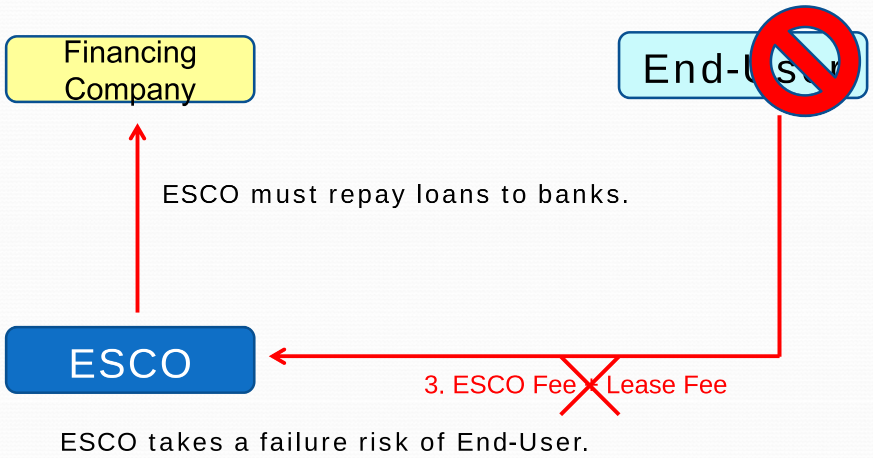
Finance for ESCO

	Project Finance	Corporate Finance	Leasing
Interest	3-4%	2-3%	4-6%
Period	5-20 years		3-10 years
Budget	over 10 mil. US$		Under 5 mil. US$
Credit decisions	Feasibility of the Project	ESCO	ESCO End-User
Owner of ESCO Equipment	ESCO	ESCO	Leasing Company (*)

(*) Property tax and machine insurance are including in lease fee.

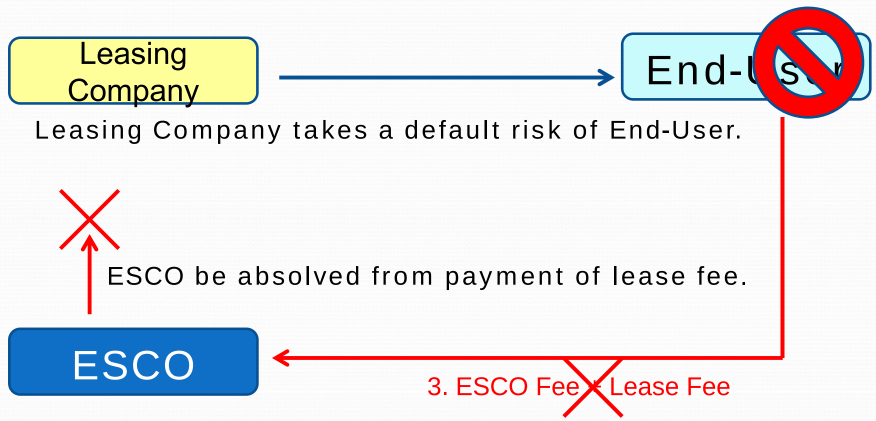
Key Point of Leasing Scheme

Business failure of End-User
(Financing Scheme)



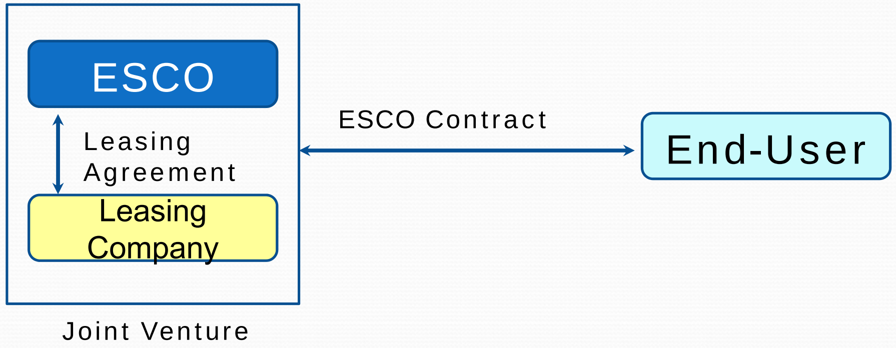
Key Point of Leasing Scheme

Business failure of End-User
(Leasing Scheme)

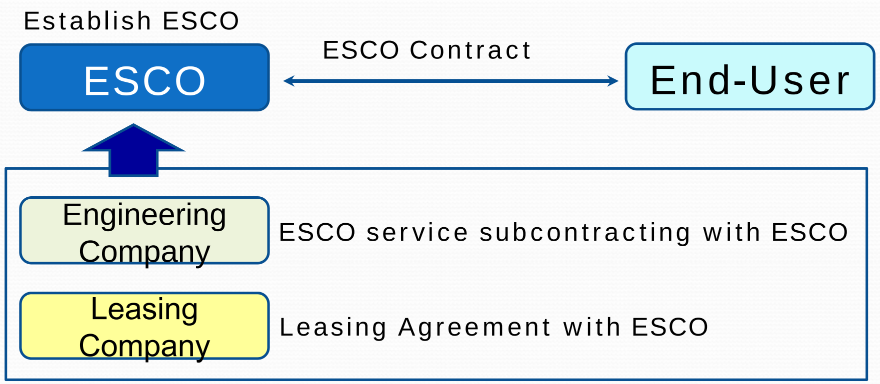


ESCO of Leasing Scheme (1)

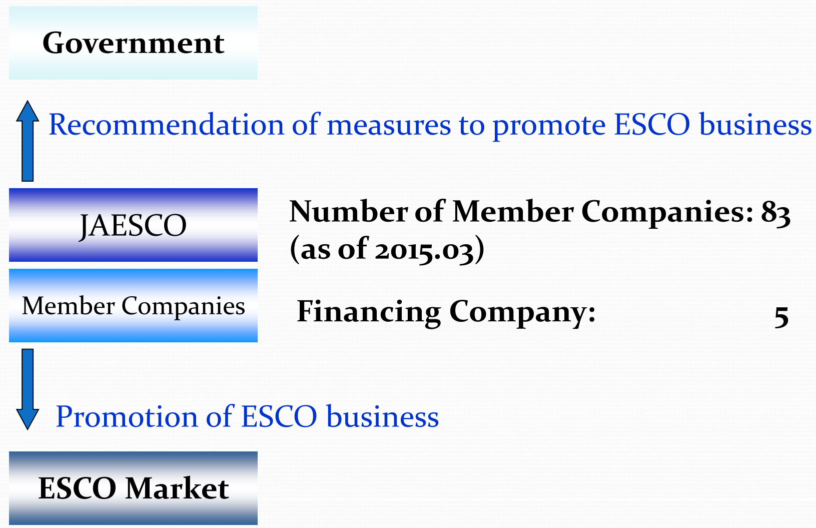
ESCO of Leasing Scheme (2)



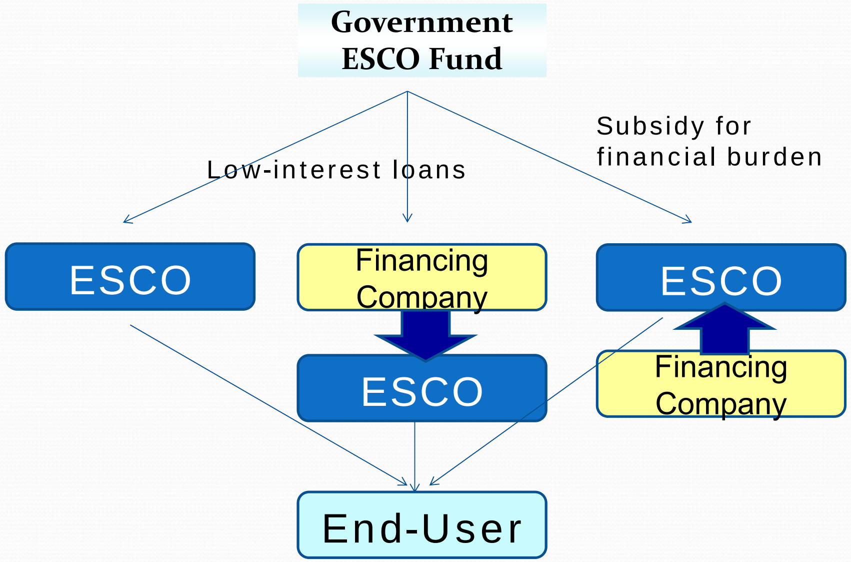
ESCO of Leasing Scheme (3)



Japan Association of ESCO (JAESCO)



ESCO Fund



END

Thank you for your attention.

JICA Study Team

The Project on Implementation of Pilot Projects to Introduce ESCO for Government's Buildings In the Islamic Republic of Iran

Introduction of success practice and new ESCO scheme in Japan

November 23, 2015
JICA Project Team

Agenda

1. Success Practice

2. New ESCO scheme

1. Success Practice

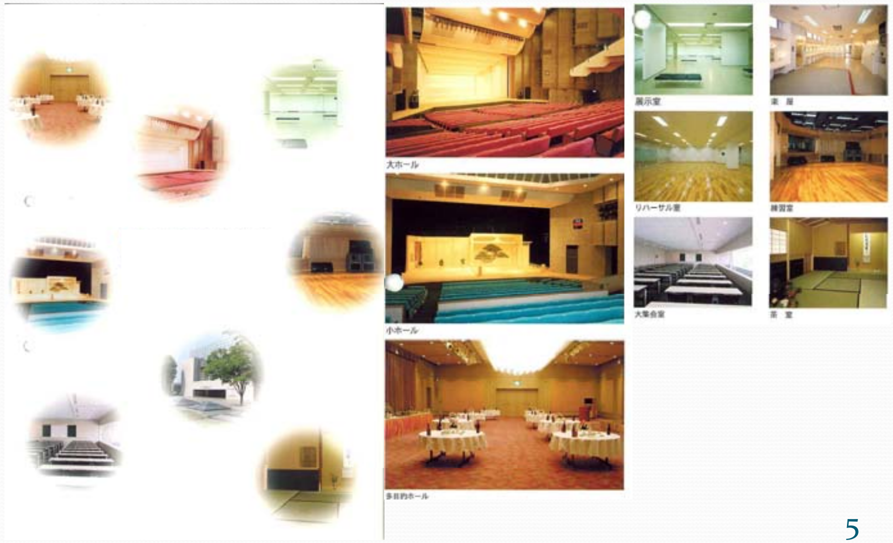
1. Success Practice – Building Summary

Basic information

Building usage: Cultural (Theater, convention)
Floor area: 20,873m2
Operation day: 305 days (non-working: Monday)
Construction year: 21 years after completion
Energy consumption:
  Electric power, approx. 2,400,000 kWh/annual
  Gas, approx. 123,000m3/annual
  Water, approx. 19,000m3/annual
Main user: Citizen (by application)
Contract type: Guaranteed type

1. Success Practice – Building summary

Picture of building



1. Success Practice – Technical proposal

Summary of optimized EE&C

Summary - 1

a. Table of opted EE&C technique (1USD=120JPY)

Item	Current amount of consumption of Electric power, Gas, Oil, Water		Energy consumption		CO2 Emission		Estimated Energy fee USD/Annual (A)	Investment USD (B)	Pay Back Period Year (B/A)
	Type	Reduction (Unit)	Reduction MJ/Annual	Rate %	Reduction kg-CO_2/Annual	Rate %			
Replace the heat source from absorption chiller to heat pump chiller.	Electric	-182,872kWh	3,039,353	10.9%	183,361	15.2%	50,692	687,925	13.6
	Gas	112,034m3							
	Water	2,408 m3							
Introduction of VSD and number control of pumps	Electric	21,772 kWh	212,495	0.8%	7,381	0.6%	2,025	27,042	13.4
Introduction of VSD and number control of fans	Electric	141,805 kWh	1,384,017	4.9%	48,072	4.0%	13,208	197,492	15.0
Introduction of On/Off control of machine room fan	Electric	7,826kWh	76,382	0.3%	2,653	0.2%	725	6,300	8.7
Replace to emergency exit lighting with high efficiency	Electric	44,245 kWh	431,831	1.5%	14,999	1.2%	4,117	82,950	20.1
Replace to CFL lamp	Electric	98,437 kWh	960,745	3.4%	33,370	2.8%	9,167	5,867	0.6
Introduction of electric type ballast	Electric	34,055 kWh	332,377	1.2%	11,545	1.0%	3,175	60,900	19.2
Introduction of On/Off control by moving sensor	Electric	12,511 kWh	122,107	0.4%	4,241	0.4%	1,167	5,692	4.9
Introduction of water saving bulb	Water	1,691 m3	-	-	-	-	10,025	30,625	-
Sum	—	-	6,559,307	23.5%	305,622	25.3%	94,300	1,104,775	11.7

Remark) ESCO competition participant must not mention reduction of energy, CO2 emission, in case that they will optimize proposal for water reduction.

1. Success Practice – Financial estimation

Financial plan (Construction year to termination year of ESCO project)

	FY Year	1388 Construction	1389 1st	1390 2nd	1391 3rd	1392 4th	1393 5th	1394 6th	1395 7th
In - come	A=I+II	0	94,300	94,300	94,300	94,300	94,300	94,300	94,300
Guaranteed reduction of energy cost	I	-	94,300	94,300	94,300	94,300	94,300	94,300	94,300
Prospected reduction of energy cost	II	-	-	-	-	-	-	-	-
Subsidy	III	-	-	-	-	-	-	-	-
Out - go	B=IV+V+VI	1,137,150	20,283	20,283	20,283	20,283	20,283	20,283	20,283
ESCO service fee I (Design & Construction)	IV	1,137,150	0	0	0	0	0	0	0
Detailed audit	a	5,250	-	-	-	-	-	-	-
Design fee	b	4,375	-	-	-	-	-	-	-
Construction cost	c	1,104,775	-	-	-	-	-	-	-
M&V instrument install cost	d	0	-	-	-	-	-	-	-
Supervisory cost	e	22,750	-	-	-	-	-	-	-
The other	f	0	-	-	-	-	-	-	-
ESCO service fee II (M&V, O&M)	V	0	20,283	20,283	20,283	20,283	20,283	20,283	20,283
Maintenance cost	g	-	12,100	12,100	12,100	12,100	12,100	12,100	12,100
M&V cost	h	-	2,517	2,517	2,517	2,517	2,517	2,517	2,517
Operation cost	i	-	417	417	417	417	417	417	417
The other	j	-	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Payment for O&M by municipality	VI	0	0	0	0	0	0	0	0
O&M		-	-	-	-	-	-	-	-
The other		-	-	-	-	-	-	-	-
Guaranteed benefit of building owner	C=A-B	-1,137,150	74,017	74,017	74,017	74,017	74,017	74,017	74,017

1. Success Practice – Financial estimation

Financial plan (after termination year of ESCO project)

	FY Year	1396 8th	1397 9th	1398 10th	1399 11th	1400 12th	1401 13th	1402 14th	1403 15th	Total
In - come	A=I+II	94,300	94,300	94,300	94,300	94,300	94,300	94,300	94,300	1,414,500
Guaranteed reduction of energy cost	I	-	-	-	-	-	-	-	-	660,100
Prospected reduction of energy cost	II	94,300	94,300	94,300	94,300	94,300	94,300	94,300	94,300	754,400
Subsidy	III	-	-	-	-	-	-	-	-	
Out - go	B=IV+V+VI	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	1,414,217
ESCO service fee I (Design & Construction)	IV	0	0	0	0	0	0	0	0	1,137,150
Detailed audit	a	-	-	-	-	-	-	-	-	5,250
Design fee	b	-	-	-	-	-	-	-	-	4,375
Construction cost	c	-	-	-	-	-	-	-	-	1,104,775
M&V instrument install cost	d	-	-	-	-	-	-	-	-	0
Supervisory cost	e	-	-	-	-	-	-	-	-	22,750
The other	f	-	-	-	-	-	-	-	-	0
ESCO service fee II (M&V, O&M)	V	0	0	0	0	0	0	0	0	141,983
Maintenance cost	g	-	-	-	-	-	-	-	-	84,700
M&V cost	h	-	-	-	-	-	-	-	-	17,617
Operation cost	i	-	-	-	-	-	-	-	-	2,917
The other	j	-	-	-	-	-	-	-	-	36,750
Payment for O&M by municipality	VI	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	135,083
O&M		19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	135,083
The other		-	-	-	-	-	-	-	-	0
Guaranteed benefit of building owner	C=A-B	74,633	87,300	30,633	87,300	77,550	87,300	87,300	87,300	283

Total building owner (in this case, municipality) could pay back the cost regarding ESCO project.

1. Success Practice – Technical proposal

Summary of ESCO project

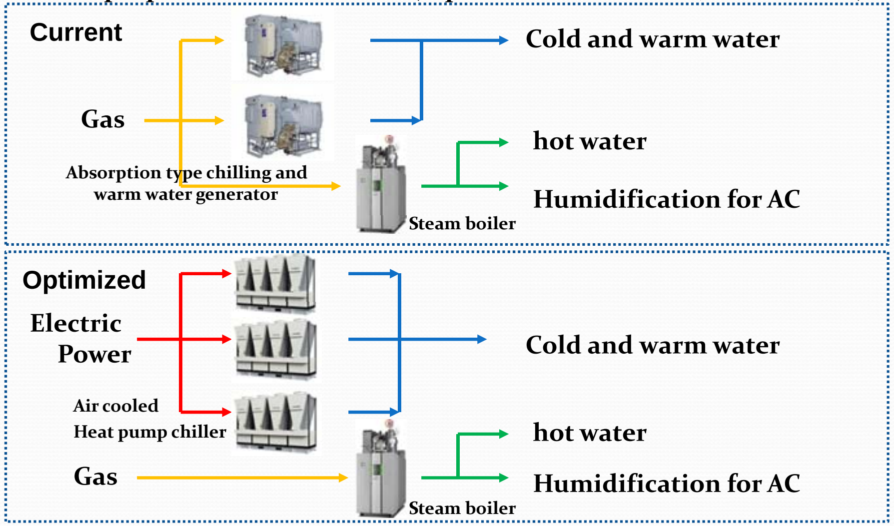
Summary - 2 (Without Subsidy)

ESCO competition participant shall mention Summary of project estimation in entire ESCO project period.

I	Initial ESCO service fee	1,137,150 USD	
II	Presided energy fee reduction	94,300 USD/Annual	
III	Guaranteed energy fee reduction	94,300 USD/Annual	
IV	Annual ESCO service fee	20,283 USD/Annual	
V	Annual Owner share of Guaranteed energy fee reduction	74,017 USD/Annual	III-IV
VI	ESCO service duration	7 years	
VII	Owner share of Guaranteed energy fee reduction in ESCO service duration	518,117 USD	V x VI
VIII	Balance of owner in ESCO service duration	Minus 619,033 USD	I- VII
IX	O&M cost from the date of termination of ESCO contract onward	135,083 USD	
X	Balance of owner from the date of termination of ESCO contract onward	619,317 USD	II x V
XI	Sum of Building owners benefit	284 USD	IV x V

1. Success Practice – Technical proposal

Technical proposal – EE&C method (replace the heat source, as reference)



1. Success Practice – Maintenance

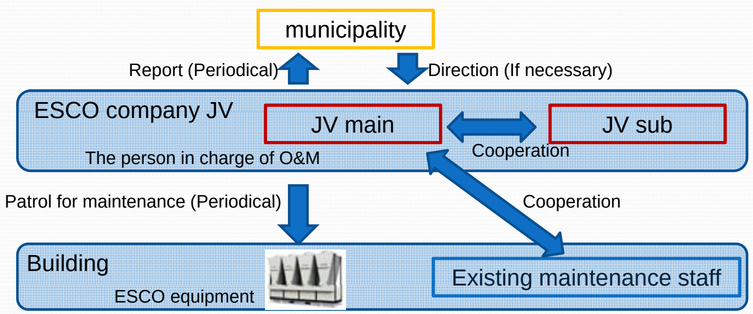
Maintenance proposal

(1) Policy

The person in charge of maintenance who is assigned from ESCO company would make plan.

The appliance with good workability in maintenance would be introduced.

(2) Maintenance organization



1. Success Practice – O&M

Maintenance proposal

(3) Making sure of Maintenance work

Phase	Proposal
At commencement of ESCO project	maintenance management plan (including check list) would be prepared with support of Maintenance expert.
During ESCO project	ESCO company would carry out Maintenance work due to check list.
At termination of ESCO project	ESCO company would carry out audit, then prepare mid-long term Maintenance plan.

(4) Item of Maintenance work

Item	Frequency, specification
Patrol	Freq.: 4 times per annual. (only at initial year, 12 times per annual) Spec.: Periodical check by check list.
heat source	Freq.: 4 times per annual. (2 times before season-in, 2 times under season) Spec.: checking of abnormalities in the heat source record of value at indicator, appearance checking change of chilling/warm operation check of fan and compressor of heat source Especially, compressor overhaul 1 time per 10 year Fan overhaul 1 time per 8 year are recommended. (after termination of ESCO project)

1. Success Practice – O&M

Maintenance proposal

(4) Item of Maintenance work (continued)

Item	Frequency, specification
VSD for pump	Freq.: 4 times per annual. Spec.: checking of abnormalities in the VSD record of value at indicator, appearance checking Especially, exchange of cooling fan for VSD panel 1 time per 4 year exchange of condenser of VSD panel 1 time per 10 are recommended.
VSD for fan and CO_2 control	Freq.: 4 times per annual. Spec.: checking of abnormalities in the VSD record of value at indicator, appearance checking Especially, exchange of cooling fan for VSD panel 1 time per 4 year exchange of condenser of VSD panel 1 time per 10 are recommended.
On/Off control of machine room fan	Freq.: 4 times per annual. Spec.: checking of abnormalities in the controller record of value at indicator, appearance checking
Lighting appliance (electronic ballast, CFL, emergency exit lighting)	Freq.: 4 times per annual. Spec.: checking of abnormalities in the mounting situation of lighting appearance checking by On/Off

1. Success Practice – O&M

Maintenance proposal

(4) Item of Maintenance work (continued)

Item	Frequency, specification
Moving sensor	Freq.: 4 times per annual. Spec.: checking of abnormalities in the mounting situation of lighting appearance checking by On/Off
Water saving bulb	Freq.: 4 times per annual. Spec.: appearance checking

(5) Annual Maintenance cost (During ESCO project)

Item	Cost
Patrol	2,350 USD per annual
Heat source	9,083 USD per annual
VSD	417 USD per annual
Lighting(electronic ballast, CFL, emergency exit lighting)	250 USD per annual
Total	12,100 USD per annual

1. Success Practice – O&M

Maintenance proposal

(6) Maintenance cost (after termination of ESCO project)

year	Cost
8^{th} year	19,667 USD
9^{th} year	7,000 USD
10^{th} year	63,667 USD
11^{th} year	7,000 USD
12^{th} year	16,750 USD
13^{th} year	7,000 USD
14^{th} year	7,000 USD
15ht year	7,000 USD

1. Success Practice – O&M

Operation proposal

(1) Item of Operation work

Item	Frequency, specification
heat source	Freq.: 1 time per month Spec.: Record of current value, temperature of chilling & warm water and pressure, checking of abnormalities in the heat source by sounds and smell.
VSD for pump	Freq.: 1 time per month Spec.: Record of current value and pressure, checking of abnormalities in the heat source by sounds and smell.
VSD for fan and CO_2 control	Freq.: 1 time per month Spec.: Record of current value and pressure, checking of abnormalities in the heat source by sounds and smell.
On/Off control of machine room fan	Freq.: 1 time per month Spec.: Record of current value and pressure, checking of abnormalities in the heat source by sounds and smell.
The other	Freq.: 4 times per annual Spec.: appearance checking

(2) Annual Operation cost (During ESCO project)

Item	Cost
Operation work	417 USD per annual (ESCO company would entrust to operation work)

1. Success Practice – M&V

Measurement and Verification proposal

(1) Item of Measurement and Verification

Item	Frequency, specification
Heat source	Measurement item: integrated watt hour, operation time of heat source Instruments: ESCO company would install permanently Frequency: periodical within ESCO contract duration
VSD for pump	Measurement item: integrated watt hour, operation time of pumps Instruments: ESCO company would install permanently Frequency: periodical within ESCO contract duration
VSD for fan and CO_2 control	Measurement item: integrated watt hour, operation time of fans Instruments: ESCO company would install permanently Frequency: periodical within ESCO contract duration
On/Off control of machine room fan	Measurement item: operation time of fans by data logger of current Instruments: temporary Frequency: first half year only
Lighting appliance (electronic ballast, CFL, emergency exit lighting)	Measurement item: integrated watt hour on the typical point Instruments: ESCO company would install permanently Frequency: only once, at early time of ESCO project
Moving sensor	Measurement item: operation time of fans by data logger of current Instruments: temporary Frequency: first half year only
Water saving bulb	By water consumption notification by water supply company

1. Success Practice – M&V

Measurement and Verification proposal

(2) Needed instruments and number of them

Instruments type	Number
Integrated watt hour meter	23 (included construction work and cost)
Time meter	20 (included construction work and cost)
data logger of current	6

(3) Annual M&V cost (During ESCO project)

Item	Cost
M&V work	2517 USD per annual

1. Success Practice – Financial estimation

Financial plan (Construction year to termination year of ESCO project)

	FY Year	1388 Construction	1389 1st	1390 2nd	1391 3rd	1392 4th	1393 5th	1394 6th	1395 7th
In - come	A=I+II	0	94,300	94,300	94,300	94,300	94,300	94,300	94,300
Guaranteed reduction of energy cost	I	-	94,300	94,300	94,300	94,300	94,300	94,300	94,300
Prospected reduction of energy cost	II	-	-	-	-	-	-	-	-
Subsidy	III	-	-	-	-	-	-	-	-
Out - go	B=IV+V+VI	1,137,150	20,283	20,283	20,283	20,283	20,283	20,283	20,283
ESCO service fee I (Design & Construction)	IV	1,137,150	0	0	0	0	0	0	0
Detailed audit	a	5,250	-	-	-	-	-	-	-
Design fee	b	4,375	-	-	-	-	-	-	-
Construction cost	c	1,104,775	-	-	-	-	-	-	-
M&V instrument install cost	d	0	-	-	-	-	-	-	-
Supervisory cost	e	22,750	-	-	-	-	-	-	-
The other	f	0	-	-	-	-	-	-	-
ESCO service fee II (M&V, O&M)	V	0	20,283	20,283	20,283	20,283	20,283	20,283	20,283
Maintenance cost	g	-	12,100	12,100	12,100	12,100	12,100	12,100	12,100
M&V cost	h	-	2,517	2,517	2,517	2,517	2,517	2,517	2,517
Operation cost	i	-	417	417	417	417	417	417	417
The other	j	-	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Payment for O&M by municipality	VI	0	0	0	0	0	0	0	0
O&M		-	-	-	-	-	-	-	-
The other		-	-	-	-	-	-	-	-
Guaranteed benefit of building owner	C=A-B	-1,137,150	74,017	74,017	74,017	74,017	74,017	74,017	74,017

1. Success Practice – for reference (subsidy)

Subsidy case (1/3 of construction cost, will come construction year)

Total building owner would get subsidy. in this case, one third of construction cost.

	FY Year	1388 Construction	1389 1st	1390 2nd	1391 3rd	1392 4th	1393 5th	1394 6th	1395 7th
In - come	A=I+II	341,000	94,300	94,300	94,300	94,300	94,300	94,300	94,300
Guaranteed reduction of energy cost	I	-	94,300	94,300	94,300	94,300	94,300	94,300	94,300
Prospected reduction of energy cost	II	-	-	-	-	-	-	-	-
Subsidy	III	341,000	-	-	-	-	-	-	-
Out - go	B=IV+V+VI	1,137,150	20,283	20,283	20,283	20,283	20,283	20,283	20,283
ESCO service fee I (Design & Construction)	IV	1,137,150	0	0	0	0	0	0	0
Detailed audit	a	5,250	-	-	-	-	-	-	-
Design fee	b	4,375	-	-	-	-	-	-	-
Construction cost	c	1,104,775	-	-	-	-	-	-	-
M&V instrument install cost	d	0	-	-	-	-	-	-	-
Supervisory cost	e	22,750	-	-	-	-	-	-	-
The other	f	0	-	-	-	-	-	-	-
ESCO service fee II (M&V, O&M)	V	0	20,283	20,283	20,283	20,283	20,283	20,283	20,283
Maintenance cost	g	-	12,100	12,100	12,100	12,100	12,100	12,100	12,100
M&V cost	h	-	2,517	2,517	2,517	2,517	2,517	2,517	2,517
Operation cost	i	-	417	417	417	417	417	417	417
The other	j	-	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Payment for O&M by municipality	VI	0	0	0	0	0	0	0	0
O&M		-	-	-	-	-	-	-	-
The other		-	-	-	-	-	-	-	-
Guaranteed benefit of building owner	C=A-B	-796,150	74,017	74,017	74,017	74,017	74,017	74,017	74,017

1. Success Practice – for reference (subsidy)

Subsidy case (1/3 of construction cost, will come construction year)

	FY Year	1396 8th	1397 9th	1398 10th	1399 11th	1400 12th	1401 13th	1402 14th	1403 15th	Total
In - come	A=I+II	94,300	94,300	94,300	94,300	94,300	94,300	94,300	94,300	1,755,500
Guaranteed reduction of energy cost	I	-	-	-	-	-	-	-	-	660,100
Prospected reduction of energy cost	II	94,300	94,300	94,300	94,300	94,300	94,300	94,300	94,300	754,400
Subsidy	III	-	-	-	-	-	-	-	-	
Out - go	B=IV+V+VI	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	1,414,217
ESCO service fee I (Design & Construction)	IV	0	0	0	0	0	0	0	0	1,137,150
Detailed audit	a	-	-	-	-	-	-	-	-	5,250
Design fee	b	-	-	-	-	-	-	-	-	4,375
Construction cost	c	-	-	-	-	-	-	-	-	1,104,775
M&V instrument install cost	d	-	-	-	-	-	-	-	-	0
Supervisory cost	e	-	-	-	-	-	-	-	-	22,750
The other	f	-	-	-	-	-	-	-	-	0
ESCO service fee II (M&V, O&M)	V	0	0	0	0	0	0	0	0	141,983
Maintenance cost	g	-	-	-	-	-	-	-	-	84,700
M&V cost	h	-	-	-	-	-	-	-	-	17,617
Operation cost	i	-	-	-	-	-	-	-	-	2,917
The other	j	-	-	-	-	-	-	-	-	36,750
Payment for O&M by municipality	VI	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	135,083
O&M		19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	135,083
The other		-	-	-	-	-	-	-	-	0
Guaranteed benefit of building owner	C=A-B	74,633	87,300	30,633	87,300	77,550	87,300	87,300	87,300	341,283

Total building owner (in this case, municipality) could pay back the cost regarding ESCO project, and obtain much amount of benefit.

1. Success Practice – for reference (shared)

shared case (ratio of share, ESCO : building owner = 95%:5%)

		ESCO	Owner
Reduction	94,300	89,585	4,715
		95%	5%

	FY Year	1388 Construction	1389 1st	1390 2nd	1391 3rd	1392 4th	1393 5th	1394 6th	1395 7th
In - come	A=I+II	0	89,585	89,585	89,585	89,585	89,585	89,585	89,585
ESCO service fee	I	-	89,585	89,585	89,585	89,585	89,585	89,585	89,585
Subsidy	II	-	-	-	-	-	-	-	-
Out - go	B	1,137,150	20,283	20,283	20,283	20,283	20,283	20,283	20,283
Detailed audit	a	5,250	-	-	-	-	-	-	-
Design fee	b	4,375	-	-	-	-	-	-	-
Construction cost	c	1,104,775	-	-	-	-	-	-	-
M&V instrument install cost	d	0	-	-	-	-	-	-	-
Supervisory cost	e	22,750	-	-	-	-	-	-	-
The other	f	0	-	-	-	-	-	-	-
Maintenance cost	g	-	12,100	12,100	12,100	12,100	12,100	12,100	12,100
M&V cost	h	-	2,517	2,517	2,517	2,517	2,517	2,517	2,517
Operation cost	i	-	417	417	417	417	417	417	417
The other	j	-	5,250	5,250	5,250	5,250	5,250	5,250	5,250
benefit (balance) of ESCO company	C=A-B	-1,137,150	69,302	69,302	69,302	69,302	69,302	69,302	69,302

1. Success Practice – for reference (shared)

shared case (ratio of share, ESCO : building owner = 95%:5%)

	1396 8th	1397 9th	1398 10th	1399 11th	1400 12th	1401 13th	1402 14th	1403 15th	Total
In - come	89,585	89,585	89,585	89,585	89,585	89,585	89,585	89,585	1,343,775
ESCO service fee	89,585	89,585	89,585	89,585	89,585	89,585	89,585	89,585	1,343,775
Subsidy	-	-	-	-	-	-	-	-	
Out - go	27,850	15,183	71,850	15,183	24,933	15,183	15,183	15,183	1,479,683
Detailed audit	-	-	-	-	-	-	-	-	5,250
Design fee	-	-	-	-	-	-	-	-	4,375
Construction cost	-	-	-	-	-	-	-	-	1,104,775
M&V instrument install cost	-	-	-	-	-	-	-	-	0
Supervisory cost	-	-	-	-	-	-	-	-	22,750
The other	-	-	-	-	-	-	-	-	0
Maintenance cost	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	219,783
M&V cost	2,517	2,517	2,517	2,517	2,517	2,517	2,517	2,517	37,750
Operation cost	417	417	417	417	417	417	417	417	6,250
The other	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	78,750
benefit (balance) of ESCO company	61,735	74,402	17,735	74,402	64,652	74,402	74,402	74,402	-135,908

Actually, interest should be imposed.

Total ESCO company could not pay back the cost regarding ESCO project.

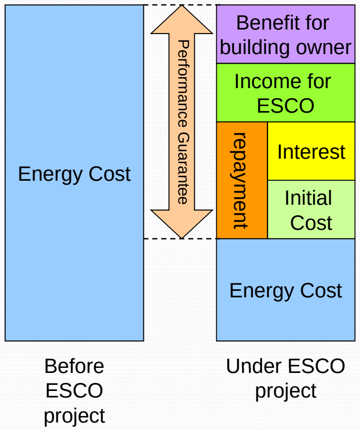
2. New ESCO scheme

New ESCO scheme– Back ground

Old scheme (Conventional ESCO)

One window service, in principal

- All cost should be paid by energy cost reduction
- Performance guarantee
- Comprehensive support
- Measure & Verification



New ESCO scheme– Back ground

New scheme

Flexible combination from 8 services

- EE &C proposal based on energy audit
- Design and/or construction for EE&C
- Operation and Maintenance for EE&C equipment
- Arrangement for optimize energy supply
- Fund purchase for introduction of EE&C equipment
- Performance guarantee of EE&C
- Measurement and Verification for EE&C equipment
- Additional EE&C suggestion based on M&V

New ESCO scheme– Back ground

Why ESCO scheme was changed?

ESCO project of ESCO company viewpoint

- Low ratio of conclusion of contract
- Low contract amount against efforts
- Low benefit, despite implementation of project
- High risk of performance guarantee

Release from original ESCO scheme

- Departure from ESCO under international definition
- To Japanese type ESCO

New ESCO scheme– Replacement type ESCO

Replacement as special requirement from building owner

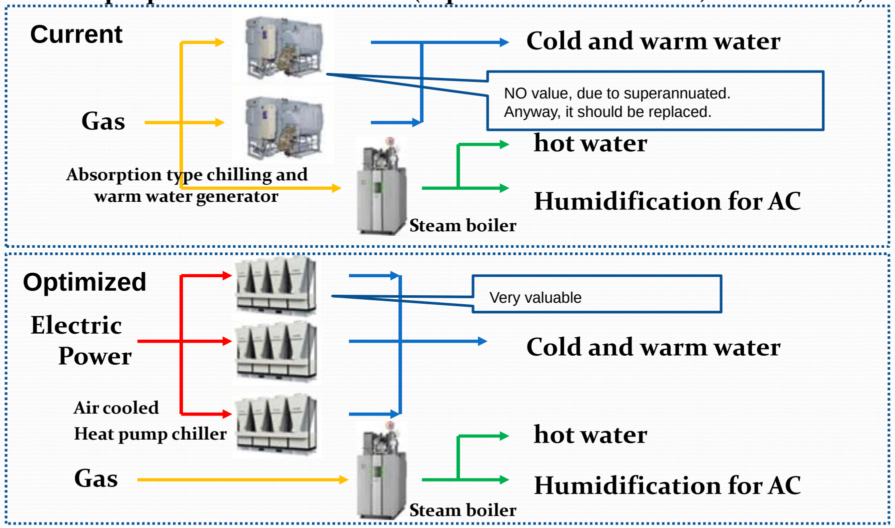
It is unconvinced idea to burden finance risk for replacement of superannuated equipment.

- Whether ESCO company would replace the equipment or not, because of its superannuated, it should be replaced.
- In case that ESCO company would replace as per request from building owner, building owner would get new equipment without their own risk.

As opinion of ESCO company, in case of replacement of superannuated equipment, building owner should burden the cost.

1. Success Practice – Technical proposal

Technical proposal – EE&C method (replace the heat source, as reference)

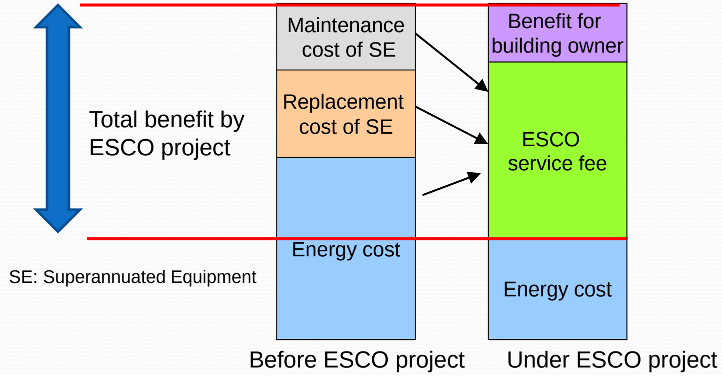


New ESCO scheme– Replacement type ESCO

Changing Idea against benefit by ESCO project

Source of benefit by ESCO project

- Cost reduction by introduction of EE&C method
- Replacement cost of superannuated equipment
- Maintenance cost of superannuated equipment



New ESCO scheme– Replacement type ESCO

Sample estimation on the almost same condition of mentioned case

Heat source is NO value, due to superannuated.
Anyway, it should be replaced. Whether ESCO project would carry out or not.

	FY Year	1388 Construction	1389 1st	1390 2nd	1391 3rd	1392 4th	1393 5th	1394 6th	1395 7th
In - come	A=I+II+III+IV+V	0	782,225	94,300	94,300	94,300	94,300	94,300	94,300
Guaranteed reduction of energy cost	I	-	94,300	94,300	94,300	-	-	-	-
Prospected reduction of energy cost	II	-	-	-	-	94,300	94,300	94,300	94,300
Reduction of construction cost for superannuated equipment	III	-	687,925	-	-	-	-	-	-
Reduction of maintenance cost for superannuated equipment	IV	-	-	-	-	-	-	-	-
Subsidy	V	-	-	-	-	-	-	-	-
Out - go	B=VI+VII+VIII	1,137,150	20,283	20,283	20,283	12,100	12,100	12,100	12,100
ESCO service fee I (Design & Construction)	VI	1,137,150	0	0	0	0	0	0	0
Detailed audit	a	5,250	-	-	-	-	-	-	-
Design fee	b	4,375	-	-	-	-	-	-	-
Construction cost	c	1,104,775	-	-	-	-	-	-	-
M&V instrument install cost	d	0	-	-	-	-	-	-	-
Supervisory cost	e	22,750	-	-	-	-	-	-	-
The other	f	0	-	-	-	-	-	-	-
ESCO service fee II (M&V, O&M)	VII	0	20,283	20,283	20,283	0	0	0	0
Maintenance cost	g	-	12,100	12,100	12,100	-	-	-	-
M&V cost	h	-	2,517	2,517	2,517	-	-	-	-
Operation cost	i	-	417	417	417	-	-	-	-
The other	j	-	5,250	5,250	5,250	-	-	-	-
Payment for O&M by municipality	VIII	0	0	0	0	12,100	12,100	12,100	12,100
O&M		-	-	-	-	12,100	12,100	12,100	12,100
The other		-	-	-	-	-	-	-	-
Guaranteed benefit of building owner	C=A-B	-1,137,150	761,942	74,017	74,017	82,200	82,200	82,200	82,200

New ESCO scheme– Replacement type ESCO

Sample estimation on the almost same condition of mentioned case

Anyway, heat source should be maintained periodically in order to keep their capacity. Whether ESCO project would carry out or not.

	FY Year	1388 Construction	1396 8th	1397 9th	1398 10th	1399 11th	1400 12th	1401 13th	1402 14th	1403 15th	Total
In - come	A=I+II+III+IV+V	0	94,300	94,300	94,300	135,967	94,300	94,300	94,300	94,300	2,144,092
Guaranteed reduction of energy cost	I	-	-	-	-	-	-	-	-	-	282,900
Prospected reduction of energy cost	II	-	94,300	94,300	94,300	94,300	94,300	94,300	94,300	94,300	1,131,600
Reduction of construction cost for superannuated equipment	III	-	-	-	-	-	-	-	-	-	
Reduction of maintenance cost for superannuated equipment	IV	-	-	-	-	41,667	-	-	-	-	
Subsidy	V	-	-	-	-	-	-	-	-	-	
Out - go	B=VI+VII+VIII	1,137,150	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	1,381,483
ESCO service fee I (Design & Construction)	VI	1,137,150	0	0	0	0	0	0	0	0	1,137,150
Detailed audit	a	5,250	-	-	-	-	-	-	-	-	5,250
Design fee	b	4,375	-	-	-	-	-	-	-	-	4,375
Construction cost	c	1,104,775	-	-	-	-	-	-	-	-	1,104,775
M&V instrument install cost	d	0	-	-	-	-	-	-	-	-	0
Supervisory cost	e	22,750	-	-	-	-	-	-	-	-	22,750
The other	f	0	-	-	-	-	-	-	-	-	0
ESCO service fee II (M&V, O&M)	VII	0	0	0	0	0	0	0	0	0	60,850
Maintenance cost	g	-	-	-	-	-	-	-	-	-	36,300
M&V cost	h	-	-	-	-	-	-	-	-	-	7,550
Operation cost	i	-	-	-	-	-	-	-	-	-	1,250
The other	j	-	-	-	-	-	-	-	-	-	15,750
Payment for O&M by municipality	VIII	0	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	183,483
O&M		-	19,667	7,000	63,667	7,000	16,750	7,000	7,000	7,000	183,483
The other		-	-	-	-	-	-	-	-	-	0
Guaranteed benefit of building owner	C=A-B	-1,137,150	74,633	87,300	30,633	128,967	77,550	87,300	87,300	87,300	762,608

New ESCO scheme– issue in Iran

Prospected issues

- Fund purchases. (in case of shared type)
- High ratio of interest. (in case of shared type)
- Maintenance of high quality equipment

↓

Counter measure

- Rising in position of ESCO company
- Fund establishment for ESCO project
- Interest subsidy establishment for ESCO project
- Sharing Maintenance and operation knowledge

New ESCO scheme– Who make scheme

To fruitful ESCO for ESCO company

- For Sustainable,

  ESCO company must obtain appropriate benefit through ESCO project.

ESCO association should act main role

- In Japan experience, JAESCO requested support for promotion of ESCO to government, Government replied opinion from JAESCO.

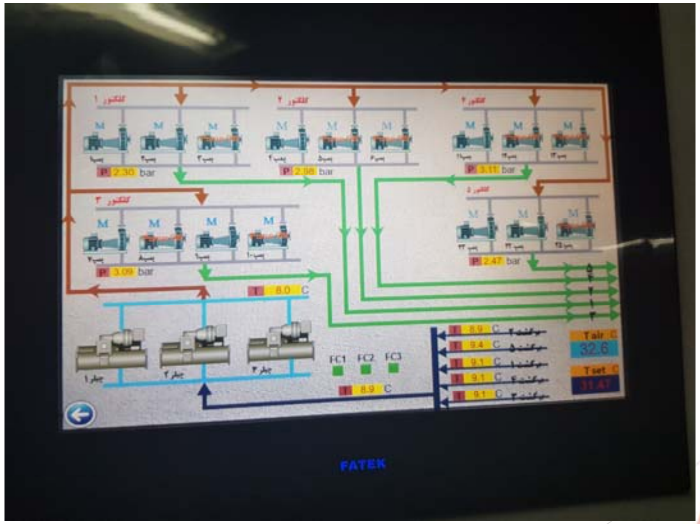
Khaste nabashi, kheili mamnoon!

ESCO Project at Ministry of Economy Affairs and Finance Building

شرکت مهندسی آسیاوات

ESCO TECHNOLOGIES

جمهوری اسلامی ایران
وزارت امور اقتصادی و دارایی



Electricity Saving at Powerhouse Smart Function Control

1st Report Period	Start date	End date	CDD (C.day)	day	Real Consumption (kWh)	Consumption in Baseline period (kWh)	Saving (kWh)	Saved Amount (IRR)
Bill 1	2017.6.5	2017.7.10	287.1	35	724,000	810,675.2	86,675.19	228,748,226.3
Bill 2	2017.7.10	2017.7.31	171.6	21	448,000	485,414.6	37,414.55	110,707,186.7
Bill 3	2017.7.31	2017.8.30	218.2	30	680,000	Not measured because of approach implementation		
Total	-	-	-	-	1,172,000	1,296,089.7	124,089.7	339,455,413

CDD: Cooling Degree Day. Degree days are based on the assumption that when the outside temperature is 65°F. If the temperature mean is above 65°F, we subtract 65 from the mean and the result is Cooling Degree Days.

2nd & 3rd Report Period	Start Date	End Date	CDD	Day	Real Consumption (kWh)	Consumption in Baseline Period (kWh)	Saving (kWh)	Saved Amount (IRR)
Bill 2-2	17.10.25	17.11.25	7.3	32	264,000	358,184.69	94,184.69	260,044,672.69
Bill 3-2	17.11.26	17.12.19	0	24	288,000	260,421.36	-27,578.64	-70,356,989.27
Bill 1-3	17.12.20	18.01.17	0	29	324,000	314,675.81	-9,324.19	-24,149,525.5
Bill 2-3	18.01.18	18.02.12	0.2	26	272,000	282,423.31	10,423.31	27,140,240.79
Bill 3-3	18.02.13	18.04.10	10.5	57	524,000	634,259.66	110,259.66	294,652,148.95
Total	-	-	18	168	1,672,000	18,499,643.82	177,964.82	487,330,547.65

Gas Saving at Powerhouse Smart function Control

2nd & 3rd Report Period	Start Date	End Date	CDD	HDD	Real Consumption (m^3)	Consumption in Baseline Period (m^3)	Saving (m^3)	Saved Amount (IRR)
Bill 1-2	17.10.28	17.11.25	7.3	123.3	27,660	48,443.44	20,783.44	60,651,481.61
Bill 2-2	17.11.26	17.12.24	0	424.4	145,714	139,092.27	-6,621.73	-12,378,330.98
Bill 3-2	17.12.25	18.01.21	0	375.5	134,882	123,801.05	-11,080.95	-19,713,565.79
Bill 1-3	18.01.22	18.02.19	0.2	423.3	156,988	138,844.36	-18,143.64	-32,278,435.22
Bill 2-3	18.02.20	18.03.17	0	203.2	70,067	69,922.14	-144.85	-257,695.75
Bill 3-3	18.03.18	18.04.21	10.5	148	25,669	57,704.24	32,035.24	83,045,936.08
Total	-	-	18	168	560,980	577,807.5	16,827.5	79,069,389.95

HDD: Heating Degree Day. If the temperature mean is below 65°F, we subtract the mean from 65 and the result is Heating Degree Days.

Issues and Problems

1- Facilities and equipment are very old which makes it difficult to operate the installed system correctly.
2- Renovation is taking place at the same time with project which results in some software/hardware changes in control system.
3- Baseline accuracy is affecting the estimation of real saving.
4- Administrative bureaucracy delayed the process of contract signing, payment, etc.
5- Problems is achieving project financial supplement.
6- High rate of loan interest and mis-confidance of financial institutes in ESCO companies.

با تشکر

شرکت مهندسی آسیاوات

A Review on Achievements and Challenges of ESCO Project

In Building of Tehran Power Distribution Company

Energy Service PISHRUN ENERGY

شرکت پیشران انرژی
Energy Service PISHRUN ENERGY
شرکت توزیع نیروی برق تهران بزرگ

General Information

Daily working hours: 9 hours	Tehran power distribution Co.
Years from construction of building: 30 years	Usage: administrative
Years from construction of facilities: Cooling, more than 20 years/ heating 3 years,	
Cooling system: 2 compressor chillers (160 ton)	
Heating system: 2 steel boilers (500,000 kcal/h)	
3 floors	Floor area: 6,400 m^2
Heating system: 5.5 months	Cooling system: 4 months
Position: 4 sided	Window type: Single chamber metal
Holiday: system is on 24 hours	Powerhouse: 24 hour working for 121 system and dispatching

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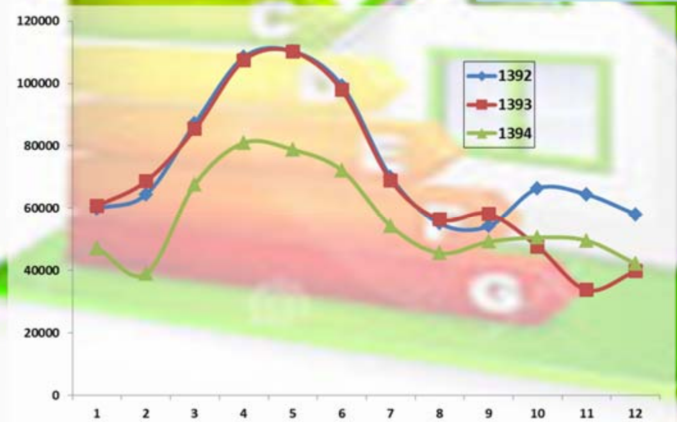
Power consumption status



Basic consumption (Baseline energy consumption of ?) 63%

Significant decrease in year 1394

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Recommended saving approaches

Recommended approaches for energy consumption optimization:

- Separating cooling and heating in 24/7 spaces
- Utilizing smart control system for cooling powerhouse
- Utilizing smart control system for heating powerhouse
- Utilizing radio control for blowing terminals
- Utilizing online monitoring system
- Utilizing inverter and control system on chilled water pump (and building heating)
- Utilizing control system on cooling tower pumps
- Utilizing inverter and control system on cooling tower fan
- Cultural activities

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شرکت توزیع نیروی برق تهران بزرگ

Estimated saving of Energy

Percentage of saving	
Electricity	22% of annual consumption
Gas	40% of annual consumption
Water	666 m^3 of annual consumption

Estimated saving amount based on 3 years average		
Electricity	176,000	kWh
Gas	49,170	m^3

Payback period : 67 months

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شرکت توزیع نیروی برق تهران بزرگ

Main activities & strength points

Measuring average temperature of rooms in 15 critical points average set on: 26.7 C

Utilizing monitoring system for:

- Analysis of quantitative information and providing thermal comfort
- Exploring problems of powerhouse
- Analyzing performance of facilities and providing solution
- Preventing change of control system setting

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شرکت پیشران انرژی

شرکت توزیع نیروی برق تهران بزرگ

Implementation phases

Operation

Beginning: 2017.Aug

- Exploring power house's problems & report to client
- Submitting progress reports
- Submitting 2 statement report

Implementation

Beginning: 2017. Jun

- Installing equipment
- Operating solutions
- Exploring optimized setting

End: 2017. Aug

Verification & agreement

Beginning: 2016. Jun

- Measurements
- Information analysis
- Providing solutions
- Holding technical meetings
- Holding M&V meetings
- Holding legal issue

Energy Service PISHRUN ENERGY
شرکت پیشران انرژی

شرکت توزیع نیروی برق تهران بزرگ

Challenges in Project

Challenges in agreement:

- Technical problems with contractor
- Various bureaus of the organization(financial, etc) were not familiar with ESCO
- Absence of M&V supervisor (third party)
- High consumption rate of basis energy and inability in controlling newly installing energy consuming equipment

Challenges in project

General challenges:

- Standard agreement did not release
- Expenditure source in annual budget is not defined
- Present grading system is not functional

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شرکت توزیع نیروی برق تهران بزرگ

Recommendation

- Utilizing the capacity of professional association for formulating typical agreements
- Information sharing, ESCO related WS, etc
- Provision/implementation of functional grading system
- Defining the budget source for ESCO projects
- Developing financial funds for energy efficiency projects

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شرکت توزیع نیروی برق تهران بزرگ

We hope that in present condition of the country, energy provision and stability is secured through facilitating energy efficiency projects,

The Project on Implementation of Pilot Projects
to Introduce ESCO for Government's Buildings
In the Islamic Republic of Iran

Recommendation for Improvement of ESCO scheme in Iran (through finding on two pilot projects)

July 3, 2018
JICA Project Team

Agenda

1. Barrier on ESCO project
2. Recommendation

Barrier on ESCO project 1

Shortage of public relation activities

Already (knowing ESCO)		NOT yet
MOE, SATBA, ESCO company		Building owner, financer

heavy gap

In Japan,
Authorized organization (ECCJ*) supports

1. To prepare PR document for ESCO
2. To authorize knowledge regarding ESCO

ECCJ*: Energy Efficiency and Conversation, Japan. Affiliated organization of Ministry of Economic, Trade, and Industry (METI).

Barrier on ESCO project 2

Lack of authorized ESCO contract
Building owner is fear to use new contract that he does not know well.

In Japan,
ECCJ* and METI support preparation of standard ESCO contract and publicize it.

Barrier on ESCO project 3

Restriction of contract procedure

Some barrier is in conventional legal institution. For example, when in not-bidding, its contract amount should be within limited value (low).

In Japan,

Government staff carried out

1. Sort of barrier from legal institution
2. Clarification in official letter
3. Some act was amended

Barrier on ESCO project 4

Lack of financial support

Interests of existing governmental fund is too high to utilize on ESCO project.

In Japan,

Central government provide

1. Low interests loan scheme
2. Subsidy (no-repayment)

with ESCO company.

Recommendation

Item	Recommendation
Acknowledge and understanding	MOE, SATBA, and ESCO companies understand ESCO business, however building owner and financer has not understood yet. Nobody can participate on unknown business. It is necessity to provide legal basis. 1. Formulation of regal institution for ESCO 2. Issue of PR documentation by authority 3. Preparation of guideline for ESCO on governmental building
Contract document	Model contract for ESCO had already prepared by IRESCO. 1. Any appropriate authority should issue it. (on going)
Contract procedure	Contract procedure is one of barrier for promotion of ESCO 1. Change of restriction term or legal interpretation
Finance	1. Preparation of subsidy for ESCO business 2. Preparation of low interests fund for ESCO busineess

技術協力成果品

1. ESCO 導入マニュアル

2. ESCO 契約書雛型 (英文)

3. 政府系ビルのエネルギー診断に係る提案書 (英文)

4. 政府系ビルのパイロット事業実施に係る提案書 (英文)

5. 政府系ビルのパイロット事業のモニタリング手法に係る提案書 (英文)

The Project
On
Implementation of Pilot Projects to Introduce
ESCO for Government's Buildings
in
Islamic Republic of Iran

Completion Report (ANNEX)

Deliverables on technical cooperation activities

ESCO manual

December 2018

Nippon Koei Co., Ltd

Iran Energy Efficiency Organization
(IEEO – SABA)

Energy Service Companies (ESCO) Manual
(Performance-based Contract Guideline)

Studies and Optimization of

Energy Efficiency Industry Office

Deputy of Training and Optimizing Energy Consumption

Fall 2014

Contents

1. Abstract

As a general definition, “ESCO is a company manages and coordinates all phases of an energy project and provides variety of services”. Another definition has been produced by Joint Research Center of European Commission is that “ESCO is a real person or legal entity conducting either energy services or providing solutions for improving energy efficiency and taking certain portion of the project financial risk”. It is also found out by World Energy Council that there are different definitions for Energy Service Companies in different countries”. Among from companies like Consulting Engineers, Equipment and Contractors’ Suppliers those provide energy services or implement efficiency solutions, ESCO companies are differentiated by the concepts of Performance-based contract. It means that the ESCO’s service remuneration is directly related to the energy savings.

The services providing by Energy Consulting Engineers Companies may include energy auditing, energy management, purchasing devices and supporting services such as space heating. ESCOs may propose different and similar services along with different mechanisms as Energy Service Providing Companies (ESCOs). These companies are to:

- Guarantee energy saving and their rewards are related and appropriate to energy efficiency of the project,
- Support or coordinate financial resources required,
- Provide variety of services, including:
    - Conducting feasibility studies (engineering and economic) to improve energy efficiency projects,
    - Basic and detailed design
    - Financial Support
    - Establishing and providing repair and maintenance services for equipment with high efficiency,
    - Verifying energy saving projects,
    - Monitoring and measuring,
    - Conducting Risk Analysis and also,
    - Accepting a certain portion of project technical and economic risks,

The table below shows a comparison between ESCOs’ supportable services and other suppliers; services shown in Table 1 and the ESCOs’ work basis provided in Figure 1.

Table 1 Comparison between ESCOs' Supportable Services and other Suppliers

Type of services	ESCOs	Sellers	Contractors	Engineering Companies	Consulting Services Companies
Energy Auditing	*		*	*	*
Design	*		*	*	*
Equipment installation	*	*	*	*	*
Project Management	*		*	*	
Supervision on Performance	*				*
Performance guarantee	*				
Repairing and commissioning	*	*	*	*	
Financial Support	*	*			
Coordination	*	*			

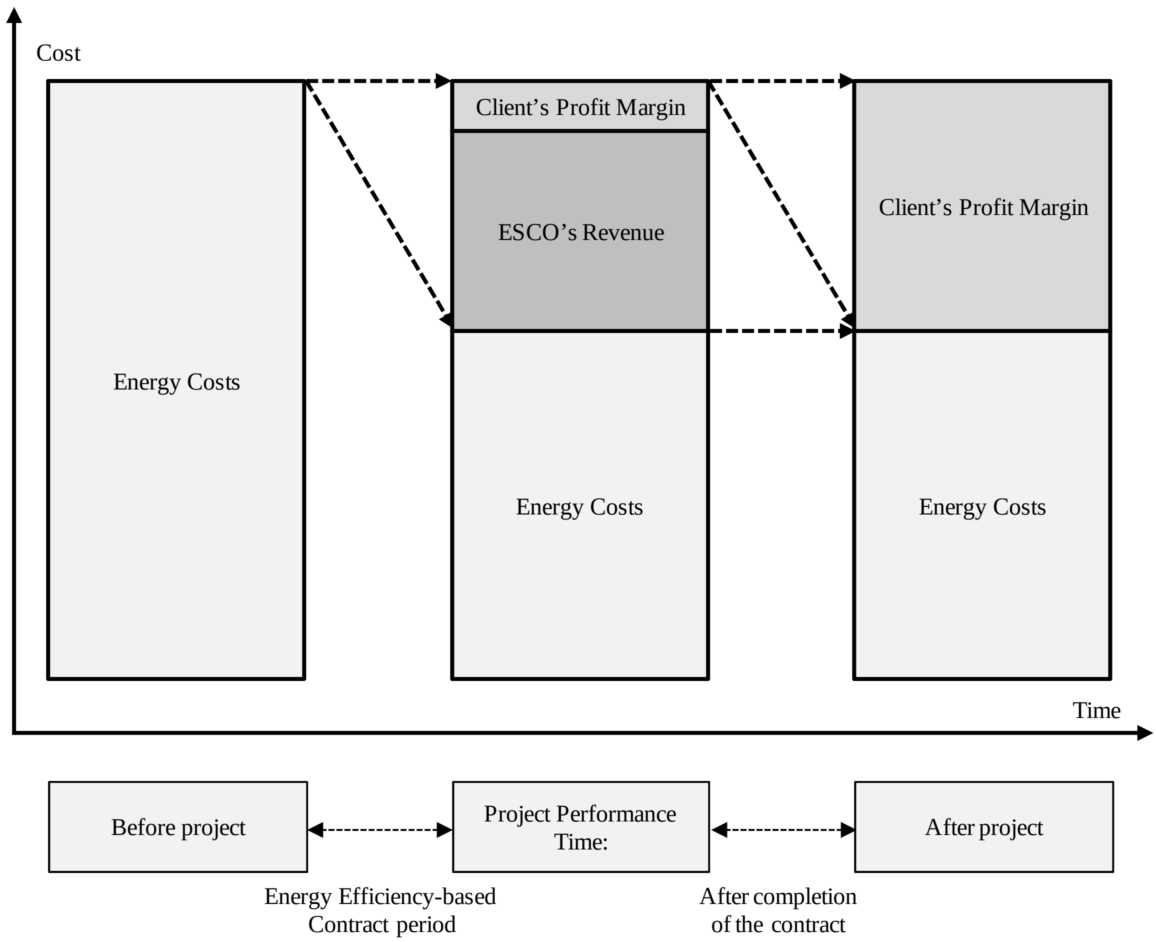


Figure 1 ESCOs' Work Basis

2. Energy Efficiency-based Contract

Energy Efficiency-based Contracts are a comprehensive set including Energy Productivity Promoting Services, Renewable Energy Utilization and DG Projects Implementation. In these contracts, the value of savings derived from implementation of the project, will be sufficient for supporting the project investment costs. Energy Service Company may procure its required services for completion of project through an Energy Efficiency-based Contract. These services include:

- Energy Auditing
- Engineering Design and Development for Energy Efficiency Projects
- Structure Management
- Financial Support to Energy Consuming Optimization Projects
- Commissioning
- Implementation and Maintenance and
- Measurement, Supervision and Verification of energy savings made in project

In an Energy Efficiency-based Contract, the energy service company forms a group of comprehensive measures to satisfy the clients' needs. These measures include:

- Optimization of Lighting Systems,
- Installations, Heating and Air Conditioning,
- Control Systems,
- Improving building roofing (Isolation, roofs, windows and ….),
- Multiple and simultaneous production of heat and power,
- Control or reduction of energy demand
- Using of Renewable Energies and Biomass Projects
- Measuring and reducing consumption in Water and Wastewater Systems

The concept of Energy Efficiency-based Contracts is provided in Figure 2:

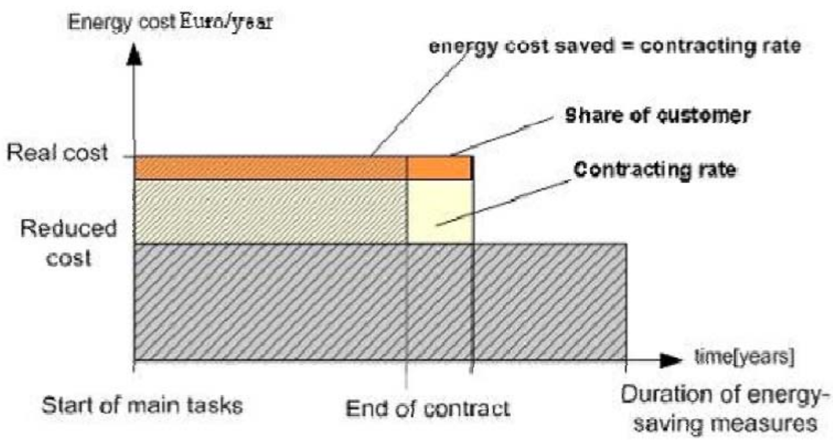


Figure 2 A diagram of concept of Energy Efficiency-based Contract

Energy service companies are the Energy Performance Contracting (EPC). The Implementation process of a project by ESCOs has been outlined in Figure 3:

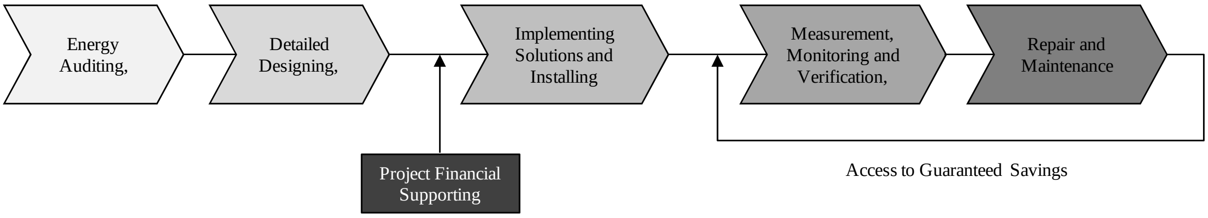


Figure 3 Steps process of an Energy Service Project

Implementation of an energy service project is initially started by conducting an energy auditing within the applicant unit. By energy auditing, the way the unit uses of energy is specified; accordingly, it will be possible to provide and prioritize cost-effective energy saving solutions. Basic and detailed design of the nominated project is developed and the project feasibility studies (engineering and economic) studied in full. Having been consulted with financial and credit institutions, the project financial support provided, then, project implementation process starts and equipment are installed. By monitoring energy consumption and verification of the savings by a neutral organization, the amendment shall be applied on implemented system, if any. In this stage, the guaranteed savings could be examined. Subsequently, having regard to the concluded contract, both parties, ESCO and the Client, will be the beneficiary of the savings made.

ESCOs in response to the demands, are capable to include new measures simultaneously to the project. These companies and their clients behave fairly conservative in selecting technologies for Projects, because the costs and expenses involved in projects have been paid from saving resources and they are almost secured by letter of guarantees. Projects almost financed by long-term debentures / lease contract. Though, some clients can pay, wholly or partially, the costs and expenses of projects contracted under the Energy Efficiency-based Contract from its capital budgeting. In the early prevalence of these contracts credit and financial institutions did not have an accurate understanding of these contracts, and they were not willing to finance the projects, so ESCOs undertook both engineering services and projects financing. Some of ESCOs, due to lacking interests in ordinary distributors to invest in Modern High-efficiency Technologies, are acting as the distributors of High-efficiency products.

The main deference between Energy Service Companies and Energy Services Providers Companies, is the type of financial support provided to an optimization project. Most of the projects include guarantee letters offered by ESCO to the clients in which project saving covers costs and expenses of a long-term project. Form of guarantees varies in different projects because the guarantees designed for clients’ particular requirements as well as countries’ law and regulations.

3. Financing of Energy Efficiency-based Contracts

In general term, Energy Service Projects shall be financed in three forms as described in brief in below:

1. Financing by ESCO which referred to investment by ESCO’s domestic budget using its own capital or funding through bond issue or lease contract. For financing, ESCOs rarely use of shares, because this option limited their capabilities for implementation of projects on a sustainable basis.

2. Financing by client or end user, usually consists of investment by client's internal fund which returned by ESCO's guaranteed energy saving. (eg. A university may use of an Endowment Funds for financing an Energy Project where energy optimization shall be guaranteed by an ESCO).
3. Third party's Finance. In this way, financing shall be conducted in the way of loaning from credit and financial institutions. There are two overall differences in arrangement and regulations of this model with Energy Efficiency-based Contract. The Key difference between them is that which part proceeds to loan: ESCO or its client?
    - The first option: ESCO loans financial resources required for implementation of the project.
    - The second option: Client takes out loan from financial institution and by an Energy Efficiency Guarantee Agreement with Energy Service Company refunds the money. The aim of Efficiency Guarantee is to show to bank that the project for which client took out loan has a positive liquid value. It means that from savings produced by the optimization project the loan repayment is covered. Therefore, energy saving guarantee reduces bank risk which affects the interest rate applied to financial support.

The loaning cost is extremely affected by the borrower's credit size and profile. These two states are presented in Figure 4 and 5.

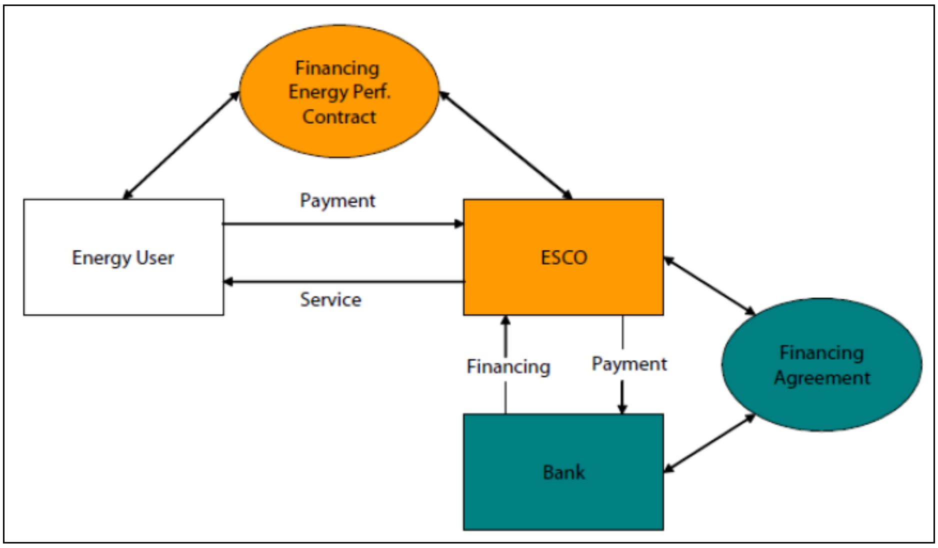


Figure 4 Third party's financial support while ESCO is the borrower

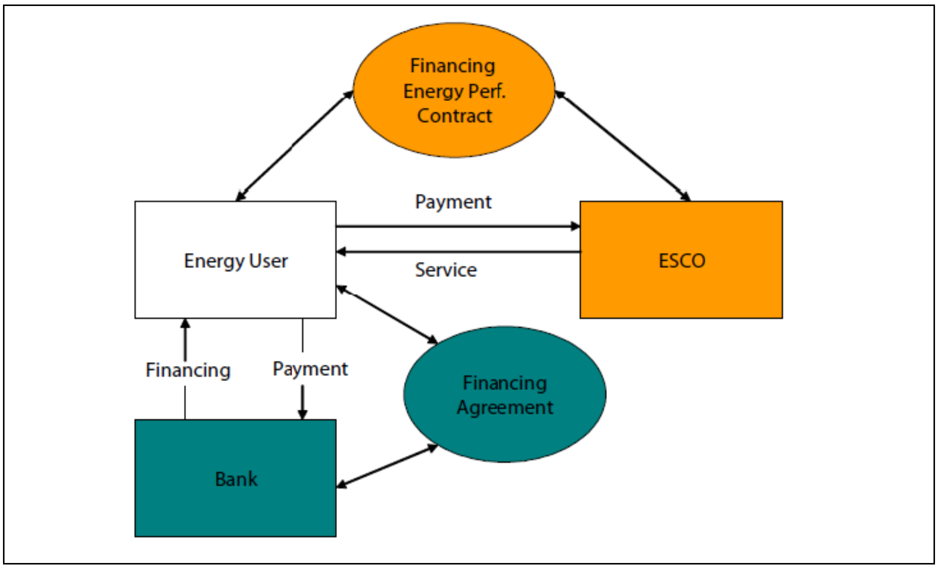


Figure 5 Third party's financial support while the client or the loan end user is the borrower

When ESCO is the borrower, the client protected from financial risks involved in the project technical performance. In this case, savings guarantee provided by ESCO derived from the project value or calculated from ESCO's balance sheet; Therefore, the debt sits on other entity's balance sheet (ESCO or Financial Institutions). Both public and private sector clients benefit from lack of such a financing in their balance sheets, because loaning service considered as an executive expenditure rather than capital liability. Countries apply various terms. For much stronger companies, it is important that liabilities do not represent in balance sheet as loan, it means that the company's capacity for loaning is not filled. Otherwise, financial support terms and conditions are automatically considered as the investment liability.

Large scale ESCO project with high capital and credit rating would prefer rather third party's financing. Because costs and expenses involved in their investment and financing often exceeded than the cost of capital lease in financial markets. Also, if an ESCO takes advantage of a third party's financing, the involved risk will be lower. Energy Efficiency-based Contract needs a Risk Management System and effective ESCOs learns how to use of projects financial structure for risk management.

4. Types of Contract and Project Services

ESCO's contract types and project services are divided in three major categories:

1. Performance-based Agreements (Performance)
2. Non-performance-based Agreements (Non-performance)
3. Consulting Services

In the next pages, each one of these contracts is discussed:

5. Performance-based contracts (Performance),

In the performance-based contract, the project's executor depends on the performances yield from the project. Types of this contract include: Shared savings, Guaranteed savings, and pay-from-savings.

A) Shared Savings Contract

ESCO's contract in big dimensions, are mostly of Performance type in Shared Savings form and these type of contract in ESCO markets, are highly regarded. Figure 6 represents process flow of this type of contract. In this way, the value derived from savings in a certain period of time and predetermined ratio is divided between ESCO and the client.

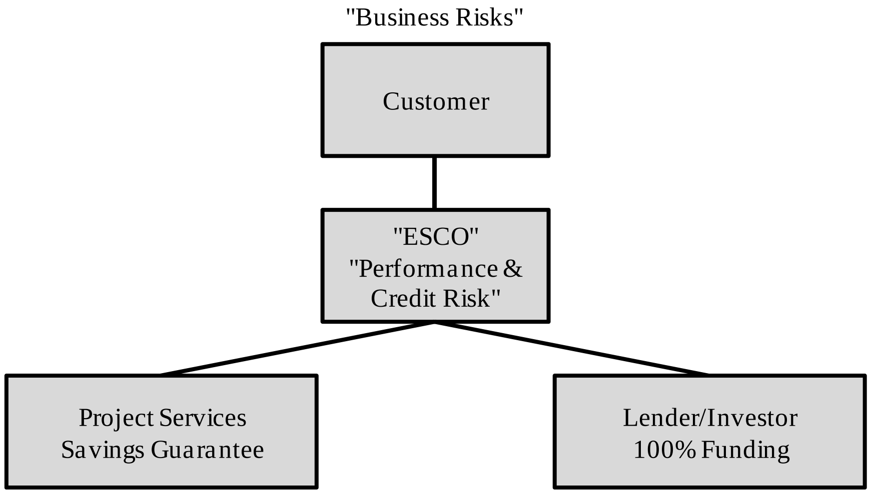


Figure 6 Diagram of Performance-based contracts, Shared Savings

Regarding work process in this method, financing mainly conducted as show in Figure 4 based on method of financing by ESCO from third party. In this way, ESCO must manage both risks involved in efficiency and credit in addition to contract risk.

In these services, an energy-efficiency contract is concluded between ESCO and Energy Consumer; and, ESCO undertakes implementation costs of the project. Depends on terms and conditions, this cost can be paid either by ESCO or paid using loan or facilities obtained from banks and financial enterprises. As shown in Figure 2, the diagram shows how the savings profit is dividing under Shared Savings Contract upon completion of optimization project depending on agreement made in Energy efficiency Contract, a portion of savings profit is given to the energy consumer and the other portion, by the end of contract period, shall be dedicated to ESCO. It is understood that the ESCO's share from the savings profit must be dedicated in the way that the loan repayment, supporting initial investment costs and its interests be covered. These type of contracts are usually concluded for a long term (more than 10 years). It must be added that no standard procedure is available for sharing ratio which determined on mutual agreement and based on factors such as investment amount, contract period, amount of acceptable risk by ESCO or client.

B) Guaranteed Savings Contract

This method is also highly regarded in ESCOs' market. The diagram of this method represented in Figure 7.

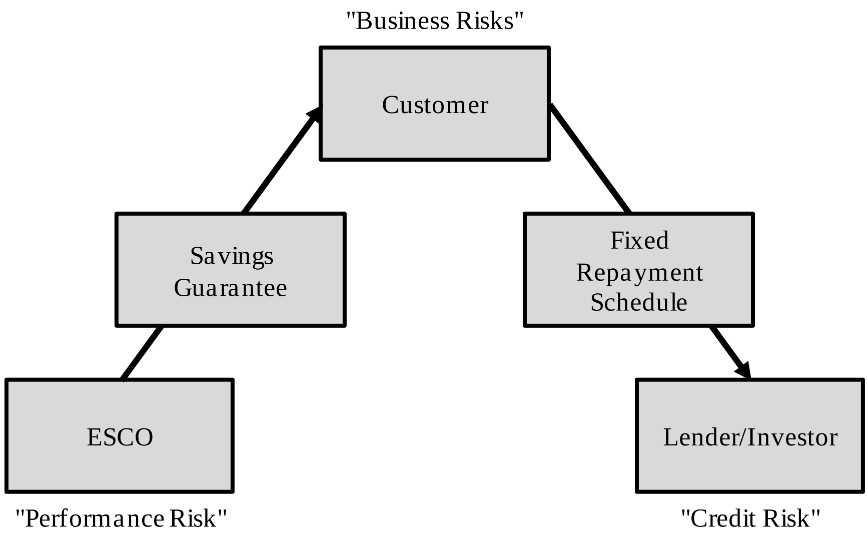


Figure 7 Diagram of Energy Savings Guaranteed Contract

In this way, ESCO guaranteed a certain level of energy saving and accordingly undertakes all risks raising from performance. In other hand, client also covers all risks involved in investment. Having regard to the type of work process, it can be said that this model of contract is mainly available in the financing models offered by client provided by a third party. In these services, an Energy Efficiency Contract is signed and concluded by and between the Energy Consumer and ESCO; accordingly, ESCO guarantees a certain level of energy savings for the consumer. The cost of project is supported by the consumer, which either paid by himself/herself or funded through loaning from a bank or financial corporation. Upon completion of the project, if the guaranteed level of savings is produced, the costs of project as stipulated in the Contract is paid to ESCO. Loan is repaid from the profit generated by savings in energy. Table 2 compares the Guaranteed Saving Contracts and Shared Savings.

Table 2 Compares the Guaranteed Savings and Shared Savings

Shared Savings	Guaranteed Savings
Risks of project efficiency, design and performance are taken by ESCO	Risks of project efficiency, design and performance are taken by ESCO
Funding is provided by ESCO and loan is recorded in Balance Sheet	Funding is provided by the Owner and loan is recorded in Balance Sheet
Performance is measured against the financial savings generated as a result of the energy savings	Performance is measured against the savings
Payment to ESCO is generally varied depending on produced savings and price of energy	Payment to ESCO is generally fixed depending on achievement of the guaranteed savings
Use of leased equipment is allowed	Requirement for providing comprehensive Measurement, Verification and Monitoring Services to make sure guarantee requirements are met
It generally has a high profit	It generally has a low profit

It is understood that innovative financing methods could be used in response to the needs. For example, composing Shared Savings and Guaranteed Savings to the extent that by change in savings the division ratio of profit produced by savings is changed or credits and financial facilities which in general provided by ESCOs in particular projects. Generally, Guaranteed Savings is employed in housing sector and smaller projects in which the user achieves savings to a certain level against funding. In larger projects almost industrial projects Shared Savings is employed due to high investment requirement and also priority of investment in manufacturing development over energy efficiency in these sectors.

C) Pay from Savings

A percent of costs and expensive generated by achieved savings shall be paid to ESCO to indemnify ESCO company investment.

6. Non-performance-based contracts

In Non-performance-based Agreements, remuneration to the project executor not depends on the performance produced by the project and its rate is determined in advance. In Non-performance-based Agreements, contracts are divided to Design/Build; Fee-for-service; Fixed price contracts.

A) Design/Build

ESCO Company conducts project on turnkey basis and payments are made against provision of service. In this way, payment of costs and expenses to ESCO company could be made based on initial offer.

B) Payment based on Services

ESCO Company is remunerated for the services provided during the project period.

C) Fixed-price contracts

Project price for the client shall be notified on a fixed rate by the Energy Service Company.

In certain definitions, Non-efficiency-based projects are not categorized among the Energy Services Companies' projects and it is only the first models acceptable as contracts of ESCO companies.

7. Consulting Services

Consulting Services is of non-performance-based agreements dealing with provision of solutions.

8. Details of ESCO Contracts

Energy Efficiency-based Contracts are a comprehensive set including Energy Productivity Promoting Services, Renewable Energy Utilization and DG Projects Implementation. In these contracts, the value of savings derived from implementation of the project, will be sufficient for supporting the project investment costs. Energy Service Company may procure its required services for completion of project through an Energy Efficiency-based Contract. These services include:

1. Energy Auditing,
2. Engineering Design and Development of Energy Efficiency Projects,
3. Structure Management,
4. Financing of Energy Consuming Optimization Projects,
5. Commissioning,
6. Implementation and Maintenance,
7. Measurement, Supervision and Verification of Energy Savings produced in project.

In an Energy Efficiency-based Contract, the energy service company forms a group of comprehensive measures to satisfy the clients' needs. These measures include:

1. Optimization of Lighting Systems,
2. Installations, Heating and Air Conditioning,
3. Control Systems,
4. Improving building roofing (Isolation, roofs, windows and ….),
5. Multiple and simultaneous production of heat and power,
6. Meeting energy demand,
7. Using of Renewable Energies and Biomass Projects,
8. Measuring and reducing consumption in Water and Wastewater Systems

Implementation of an energy service project is initially started by conducting an energy auditing within the applicant unit. By energy auditing, the way the unit uses of energy is specified; accordingly, it will be possible to provide and prioritize cost-effective energy saving solutions. Basic and detailed design of the nominated project is developed and the project feasibility studies (engineering and economic) studied in full. Having been consulted with financial and credit institutions, the project financial support provided, then, project implementation process starts and equipment are installed. By monitoring energy consumption and verification of the saving by a neutral organization, the amendment shall be applied on implemented system, if any. In this stage, the guaranteed savings could be examined. Subsequently, having regard to the concluded contract, both parties, ESCO and the Client, will be the beneficiary of the savings made.

ESCOs in response to the demands, are capable to include new measures simultaneously to the project. These companies and their clients behave fairly conservative in selecting technologies for Projects, because the costs and expenses involved in projects have been paid from saving resources and they are almost secured by letter of guarantees. Projects almost financed by long-term debentures / lease contract. Though, some clients can pay, wholly or partially, the costs and expenses of projects contracted under the Energy Efficiency-based Contract from its capital budgeting. In the early prevalence of these contracts credit and financial institutions did not have an accurate understanding of these contracts, and they were not willing to finance the projects, so ESCOs undertook both engineering services and projects financing. Some of ESCOs, due to lacking interests in ordinary distributors to invest in Modern High-efficiency Technologies, acting as the distributors of High-efficiency products.

The main deference between Energy Service Companies and Energy Services Providers Companies, is the type of financial support provided to an optimization project. Most of the projects include guarantee letters offered by ESCO to the clients in which project saving covers costs and expenses of a long-term project. Form of guarantees varies in different projects because the guarantees designed for clients' particular requirements as well as countries' law and regulations.

Contracts of and services offered to ESCO projects mentioned in project phase 1, are divided into three general categories:

1. Performance-based Agreements (Performance)
   In performance-based contracts, remuneration to the project executor depends on performance of the project. These contracts include: Shared Savings; Guaranteed Savings; Pay-from-savings.
2. Non-performance-based Agreements
   In Non-performance-based contracts, remuneration to the project executor is not depending on performance of the project and its rate determined in advanced. These contracts include: Design/Build; Fee-for-service; Fixed price contracts. In certain definitions, Non-efficiency-based projects are not categorized among the Energy Services Companies' projects and it is only the first models acceptable as contracts of ESCO companies.
3. Consulting Services

   Consulting Services is of non-performance-based agreements dealing with provision of solutions.

Unspecified Price of Contract

Unlike other contracts, contracts of energy service companies do not bear specified and fixed price, but the amount paid to the company depends on savings produced. In order for determining company's share, consumed energy is measured and specified using appropriate methods and apparatuses. Accordingly, these types of contracts called Efficiency-based Contracts.

No Cost to the Client according to Type of Contract

In general, optimizing measures are highly expensive to the extent that a client with no technical vision, rarely takes its risk. In such a contract in which Energy Service Company personally proceeds to investment, the client pays no money for contract and only takes advantage from the profits of savings. Under any other energy service contracts, client pays no more than savings to the company.

Cut the Costs of Repair and Maintenance

In most contracts concluded based on efficiency by energy service companies, costs of repair and maintenance of newly-installed machinery, wholly or partially, could be undertaken by the service provider company during the contract period.

In addition, during the contract period, Energy Service Company shall provide the maintenance team with the required training so that after completion of the contract period they would be able to keep up with the scheduled repair and maintenance plan.

Standard Job Description

Having no prescribed and standard job description, is of the most important characteristics of the ESCOs' contract in different projects. Most of the clients, particularly those are in certain industrial units or some of administrative organizations with high security priority, deny access to some of its devices or processes for implementing energy consumption optimizing solutions which could extremely affects the contract terms and negotiated agreements. In other hand, considering the vast range of activities could be done by ESCOs and client's unawareness about them, providing an introductory phase of energy consumption entitled "Energy Descriptive Auditing" is essential. Regarding the size and nature of the client, provision of this service by ESCOs could be sometime expensive. Status of this initial expenditure must be taken into account during the project process. Having been conducted Energy Auditing, energy optimizing opportunity and accordingly, ESCO's doable activities will be specified and outlined in negotiation process and job description.

Two main consumers of energy, Industrial and Housing Sectors (Residential, Office Apartments and Shopping Centers), are among the most important and prominent clients of the ESCOs which referred to in other countries' experiments. Accordingly and regarding the fact that the range of ESCO's clients is cleared, there is an opportunity to develop a comprehensive service description and standardization of job description for ESCO companies in any of these sectors which must be agreed upon at the beginning of any negotiation and based on scope of activities of client and ESCO.

Financing

Financial components and capability of active companies, particularly in project contracting and its implementation, play an important role in referral of job and build up of client's trust. Therefore, for energy service companies who provide various services ranging from feasibility studies to implementation of energy consumption optimizing projects, financial capacity is so important. Financial capacity must be taken in to consideration when ESCO companies are assessed and graded. Project financing status has a high effect on the Client and ESCO's entailed risks and the same, on each party's share of energy savings and projects' revenues.

Specifically, in energy service companies, financial capability is not considered alone, that is why these companies may take advantage of so many mechanisms for financing and absorbing financial resources. In general, financing for energy service projects are arranged in three forms set forth below in brief:

1. Financing by ESCO which refers to investment by ESCO's domestic budget using its own capital or funding through bond issue or leasing contract. For financing, ESCOs rarely use of

shares, because this option limited their capabilities for implementation of projects on a sustainable basis.

2. Financing by client or end user, usually consists of investment by client's internal fund which returned by ESCO's guaranteed energy saving. (eg. A university may use of an Endowment Funds for financing an Energy Project where energy optimization shall be guaranteed by an ESCO).
3. Third party's Finance. In this way, financing shall be conducted in the way of loaning from credit and financial institutions. There are two overall differences in arrangement and regulations of this model with Energy Efficiency-based Contract. The Key difference between them is that which part proceeds to loan: ESCO or its client?
    - The first option: ESCO loans financial resources required for implementation of the project.
    - The second option: Client takes out loan from financial institution and by an Energy Efficiency Guarantee Agreement with Energy Service Company refunds the money. The aim of Efficiency Guarantee is to show to bank that the project for which client took out loan has a positive turnover. It means that from savings produced by the optimizing project the loan repayment is covered. Therefore, energy saving guarantee reduces bank risk which affects the interest rate applied to financial support.

The loaning cost is extremely affected by the borrower's credit size and profile. When ESCO is the borrower, the client avoided from financial risks involved in the project technical performance. In this case, guaranteed savings provided by ESCO derived from the project value or calculated from ESCO's balance sheet; Therefore, the debt is mentioned in other entity's balance sheet (ESCO or Financial Institutions). Both public and private sector clients benefitting from lack of such a financing record in their balance sheets, because loaning service considered as an executive expenditure rather than capital liability. Countries apply various terms. For much stronger companies, it is important that liabilities not mentioned as loan in balance sheet, it means that the company's capacity for loaning is not filled, otherwise, financing terms and conditions are automatically considered as the investment liability.

Large scale ESCO project with high capital and credit rating would prefer rather third party's financing, because costs and expenses involved in their investment and financing often exceeded than the cost of leasing of capital from financial markets. Also, if an ESCO takes advantage of a third party's financing, involved risk will be lower. Energy Efficiency-based Contract needs a Risk Management System and effective ESCOs learns how to use of projects financial structure for risk management.

Essentially, the main factor in classifying projects, is the project financing. One of the most important problems the developing countries facing with is the way in which financial resources and required funding procured for infrastructure projects and using of products and services produced by them. Considering special status of developing countries and financial crises these countries go through, financing required for implementation of large projects cannot be easily arranged; therefore, use of foreign investment is tabled. Foreign investment absorbed in two ways, borrowing or investment.

Borrowing

In this method, the investee country receives a loan from investor country or institution and become obliged to repay the loan installments to the investor on due dates. In this way, investor country or bank, does not take any risk and the investee country entails all risks.

Finance

Finance or financial facilities, is a credit that the Central Bank pays from foreign states banks (on credit of the central bank of the buying country). This credit offered on time and interest rate and for which the buying country obliged to buy the creditor country products. In other word, in this way, the required capital for implementation of a specified commercial project is supported by a foreign credit institution or bank. Central Bank of buying country, undertakes to indemnify the investor party's damages. It is also fixed an annual interest which rate determined according to the economic conditions and the degree of risk of the investee country which determined at the time the credit is offered. In general term, finance is used for financial support of projects in two ways, Autonomous and Non-autonomous.

International Loans

This method referred to particular and conditional arrangements made for using of the loan and applies controlling measurements on the way the loan is spent during the period of time the project implemented. In this case, there had to be conducted the feasibility studies required by the lending institutions, accordingly, the technical and economic aspects of the project must be accepted by the lending institutions.

Considering the consequences of financing procedure on project final price, as well as, the involved risks, financing in ESCO's contracts must be explicitly and clearly stipulated and duly deciding on.

9. Measurement and Verification (M&V)

Measurement and verification known as M&V, is an Independent Analysis conducted on energy efficiency examines the alleging saved energy from demand side. International Performance Measures and Verification Protocol (IPMVP) is protected by Ministry of Energy of the United States of America, and a broad alliance consisting of owners of the centers or operators, investors, contractors, ESCOs and shareholders. Measurement of energy consumption saving includes measurement of saved fuel, water productivity measurement, change in load and reduction of energy through retrofitting of the equipment or modification of operational processes covered by this protocol.

Measurement and Verification Protocol Committee, is currently an Efficiency Valuating Organization (NGO) developing products and services to help below-mentioned items:

1. Measuring and Verifying Water and Energy Savings and the water saved in retrofitting stage or structure of water or energy productivity.
2. Managing financial risks of contracts based on energy efficiency
3. Determining the reduction in pollutant gas emission from energy productivity projects
4. Expansion of green and sustainable buildings through accurate and profitable analysis of water and energy savings.

But the question is how to certain that after completion of an Energy Productivity Project, saving in costs is made? The purpose of this protocol is to answer to this question. Protocol procures a measurement and verification framework for clearing water and energy savings obtained as a result of Energy Productivity Program. This framework is used as an Industrial Standard for verification of the savings achieved. This manual in a section has developed concepts and options for verification of savings and in other sections dealt with monitoring efficiency of renewable energy systems and improving environmental quality of buildings.

Measurement and verification protocol is a profile of the best techniques available for verifying the results of energy productivity and renewable energy projects.

The question addressed above, necessarily states risks involved in energy productivity measurement without efficiency. Since, the measurement and verification could be expensive, it is essential to adjust the measurement and verification strategy with the level of risk. In the most energy productivity projects, payment to contractors is made based on the amount of savings as a result of various measurements made on energy productivity, using of this protocol is a standard.

There is a simple formula for measurement of savings:

Energy Savings = Base Year Energy Use – Post Retrofit Energy Use +/- Adjustment

Knowing this point is so important, "where these figures come from" and "How these adjustments will be made". Adjustments (significant change in square meter of occupancy, weather differences, operational hours, and other loads did not exist in base year), provide a more realistic comparison of post-retrofit conditions to those of the base year. In these factors are left unaccounted for, it is possible that any realized savings would be improperly calculated.

There are different scenarios for measuring savings. Due to significant effect of measurement procedure designation on project final price, these items must be explicitly outlined in public or private terms of ESCO's contracts.

Considering International Protocol of Measurement and Verification, it is understood that a central measurement and verification for appropriate saving method, is essential in verification. Measurement and Verification Project, conceptually provides definition for savings in any project and must includes:

1. Definition of energy saving measures and the desirable results
2. General profile of protocol options including the measures and verification applied; formulating of measurements and verification measures or data of basic operational year, develop of energy saving plan and the saving boundaries.
3. Measurement methods and devices must be used
4. Commissioning, measurements and verification have recently been conducted
5. Formulating energy and operational data and post-measurement and verification operations
6. Saving reports
7. Operational costs and measurement and verification equipment

International Performance Measures and Verification Protocol procures a comprehensive list of elements must be available in a measurement and verification plan based on nature of project.

Without taking into account the used strategy of measurement and verification, the similar steps are taken for potential verification of guaranteed saved energy, which are itemized as follow:

1. Base conditions must be accurately defined which is a portion of technical energy auditing including all conditions needed for proving of guaranteed savings, before and after implementation.
2. A project special measurement and verification plan must be developed through negotiations. This plan is the most important factor in a guaranteed saving program which includes all details pertaining to energy saving measures.
3. Post-installation verification in which systems and devices are properly installed, and then, ESCO and Agency are verified. This verification is made for ensuring the proper performances of devices whether has the required potential for production of energy savings forecasted.
4. Verification of efficiency period. The period for the first time covering at least, 2 to 3 years post-installation period that ESCO must produce and forward an annual report of actual energy savings achieved. This report must cover the result or index of measurements and efficiency inspections, savings produced for the year, differentiate of actual savings and guaranteed amount and savings analysis, details of each efficiency program, the problem raised in repair and maintenance which required more attention, …

10. ESCO Contracts Components

Accordingly, the effective details of ESCO's contracts must be taken in to consideration in uniform contracts of these companies and clearly and quantitatively stipulated as follow. It must be mentioning that the general items available in all contracts will be considered the default and there are subsections which must be added to typical contracts like uniform Design and Development Contract.

Details of ESCO Contracts

In case of being edited and become binding an Assessment and Grading System for Energy Service Companies, these companies are examined and assessed against different indexes including facilities and equipment, information, technology and knowhow, specialized man power and financial resources for investment required for providing and performing special and appropriate solutions, as well as, skills and required capabilities for design and engineering, procurement, installation and commissioning, repair and maintenance of equipment and required software required for reaching to energy efficiency improvement and control, reduction and saving in consumption of energy and water. This assessment brings peace of mind for both employers and clients for job referral to these companies and creates appropriate ground for systematic activities. In following lines, the most important components which must be foreseen in the contracts of energy service companies under the public and private service descriptions, are provided:

Subject of the Contract

Subject of the contract covers certain activities the agreement thereof must be negotiated before the contract is concluded. Editing of standard job description to uniform subjects of ESCO contracts is essential. If the standard job description is served following energy transitional audit of the applicant's unit (client) there is an opportunity to hold a meeting for reaching to an agreement on paragraphs of the approved service descriptions.

In general, service description of these contracts can be included with a set of actions and activities such as:

1. Evaluation of energy auditing report,
2. Render of consulting and provision of engineering analysis
3. Provision of particular and commercial solutions practically for control, reduction, and producing saving in consumption of energy and water
4. Design and engineering services
5. Financial investment
6. Procure, supply and produce of instruments and software in full
7. Installation, commissioning and delivery
8. Guarantee the amount of saving
9. Monitoring
10. Provision of repair and maintenance, modification and retrofitting activities
11. Provision of training to the employer's staff
12. Other actions and activities

Standardized service description must be agreed upon and set out in one of the appendices of the contract.

Contract period

Period and rate of return on capital are two key factors that an energy service company using for making decision whether enters into a contract. Period of contract has a direct effect on these two factors, so, an initial agreement must be negotiated on. It must be added that in ESCO's contracts there are two types of contract period:

1. Implementation period of retrofitting project
2. Maintenance period of the contract and repayment of costs (guarantee and follow up of project performance)

These two periods must be outlined in Schedule Plan and take into consideration an actual estimation, in the form of Schedule Plan, on contracts appendices and both parties reach an agreement on. Description of activities and both parties' obligations in each one of these two periods must be cleared specifically.

Price of Contract

Being unspecified the price at the beginning of the contract, is one of the most important aspects and features of ESCO Contracts. Change in price of project costing items is mainly borne by the ESCO which brings about change in profitability, period of contract and rate of return on investment of the project (eg. Change in the price of foreign currencies occurred in the recent years, raising energy price which mainly were in the scope of authorities of the Government rather than companies and clients, may changed time to time. Energy price raising in a positive direction, boosts cost-effective aspect of ESCO's projects).

Therefore, an agreement letter as an appendix must be incorporated into ESCO's contract, in which fundamentals, calculation method and payment method of contract price is laid down in, and there must be incorporated in subsequences of change in prices, exchange rate and purchasing in foreign currencies to such an extent that in an appropriate way, expectations of both parties are satisfied.

Legal and other Requirements

Legal requirements including personnel and staff's insurance coverage, Staff Intervention Ban, Direct Tax and the requirements specified by the employer such as HSE requirements, requirements urging employees to comply with work environment prestige, certificates and work permits requirements, confidentiality of information, assignment and transfer to third parties, …. must be agreed upon and observed.

Intellectual Property Rights

In addition to financial capability and engineering knowledge, ESCO companies employ their creative ideas and initiatives in the projects to achieve more desirable results. Client's role is so effective in this process and typically, under joint cooperation, these initiatives find operational ground and get implemented. Parties must reach to an agreement on Intellectual Property Rights of these projects, and their agreement must be registered.

It is also to determine the status and share of expenditures related to royalties, intellectual property rights, authorizations for using of licensors' rights and patents and permissions, verifications, assessments, controls required and essential for implementing and completing of the subject of contract.

Terms of Revocation, Termination or Expiration of Contract

If under any circumstances, parties to the contract unable to keep the contract up, there must be laid down in contract certain provisions keeping both parties harmless. These provisions must be formulated in initial agreements and stipulated in the contract.

Guarantees

Contributions of both ESCO and Client are of highly importance in ESCO contracts. On the one hand, client has made available its production line, facilities and installations to the ESCO, and any destruction or malfunction in their performances could cause irreparable damages to the client; and on the other hand, ESCO company a huge costs and expenses occurred to ESCO company for implementing the project and providing the project with engineering services and manpower. Receiving two-sided guarantees for reassuring purposes is essential. These assurances may be partially or wholly equal to the value of either contract, project or equipment in form of banking guarantees.

Parties' Obligations

Regarding the fact the ESCO Contracts are almost on trust and creditability; and the client and ESCO entering in to partnership based on the other party's creditability, so, both parties' obligations shall be mentioned in the contract as their commitments. Regarding the executive and financial cohesions in these projects, both parties' obligations shall be of more credit and importance in these contracts.

Disputes Settlement Authority

Considering some uncertainties in the subjects and service descriptions of the contract, as well as price and financial liabilities, savings produced, savings value, measurement and verifications and more importantly, unavoidable risks involved in technical and financial aspects of the ESCO's projects, it is essential that the dispute settlement authority be determined for the event any dispute raises. The authority must basically be familiar with updated legal concepts, the technical and financial views of ESCO's projects and understood their concepts.

Confirming Executive Projects Details

In terms of amount of savings, investment costs and level of technical and technological complexities, retrofitting measures and savings solutions are not weighing the same. Taking client's conformation on development of solutions is mandatory. However, the surface and deep extents of the projects are of the items which must be agreed upon. In other word, for some projects confirmation of title is sufficient, in fact for other projects verification and approval of maps, technical documents and execution details are required.

Measurement and Stipulations

Upon implementation of retrofitting project, guaranteed savings period is started. Formulation, confirmation and approval of an appropriate methodology which represents amounts of water and energy savings produced by ESCO's saving solutions, is essential at the beginning of this stage.

In industrial units, there are several factors effective in energy consumption including level of production, climatic conditions, material and quality of raw materials input, operational terms, number of production pauses, fuel quality, repair and maintenance conditions of equipment, life and durability of equipment, process and energy requirement profile of the organization effective in energy consumption. In buildings, there are also different factors effective in energy consumption level including the number of users, climatic conditions, heating and cooling required on degree/day basis, utilization terms, life and durability conditions of main equipment, repair and maintenance conditions, and energy requirement profile of the organization.

Methodology of measurement and verification must be capable to provide an accurate estimation of the level of organization energy requirement for being recognizable the ESCO's activities contribution to the next stage when the Energy Performance Retrofitting Project is implemented. According to the energy consumption baseline, this methodology could be subject to measurement and agreement based on effective factors on energy consumption, systems and measurement equipment or counters, analytic methods and other confirmed methodologies.

Measurements are used to confirm the equipment performances and represents that the saving could be achieved. Generally, one or two group of measurements shall be conducted and the results thereof are verbally mentioned in the contract concluded by both parties. If it is not anticipated that the desired parameter modifies subsequent installations and implementations, another measurement shall be conducted. If it is anticipated that the said parameter, modifies the subsequent installation and implementation, two measurements are conducted before and after installation and implementation. Instead of measurements, some of variables will be based on contributions and shall be mentioned, expressly and explicitly, in the contract as stipulation. In these events, an agreement is reached by all parties which assumed fixed within the whole period of the contract or project.

Stipulation is provided as keeping fixed a parameter, without any consideration to the actual quantity of that during the contract period. Stipulation in measurement and verification program of an agreement between ESCO and Agency, is for acceptance of a defined quantity of a special factor such as operation hours which is guaranteed for determination of base energy consumption and after installation and implementation, is applied for calculating the guaranteed savings that the calculated quantity must be close to the actual quantity and as a result, having omitted the measurement process, savings be produced in costs and expenses. According to the realistic information resources, the rejected values must be traceable and documented. Such as:

1. Table of standard lightings extracted from recognized resources,
2. Characteristics of the Producer
3. Building operation time table
4. Documents pertaining to repair and maintenance
5. Efficiency curve published by national organizations
6. Climatic data extracted from the state's agencies

The resources of the conditioned values must be edited in the measurements and verification programs. Even while the conditioned value applying for the measurements, yet verification of equipment performance must regularly (Technical y and potentially for implementation) be applied and the accepted derivation of results from the guaranteed value of savings as well as, measurement period must be set out in this section. It is highly important that the Dispute Settlement Authority and Third party's Confirmation terms be mentioned in this section.

Third Party's Conformation

Based on IPMVP, the client, in association with a professional consultant, is entitled to examine and review the report related to Energy Savings Project. This service must be conducted in beginning of the M&V process. It is very important that the beneficiary parties to the contract (the Client and ESCO), guaranteed savings contract in particular, believing that the payments are made in an appropriate and accurate manner.

Evaluation of the Saved Resources

One part of IPMVP pertains to Energy Price which stipulated as follow:

The value of the energy savings produced by project may be set aside in accordance with the price of any energy item with selling price. The price of energy item must be based on the energy priced by the supplier or a clear simplified method. Appropriate simplifying uses of the final prices which included all effective items on the invoice including costs of electricity power, demand, transformation credit, power factor, …

Defining and clarifying of the evaluation method of the saved resources in ESCO's contracts are very important for the beneficiary parties to contract (the Client and ESCO) particularly, guaranteed savings contracts, and is influential in conclusion or not conclusion of the contract.

Repair and Maintenance

Preventive repair and maintenance of energy has an important role in reduction of operational costs of the equipment. In other word, if an organization purchases the most efficient equipment and in time of operation its operational conditions are not appropriate, the organization will be faced with the consequences thereof in the raise of energy consumption fee. Keeping equipment in the highest efficiency conditions, is the desirable objective of the maintenance section. Concerning the equipment reaching to the end of life during the guaranteed savings period, or due to any reason required to be repaired or replaced, the fact must be stipulated in the contract clearly. Considering the Client and ESCO's joint objective to keep the organization in the best operational conditions and lowest level of energy consumption, providing repair and maintenance service to the organization during the guaranteed energy saving period is essential. Providing repair and maintenance services and its effect on failing to reach to the savings milestones and parties' attitudes toward collected guarantees must be outlined in the contract clearly.

Insurance

On insurance coverage, there are three different aspects considered:

1. Insurance coverage for Personnel and Staff's Civil Liability. Under article 38 of Social Security Act, ESCO Company must provide Civil Liability Insurance coverage for its staff.
2. Insurance coverage for equipment and installations erected by the ESCO: ESCO Company shall purchase adequate insurance coverage for equipment and supplies have bought and installed in the Energy Efficiency Optimization Project. Investment Policies in this section could be more profitable.
3. Insurance coverage against damage to the employer's installations and facilities: the payment obligation of the costs involved in provision of Liability Insurance Coverage for indemnifying the employer against the loss derived from damaging installations and facilities as a result of implementing energy savings solutions, must be determined. These insurance coverage must be purchased in favor of and through making arrangement with employer and prior to installation and implementation operation is delivered to the employer.

Under article 2 of the By-law, note 2 of article 134 of the Fifth Development Act, the term of insurance is defined as set forth below:

Article 2 – the company shall provide Liability Insurance Coverage for indemnifying the employer against any damage incurred to its installations and facilities as a result of the execution of the contract, if any; and be authorized to provide Investment Insurance Coverage too.

Note: Investment Policies as acceptable securities, which could be used for Energy Service Contracts.

Accordingly, and for covering probable risks involved in implementation of energy savings solutions, there must be prepared a list of probable risks in accordance with phasing and time scheduling plan facing execution of the contract; and concerning insurance coverage, deciding on payment of the costs and management them and being attached to the contract as an appendix.

Risks, Losses, Damages and Hazards

One of the main objectives of Measurement and Verification, is to reduce the level of risk to an acceptable level based on Agency's priorities and preferences. In Energy Efficiency-based contracts, risks created on both parties, ESCO and the Owner. The risks are calculated through a precise Measurement and Verification Strategies.

Risk in sense of Measurement and Verification, is attributed to the uncertainty that the anticipated savings is realized or not; assumption of risk, paving acceptance of potential financial consequences. Both parties, ESCO and Agency, do not tend to accept any responsibility for such factors are out of their control. Therefore, asserting cleared parameters in measurement and verification program may give each party responsibility for the parameters are well controlled. For example, Factors under the control of agency including operating hours in daylight and set point of thermostats which are usually specified. Efficiency risk resulted by uncertainty in associated with features of a special level of equipment performance. Ultimately, ESCO is responsible for selection, application, design and equipment efficiency operation and usually takes the responsibilities for achieving energy savings using efficient equipment. For efficiency credibility, ESCO should represent that the equipment operating as they designated for and are capable for the guaranteed savings.

Both parties' responsibilities in taking on the contract loss and damages risks until the final delivery of the subject of the contract considering in to account the guaranteed savings period and project performance, must be specified.

Using of different policies such as Liability Insurance Policy, Investment Insurance Policy, shall cover all damages, losses and harms to the employer's installations, machines and ESCO's investment.

Training

Training plays an important role in the energy savings programs of the organizations. Accordingly, providing specialized training to the ESCO's personnel occupied in any project as well as, provision of the required training to the employer's personnel is essential and both parties' obligations and manner of calculation of its costs and expensive must be agreed upon in the contract. The responsibility for failing to provide such a training or inadequate training must be set aside in agreements.

Force Majeure Events

In accordance with clauses set out in other engineering contracts, this clause must be available in Energy Service Companies' contract and making a proper decision on both parties' contributions, securities, insurance policies and obligations. Referral terms in force majeure must be mentioned in contract clearly.

11. Activities and Executable Projects by ESCO

The titles of executable projects by ESCOs have been provided through Table 3 to 5. It must be added that it is impossible for all users to use of these projects as a general prescription that energy saving optimization solutions in any organization shall be produced by conducting detailed energy auditing.

Table 3 ESCOs' Executable Projects in Industry Sector

Type of Solutions	Titles
Low-costs Solutions	- Insulation of Heating Surfaces
	- Regulation of Air to Fuel Ratio in Combustion Processes
	- Management of Electrical Energy Usage Load
	- Management of Energy Tariff
	- Establishment of Energy Management System based on ISO 50001
	- Application of Energy Preventive Repair and Maintenance
	- Production of Low-cost Solutions for different systems: Examine pressure drop in production and distribution network of compressed air and steam, cleaning of heating surfaces in boilers
	- Constant Monitoring and Measuring of Systems Energy Consumption
Average Costs Solutions	- Use of Equipment with Higher Electrical and Thermal Efficiency
	- Analysis and Control of Combustion System with Constant Monitoring of Combustion-emitted Gas
	- Optimization of Steam Systems
	- Optimization of Compressed Air Systems
	- Optimization of Process Furnaces and Heating Systems
	- Use of Renewable Energy Technology and Equipment, specially Solar
	- Use of Variable Speed Driver and Control Norms in Electric Systems
Costly Solutions	- Use of CHP Systems
	- Improvement and Optimization of Production Process
	- Renewable Energy Power Generation Projects
	- Waste Heat Recovery Projects (WHR)

Table 4 ESCOs' Executable Projects in Buildings

Type of Solutions	Titles
Low-costs Solutions	- Establishment of Energy Management System based on ISO 50001
	- Constant Monitoring and Measuring of System Energy Consumption
	- Regulation of Air to Fuel Ratio in Combustion Processes
	- Cleaning Heating Surfaces in Boilers and Chillers
	- Preventive Energy Repair and Maintenance
	- Management of Electric Energy Consumption Load
	- Management of Energy Tariff
	- Insulation of Heating Surfaces
	- Energy Sustainable Architecture
	- Application of Sealants
Average Costs Solutions	- Use of Renewable Energy Technology and Equipment, specially Solar
	- Analysis and Control of Combustion System with Constant Monitoring of Combustion-emitted Gas
	- Use of Equipment with Higher Electrical and Thermal Efficiency
	- Use of Smart Control Systems of Engine Room
	- Use of Window Film in Building Windows
	- Maximum use of Natural Day-light
	- Optimization of Lighting Energy
Costly Solutions	- Replacing Available Cooling Systems with VRF Cooling System
	- Installation of Double-glass Windows with UPVC frame
	- Use of CHP System

Table 5 ESCOs' Executable Projects in Transportation Sector

Type of Solutions	Titles
Low-costs Solutions	- Replacement of Exhausted Parts affecting Vehicle Energy Consumption
	- Preventive Repair and Maintenance of Vehicles
	- Vehicles Fuel Change
	- Training and Fostering Culture
Average Costs Solutions	- Replacement of Efficient Vehicles with Available Inefficient Vehicles
	- Optimization of Vehicle Engines Technologies
	- Optimization of Vehicle Manufacturing Methods
	- Manufacture of Hybrid Vehicles
Costly Solutions	- Optimization of Transportation Systems
	- Development of Rail Transport

12. Standard Service Description for Activity of Energy Service Companies

Energy Service Companies under a specified system that interactive with other beneficiaries, conduct Energy Saving Projects. What is certain, reduction of energy costs in an organization is not such a subject that achievable through a single project. But in general, a project under the title of Energy Consumption Optimization must be developed in any organization, which essentially has many sub-projects. These sub-projects can cover a range of stages from studies and design to purchasing, installation and implementation.

Regarding the fact that the responsibility of energy auditing with investment degree as well as, edition of M&V Project has been placed on Energy Optimization Consulting Company, it shall be provided with a Standard Service Description for them.

Methodologies of ESCOs' activities in Building and Transportation sectors are similar, but only activities of these companies in each group varied over the effective factors on energy consumption, costs, return on investment period, risk management, insurance and energy saving solutions those are taken into consideration and clarifies in private terms of the contracts according to the requirements of each item.

ESCO's Service Description includes implementation of optimization project notified in tender documents. The service description in the subject-matter of contract shall be mentioned in Energy Performance Contract and could be divided in to lower levels of activity, if required. It must be added that from the beginning of each project, M&V Project (1 out of 4 main options) of that project must be specified and confirmed by ESCO and the Client. Accordingly, the syllabuses of the service description of Energy Efficiency Contract shall be provided as follow:

- Rendering Energy Savings Consulting;
- Conducting Studies and Engineering Analysis;
- Providing Basic and Detailed Design Services;
- Supplying Goods, Equipment and Parts;
- Design and Manufacture of the Required Equipment

- Financial Management and Investment
- Provide Energy Consumption Optimization Solutions;
- Installation, Commissioning and Delivery
- Procure, Supply / Development of the Required Software
- Guaranteeing Energy Saving
- Monitoring
- Training
- Developing Energy Repair and Maintenance System

It ‘s worth mentioning that based on the nature of ESCO Contract which are similar to EPC in Industrial and Non-industrial Sectors, the executive regulations of design and development method of State’s Engineering Order could be referred to in this connection. If the client needs to use of a consultant services in this job, service description of the Employer’s Consultant in Design and Development case, has been stipulated in this regulations and can be referred to.

Regarding provided items, standard service description of ESCO Companies in different sectors are provided as follow. It must be added that provided activities are practicable in all sectors, however, severity, dept and attention level to them, in different sectors are different. Here, not being specified an activity for one sector does not mean that it has no priority in that sector.

Table 6 ESCO Service Description in Different Sectors Projects

Phasing		Description	Building	Industry	Processing Industries & Power Plants
Phase I	Formulation of Basket of Practicable Projects				
	1-1	Analysis of Energy Auditing Results	*	*	*
	1-2	Analysis of Energy Auditing if required		*	*
	1-3	Identifying Prioritized Project to Implement		*	*
	1-4	Determining and Finalizing Project to Client	*	*	*
	1-5	Finalizing M&V Option for the projects have been finalized in association with the Client and Optimization Consulting Engineers, if required	*	*	*
	1-6	Formulation of Basket of Practicable Projects to Implement	*	*	*
Phase II	Financial Management and Investment				
	2-1	Formulation of Feasibility Study Packages (Economic and Engineering) for Designated Projects	*	*	*
	2-2	Interaction with Financial and Investment Organization (National and International)		*	*
	2-3	Conclusion of Financial Memorandum of Understanding		*	*
	2-4	Financial Management and Investment	*	*	*
	2-5	Formulation of Financial Balance Sheet of Projects	*	*	*
	2-6	Guarantee of Energy Saving	*	*	*
Phase III	Engineering Analysis, Detailed and Basic Design, Manufacture and Supply of Equipment of Basket Projects				
	3-1	Providing Expert Team of Detailed and Basic Design		*	*
	3-2	Supplying Goods, Equipment and Parts	*	*	*
	3-3	Design and Manufacture of the Required Equipment		*	*
	3-4	Procure, Supply / Development of the Required Software	*	*	*
	3-5	Installation, Commissioning and Delivery	*	*	*
Phase IV	Confirmation of Measurement and Verification				
	4-1	Adjust Projects with M&V Procedures in association with the Client and Optimization Consulting Engineers, if required	*	*	*
	4-2	Examination and Confirmation of the amount of Energy Saved	*	*	*

13. Standard Service Description of Consulting Engineers Companies for Energy Optimization

Consulting Engineers Companies for Energy Optimization are responsible for energy auditing and preparation of tender documents for implementing energy optimization project in an organization. They have also the duty of measurement and verification. This duty through a Supervision Contract based on Measurement and Verification Protocol, becomes conductible.

Table 7 Description of Energy Detailed Auditing and Formulation of Tender Documentation

Phase I	Studies, Initial Examination and Information Collection	
	1-1	Identification and Examination of Installations and Facilities of the Energy Consuming Organization through Perception
	1-2	Collection of Information Records of Heating and Electrical Energy Consumption related to Preceding 3 years (through Analysis of Bills)
	1-3	Analysis of Information of Energy Consumption and Determination of Particular Consumption of Heating and Electrical Energy
	1-4	Examination of Effective Parameters on Energy Consumption of an Organization
	1-5	Edition of the Organization Energy Baseline considering Consumption Records and Effective Parameters
	1-6	Comparison of the Energy Consumption of the Organization with Standard Amount and Conducting of Gap Analysis
	1-7	Examination of Performance Records of Energy Management Unit (Energy Management Matrix)
Phase II	Measurement of Electrical and Mechanical Parameters	
	2-1	Preparation and Edition of Energy Auditing Checklists
	2-2	Collection of Information and Technical Documentations related to Performances of Different Sectors of the Organization Consuming Energy
	2-3	Measurement of Mechanical and Electrical Parameters of main Energy Consuming Equipment
	2-4	Completion of Energy Auditing Checklists and Analysis of Information Collected on Energy Items
	2-5	Determination of Performance Indexes of Organization Energy
Phase III	Information Processing and Provision of Solutions	
	3-1	Processing of Data obtained from Measurements conducted for Identification of Energy Waste Points and the degree of wasting in them.
	3-2	Determination of Reduction Practical Potential in Energy Consumption of the Organization
	3-3	Provision of Energy Consumption Optimizing Solutions in Different Sectors of the Organization on Energy Items, Consumption and Energy Application
	3-4	Engineering and Economic Assessment of the Provided Solutions
	3-5	Provision of Final Report on Energy Auditing
Phase IV	Formulation of Tender Documentations	
	4-1	Formulation of Optimizing Project for Energy Consumption of the Organization in association with Energy Management Unit members, including: - Description for Optimizing of Energy Consumption - Assessment of Investment Costs - Assessment of amount of Energy Saving - Assessment of Contract Period - Assessment of Rate of Return on Investment - Assessment of Parties' Share
	4-2	Formulation of Tender Documentation
Phase V	5-1	Collaboration in Edition of M&V Project for the Project confirmed by the Client and ESCO

14. Legal Provisions Pertaining to Energy Service Companies

Article 17: Amendment to Consumption Model:

In order for protecting of Energy service Companies, based on joint proposal of the Ministry of Petroleum, Energy, Economic and Financial Affairs, President's Planning Deputy and Strategic Supervision, Ministers' Council ordered to formulate the required procedures which adequately motivates formation and development of these types of companies throughout the country and enacting it within six months after enactment of this act. Financial resources for implementation of this article will be supported from article (37) of this act. Also, executive organizations, subject-matter of article (4) of Civil Service Act may create obligation for conclusion of energy saving contracts from the produced savings and proceed to from credit resource of article 73 and yield savings.

Article 73: Amendment Act of Consumption Model:

In order for protecting implementation of Consumption Optimization Solutions, and promotion of Energy Efficiency in framework of objectives and provisions laid down in this act, hereby, Ministries of Petroleum and Energy shall be authorized to acquire the required financial facilities from savings produced by this act, annual budgets, internal resources and affiliated companies. The amount of financial facilities mentioned in this article shall be determined by Supreme Council of Energy.

Article 134: 5th Development Program Act

In order for applying saving measurements, encouraging and protecting of consumers in line with making logic and modify electricity power and energy consumption models, preserving country's energy reservoirs and protecting environment, Ministries of Energy, Oil, Industries and Mines, shall be authorized to apply financial intensive packages for observing consumption model and optimizing energy consumption, producing CFL Products under high standard, based on directives which shall be approved by the Economic Council by the end of the first year of the program at most. Financial resources required for implementation of this article shall be supported from the funds produced by the implementation of Subsidiaries Act, Internal Resources of Affiliated Companies of Ministries of Oil, Energy, Industries and Mines / Selling Power Plants and Other Assets including Moveable or Immovable Properties, Ministry of Energy Shares and Stocks, as well as, Subsidiary and Affiliated Companies and Enterprises in form of annual budgeting.

Note 2: Executive Organizations shall be authorized to conclude contract with private sector and cooperative companies for reaching to saving in energy consumption preserving previous productivity. Contract price shall be supported and payable from savings produced by savings under the agreement exchanged with Deputy Office. Directive thereof, based on proposal of Ministries of Energy and Oil and Deputy Office shall be approved by the Ministers' Council.

The Project
On
Implementation of Pilot Projects to Introduce
ESCO for Government's Buildings
in
Islamic Republic of Iran

Completion Report (ANNEX)

Deliverables on technical cooperation activities

Model contract of ESCO

December 2018

Nippon Koei Co., Ltd

Recommended contract text for building's energy performance

This agreement is made and entered into as of ……………….. by and between Mr./Mrs. …………… holder of national I.D. card No ………… , owner/ representing building's managing board, residing at …………………………………., post code ……………………, phone no. ………………… (hereinafter referred to as the Employer) and ……………… corporation as the energy services provider with registration No. ………….. , holder of national I.D. card No. ………. , residing at ………………………., post code …………………, phone No. ………………….. (hereinafter referred to as the Contractor) with the following terms and conditions:

Article 1: Object of Contract

The object of this contract is a set of works and activities including: performing project description specified in appendix 1, consulting and providing engineering analyses and operational specific and economical procedures in order to control, reduction and saving in energy and water consumption, providing design and engineering services, management, financial investment, preparing, supplying or manufacturing equipment, requirements and software completely, installing, starting and delivering, ensuring the amount of saving and performing survey, repairing, correcting and improving, teaching Employer's staffs and other services in order to performing the project and ensuring the improvement of energy efficiency, reduction and saving in different forms of energy and water which are accomplished in Employer's site so that the Employer profit from the advantages and revenues resulting these savings.

Both parties acknowledge that performing the project is not limited to the contract's object and appendix, but the contractor shall undertake complete investment and all the services mentioned in the contract, prepare and provide equipment, software and required machinery and also the tasks which are necessary to achieve purposes of the contract's object.

Article 2: Contract Duration

2.1. Duration of this contract is …………….. Contract leverage shall be after contract's conclusion and exchange. Contractor acknowledges that date of commencement of saving guarantee will be formed after interim delivery or each separate section of project which is presentable.

Article 3: Value of Contract

3.1. Ceiling price of the contract is …………………… This ceiling price is sum of all the expenses of services and purchasing equipments under the contract including capital charges, providing finance and contractor's profit until final delivery and all the expenses of capital return out of the income resulting from saving and reduction in energy and water costs in the long term and commensurate with final term of the contract and commensurate of total costs. Contractor's part from returning savings shall be equal to ………… percent of conducted monthly savings until contract liquidation.

3.2. The parties herein consideration agree that if contractor's invoices up to final ceiling price of the contract issued earlier, the contract will be terminated, Employer's payments will be stopped and the contract will be settled. Then the income resulted from more savings is chargeable to the Employer.

3.3. The parties herein consideration agreed that savings in energy and water consumption based on reduction in energy and water consumption will be calculated due to performing this contract, not the decrease or increase in energy and water consumption. Therefore invoices are calculable and payable based on the amount of proved savings and the forms of energy market price.

3.4. The contractor shall be responsible for all taxes including income tax and other state pensions arising out of contractor and the staff in accordance with this contract, which is held from the commencement date and during execution of the contract.

3.5. Employer shall pay for confirmed invoices one month after the invoices submission, as per appendix 5 of the contract.

3.6. Down payment shall not be paid for this contract.

Article 4: Employer and Contractor's Obligations

4.1. Employer will introduce a representative to contractor with limited authorities in order to confirm or reject services and works provided in contract on behalf of the Employer. Employer may replace Employer's representative notifying the contractor in written form.

4.2. Employer shall perform higher supervision, evaluation and validation both directly by introducing a representative, and indirectly by consulting related experts.

4.3. Employer, compliance with regulations, shall immediately provide technical information necessary for contractor in order to perform contract's provisions. Any documents and information which is provided to contractor by Employer is only to facilitate contractor's task. Therefore the Employer will not ensure adequacy, validity and reliance of submitted documents and information.

4.4. Contractor undertakes contractor's full authority and the best skills and attention in technical, financial and capital capabilities as well as necessary permits and certificates to perform and completion of the contract.

4.5. Completion of the contract and obligations specified in the contract's job description, based on technical and engineering principles and according to Employer's accepted professional and expert standards observing financial consideration and executive economical procedures, according to related codes and regulations and guidelines, and exploiting maximum proficiency and accuracy by prominent design, engineering and executive experts and other qualified staff.

4.6. Contractor undertake to introduce natural entities as contractor's fully authorized representatives related to the contract's provisions with limited powers, at last one week after conclusion of the contract. Contractor may replace contractor's representatives notifying the Employer in written form.

4.7. Contractor's own procedures and performance under contract's provisions, by no means, shall not intervene in current matters or degrade Employer's position.

4.8. Contractor shall submit service and purchase invoices to Employer along with progress reports.

Article 5: NO Assignment

5. Contractor has confirmed and declared that contractor is not subjected to prohibition mentioned in the law approved on 22th of Dey, 1337 (Persian calendar). Contractor undertakes that benefits of this contract will not be transferred to any predicted or inferable person in the aforementioned law or accepted their entrance into the company. In the case of breach in the abovementioned circumstances, Employer shall have the right to treat contractor according to the regulations.

Article 6: Guarantee

6.1. In event of providing investment on behalf of Employer, in order to fulfillment of the obligations, contractor undertakes to submit a bank letter of guarantee amounting 5 % of total value of the contract as a guarantee of contractor's obligations, concurrent with signing of contract and before starting any executive task of the contract. Guarantee letter shall be released after interim delivery of the project. In event of contractor's failure in fulfillment of obligations, Employer shall have the right to confiscate the amount of bank guarantee or cover the incurred losses according to the regulations.

6.2. In event of providing investment on behalf of contractor, in order to fulfillment of the obligations, Employer undertakes to submit a bank letter of guarantee/ certified check/ bank paper accepted by contractor amounting 5 % of total value of the contract as a guarantee of Employer's obligations, concurrent with signing of contract and before starting any executive task of the contract. Guarantee letter shall be released after interim delivery of the project. In event of Employer's failure in fulfillment of obligations, contractor shall have the right to confiscate the amount of bank guarantee or cover the incurred losses according to the regulations.

Article 7: Evaluating the amount of savings/ surveying and certifying

7.1. Contractor shall prove the amount of water and energy savings based on reduction in water and energy consumption arising from project execution measuring validity and the extent of recommendation or agreements in one of the manners hereunder and observing specified instances in international protocol of measurement and certifying energy performance (IPMVP) appendix 2 of the contract to Employer/adviser after interim delivery and before the period of guarantee of annual saving.

7.1.1. Through meters and measuring facilities: contractor shall install proper meters and measuring equipment on every available consumer of water and energy forms notifying Employer and register and report changes in consumption of energy forms. Contractor also may utilize existing measuring equipment in event of Employer's consent and changes in the amount of consumption shall be proved in this manner. State of usage and installed measuring equipment's accuracy shall be confirmed by both parties. The results of this method, in which registration manner and reporting registered results shall be approved by both parties, will be noticed by contractor to Employer in periods of at most 3 months.

7.1.2. Using the approved measuring method by both parties according to appendix 2 of the contract.

7.1.3. Using energy bills and showing the reductions in water and energy consumption.

Article 8: Maintenance

8.1. Maintenance of installed facilities, until the date of final delivery, shall be paid by contractor at contractor's own expenses and contractor shall control facilities' proper performance and prevent damages.

8.2. Expenses of repairing and replacement of damaged pieces during maintenance period shall be paid by contractor unless it is proved that the appeared damages resulted from demolition activities of Employer's staff.

8.3. Employer shall provide contractor with conventional access during period of maintenance or repair damages of guarantee period and pursuing project performance.

Article 9: Contract changes

9.1. Changes in amount

9.1.1. It may be necessary to make changes in amount, volume, type, quality and facilities and services technical information while the project is running.

These changes, including decrease or increase, will be valid only by approving Employer and at most 25 percent of initial amount of contract. The abovementioned changes shall not reduce the percentage of uncommitted savings by contractor.

9.1.2. If changes appear only in technical specifications and quality and the amount of contract doesn't change, contractor shall receive technical approval of Employer. If changes lead to change in the amount of contract, it shall be valid by proportional changes in guaranteed amount of savings. In this case contractor shall notify Employer of detailed price analysis including real costs and percentage of profit and if it approved by Employer, new prices shall be the basis for payment of invoice during refund of the amount of contract.

9.1.3. If Employer consider any changes necessary to protect and prevent from risks and reductions in production capacity, contractor shall be notify Employer in writing the amount of effectiveness of aforesaid changes on savings rate, and perform in event of Employer's approval. In event of decrease or increase in savings, the corresponding time shall be effective in contract duration.

9.1.4. If contractor encounter undefined conditions during project execution, Employer shall be informed immediately and both parties must reach to an agreement toward aforesaid condition and possible changes.

9.2. Changes in contract term

Date of interim completion and interim delivery of contract, final delivery, time periods and specified critical path in phasing and scheduling contract's execution will not changed if contractor have Employer's approval to make changes in contract duration. Changes in contract duration, corresponding to changes in labor, are applied in schedule and shall not be subjected to delays.

Article 10: Insurance

10.1. Contractor is obliged to provide liability insurance coverage in order to compensate probable losses due to damaging installations and facilities of Employer as a result of contract execution. Related insurance policy shall be bought to the advantage of Employer and submitted to Employer before commencement of installation and execution.

10.1.1. In event of failure in providing liability insurance by the insured, contractor is obliged to provide related approved guarantees in order to compensate probable losses and damages.

10.2. Contractor is obliged to cover civil liability insurance of staff (according to article 23) with no exemption of any incidence, disability and disease and discharge Employer from any other claims hereof.

10.3. Contractor is obliged to provide necessary insurance coverage for purchased facilities and equipment in order to contract execution and authorized to provide investment insurance coverage.

Article 11: Training

11.1. Providing necessary education for Employer's staff during installation, execution, establishment and interim delivery is obligatory and contractor shall submit recommended training instructions to Employer to be approved.

11.2. Contractor's guiding training and exploitation shall be complete in a manner that introduced staffs of Employer are able to lead and exploit from project's facilities and equipment after interim delivery.

11.3. Contractor is obliged to demonstrate basic and trivial maintenance instruction booklets for introduced staffs on behalf of Employer.

11.4. In event of any incidence due to failure in proper training of Employer's staffs, contractor shall be responsible for compensation until final delivery of contract.

Article 12: Suspension of the contract

In event of suspension of contract on behalf of Employer, expenses of suspension period shall be calculated according to suspension period and amounting accomplished investment by contractor until suspension period which is in accordance to Employer's approved documents and based on three year term deposit of Islamic Republic of Iran's central bank and paid by contractor. Suspension period of the contract, in any cases, shall not exceed two months. In this case contractor has the right to terminate the contract.

Article 13: Termination of the contract

Employer may, any time, terminate the contract with the following terms and conditions:

13.1. Employer, in each phase of the contract in which Employer intends to terminate the contract, shall notify contractor by determining a two month deadline.

13.2. Contractor, upon receiving termination notice, shall immediately stop operation and prepare the report of service progress condition up to termination notice until 15 days and submit it to Employer. This report must contain degree of progress in each part of services, phases and sections which their completion is necessary to protect Employer's interest during two month deadline, and it is also include determining their fees.

13.3. Employer, within fifteen working days after receiving invoices, shall measure necessary considerations with contractor to terminate the contract and prepare contract termination minutes and pay contractor's expenses as follows:

13.3.1. Employer shall pay contractor's expenses and their interest, at most within 21 working days, according to contract termination minutes in other sections different from services in accordance to appendix 5 and project progress up to determined time table for termination of the contract based on three years term deposit rate by Islamic Republic of Iran's central bank.

13.3.2. Employer shall pay expenses of contract services when social security organization's liquidation certificate is submitted and with tax deduction and complete settlement with contractor consist of releasing whole amounts, guarantees and providing tax payment receipt.

Article 14: Natural and unexpected events (Force majeure)

14.1. In event of natural and unexpected events such as war including declared and undeclared, revolutions, public strikes, outbreak of contagious diseases, earthquakes, dust pollution, unusual overflows and floods, unprecedented droughts and widespread fires which are not resulted from the operation of contractor, and both parties cannot fulfill their obligations, failure in the aforesaid fulfillment shall not be considered as violation of the contract and the contract will continue to be valid. In event of force majeure occurrence, both parties undertake that, up to at most 48 hours, notify the other party considering that the force majeure prevent which party under contract from fulfillment of obligations.

14.2. If force majeure condition lasts for more than 45 successive days, both parties hereto have the right to terminate the contract submitting written notice during 15 working days after above mentioned duration.

Article 15: Regulations governing the contract and disputes conciliation

Islamic Republic of Iran's rules and regulations govern this contract. In event of arising differences between the parties in connection with interpretation or execution of this contract's clauses, Employer's association of energy services as consensual reviewer shall consider the dispute in presence of both parties, and if no settlement can be reached. The differences shall be solved in accordance with the current law and regulations of Iranian courts.

Article 16: Notices

Any types of announcement, instruction, opinion, suspension notice, completion and termination of the contract shall be valid in writing. Secretariat receipt on both parties, and post delivery receipt will be the proof of notice submissions (reports, documents and letters).

Employer	Contractor (energy services cooperation)
....	....
Name:	Name:
Position:	Position:
Address:	Address:
Economic code:	Economic code:
Tax area:	Tax area:
Postal code:	Postal code:
Phone No:	Phone No:
Fax no:	Fax no:
Signature	Signature

The Project
On
Implementation of Pilot Projects to Introduce ESCO for Government's Buildings
in
Islamic Republic of Iran

Completion Report (ANNEX)

Deliverables on technical cooperation activities

Brief report based on pre-walk through at candidate building

December 2018

Nippon Koei Co., Ltd

Example format

Financial proposal (one case)

Technical proposal (three cases)

Note: This format was suggested and shared to SABA as sample of ESCO proposal.

(Format A-1)

Summary - 1

a. Table of opted EE&C technique

Item	Current amount of consumption of Electric power, Gas, Oil, Water		Energy consumption Base line XXXX MJ/Annual (a)		CO_2 Emission Base line XXXX kg-CO_2/Annual (c)		Estimated Energy fee Million Rials/Annual (A)	Investment Million Rials (B)	Pay Back Period Year (B/A)
	Type	Reduction (Unit)	Reduction MJ/Annual (b)	Rate % (b/a)	Reduction kg-CO_2/Annual (d)	Rate % (d/c)			
Replace to LED lighting from fluorescent lamp	Electric	61,440kWh	553,000				190	1,296	6.8
Introduction of VSD and number control of pumps	Electric	110,600 kWh	995,000				244	200	1.2
Replace to high efficiency turbo chiller from existing turbo chiller	Electric	~~351,628 kWh~~	~~3,164,000~~				~~776~~	~~25,500~~	~~32.2~~
Sum	—	172,040 kWh	1,548 MJ				434	1,496	3.9

Remark) Competitor must not mention reduction of energy, CO2 emission, in case that they will optimize proposal for water reduction.

(Format A-2)

Summary - 2

Competitor shall mention Summary of project estimation in entire ESCO project period.

I	Presided energy fee reduction	434 Million Rials/Annual	
II	Guaranteed energy fee reduction	391 Million Rials/Annual	
III	ESCO service fee (payment to ESCO)	371 Million Rials/Annual	
IV	Building owners benefit	20 Million Rials/Annual	II - III
V	Contract period	7 Years	
VI	Sum of presided energy fee reduction in contract period	3,038 Rials	I x V
VII	Sum of guaranteed energy fee reduction in contract period	2,737 Rials	II x V
VIII	ESCO service fee in contract period	2,597 Rials	III x V
IX	Sum of Building owners benefit	140 Rials	IV x V

(Format C-1)

Summary of ESCO plan -1

a. ESCO project balance sheet (ESCO contract duration 7 years)

(Included tax, Unit: million Rials)

	FY	1394	1395	1396	1397	1398	1399	1400	1401
	Year	Construction	1st	2nd	3rd	4th	5th	6th	7th
Prospected reduction of charge	I	-	434	434	434	434	434	434	434
Guaranteed reduction of charge	II	-	391	391	391	391	391	391	391
ESCO service fee	III	-	371	371	371	371	371	371	371
Guaranteed benefit of building owner	IV=II-III	-	20	20	20	20	20	20	20

(Format C-2)

Summary of ESCO plan -2

b. ESCO project balance sheet (ESCO contract duration XX years)

(Included tax, Unit: thousands Rials)

	FY	1394	1395	1396	1397	1398	1399	1400	1401
		Construction	1st	2nd	3rd	4th	5th	6th	7th
	In - come								
A	Finance procurement	1,712,300	---	---	---	---	---	---	---
B	Subsidy (If possible)		---	---	---	---	---	---	---
C	ESCO service	---	371,000	371,000	371,000	371,000	371,000	371,000	371,000
D	The other	---	0	0	0	0	0	0	0
	Out - go								
a	Charge for detailed audit	141,500	---	---	---	---	---	---	---
b	Charge for design work	74,800	---	---	---	---	---	---	---
c	Charge for construction	1,496,000	---	---	---	---	---	---	---
d	Charge for maintenance	---	20,000	45,000	45,000	45,000	45,000	45,000	45,000
e	Charge for operation	---	10,000	10,000	10,000	10,000	10,000	10,000	10,000
f	Charge for measurement and verification	---	28,000	28,000	28,000	28,000	28,000	28,000	28,000
g	Charge for insurance	---	0	0	0	0	0	0	0
h	Tax	---	8,000	8,000	8,000	8,000	8,000	8,000	8,000
i	The other	---	0	0	0	0	0	0	0
j	Benefit to ESCO company		50,000	50,000	50,000	50,000	50,000	50,000	50,000
k	Interests(=4%)	---	68,492	61,032	49,390	38,215	27,486	17,187	7,299
l	Repayment to financer	---	186,508	291,032	279,390	268,215	257,486	247,187	237,299
m	Debt	-1,712,300	-1,525,792	-1,234,760	-955,370	-687,155	-429,669	-182,482	54,817

(Form B-1)

Technical proposal 1-1

a. Explanation of optimized EE&C technique

ESCO company shall mention each EE&C techniques of technical proposal under format bellow respectively.

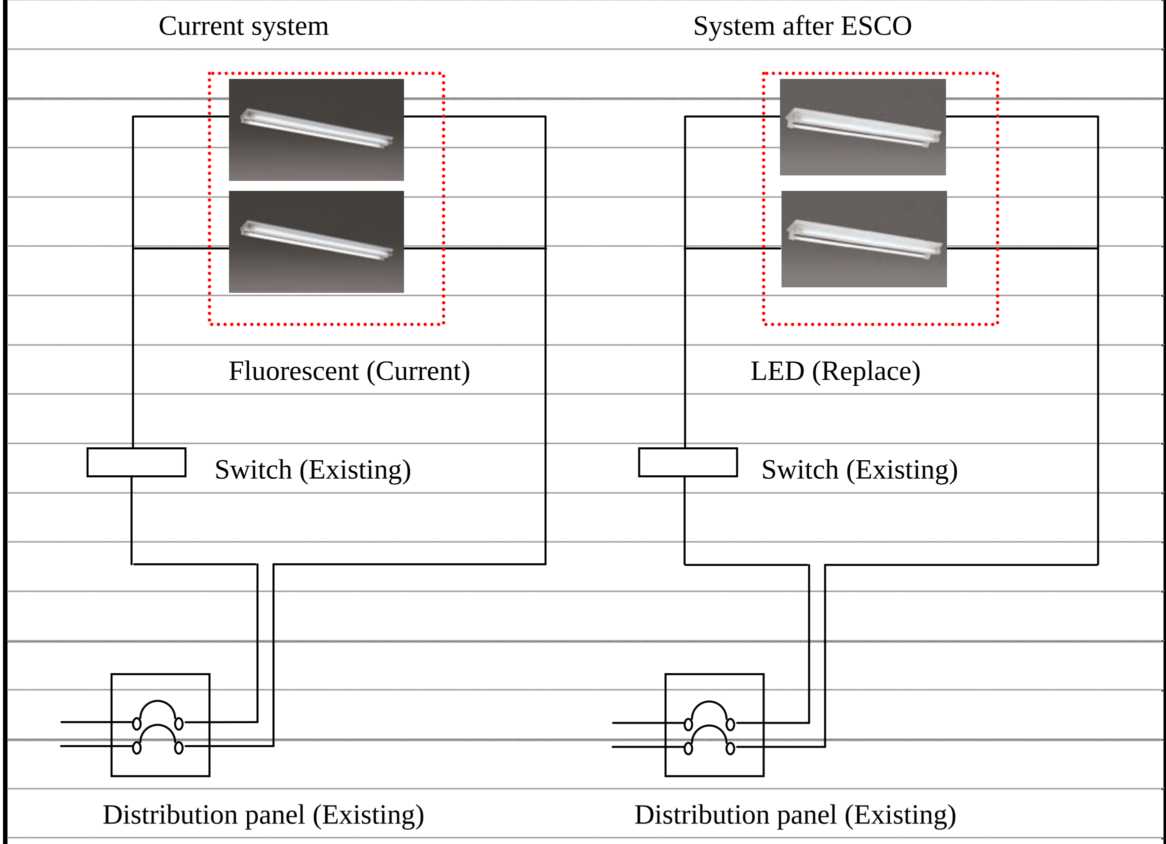
(On First page)

1. System diagram both current system and after ESCO.

(From next page after first page)

2. Estimation of energy consumption on current system and the issues on it.
3. Explanation of techniques of technical proposal
4. Estimation of energy consumption on current system after ESCO and sources to be calculated.

(1) General diagram between current system and system after ESCO



(Form B-2)

(2) Presumption of the current energy consumption and current issue

At present, conventional type fluorescent lamps are installed in office area of Ministry of Finance as lighting equipment, that consumes approx. 50 W of energy consumption per lamp, 40 W of energy consumption is at fluorescent lamp and 10 W of energy consumption is at blast. It means that current system consumes more energy than case of introduction of high energy efficiency lamp.

Because diagrams regarding number and location of lighting in Ministry of Finance were not shared prior to walk through survey, We has no idea for exact figure of fluorescent equipment. Therefore we estimated energy efficiency potential with assumption under experience.

Assuming that 4 fluorescent lamps with 40 W of capacity are installed in 15m2 of area, because total floor area of Ministry of Finance is approx. 55,000m^2, approx. 15,000 fluorescent lamps (55,000 / 15 x 4 =14,666 = approx. 15,000) may be installed.

1,000 lamps with high operation factor among installed fluorescent lamp will be replaced in this Proposal.

In case that amount of energy consumption is calculated under mentioned condition,

(a) Daily lighting time : 8 hours/day

(b) Annual operation days : 240 days/year

(c) Energy consumption per fluorescent lamp : 50 W (fluorescent 40W＋blast 10W)/lamp

(d) Number of fluorescent lamp : 1,000 lamps

Annual energy consumption = (a) x (b) x (c) x (d) =8 x 240 x 50 x 1,000

=1,440,000,000Wh/year =96,000kWh/year

(3) Brief presentation of optimized energy efficiency technology

Fluorescent lamps are operated to turn on/off of lighting switch by hand control that someone uses the room under existing system. On this proposal, fluorescent lamps will be changed to LED lamps without amendment of such hand operation system, then power consumption will be reduced with introduction of high efficiency lighting appliances.

Because energy efficiency potential on this proposal is estimated under assumption that is mentioned in clause (2), energy efficiency potential shall be amended based on result of detailed audit.

Especially, the lamps with low return on investment, it means that the lamps are short time turning on annually, shall be omitted from candidate lamps to be replaced.

(Form B-3)

(4) Presumption of the energy consumption after the replacement

Assuming that energy consumption on LED lamp is set 40 W of electric power per lamp, further number of replace of fluorescent lamps are 1,000 lamps with high operation factor, annual energy consumption is estimated below,

(a) Daily lighting time : 8 hours/day

(b) Annual operation days : 240 days/year

(c) Energy consumption per LED lamp : 18W/lamp

(d) Number of fluorescent lamp : 1,000 lamps

Annual energy consumption ＝(a) x (b) x (c) x (d) =8 x 240 x 18 x 1,000=34,560,000Wh/year

=34,560kWh/year

(Form B-4)

Technical proposal 1-2

b. Environmental Effect

ESCO company shall mention environmental effect for increase and decrease of NOx, SOx, PM, Noise with introduction of EE&C technique.

(1) New on-set environmental impact
Environmental impact, e.g. NOx, SOx, PM, Noise, will not occur newly with replace of lighting
equipment.
But, it is necessary to dispose fluorescent lamp tube with removal of existing equipment.
(2) Decrease of environmental impact
NOx, SOx emission from power plant will decrease with reduction of power
consumption.
In 1393, amount of NOx and SOx emission per 1 kWh of power consumption is set
XX1 mg/kWh, XX2 mg/kWh respectively. So, annual amount of NOx and SOx emission
will decrease to YY1 mg, YY2 mg respectively with replace of lighting equipment.

(Form B-5)

Technical proposal 1-3

c. Effect for existing equipment

ESCO company shall mention scope to install new equipment or delete existing equipment.

(1) Introduction of new equipment
Just the part of fluorescent lamp tube will be replaced to LED lamp tube.
The other miscellaneous parts, e.g. blasts and covers, will not be replaced.
Because LED lighting does not need blast part, the wire from blast to lighting tube is
not available, so the wire works to electric source from LED lamps need newly.
As mentioned in clause a (2), the lamps with low return on investment, it means that
the lamps are short time turning on annually, shall be omitted from candidate lamps to
be replaced. And the scope of replace will be discussed with building owner after
detailed audit.
As mentioned above, some existing fluorescent lamp will remain after introduction of
LED lamps, so the whole look together on lighting equipment will be lost.
And, because it is guessed that colour uniformity will be changed from present
condition, specification of LED lamps will be decided under adequate discussion with
building owner.
(2) Removal of existing equipment
As mentioned above, number and location of LED lamp to be exchanged will be specified
after detailed audit.
Only fluorescent lamp tube will be removed, Cover and wire will not be removal for
using continuously, blast will not be removed despite non using it.

(Form B-6)

Technical proposal 1- 4

d. Building operation in construction period

ESCO company shall mention the important item regarding safety, project schedule control, further quality control, deadline of completion of construction and handover of ESCO equipment.

(1) The effect for building operation on Ministry of Finance
In order to reduce any risk to be obstacles on implementing daily business by
construction work, ESCO company will implement the replace work of lighting
appliances on holydays or night time of working days.
ESCO company will discuss the details with building owner after detailed audit.
(2) Safety management
ESCO company will make the replace work plan under confirmation of replace methods
for existing fluorescent lamp from current operation company, because of reducing risk
of high place work.
ESCO company will provide appropriate scaffold (including stepladder), use safety belt
out and out, work with supervisor to be ensured safety and support person, because of
implementing construction work with smooth and safety.
ESCO company will discuss the details with building owner after detailed audit.
(3) Quality management
ESCO company will carry out lighting test of LED lamp prior to installation, further
will carry out lighting test of LED lamp after installation.
(4) The date of competition
ESCO company shall complete the construction work by DD MM.
(5) Taking over of ESCO equipment
Despite of the date of completion for construction work, ESCO company will take over the
equipment that will be completed installation and lighting test either on the date, on the tomorrow
or the immediate working day.
On taking over ESCO equipment to building owner, ESCO company will re-confirm that
the LED lamps can turn on/off without problem in the presence of in charge of person of
building owner.

(Form B-7)

Technical proposal - 5

e. Treatment on termination of ESCO contract

ESCO company shall mention treatment on termination of ESCO contract, e.g. transfer of property of ESCO equipment

(1) Ownership transfer of ESCO equipment
ESCO company will own the ESCO equipment.
After termination of ESCO contract, ESCO company will assign and transfer ESCO
equipment ownership to Building owner.

Technical proposal 2-1

a. Explanation of optimized EE&C technique

Competitor shall mention each EE&C techniques of technical proposal under format bellow respectively.

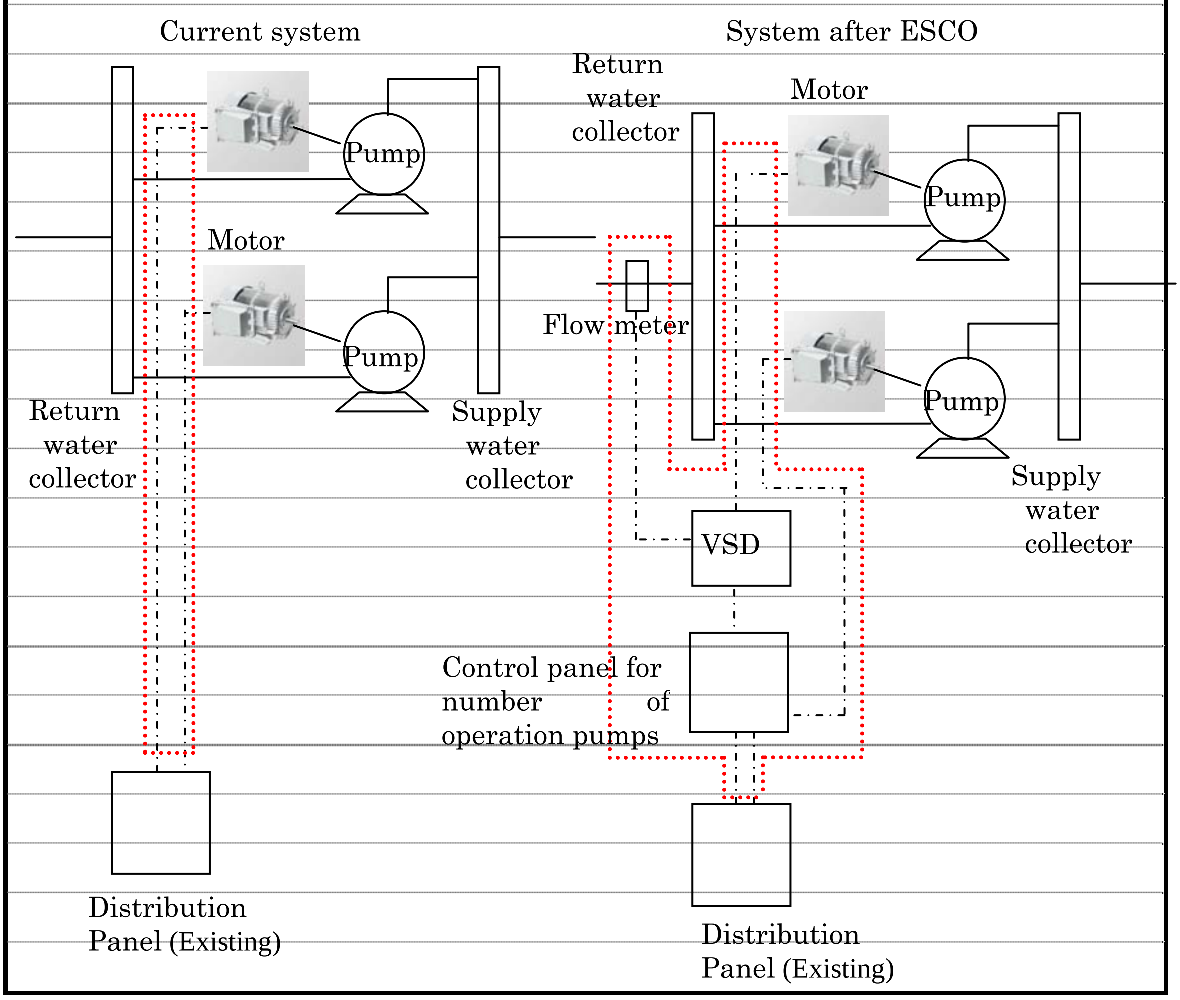
(On First page)

1. System diagram both current system and after ESCO.

(From next page after first page)

2. Estimation of energy consumption on current system and the issues on it.
3. Explanation of techniques of technical proposal
4. Estimation of energy consumption on current system after ESCO and sources to be calculated.

(1) General diagram between current system and system after ESCO



(2) Presumption of the current energy consumption and current issue

At present, twelve pumps for chilling and warm water with conventional type motor exist, and such all motors have 22 kW of rated capacity per motor and are turned on/off switch by hand control of operator. Current system consumes more energy (low energy efficiency) in comparison with introduction of high efficiency control system.

Because ESCO company can not get diagrams and operation record from Ministry of finance, actually ESCO company does not have accurate information on air conditioning system, so energy efficiency potential is estimated under assumption of operation condition based on interview of walk through.

Due to interview of walk through, the duration of warm air conditioning is from 20th September to 20th March, the duration of cooling air conditioning is from 1st May to 20th September, further assuming that daily operation time for air conditioning is eight hours, eight pumps within twelve pumps with installation is operated usually.

In case that amount of energy consumption is calculated under mentioned condition,

(a) Daily operation time for air conditioning: 8 hours/day

(b) Annual operation days : 240 days/year

(c) Energy consumption per pump : 19kW (22kW x 85%)

(d) Number of pump in operation : 8pumps

Annual energy consumption =(a) x (b) x (c) x (d) =8 x 210 x 19 x 8

=255,360kWh/year ≒250,000 kWh/year

(3) Brief presentation of optimized energy efficiency technology

Pumps for chilling and warm water are operated to turn on/off of pump switch by hand control of operator under existing system. On this proposal, Pumps for chilling and warm water will be changed to automatic operation system with control system for number of operation pumps and variable speed control system (by VSD) power consumption will be reduced by introduction of such control system.

Because energy efficiency potential on this proposal is estimated under assumption based on finding of walk through due to lack of accurate information, energy efficiency potential shall be amended based on result of detailed audit.

(4) Presumption of the energy consumption after the replacement

Assuming that two VSDs will be introduced newly, further number of pump control system will be introduced as from eight pumps operation to four pumps operation in low load months, and the other condition is the same as current condition,

annual energy consumption is estimated below,

Annual energy consumption =140,000Wh/year

Technical proposal 2-2

b. Environmental Effect

Competitor shall mention environmental effect for increase and decrease of NOx, SOx, PM, Noise with introduction of EE&C technique.

(1) New on-set environmental impact
Environmental impact, e.g. NOx, SOx, PM, Noise, will not occur newly with introduction of VSD and the parts incidental to VSD newly.
But a portion of existing pipe shall be removed and be disposed with installation of flow meter.
And in case that existing motors do not comply with requirement specification for operation by VSD, existing motors will be replaced to compliance type for operation by VSD. In such case, existing motors will be disposed.
(2) Decrease of environmental impact
NOx, SOx emission from power plant will decrease with reduction of power consumption after introduction of VSD and the parts incidental to VSD newly.
In 1393, amount of NOx and SOx emission per 1 kWh of power consumption is set XX1 mg/kWh, XX2 mg/kWh respectively. So, annual amount of NOx and SOx emission will decrease to YY1 mg, YY2 mg respectively with introduction of VSD and the parts incidental to VSD newly.

Technical proposal 2-3

c. Effect for existing equipment

Competitor shall mention scope to install new equipment or delete existing equipment.

(1) Introduction of new equipment
As introduction of new equipment, VSD, control panel for number of operation pump and flow meter will be installed.
In case that existing motors do not comply with requirement specification for operation by VSD, existing motors will be replaced to compliance type for operation by VSD. Such motor also will be installed, and relevant wire will be installed newly.
ESCO company proposes that two pumps will be introduced variable speed control newly with installation of VSD respectively.
ESCO company proposes installation of one control panel for number of operation pump, and it can control twelve pumps (including two pumps with VSD control) per panel.
ESCO company proposes installation of one flow meter.
Number of installation of control appliances as mentioned above are just draft idea at the phase of proposal, it will be decided in consultation with building owner after detailed audit.
(2) Removal of existing equipment
A portion of existing pipe will be removed. And existing motor may be removed under consideration based on detailed audit.

Technical proposal 2-4

d. Building operation in construction period

Competitor shall mention the important item regarding safety, project schedule control, further quality control, deadline of completion of construction and handover of ESCO equipment.

(1) The effect for building operation on Ministry of Finance
In order to reduce any risk to be obstacles on implementing daily business by
construction work, ESCO company will implement installation of VSD and the parts
incidental to VSD on holydays or night time of working days.
ESCO company will discuss the details with building owner after detailed audit.
(2) Safety management
Pipe may be cut and welded on installation of flow meter. So ESCO company will comply
with legal provision for treatment of heavy weight material and method of welding.
ESCO company will discuss the details with building owner after detailed audit.
(3) Quality management
ESCO company will carry out loop test of VSD and the parts incidental to VSD after
installation.
(4) The date of competition
ESCO company shall complete the construction work by DD MM.
(5) Taking over of ESCO equipment
Despite of the date of completion for construction work, ESCO company will take over the
equipment, VSD and the parts incidental to VSD, that will be completed installation and verification
test of normal operation either on the date, on the tomorrow or the immediate working day.
On taking over ESCO equipment to building owner, ESCO company will re-confirm that
the VSD and the parts incidental to VSD can execute normal operation in the presence of in
charge of person of building owner.

(Form B-7)

Technical proposal 2-5

e. Treatment on termination of ESCO contract

Competitor shall mention treatment on termination of ESCO contract, e.g. transfer of property of ESCO equipment

(1) Ownership transfer of ESCO equipment
ESCO company will own ESCO equipment.
After termination of ESCO contract, ESCO company will assign and transfer ESCO
equipment ownership to Building owner.

(Form B-1)

Technical proposal 3-1

a. Explanation of optimized EE&C technique

Competitor shall mention each EE&C techniques of technical proposal under format bellow respectively.

(On First page)

1. System diagram both current system and after ESCO.

(From next page after first page)

2. Estimation of energy consumption on current system and the issues on it.
3. Explanation of techniques of technical proposal
4. Estimation of energy consumption on current system after ESCO and sources to be calculated.

(1) Improvement of chiller operating efficiency by replacement	
E/E plan is the replacement of the superannuated turbo chiller to latest high-efficient one which reduces power consumption and contract demand.	
Current system	System after ESCO implementation

(Form B-2)

(2) Presumption of the current energy consumption

The chillers of 600USRT×3 are used as a heat source for air-conditioning now.

The chillers were turbo refrigerators made by the York Company 35 years ago, and superannuation is advanced.

As the existing chiller's COP and the capacity of the electric motor were uncertain, COP is assumed to be about 3.0 considering the aged deterioration.

Moreover, because details are uncertain, the operating days and hours of the chiller are assumed to be the following.

(a) Operating hours per day: For 10hours (Assuming 2hours longer than AHU)

(b) Operating days per year: 100days (Summer)

(c) Annual power consumption: 703,256 kilowatt-hour (before E/E).

(d) Used power: 703.3 kilowatt (before E/E).

(3) Presumption of the energy consumption after the replacement

The newly established turbo refrigerator is assumed to be COP6.0.

The new machine assumed the one always driven for the air-conditioning period as a base machine. Refer to the energy calculation seat for details.

(a) Operating hours per day: For 10hours (Assuming 2hours longer than AHU)

(b) Operating days per year: 100days (Summer)

(c) Annual power consumption: 351,628 kilowatt-hour (after E/E).

(d) Used power: 351.6 kilowatt (after E/E).

(4) Presumption of amount of reduction and reduction cost

Unit price of the contract power(kW) and the power consumption(kWh) assumed the following. Refer to the energy calculation seat for details.

Unit price: Contract power: 1,500yen/kW, Power consumption: 6cent/kWh

(a) Decrease contracted power: 350kW

(b) Amount of reduction electric power consumption: 351,628 kilowatt-hour

(c) Reduction cost: 8,831,721 yen

(5) Presumption of investment cost of E/E construction and payback years for the cost

As follows. Refer to the energy calculation seat for details.

(a) Cost of E/E construction: 90 million yen

(b) Payback years for the cost: 10.2 years

Technical proposal 3-2

b. Environmental Effect

Competitor shall mention environmental effect for increase and decrease of NOx, SOx, PM, Noise with introduction of EE&C technique.

(1) New on-set environmental impact

New environmental impacts such as NOx, SOx, PM, and Noise are not generated by replacing the chiller.

(2) Decrease of environmental impact

It leads to the reduction in the power plant in the amount of the CO_2 generation along with the reduction in the amount of the electric power use.

(Form B-4)

Technical proposal 3-3

c. Effect for existing equipment

Competitor shall mention scope to install new equipment or delete existing equipment.

(1) Introduction of new equipment
The chiller equipment is updated to the latest high-efficiency type.
Neither the cold water pump, the cooling-water pump nor the cooling tower are
included in the renewal cost assuming that existing is used as it is.
(2) Removal of existing equipment
600USRT freezer of existing is removed.

(Form B-5)

Technical proposal 3-4

d. Building operation in construction period

Competitor shall mention the important item regarding safety, project schedule control, further quality control, deadline of completion of construction and handover of ESCO equipment.

(1) The effect for building operation on Ministry of Finance
The construction of the replace of the chiller equipment shall be carried out
on holidays or the weeknight, not to prevent the influence on staff and visitors.
ESCO company will discuss the details with building owner after detailed audit.
(2) Safety management
Substitution plan shall be planned appropriately after the safe installation is
confirmed to the trader.
Execute construction smoothly and safely by multiple people such as support
and supervisors in the work stand excluding the worker.
Confer on details in the implementation plan submitted after the detailed diagnostics.
(3) Quality management
Carry out a performance test after construction and verify the expected performance.
(4) The date of competition
Complete construction and the adjustment before beginning of the air-conditioning
season. (Until which month what day)
(5) Taking over of ESCO equipment
Operation by the MOF building operator will be started after the operation guidance
with the attendance of the person in charge of the Ministry of Finance.

(Form B-6)

Technical proposal 3-5

e. Treatment on termination of ESCO contract

Competitor shall mention treatment on termination of ESCO contract, e.g. transfer of property of ESCO equipment

(1) Ownership transfer of ESCO equipment
The ESCO company will own the ESCO equipment.
After termination of ESCO contract, ESCO company will assign and transfer ESCO equipment ownership to Building owner.

Brief report on

1. Tehran Vaterinary University,
2. Medical Science University,
3. Department of Energy,
4. Ministry of Finance,
5. Tehran Municipality Building
6. Isfahan municipality

Brief report
on Tehran Vaterinary University
in English

Date of Visit : 2015/07/28

1394/05/04

(Form B-2)

Name of Building	: Tehran Vaterinary University
Name of Department in charge	: Tehran Vaterinary University, Dr. Qasimi and Mr. Sharifi
Postal Address of building	: Tehran Enghelab Square street intersection Qryb- freedom of Tehran University
Use of building	: University
Number of days in operation per year	: Approx. 280Days / year (This building is in operation on working day.)
Number of hours in operation per day	: 12 Hours / Day Air conditioning:12H
Number of users	: About 1,200 people at a time (Quite approximate)
Temprature of air condition	: At cooling season: from beginning of March to end of September Unknown Degree C(Set by office stuff as they wish) At heating season: from end of September to end of March Unknown Degree C (Set by office stuff as they wish) There is no control system on heating and cooling.
Season of air condition	: At cooling season : Manually and close people (water coolers and gas systems) At heating season: From 15 October to Persian date Farvardin 30
Hour of condition per day	: At cooling season : 12H (Regulated by the people - water coolers and gas) At heating season: 12H (Unregulated by thermostat)
Total floor area	: Approx. 10,000 squere meters
Year of construction	: Approx. 65 years ago

Outline of building		
Item	Contents	Remark
Name of building	Tehran Vaterinary University	
Use of building	University	
Total floor area	Approx.10,000 squere meters	
Year of construction	Approx. 65years	
Number of floor	SRC/SC/WCAbove ground : 4 stories Underground : 1storey	
Record of Rehabilitation or Repair		
Architecture field	No rehabilitation is carried out until now.	
Mechanical facilities	No rehabilitation is carried out until now.	
Electrical facilities	No rehabilitation is carried out until now.	
Other facilities	No rehabilitation is carried out until now.	

■Energy consumption （Whole Building） All bills is not yet available

Power contract	Type of contract	No data	
	Received voltage	No datakV	
	Peak of power	No datakW	
	Unit price of power	No dataRials / kW	
	Unit price of pay-as-you-go	No dataRials / kWh (summer season) No dataRials / kWh(other season)	
Gas contract	Type of contract	No data	
	Diameter of receiving pipe	No datamm	
	Max amount of gas consumption per hour	No datacubic meter / hour	
	Price based on max amount of gas consumption per hour	No dataRials / (cubic meter / hour)	
	Price based on amount of gas consumption	No dataRials / (cubic meter / hour)	

(Form B-3)

■Outline of facilities

The building has a central room for hot water and heating.

And the cooling of air conditioners and water for local use

Month (in 1393)	The number of days	Power cousumption			
		in Low rate time	In standard rate time	In peak time	Total
Tīr	31	27,900	79,567	12,400	119,867
Mordād	31	27,679	80,821	13,286	121,786
Shahrīvar	31	23,250	74,179	11,071	108,500
Mehr	30	18,000	55,000	10,000	83,000
Ābān	30	15,517	42,414	8,276	66,207
Āzar	30	17,778	46,667	10,000	74,444
Dei	30	17,500	43,750	10,000	71,250
Bahman	30	17,308	43,846	9,231	70,385
Esfand	29	18,962	45,731	10,038	74,731
Farvardīn	31	18,744	42,535	10,093	71,372
Ordībehesht	31	11,759	56,655	8,552	76,966
Khordād	31	26,867	83,700	12,400	122,967

Month (in 1393)	The number of days	Natural gas consumption
Tīr	31	14,923
Mordād	31	13,072
Shahrīvar	31	12,297
Mehr	31	1,542
Ābān		
Āzar		
Dei		
Bahman		
Esfand		
Farvardīn	28	3,912
Ordībehesht	38	8,723
Khordād	31	10,876

(Form B-4)

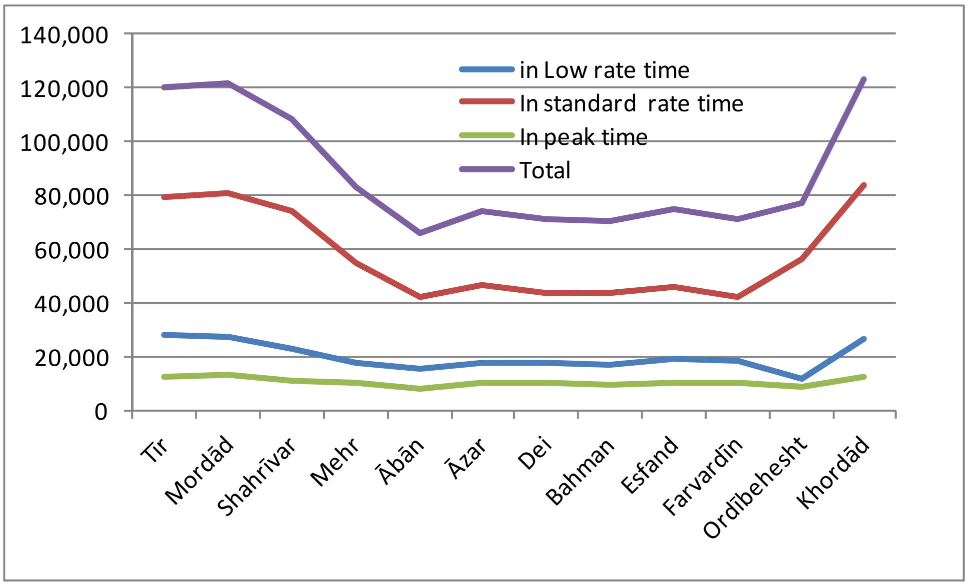


Figure Monthly electric power consumption (Unit: kWh)

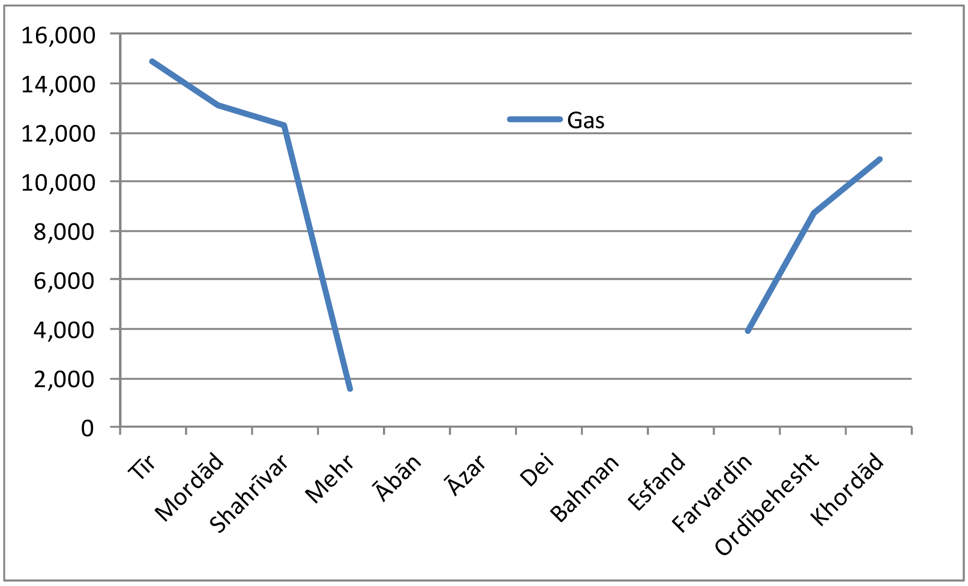
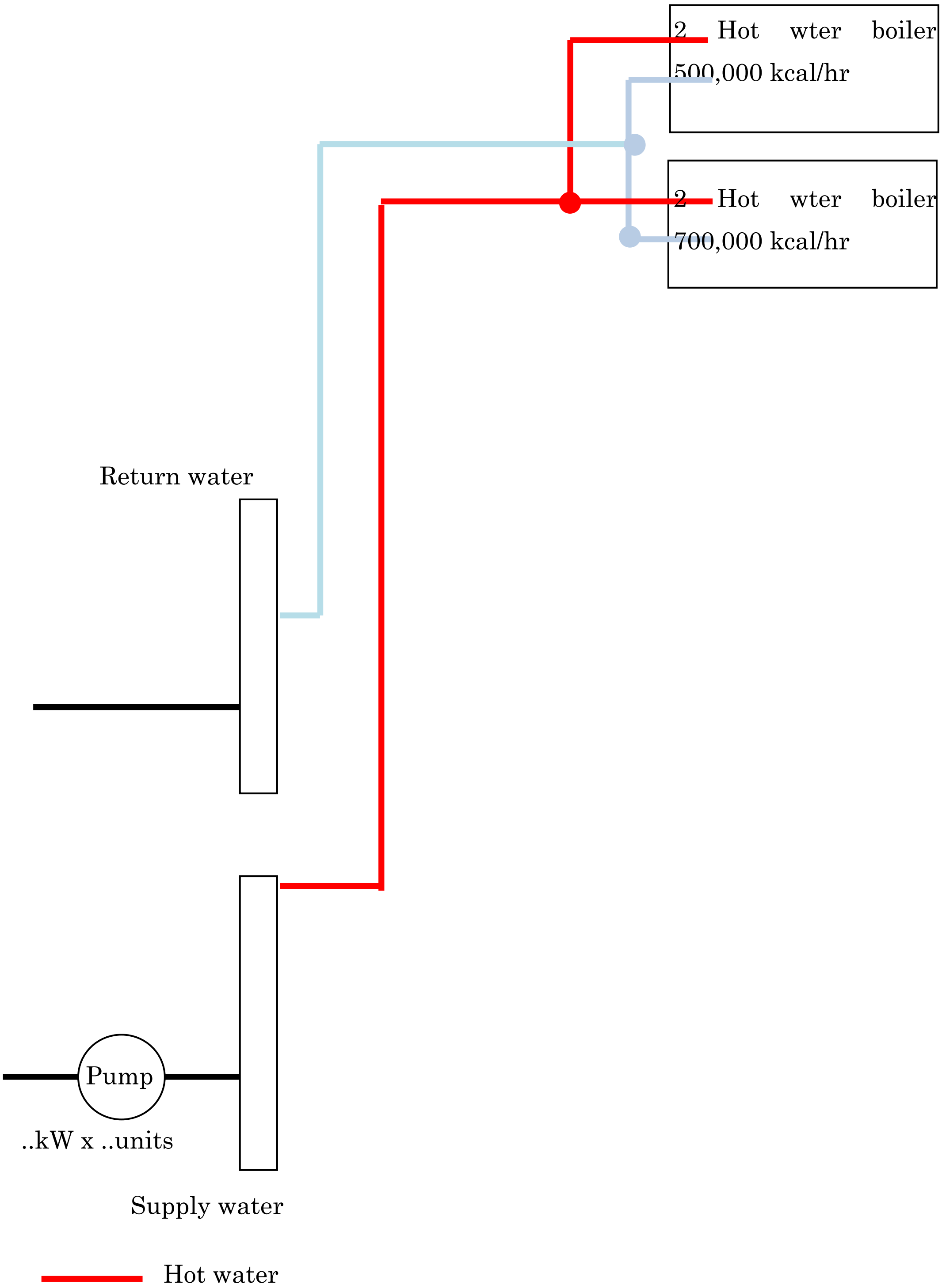


Figure Monthly natural gas consumption (Unit: m^3)

(Form B-5)


2 Hot wter boiler
500,000 kcal/hr
2 Hot wter boiler
700,000 kcal/hr
Return water
Pump
..kW x ..units
Supply water
Hot water

(Form B-6)

Summary of Interview
The building was very old and consequently it is an old heating system. After years of central chiller cooling system for water cooler and gas has changed. However, the set consists of three separate buildings Notes on the electrical and mechanical installations for buildings below are available separately. Notes on electrical installations for buildings: Main Building: In the main building of old electrical panels have been used. Cabling and wiring, and Sarbandi Fydrbndy and communication paths on the surface and the old method that can be used with new, optimized system. Old high-consumption lighting of lamps that can be used instead of LED lights and the other used to consume about 50 percent less than the current lights and higher quality lights are used. The lighting in the stairwell of motion detector sensor can be used only at the time of travel, active, and intelligent lighting systems can be optimized consumption. In the laboratory of pendant lights are used for lighting lab tables that can be used with desktop outlets and interior lighting lighting systems more efficient. You can make panels with quality new equipment and more efficient use of the principles feeders. In addition, more and better to exploit the space. Advanced audio-visual systems and fire alarm, the quality and quantity will improve. Anatomy Building: The type of lamps used in the lighting system, which has replaced the old with LED lights and other energy-saving can be made great. The building was very old made an investment compared to the same pod, Wiring, headscarves, and feeder routes of communication were worn with up to date can be a significant savings in energy consumption. According to the signs of intelligent electrical system can be updated and optimized. Construction of electrical panels with quality new equipment and more efficient use of the principles feeders. In addition, more and better to exploit the space. Advanced audio-visual systems and fire alarm, the quality and quantity will improve. Building doctor prosper: Lighting in the hallways and rooms, offices and classrooms with smart designing and calculation of equipment and systems, including the use of LED lights and motion detectors in the stairwell communication Tvandr energy savings. The electrification system and split air conditioners can be used in heating and cooling systems that consume less compared to the current system, such as VRF and VRF that lead to better and more beautiful is all. Notes on the mechanical construction: Main Building: Radiator heating and cooling system water cooler, conditioning and split in different areas according to the degree of importance is that the largest share, related to the domestic. Building consists of five steel boiler room capacity is 500,000 and 700,000 kcal. Three old with a capacity of 500,000 kcal that a device has been switched off and two new machines with a capacity of 700,000 kcal, the torch of the two new boilers and also looks good. Two coils with a capacity of 2,000 liters, there is rust on the pipes and coils. Four-ground pump and radiator heating system is 250-50 for feeding a device is switched off.

(Form B-7)

Descaling and adjust the burner and boiler temperatures and smart as well as the engine room, which is off the burners are fitted with outside temperature, can affect efficiency. In the event that the employer is willing to pay higher costs, more suitable for air supply, taking advantage of the central cooling system chiller and fan coils is recommended. Anatomy Building: The building's heating and cooling system radiator with water coolers, air conditioners and split air conditioners percent higher that account. Engine room of the building consists of three cast-iron boilers with different capacities that two switching devices and also made modifications to the engine room piping and two new coil also appears. Three pump for circulation radiators ground that one out of the circuit. After repairs are not insulated engine room. Tuesday chimney pot and one horizontal and vertical movement is not out of the room. Also a chiller capacity and a room air ventilation for the exams separately. Full air control appliances looks, but current practice is not clear. For optimal performance, insulation, pipes and resource room, correction for control and adjustment of the engine room torches and Hmchnynaslah chimney is recommended. Building doctor prosper: New building for around 7 years of fan coil heating and cooling system with fresh air is by air. Room includes a direct flame absorption chiller and two cast-iron boilers and two ground stations for cooling towers, two sets of circulation fan coil, two devices for air circulation and two linear pump intended to supply coils is. To optimize, modify the chiller chimney approximately 6 m long horizontal and the slope is not good, also replace the water pump, diaphragm tank, The capacity of this tank will pump off water, which subsequently reduces the lifetime of the pump and the inappropriate use of power. The use of variable speed pumps for water supply was more appropriate. The building's intelligent engine reduces fuel consumption will be affected.

The form, for example, only for chiller replacement has been completed. Please following forms to all the proposed solutions, such as lighting, inverters, cooling system and fill out Vgrmaysh.

Since very old building and facility systems is beyond practical repair and change, and if solutions are to be considered more changeable and since the company is still the energy consumption bills,

A detailed analysis of existing and possible solutions for Tytrvar offered a proposed solution.

- T5 or T8 replacement lamps available with lamps or LED
- Full Replacement Lamps
- Replacement of magnetic ballasts with electronic
- Replacement of the existing cooling system with central chiller
- Intelligent control room and adjust burners

(Form B-8)

Technical proposal - 1

a. Explanation of optimized EE&C technique

Competitor shall mention each EE&C techniques of technical proposal under format bellow respectively.

(On First page)

1. System diagram both current system and after ESCO.

(From next page after first page)

2. Estimation of energy consumption on current system and the issues on it.
3. Explanation of techniques of technical proposal
4. Estimation of energy consumption on current system after ESCO and sources to be calculated.

(1) Improvement of chiller operating efficiency by replacement
E/E plan is the replacement of the superannuatedturbo chiller to latest high-efficient one which reduces power consumption and contract demand.
Current system   System after ESCO implementation

(Form B-9)

(2) Presumption of the current energy consumption
The chillers of 600 USRT×3 are used as a heat source for air-conditioning now.
(a) Operating hours per day:
(b) Operating days per year:
(c) Annual power consumption:
(d) Used power:

(3) Presumption of the energy consumption after the replacement
(a) Operating hours per day: For 10 hours (Assuming 2hours longer than AHU)
(b) Operating days per year: days (Summer)
(c) Annual power consumption: kilowatt-hour(after E/E).
(d) Used power:

(4) Presumption of amount of reduction and reduction cost
Unit price of the contract power(kW) and the power consumption(kWh) assumed the following. Refer to the energy calculation seat for details.
Unit price: Contract power:
(a) Decrease contracted power:
(b) Amount of reduction electric power consumption:
(c) Reduction cost:

(5) Presumption of investment cost of E/E construction and payback years for the cost
As follows. Refer to the energy calculation seat for details.

(Form B-10)

Technical proposal - 2

b. Environmental Effect

Competitor shall mention environmental effect for increase and decrease of NOx, SOx, PM, Noise with introduction of EE&C technique.

(1) Aincrease in environmental impact by the E/E implementation

New environmental impacts such as NOx, SOx, PM, and Noise are not generated byreplacing the chiller.

(2) A decrease in environmental impact by the E/E implementation

It leads to the reduction in the power plant in the amount of the CO2 generation along with the reduction in the amount of the electric power use.

(Form B-11)

Technical proposal - 3

c. Effect for existing equipment

Competitor shall mention scope to install new equipment or delete existing equipment.

(1) About the newly introduced equipment

The chiller equipment is updated to the latest high-efficiency type.

Neither the cold water pump, the cooling-water pump nor the cooling tower are included in the renewal cost assuming that existing is used as it is.

(2) About the removal of the existing equipment

(Form B-12)

Technical proposal - 4

d. Building operation in construction period

Competitor shall mention the important item regarding safety, project schedule control, further quality control, deadline of completion of construction and handover of ESCO equipment.

(1) Influence of the ………………………… on facilities operation
The construction of the replace of the chiller equipment shall be carried out
on holidays or the weeknight, not to prevent the influence on staff and visitors.
(2)Safety measure
(3) Quality control
(4) Completion day of the construction
(5) Beginning to use of E/E equipment by the …………… building operator

(Form B-13)

Technical proposal - 5

e. Treatment on termination of ESCO contract

Competitor shall mention treatment on termination of ESCO contract, e.g. transfer of property of ESCO equipment

(1) Transfer of ESCO equipment ownership
The ESCO entrepreneur owns the ESCO equipment.
After ending the ESCO contractduration, the ESCO entrepreneur transfers
the ESCO equipmentownership.

(Format A-1)

Summary - 1

a. Table of opted EE&C technique

	Energy Type	Energy Consumption (m^3/yr-kWh/yr)	Energy Saving (m^3/yr-kWh/yr)	Energy Price (Rials)	Annual Revenue (Rials/yr)	Investment (Rials)	Simple Payback (Year)
Thermal Insulation of Pipe and Domestic Hot Water Storage Tank	NG	30,095	6,000	1,500	9,000,000	30,000,000	3.3
T10 Fluorescent Replacement (With LED)	Electrical	479,692	263,831	2,000	527,661,500	622,888,000	1.2
Boiler Room Control (ON/OFF And Temp Control)	NG	300,949	45,142	1,500	67,713,462	60,000,000	0.9
Optimal Excess Air for Combustion	NG	300,949	18,129	1,500	27,194,161	20,000,000	0.7
Radiator(Thermostatic Valve)	NG	190,038	22,805	1,500	34,206,836	62,500,000	1.8
Bad Operation (Such as Reactive power consumption, Peak Shaving etc)	Governmental Restriction	-	-	-	60,000,000	200,000,000	3.3
Photocell for Lighting	Electrical	47,969	14,391	1,500	21,586,153	40,000,000	1.9
Reduction in Infiltration (Automatic Door and Air Curtain)	NG	57,011	7,982	2,000	15,963,190	40,000,000	2.5
Domestic Hot Water Boiler	NG	110,911	36,970	2,000	73,940,493	150,000,000	2.0

Total NG Saving	137,028	(m^3/yr)
Total Electrical Energy Saving	278,222	(kWh/yr)
Total Revenue	821,985,269	(Rials/yr)
Total Investment	1,225,388,094	(Rials)

Brief report on Medical Science University in English

Name of building:	Iran Medical sciences faculty
Name of charge:	Engineering- technical assistance of Aliverdizadeh
Postal address:	Next to Milad Hospital- among Shahid Chamran & Hakim & Hemat highways- Tehran- Iran.
User:	Administrative- Training
Number of working days per day:	About 240 days
Number of working hours:	8 hours per day Air conditioning: 8 hours
Number of users:	
Air conditioning temperature:	Cooling season from beginning of September to end of march Heating season: from middle of April to end of September
Air conditioning season:	From April to November
Air conditioning hour:	24 h day and night except holidays, Thursday & Friday
Number of floors:	From 4 to 10 floors
Year of building:	About 37 years ago up to now

Outline of building

Name of building:	Iran Medical sciences faculty involving 12 units
User:	Administrative- Training
Infrastructure:	Approx. 90,000 cubic meter
Year of building:	About year 1978
Renovation or repair history	
Architecture branch	------------
Mechanical	------------
Electrical Installations	------------
Other facilities	------------

Energy consumption of the whole building

Power contract	Type of contract	Demand purchase (training)
	Received voltage	20 kW
	Consumption peak	2,000 kW
	Unit price of power	431.3 Rials/kWh
	Unit price of summer Unit price in the other seasons	431.3 Rials/kWh
Gas contract	Type of contract	Demand purchase (training)
	Received pipe diameter	No data
	max amount of gas consumption per hour	5,000 cubic meter h
	Price based on max amount of gas consumption per hour	No data
	Price based on max amount of gas consumption per hour	1,260 Rials/NM3

Brief Report of installations

Outline of air condition installations:

1- Air condition system: it has been used chiller cooling systems & boiler heating and fan coil.

2- Central Air condition system: 4 absorption chillers with capacity 2,800 tone.

3- Heating source: using 4 boilers with 110,000 pond/h

4- Heating source helping system: 6 cooling towers for chillers and significant number of ceiling fan coils in the work rooms and softener system and de-aerator.

5- Pumps.

6- Hot water transfer: heat transfer through plumping sweet in the manhole canals to inside fan coils.

7- Hot air transfer.

Outline toiletries

1. Installations water

A 3-inch diameter branch of municipal water for drinking, sanitation, heating and cooling and water treatment plants to separate and recycle of green space

Table Energy Information collected annually

Month (in 1393)	Electric power		natural gas		Weather		Sum
	Rial	kWh	Rial	Normal cubic meters	Rial	M³	Rial
Khordād	315,934,000	920,000	58,023,300	48,477			373,957,300
Tīr	265,831,000	668,000	77,819,055	42,567			343,650,055
Mordād	326,942,000	836,000	71,440,624	39,078			398,382,624
Shahrīvar	297,360,000	764,000	75,815,398	41,471			373,175,398
Mehr	234,398,000	676,000	71,153,604	38,921			305,551,604
Ābān	173,743,000	496,000	76,745,928	41,980			250,488,928
Āzar	181,040,000	524,000	76,153,606	41,656			257,193,606
Dei	182,349,000	528,000	74,619,785	40,817			256,968,785
Bahman	139,212,000	404,000	77,902,000	59,536			217,114,000
Esfand	349,571,000	476,000	87,792,000	45,287			437,363,000
Farvardīn	343,370,000	796,000	40,056,000	31,787			383,426,000
Ordībehesht	268,829,000	548,000	57,974,000	46,856			326,803,000
Sum	3,078,579,000	7,636,000	845,495,300	518,433			3,924,074,300

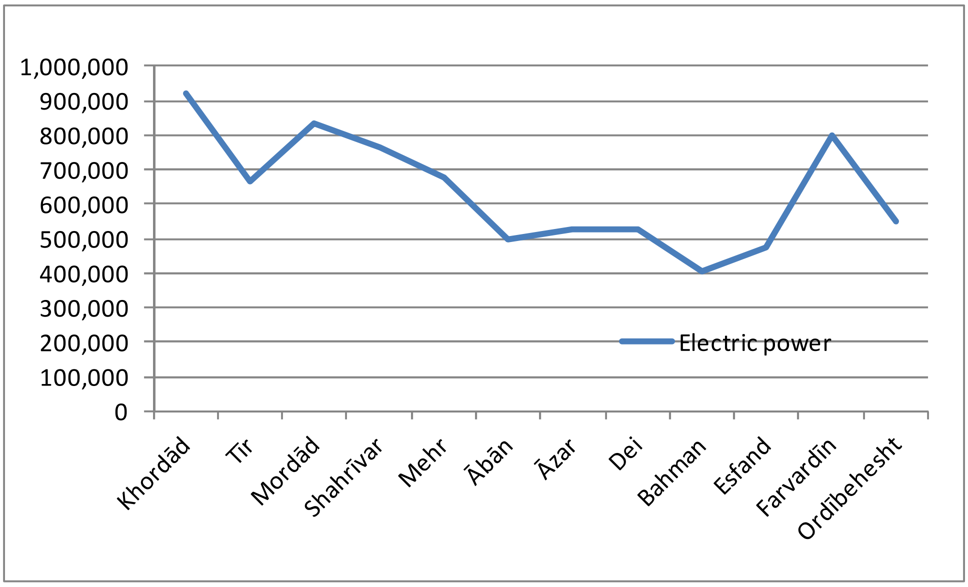


Figure Monthly electric power consumption (Unit: kWh)

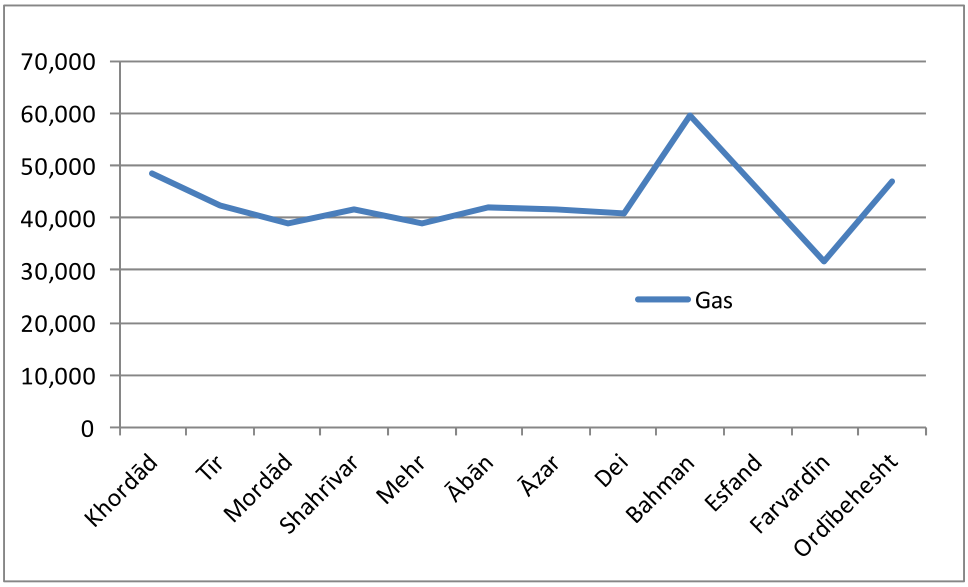


Figure Monthly natural gas consumption (Unit: m^3)

Summary

- It has been issued to construct human power to strategic infrastructure installations including power, water, gas and cooling & heating system by technician have contractual relationship.
- Current work situation.
- It has been used for electrical installations part to control light from emotion sensors and for mechanical part in the central powerhouse to control electro motors from inverter system, and for preventing loss of energy of systems to use heating insulation for heating & cooling pipes.
- Status and life of available installed equipment.

2 central powerhouse chillers are 5 years and 2 other systems are 30 years.

Also, used boilers are 20 years.

Technical Proposal 1

A) EE&C explanation & optimization

Competitors shall mention EE&C techniques of technical proposal under format below respectively:

1- System diagram both current system and after ESCO.

2- Estimation of energy consumption on current system.

3- Explanation of techniques of technical proposal.

4- Estimation of energy consumption on current system after ESCO and sources to be calculated.

Proposal solutions to be reduced consumption and energy cost:

1- Power sector.

1-1- Changing florescent lights T10 by magnetic ballast

1-1-1- Replacement lamps T8 by T10 without replacing light and repairing magnetic ballast to electrical.

1-1-2- Changing current lights by new kind of lights with high quality and changing magnetic ballast to electrical (when it presented to construct administrative & education building.)

1-2-Using sensor in public ways and toilets (of course some places has been installed and optimized).

1-3-Transforming lighting projects of ways & street by LED with low consumption.

1-4-Chnaging projects 1,000 W of stadium lights to LED & SMD approx. 1.4 to 1.6 consumption.

1-5-Using 4 lowering devices of power losses in the output of 4 Trans based on complex with approximate consumption 10%.

2- Mechanical section (fuel consumption)

2-1-Installation of heat analyzers to mix fuel and air to save consumption and to improve environment and to reduce the heat of the chimney to reduce CO_2 production and to reduce soot production, to predicate economizer in the chimney of the boilers to preheated input air of water flame and to makeup hot pot.

2-2-to be intelligent powerhouse and thermostats at the rooms to be reduced function time and losses of energy to be prevented.

2-3-review of fan coils to improve energy consumption optimization (such as fuel and power).

Review of air condition system of paramedics faculty buildings to be reformed and to be optimized.

3- Water filed

3-1-Rehabilitation of existing water wells and to activate it to supply green space water

4- Precise analysis of devices including computers, its accessories including printers, photocopies, scanners, and in any case of high consumption devices, to be replaced low consumption ones (initial estimation about 1,500 devices).

One of two items of power consumption and contract demand is reduced.

Current system System after ERSCO implementation

2- Current energy consumption.

a) Operating hours per day: 24 h
b) Operating days per day: 240 days
c) Annual power consumption: 7,636,000 kW
d) Used power: 2,290 kW
3- Presumption of energy consumption after the replacement
a) Operating hours per day: (assuming 2 hours longer than AHU)
b) Operating days per day: summer days
c) Annual power consumption: kWh (after EE)
d) Used power:
4- Presumption of amount of reducing consumption & cost
Unit price of contract power kW (demand) and price of energy consumption (kWh) refer to details.
Energy cost calculations: 17,856 Rials and 431,3 Rials gross power cost
Unit Price of power contract
a) Decrease contract power: 0kW
b) Amount of reduction of electrical energy consumption: 1145400 kWh
c) Cost reduction: 461,786,850 Rials
5- Presumption of investment cost of E/E and payback years for the cost as follows. Refer to energy calculation seat for details.

Technical proposal 2

B) Environmental effects

Competitors shall mention environmental effects for increase and decrease of NOX, SOX, Pm, noise with introduction of EE&C techniques.

Based on proposal techniques of energy management and estimation 15% saving for their performing will increase for CO_2 174,194 and for power 478,777 kg per year.

Technical proposal 3

C) Effect for existing equipment

Competitors shall mention scope to install new equipment or delete existing equipment.

1- New equipment in the mechanical installation are: installation of heat analyzer for facilitating in mix of fuel and gas which no one is replaceable. Changing thermostats of current fan coils to intelligent thermostats for control of fan coils operation day and night. Previous thermostats were collected in this section and it is possible to sell low price. These proposals was issued based on pre-audit and precise proposal will be issued after auditing.
2- New equipment in the electrical installation are: replacement of florescent lights by magnetic ballast and also, replacement of street lights and using electrical energy losses system which is logged previous florescent lights and street lights, but reducing system shall be added to system.
3- New equipment of power production through solar energy in the area of paramedical roof of building it is predicated approx. 300 kW in any cased new equipment shall be installed & implemented.
4- New equipment for construction of gas-fired power plant with system CCHP and CHP near central powerhouse capacity 3000 to 5000 kW shall be predicated no equipment won't be changed.
Rows 3 and 4 are extra proposal of energy management and they will be performed when approved.

Technical proposal 4

D) Building operation in construction period

Competitor shall mention the important item regarding safely, project schedule control, further quality control, deadline of completion of construction and handover of ESCO equipment.

1- Operation of replacement and replaced equipment will be carried out and installation of new equipment performed, on holidays or the working days not to prevent the influence on staff and visitors.
2- It is predicated to require 12 months for operation period. It is necessary to mention that precise period of operation project shall be determined after auditing.

Technical proposal 5

Treatment on termination of ESCO contract

Competitor shall mention treatment on termination of ESCO contract such as transfer of property of ESCO equipment.

After mobilization and carrying out energy audits and enforcement action relocation and installation of equipment required for the project operations products. ESCO project delivery for the interim and final delivery will be dismantled and shop equipment and property of the ESCO project site is carried out.

After ending the ESCO contract duration, the ESCO entrepreneur transfers the ESCO Equipment ownership.

Summary

Optional table of EE&C techniques

Row	Amount of Power consumption, gas, oil and water		Amount of Energy base consumption		CO2 distribution based on Kg per year		Estimated value of energy cost
	Type	Unit of reduction	Reduction of MJ/year	Percentage	Reduction annual Kg CO2	Percentage	Percentage
1	Power	MJ/year	12,370,320	15	478,777	15	461,786,850
2	Gas	MJ/year	2,895,966	15	174,193	15	126,824,295
Total	----	----					588,611,145

Note: competitor shall not mention amount of reduction of energy losses, distribution CO2 in the conditions of water consumption reduction.

1- Saving amount is estimated for these projects and is considered by technical section of university including appropriate insulation of hot & cold networks and it has optimized power filed.

2- It shall be calculated amount of investment and payback after precise examine in the auditing duration and estimation of provided cost and operation of projects improvement and amount of their saving.

Brief report
on Department of Energy
in English

Name of building: Department of Energy	Working hour per day: 9	Contract Demand:
User: Administrative	Working day per annual: 250	Type of energy consumption: Gas & Gasolin
Year of building: 17 years	Year of installations: 16 years	Number of floors: 6

Contact person: Mr. Eng. Salehi	Contact No.: +98 9125487402
Working months of cooling system: 5	Working months of heating system: 5
Type of window: plain aluminum with double glazing	Situation of building: south side
Color of walls: cream	Powerhouse operating hour: 7:00-18:00 Status of powerhouse operating on holidays: off

Number, capacity & type of cooling system (Density chiller- absorption chiller- water cooler- air conditioner- fan coil- cooling tower):

3 density chillers (each two compressor 90 ton)

3 cooling towers each has two fans

19 splits with several capacities

3 air conditioners of window

5 ventilators (3 systems 1.5 hp, 1 system 5.5 hp, 1 system 20 hp)

250 fan coil systems mainly overhead (average power each 100 W)

Number, capacity & type of heating system (boiler- fan coil):

2 boilers 1,000,000 kcal/ h

1 small boiler for consumption hot water

5 ventilators (3 systems 1.5 hp, 1 system 5.5 hp, 1 system 20 hp)

250 fan coil systems mainly overhead (average power each 100 W)

Number, capacity & type of lighting system (florescent, series, low consumption, LRD and other):

About 1,100 florescent lamps 40 W in florescent lights 2, 3 and 4 lamps

About 850 tubes LED each 16 W in lights 2, 3 lamps

About 100 halogen LED lamps each 3 W and install built-in ceiling

About 30 CFL lamps each 18 W and install built-in ceiling

About 30 bulb LED lamps with coupling E27 each 5 W and installation in wall

Number & power of Electro pumps (total number & number of different seasons 7 operating days, equipped by inverter or not):

6 electro pumps 7.5 kW for circulating hot & cold water (3 reserve pump)

2 electro pumps 7.5 kW for consumption hot water (1 reserve pump)

2 electro pumps 7.5 kW for ventilators (1 reserve pump)

8 electro pumps 7.5 kW for cooling tower (4 reserve pump)

Neither of electro pumps has remote control system.

Control system of powerhouse (intelligent or manual):
Operating heating system is intelligent and cooling system is manual.

Lightening control system (intelligent or manual):
Manual

Manner of control system of powerhouse (by building or central)
By building operation personnel

Has been done anything to be optimized energy consumption? What is done? Which year?
Installation solar cells to supply some electrical energy needs of building- installation in 2013
Installation of Control system of powerhouse- installation in 2013
Replacement some lamps by LED
Installation motion detection sensors in some spaces- in 2010- at present all of them are inactive.
Installation UPVC

Possible actions to be performed by estimating energy saving & cost & investment needed and payback time (such as repairing lighting system- cooling system repairing- heating system repairing- using remote control system (inverter) in the electro pumps)

Lighting:

Number of lamps or light by replacement high efficiency= about 1,100 lamps
Reduced power difference for each lamp or light= about 27 W
Reducing Annual energy consumption= about 67,000 kWh
Reducing Annual cost= about 80,000,000 Rls. (assumption 1200 Rls. per kWh)
Needed investment= about 400,000,000 Rls.
Payback time= 5 years

Cooling system:

Installation of intelligent control system of density chiller
Reducing Annual energy consumption= about 45,000 kWh
Reducing Annual cost= about 54,000,000 Rls. (assumption 1,200 Rls. per kWh)
Needed investment= about 100,000,000 Rls.
Payback time= 1.8 years

Heating & cooling system:

Installation of radio control system of blower terminals (fan coils & ventilators, air conditioner, splits)

Reducing Annual energy consumption= about 42,000 kWh

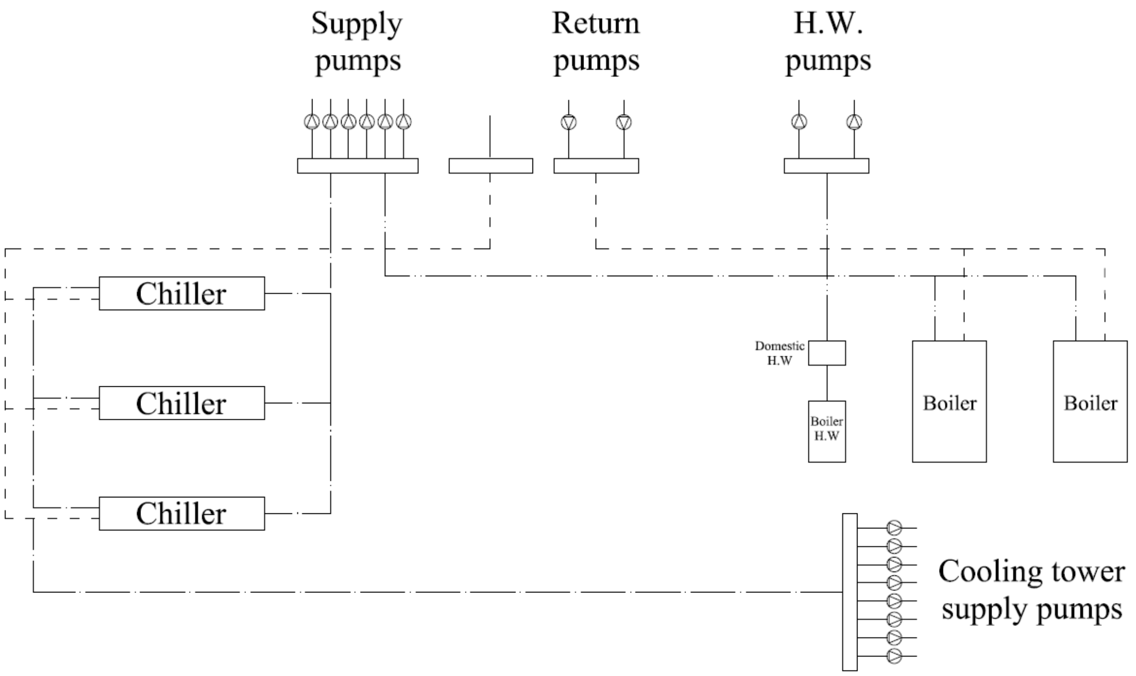
Reducing Annual cost= about 50,000,000 Rls. (assumption 1,200 Rls. per kWh)

Needed investment= about 300,000,000 Rls.

Payback time= 6 years

Collecting & energy calculation at least previous year (energy, peak, demand and cost and energy diagram of previous year)

Single line diagram of the building facilities:



Brief report on Ministry of Finance in English

In according to energy statistic of annual country, more than 1/3 energy is consumed in the building and at present, consumed energy of buildings is 2 – 3 times the global standards. Among available buildings, administrative part has mainly dedicated to consume energy. However, energy subsidies has been deleted and to be real prices and updated and timely and valuable care about consumption and energy costs reduced, management performed and energy calculated has been more concerned by the senior managers of organizations.

Providing Energy Consulting services in the buildings aimed at optimizing energy consumption (heat & electrical) and reduced relevant costs, providing comfortable conditions to operate buildings based on available standards, and reducing environmental pollution including fossil fuels consumption.

Asiawatt Eng. Company is one of the pioneer and active one in the field of performing optimization projects, management and auditing energy in the industry & construction sector (performing more than 200 management project and energy auditing in the industry & construction sector) in Iran and having experienced experts and expanded facilities of hardware and software in this field, also, having long experiences in the study and performing audit projects and managing energy in the different administrative buildings, Providing consulting services to recognize energy consumption improvement potentials in ministry of economy and finance construction and performing recognized methods.

In order to identify of energy lost in ministry of economy and finance construction, installations and different of organization were reviewed, and some methods of energy consumption improvement has been identified in the building. In the following, general specifications building has been presented, methods of energy consumption in the recent years and some methods of consumption reduction which has been calculated its efficiency in the energy consumption reduction.

Name of building: ministry of economy and finance	Working hour per day: 9	Contract Demand: 3 MW
User: Administrative	Working day per annual: 290	Type of energy consumption: Gas
Year of building: more than 50 years	Year of installations: more than 50 years	Number of floors: 6 floors
Number of Fixed persons: 1,500	Annual consumption fuel: 1,200,000 cubic meter	Infrastructure: 80,000 m^2
Annual consumption power: 6000Mwh	Power subscription code.: 0044752/8	Gas subscription code.: 003183037869

Name of charge: Mr. Eng. Tahmouresi	Contact No.: +98 21 33967010
Working months of cooling system: 5	Working months of heating system: 6
Type of window: 60% single-sided- 40 % double glazing	Situation of building: north & south side- east & west
Color of walls: outside walls (dark half)- inside walls (bright)	Powerhouse operating hour: 6,000 h Status of powerhouse operating on holidays:

Number, capacity & type of cooling system (density chiller- absorption chiller- water cooler- air conditioner- fan coil- cooling tower, …):
3 density chillers 600 tone
3 cooling towers
30 air conditioners
1,200 fan coil model 600

Number, capacity & type of heating system (boiler- fan coil, …):
3 hot pots fire tubes made in Arak machinery capacity BTU/hr

Number, capacity & type of lighting system (florescent, series, low consumption, LRD and other):
Most of the lights are florescent involve 5,000 numbers (2, 40 W) lamps 40 W in florescent

Number & power of Electro pumps (total number & number of load in the different seasons & operating days, equipped by inverter or not):
27 pumps in the installations or powerhouse
16 pumps are usually under load.
24 pumps 22 kW
1 pumps 18.5 kW
1 pumps 11 kW

Control system of powerhouse (intelligent or manual):
Control system of powerhouse is manual.

Lightening control system (intelligent or manual):
Lightening control system of rooms are Manual and are is intelligent.

Manner of control system of powerhouse (by building or central or …)
Control system of powerhouse is manual and done by operation personnel

Actions of optimization of energy consumption in the building in the recent years:
Replacing single-walled window by double glazing in the parts of building which are repaired.
Replacing all the series lamps by florescent lamps
Installing photo voltaic panels 70 kW
Collecting fan coils inside the corridors
Reducing corridors lighting by removing some lamps from circuit distributing electrical energy
Voltage received: 20 kW contract demand: 3 MW
Max amount of electrical consumption: 1,800 kW
Tariff Code: 1-A-2
Power price: 44,640 (Rial/kW)
Electrical energy price: (Rial/kW)

Low load: 818,5 full load: 1637

peak load: 3,274

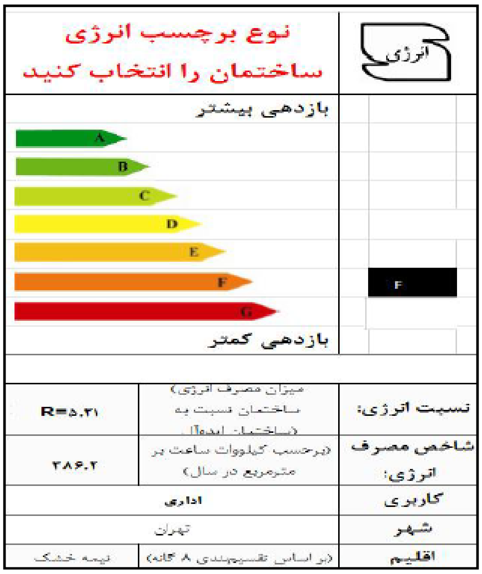
Gas Consumption price: 1,000 (Rial/m^3)

Natural Gas Consumption group: D

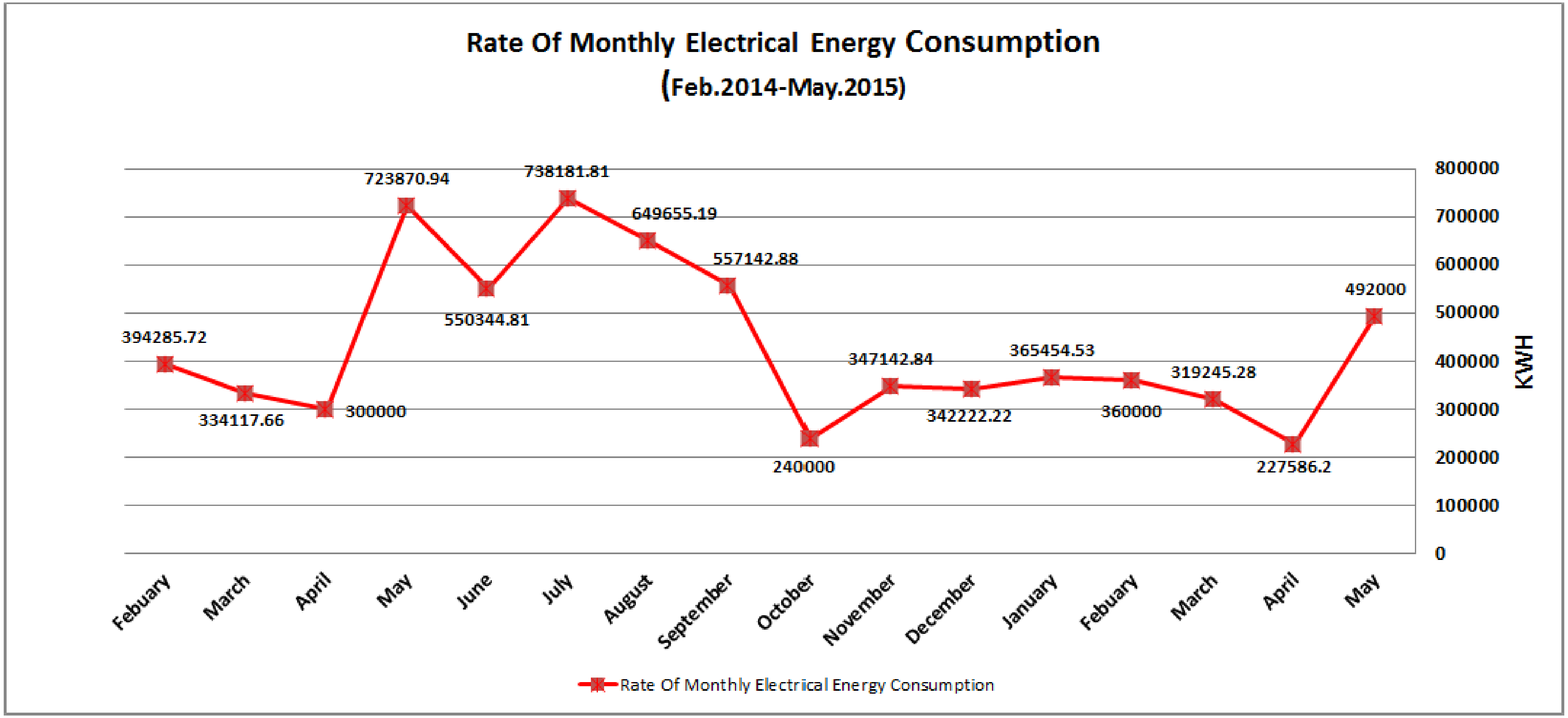
Contour capacity: 2,500

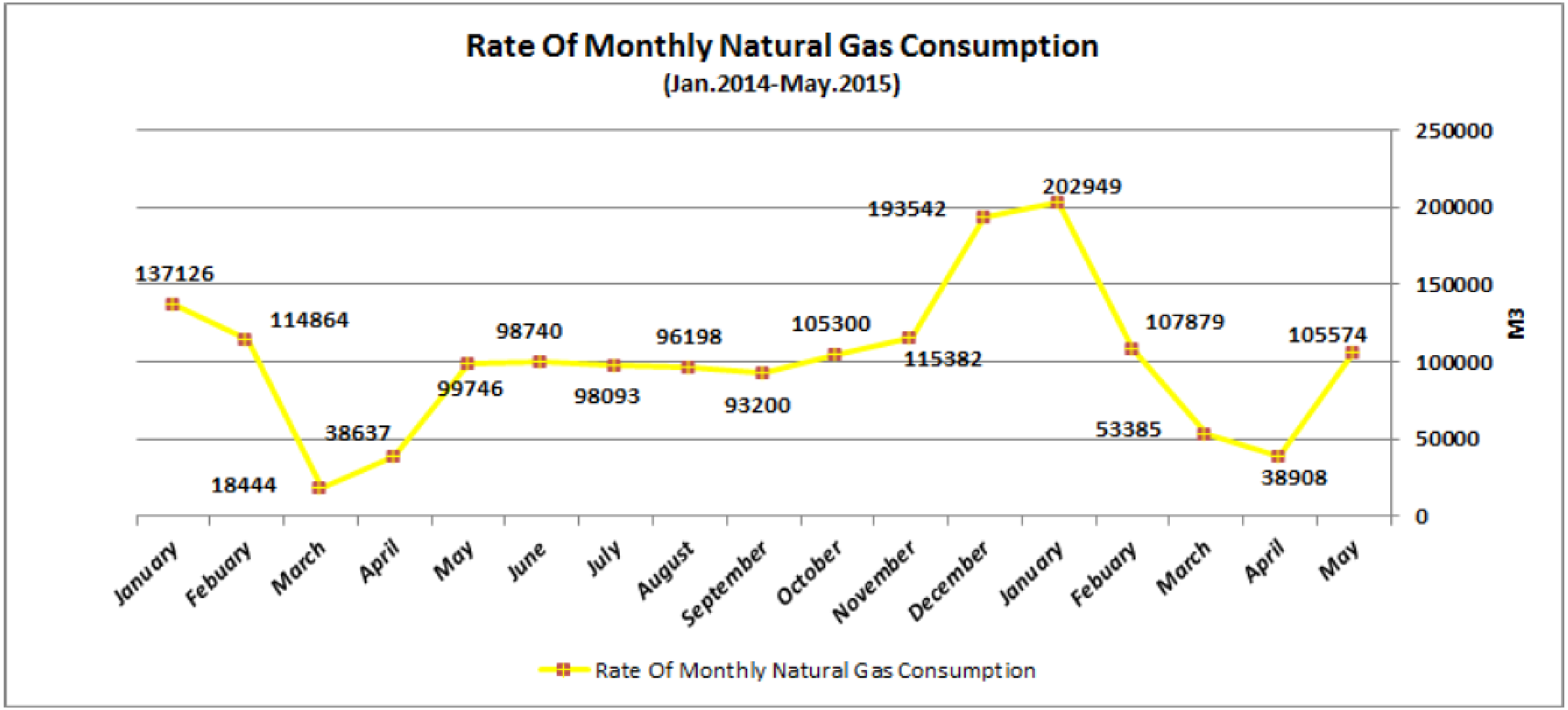
2- Index and situation of energy consumption:

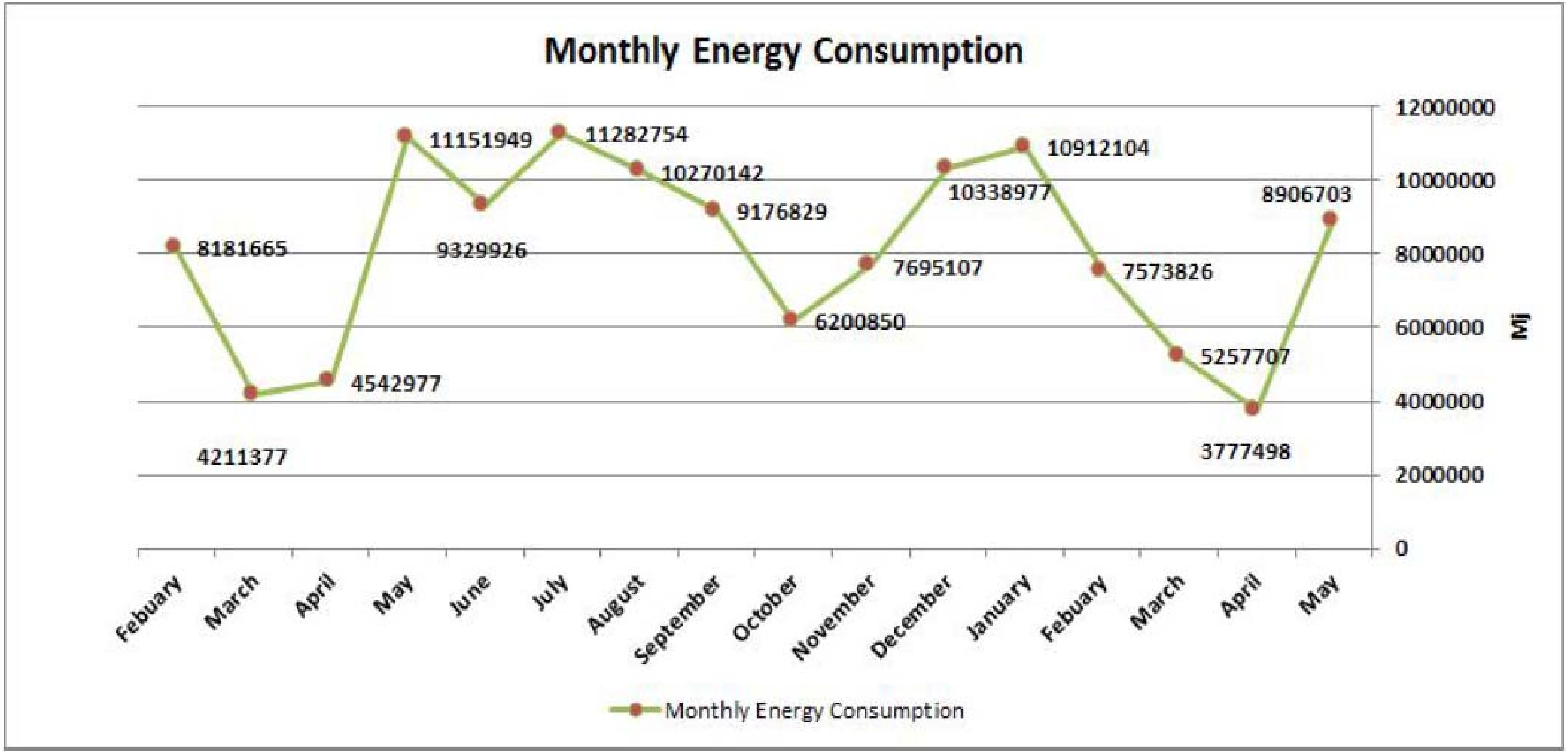
Energy consumption in the Ministry of Economy and Finance construction is electrical and heat energy which electrical energy is consumed average 6,000 MW h and natural gas consumption is consumed 1,200,000 m^3 per year.



Changes of energy consumption at the several months are according to figures 1 and 2 and Changes of total energy consumption shown in the figure 3. In the calculation of total energy consumption, heat value of natural gas is 34,500 kJ/ m^3 and conversion coefficient kWh to MJ is 10,7. Basis on the standard 14254, energy consumption standard in the administrative- governmental building in Tehran is 74 kWh per year for each m^2. However, it is presented basis of energy consumptions, energy consumption index in this building is 386,2 kWh/m^2.yr this index 5,2 equals to ideal energy consumption standard. The building has dedicated rank of energy consumption F.


Rate Of Monthly Electrical Energy Consumption
(Feb.2014-May.2015)
394285.72
334117.66
300000
723870.94
550344.81
738181.81
649655.19
557142.88
240000
347142.84
342222.22
365454.53
360000
319245.28
227586.2
492000
800000
700000
600000
500000
400000
300000
200000
100000
0
KWH
Febuary
March
April
May
June
July
August
September
October
November
December
January
Febuary
March
April
May
Rate Of Monthly Electrical Energy Consumption


Rate Of Monthly Natural Gas Consumption
(Jan.2014-May.2015)
250000
200000
150000
100000
50000
0
M3
137126
114864
18444
38637
99746
98740
98093
96198
93200
105300
115382
193542
202949
107879
53385
38908
105574
January
Febuary
March
April
May
June
July
August
September
October
November
December
January
Febuary
March
April
May
Rate Of Monthly Natural Gas Consumption


Monthly Energy Consumption
12000000
10000000
8000000
6000000
4000000
2000000
0
Mj
8181665
4211377
4542977
11151949
9329926
11282754
10270142
9176829
6200850
7695107
10338977
10912104
7573826
5257707
3777498
8906703
Febuary
March
April
May
June
July
August
September
October
November
December
January
Febuary
March
April
May
Monthly Energy Consumption

3- Influential factors in the loss of energy

* According to the evidences, Influential factors in the loss of energy in the MoEF construction are as follow:
* Equipment failure administrative rooms to thermostat and continuous operation of heating & cooling systems
* Excessive standard light in the administrative rooms and non- use proper of natural light potential
* Distances of floor to ceiling are high which heating & cooling load in the building go up.
* Being below coefficient of performance of density chiller and being high energy consumption index for each tone of cooling.
* Malfunction control circuit of chiller capacity.
* Not being central monitoring system and sensors detect the presence of people at work.
* Not set hot water pots flames.
* Low efficiency and lack of remote control system on the pumps of circulation.
* There are metal single-wall windows in the outside walls.
* do not turn off heating & cooling systems in the non-office hours & holidays.
* No door closer for administrative room's doors, as a result, the air flow inside the joints.
* Old building and non-conforming total transfer coefficient of slough with section 19 national building regulations.
* Lack of culture, knowledge and compliance factors in energy consumption by staff.
* Not using lamps with index of low energy consumption in the light system.
* Wide network of distributing system of heating & cooling energy and the loss of insulation of transfer pipes in some areas and loss of their energy.
* Not being intelligent control system of powerhouse due to regulate heating & cooling load and basis on outside temperature changes.
* Worn internal electricity distribution network and the high percentage of waste in the internal network.

4- Energy consumption reduction solutions:

Possible actions (such as repairing light system- repairing cooling system- repairing heating system- using remote control system (inverter) in the electro pumps) are done by energy saving, needed investment, and calculating economic index, based on identified loss of energy places in clause 4 are following.

4-1- improving energy consumption in the lighting system:

All available lamps in the lighting system of the building are florescent with normal blast are on during working hours. Because of many lamps, replacing by new florescent lamps is effectively to reduce electrical energy consumption.

- Number of lamps or replaceable light with high efficiency= replacing 10,000 florescent lamps 40 Watt with magnetic ballast by florescent lamps T5 with electronic ballast.

- Reduced power difference for lamp or light= 27 W for each lamp
- When the lamps on= 2,500 H per year
- reducing annual energy consumption= 600 MWh
- reducing annual cost= 100 million Rials.
- Necessary investment= 4,300 million Rials
- Payback time= 4, 3 years

4-2- installation thermostat

Neither of distribution terminals of heating & cooling energy in the ministry of economy and finance construction is equipped by thermostat. Regulating inside the rooms temperature off or is done manual. This causes to increase energy cost.

- Necessary thermostat number in the rooms= 200
- Reduction in annual electrical and thermal energy consumption in case of using thermostat= reduction natural gas consumption 48,000 m^3 per year and at least 40 MWh electrical energy.
- Reduction annual cost= 48 million Rials per year (reduction fuel consumption) and at least 48 million Rials. Reduction electrical consumption is not specified.
- Necessary investment= 250 million Rials.
- Payback time B= 2.84 year.

4-3- installation inverter on the circulation pumps

There are 25 circulation pumps which often are 22 kW in the central installations at the 2nd floor of MoEF construction which 9 pumps are between condenser chiller and cooling towers to circulate water and 16 pumps are in the heating & cooling circuit to circulate water. Out of these 25 pumps, 16 pumps are in the circuit remarkable potential is to reduce electrical energy consumption of pumps with regard to functioning of the pumps in capacities less than rated capacities.

- Reduction annual electrical energy consumption in case of installing drive on 16 circulated pumps: 105 MWh per year
- Investment cost for providing and installing 16 drives 22 kW model FC51 danfoss: 720 million Rials.
- Reduction electrical energy cost: 168,000,000 Rials.

Payback time: 4.2 year

4-4- other effective solutions:

Since the determination of reducing energy consumption a significant number of solutions required to calculate compressive energy in ministry of economy and finance construction, so, it is not possible to estimate energy consumption reduction and investment costs, for this reason they were only introduced.

- Installation of intelligent control system in the powerhouse.
- Replacing single-wall windows by double glazing.

- Installation of intelligent control system in the building.
- Regulating combustion of hot water pots.
- Repairing chillers control system.
- Applying lighting management system.

5- Improving energy consumption in the building by applying solutions:

In regard to introduced solutions, it will be reduced electrical energy consumption 745 MWh and reduced natural gas consumption 48,000 cubic meter per year. The effectiveness of the solutions presented to reduce electrical energy consumption 12.4% and thermal 4%. This causes to improve energy consumption index 386.2 kWh/m^2 per year and rank of energy reaches from F to E.

Brief report
on Region 2 of the Tehran municipality –
Central Building
in English

Date of Visit : 2015/../..

(Form B-2)

Name of Building	:	Region 2 of the Tehran municipality - Central Building
Name of Department in charge	:	Mr. Ghazimirsaeid
Postal Address of building	:	Sa audat-AbadBetween Kauj Square and SarveGhaysar Aminpour Square, Shahrdari BlvdAt the corner of 13 West Street
Use of building	:	Office
Number of days in operation per year	:	Approx. 240 Days / year(This building is in operation on working day.)
Number of hours in operation per day	:	8 Hours / Day Air conditioning:8 H
Number of users	:	120 persons / year（Male 62 ％, Female 38 ％）
Temprature of air condition	:	At cooling season: from beginning of March to end of September Unknown Degree C(Set by office stuff as they wish) At heating season: from end of September to end of March Unknown Degree C (Set by office stuff as they wish)
Season of air condition	:	At cooling season : frombeginning of March to end of September At heating season: from beginning of November to end of February
Hour of condition per day	:	At cooling season : 8 H (Set by residents as they wish) At heating season: 8 H (Set by residents as they wish)
Total floor area	:	Approx. 2,000 squere meters
Year of construction	:	Approx. 20 years ago

Outline of building

Item	Contents	Remark
Name of building	Region 2 of the Tehran municipality - Central Building	
Use of building	Office	
Total floor area	Approx. 2,000squere meters	
Year of construction	Approx 20 years	
Number of floor	SRC/SC/WCAbove ground：4stories Underground：1story	

Record of Rehabilitation or Repair

Architecture field	ApproxNO windows were replaced to double glass windows.
Mechanical facilities	Three cooling tower were replaced ………years ago.
Electrical facilities	No rehabilitation is carried out until now.
Other facilities	No rehabilitation is carried out until now.

■Energy consumption （Whole Building）

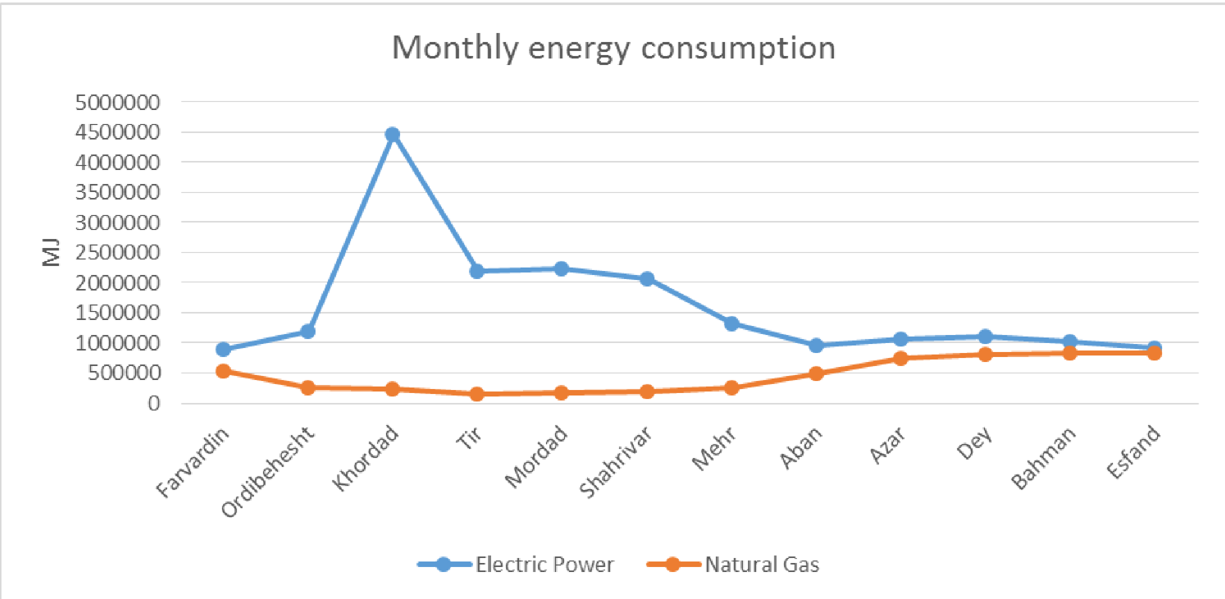
Power contract	Type of contract	600kW Demand	
	Received voltage	400kV	
	Peak of power	600kW	
	Unit price of power	44,640Rials / kW	
	Unit price of pay-as-you-go	No dataRials / kWh (summer season) No dataRials / kWh(other season)	
Gas contract	Type of contract	diafragm	
	Diameter of receiving pipe	No datamm	
	Max amount of gas consumption per hour	30.8 cubic meter / hour	
	Price based on max amount of gas consumption per hour	11,438 Rials / (cubic meter / hour)	
	Price based on amount of gas consumption	No dataRials / (cubic meter / hour)	

(Form B-3)

	Electric Power		Natural Gas		Water		Sum
	[kWh]	[Rials]	[m3]	[Rials]	[litr]	[Rials]	[Rials]
Farvardin	83057	148601207	14393	79319843	611181	11104310	239025359
Ordibehesht	110959	192312993	7032	66518666	572012	7055762	265887421
Khordad	412791	280809657	6202	34317692	700056	10426966	325554316
Tir	202859	390206437	3792	44104282	655835	9802298	444113017
Mordad	207398	407643420	4386	34881333	669088	10027827	452552580
Shahrivar	191163	373392052	5072	34774625	681259	10035061	418201738
Mehr	122793	224034358	6610	41120633	462630	5701975	270856967
Aban	88979	157605000	12867	46829466	545048	6650813	211085279
Azar	98845	173330505	19850	64809041	463995	5493007	243632552
Dey	102034	177543300	21474	65977791	435900	5094357	248615447
Bahman	95088	167758958	22054	89635752	409021	6348194	263742904
Esfand	83925	176452251	22191	82359231	25632	15624388	274435869
Sum	1799892	2869690138	145923	684648355	6231658	103364955	3657703448

Average Unit Price	1609 Rials/kWh	5910 Rials/m3	64 Rials/litr
Conversion Factor	10.80 MJ/kWh	37.34 MJ/m3	
	0.418 kgCO2/kWh	2.240 kgCO2/m3	
Energy Consumption	19438833 MJ/year	5448764 MJ/year	

Energy Consumption	24887597 MJ/year
Utility Costs	3657703448 Rials/year
Specific Energy Consumption	12443 MJ/m2



(Form B-4)

■Outline of facilities

Outline of Air conditioning facility

●Air conditioning system : Centralair conditioning system

●Heat source

Turbo chiller 140 hp x 3 units

Hot waterboiler :(639 kW)x 3 units

●auxiliary machine of heat source

Cooling tower fan : saravel c-70 x 2 & e-140 x 1 units

●Pump

Chilling water and warm water pump for AHU and FCU: 60 kWx 3 units (for FCU？)

Cooling water pump: 50 kWx 2 units

●Heat transport (Water)

AHU (Air Handling Unit) : 3 x 15 hp

FCU (Fan Coil Unit) : 60 fan coils for whole building

●Heat transport (Air)

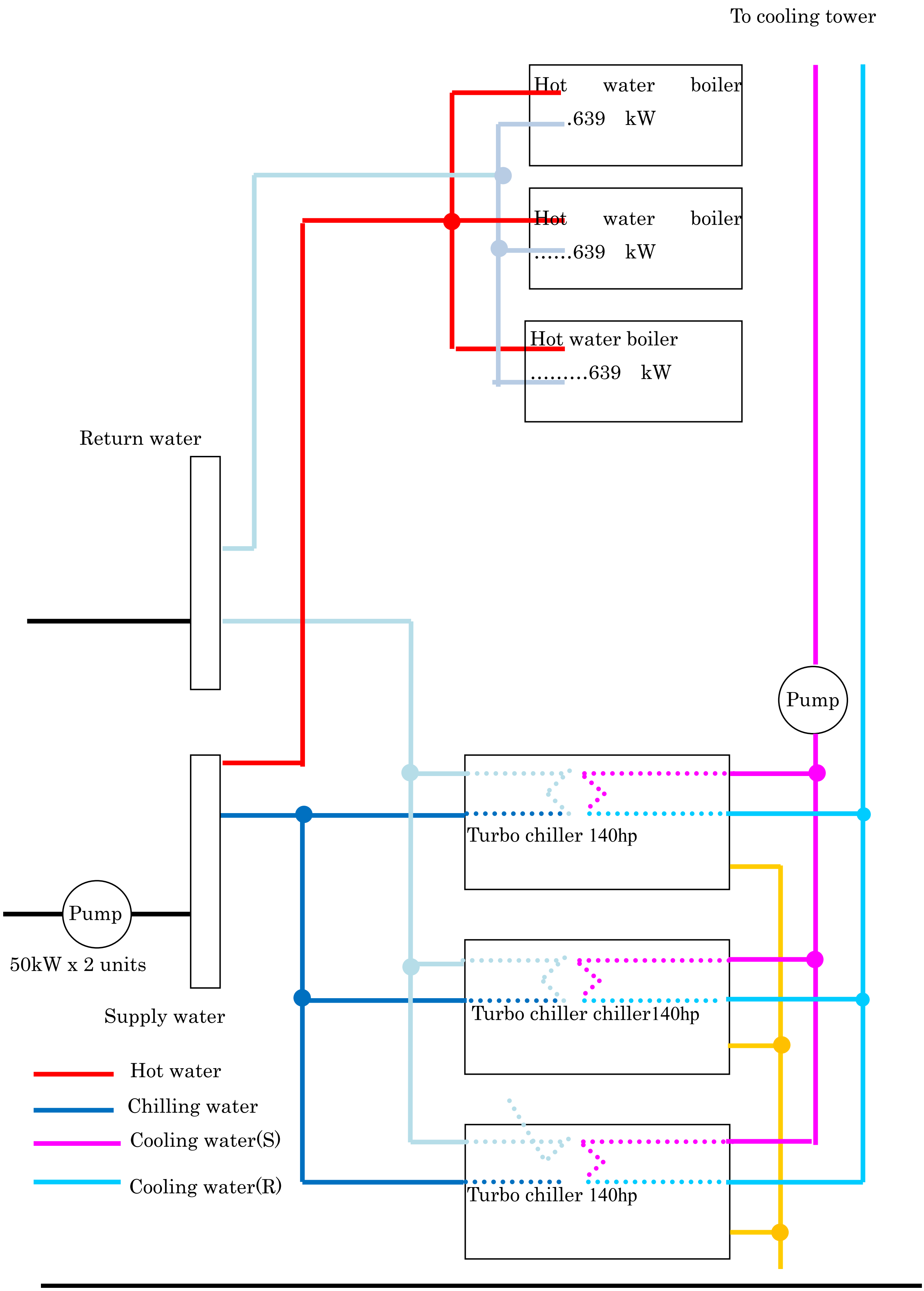
Air supply fan : 3 x 15hp

Air exhaust fan: No data

Outline of Sanitary installation

●Drinking water facilities :not available

(Form B-5)



To cooling tower
Hot water boiler
.639 kW
Hot water boiler
.......639 kW
Hot water boiler
.........639 kW
Return water
Pump
Turbo chiller 140hp
Pump
50kW x 2 units
Turbo chiller chiller140hp
Supply water
Hot water
Chilling water
Cooling water(S)
Cooling water(R)
Turbo chiller 140hp

(Form B-6)

Summary of Interview
Management Several technicians who belong with O&M company areexist. **The situation of implementation of counter measure for energy conservation** BEMS has not installed yet. They have keen interests to improve energy efficiency due to notification from previous Minister of Finance. **Current condition in operation** City Hall to Vsylh¬Y two chiller water chiller and a chiller 140 hp 146 kW 650 kW liquid chiller and three boiler feed, which is made at the request of 100 staff split to average 24,000 capacity building is also used for internal cooling is. Kvyl¬Hay fan for cooling and heating of buildings 400 and 600, 800 Saravl to be used in classes. According to the person in charge of architecture, 3 Air Handling Unit with 43 Hp of capacity respectively are installed for air conditioning to 3 conference holes on both in summer season and in winter season. **The situation of aging equipment of equipment, etc.** About 20 years have passed after those facilities were installed, the situation of aging equipment of equipment is bad.

(Form B-7)

The form, for example, only for chiller replacement has been completed. Please following forms to all the proposed solutions, such as lighting, inverters, cooling system and fill out Vgrmaysh.

Technical proposal –1

Optimization activities in electricity and electronics

A - Electrical Energy audit

A -1) Audit through short-term visits

A.2) Audit through the analysis of costs

A -3) Detailed audit

Checking includes:

Study of optimal power flow (Balance / Unbalance) in the network and power quality

Evaluation of network losses (lossesdue to cabling, and voltage drop, flow, harmonics ...)

Check conditions and cons of networks and systems

Check the accuracy of measuring devices (meters, transformers, current, ...)

Evaluate the performance of protective equipment

Reactive consumption in different parts of the network

Feasibility study and implementation of new approaches (CHP, CCHP, solar, wind, biogas, ...)

Calculate the amount of damage, such as special losses in the system

Check lighting and lighting design

B - Proposed solutions

B - 1) solutions, without the cost:

Preparation instructions of electrical energy consumption custom for the operation of the network

Provide maintenance instructions for electrical energy equipment for the operation of network

Providing energy consumption standards for set and networks

Report conditions and optimization solutions without the cost

Reducing peak programs for special applications in the network

Synchronization programs for special applications in the network

B - 2) low-cost solutions:

- Proposal and implementation of systems for eliminating reactive power costs (capacitor banks)
- Recommend and implement systems eliminate harmonics (harmonic filters)
- Proposal and implementation of optimal power flow and the elimination of asymmetries of the network
    - Proposal and implementation of compensation for loss / over-voltage (Voltage Stabilizer)
    - Proposal and implementation of driving systems of electric motors

- Proposal and implementation of layout and type of lighting

B -3) costly solutions:

- Proposal and implementation to replaced compression or absorption chillers
- Proposal and implementation of combined heat and power production (CCHP-CHP)
- Proposal and implementation of electrical energy through solar energy
- Proposal and implementation of electrical power generation through wind energy
- Proposal and implementation of electrical energy through biogas plants

B - 4) Consulting services:

- Advice for the buying of electricity
- Advice and supervision of the distribution network
- Advice and supervision of electrical posts
- Consumer demand optimization advice
- Consulting peak reduction
- Consulting to chose optimal tariff
- Taking advantage of modern equipment and advice day
- Counseling and monitoring of electrical plans
- Counseling and monitoring of lighting projects
- Counseling and monitoring of power projects

Energy audit of mechanics

- Check gas and water bills
- Determine the amount of thermal energy per year
- determine the extent of thermal energy consumption compared to standard values
- Identify energy consumer equipment such as air conditioners , boilers , compressors and process equipment
- Measure and calculate the amount of energy efficiency of equipments
- Give Strategies at no cost , low cost and expensive due to economic considerations and return on investment
- Priorities for the implementation of the strategies mentioned
- Implement the strategies by priorities
- Review the effectiveness of implemented strategies

(Form B-9)

Technical proposal - 2

a. Environmental Effect

Competitor shall mention environmental effect for increase and decrease of NOx, SOx, PM, Noise with introduction of EE&C technique.

(1) Aincrease in environmental impact by the E/E implementation
New environmental impacts such as NOx, SOx, PM, and Noise are not generated by implementation of strategies
(2) A decrease in environmental impact by the E/E implementation
It leads to the reduction in the power plant in the amount of the CO2 generation along with the reduction in the amount of the electric power use.

(Form B-10)

Technical proposal - 3

b. Effect for existing equipment

Competitor shall mention scope to install new equipment or delete existing equipment.

(1) About the newly introduced equipment
UPVC windows will be replaced with the previous window
Lighting control system is installed
The outer shell of the insulated walls
Solar water heater to provide hot water in summer and warm in winter water is installed
(2) About the removal of the existing equipment
Remove air conditioners are available
Windows with metal frames are removed

(Form B-11)

Technical proposal - 4

c. Building operation in construction period

Competitor shall mention the important item regarding safety, project schedule control, further quality control, deadline of completion of construction and handover of ESCO equipment.

(1) Influence of the ………………………… on facilities operation
The construction of the replace of the chiller equipment shall be carried out
on holidays or the week night, not to prevent the influence on staff and visitors.
(1) Safety measure All measures will be taken with regard to the measures done HSE
(3) Quality control
All measures will be taken under the supervision and approval of employee representative
(4) Completion day of the construction
All enforcement actions to be completed in 200 days
(2) Beginning to use of E/E equipment by the building operator

(Form B-12)

Technical proposal - 5

d. Treatment on termination of ESCO contract

Competitor shall mention treatment on termination of ESCO contract, e.g. transfer of property of ESCO equipment

(1) Transfer of ESCO equipment ownership
The ESCO entrepreneur owns the ESCO equipment.
After ending the ESCO contractduration, the ESCO entrepreneur transfers
the ESCO equipmentownership.

(Form A-1)

Summary - 1

a. Table of opted EE&C technique

Item	Current amount of consumption of Electric power, Gas, Oil, Water		Energy consumption Base line XXXX MJ/Annual		CO2 Emission Base line XXXX kg-CO_2/Annual		Estimated Energy fee Rials/Annual (A)	Investment Rials (B)	Pay Back Period Year (B/A)
	Type	Reduction Unit	Reduction MJ/Annual	Rate %	Reduction kg-CO_2/Annual	Rate %			
Insulation of the building shell	Electric power		302,220				204,000,000	973,000,000	4.7
	Gas		199,360				11,200,000		
Replacement windows	Electric power		243,144				144,000,000	12,930,000	7.6
	Gas		1,121				6,300,000		
Installation of solar collector									
	Gas		33,820				45,000,000	55,000,000	11
	Electric power								
	Gas								
Sum	—	—							

Remark) Competitor must not mention reduction of energy, CO2 emission, in case that they will optimize proposal for water reduction

Brief report
on Isfahan Municipality
in English

Among visited buildings, building of Isfahan municipality of district 4 is relatively suitable for activities of this company. (Following reports have been presented by confirming charge of building to technical expert of this company).
Regarding to activity of this company in the field of (optimizing heating & cooling equipment) it has not estimated lights of building.

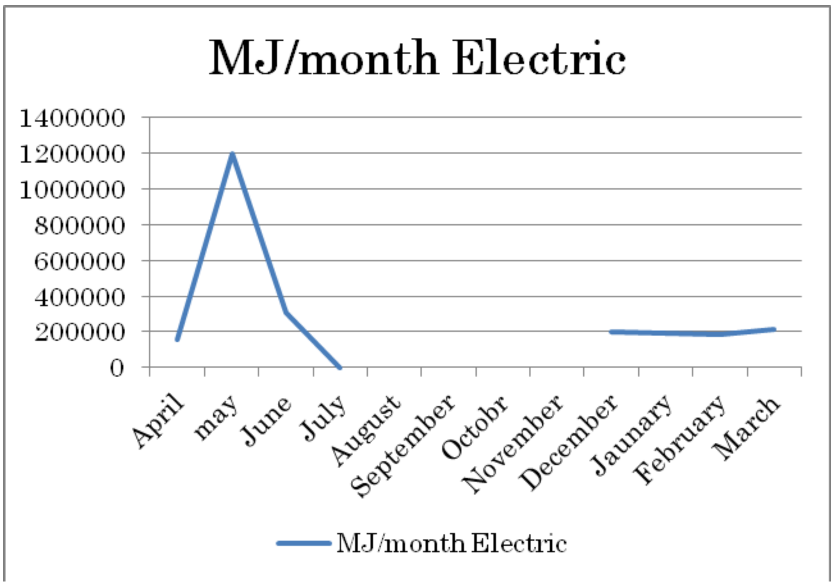
Specification of building of Isfahan municipality of district 4

Working hour per day: 8 H	infrastructure: 2,500 m^2	Type of energy consumption: urban gas
Year of building: 20 years	Year of installations: 20 years	Number of floors: 4 floors
Cooling operating months: 4 months	heating operating months: 5 months	Type of window: metal-single-walled
Type of wall: brick without heat insulation	Color of walls: cream	Powerhouse operating hour: 24 H

Status of powerhouse operating on holidays: off	Status of powerhouse operating after working hour: chiller: on, heating powerhouse probably is off
Number & type of cooling system: 2 water cooler 7000- absorption chiller	Number & type of heating system: hot water powerhouse- fan coil
Code No. of power: 80076746	Gas subscription No.: 002126451363

Technical expert declared there is an absorption chiller in this building, but it was found there is two chassis of density chiller 30 ton.

During many years ago, some remarkable of buildings of Isfahan municipality measured to inactivate heating & cooling systems as manual & human power after end of working hours. This makes to reduce potential saving.



month	MJ/month
	Electric
April	160,369
may	1,194,019
June	307,208
July	No data
August	
September	
Octobr	
November	
December	199,260
Jaunary	193,730
February	182,250
March	214,164

month	Electric	
	Rials	KWh
April		14,849
may		110,557
June		28,445
July		0
August		0
September		0
Octobr		0
November		0
December		18,450
Jaunary		17,938
February		16,875
March		19,830

Annex 2- forecasting energy saving:

Heating system:

Gas energy is consumed per day is 33740 cubic meter from 17 June 2014 to 25 May 2015. Mainly consumption is 31308 cubic meter from 29 October 2014 to 15 April 2015 (for 5 months at cooling season) and 2432 cubic meter for 7 months at heating season.

Gas consumption measure of this building is approximately 14 cubic meter for each m^2 of building area per year.

Administrative buildings are average 30 to 35 cubic meter. After working hours, powerhouse of building inactivate manual.

A significant part of potential saving reduces for inactivating powerhouse after working hours. And it is time to save in operation despite the heat terminals (fan coil) is necessary to avoid cold wind blowing and staff dissatisfaction at least is supplied hot water 50 centigrade circulating in the systems. So, it is predicated to consume gas about 5% per year.

Cooling system:

Building officials declared condition of operation of chiller has not been equivalent to heating system. Cooling systems is always on during 4 months. Of course, because of inaccessibility of annual power consumption it hasn’t been checked consumption. (Courses available are as date of December 2014 to May 2015).

Regarding to officials building declaration and experimental calculations it is predicated to be consumed power of cooling system approx. 110000 kWh during 4 months (120 days).

According to the hours of operation is expected to be saved 30% potential during power consumption.

While peak load is from 11 to 15. So, the basis for calculating the saved power tariff is based on the average price is low load and full load.

Forecasting energy saving:

a) Annual gas saving:

33,740×5% × 1,300 (gas tariff based on gas site) = 2,193,100 Rials.

b) Annual power saving (according to bill of municipality building):

Forecasting power saving in the cooling system during 120 days operation:

103,680 × 30% = 31,104 kWh

31,104 kWh × 1,228 Rials. (Average low load and full load) = 38,195,712 Rials.

c) Forecasting total saving Rials (gas- power):

2,193,100 Rials. + 38,195,712 Rials. = 40,388,812 Rials.

As it has visited and estimated building for a short time and less than one hour and this company has no information about operation conditions, compliance or non-compliance of heating & cooling systems capacity fitted building conditions, number of staff, heat efficiency and other efficient parameters in energy saving as well as service conditions, maintenance & basic repairs of powerhouse. Audits carried out empirically and is only forecasted.

Annex 3- Cash cost of the project:

Table 1- Cost Estimation (Control equipment of source)

Row	Type of equipment	Number	Unit price (Rials.)	Total (Rials.)
1	Heating intelligent control system	1	9,500,000	9,500,000
2	Cooling intelligent control system (density chiller)	1	78,500,000	78,500,000
Total				88,000,000

Table 2- Cost Estimation (Control equipment of destination)

Row	Type of equipment	Number	Unit price (Rials.)	Total (Rials.)
1	Radio control transmitter	1	67,000,000	67,000,000
2	Fan coil radio receiver	72	800,000	57,600,000
3	Antenna amplifier	2	6,000,000	12,000,000
Total				136,600,000

Total tables 1 & 2: 224,600,000 Rials.

Above prices are basis on cash purchase of equipment and tariffs in 2015. If energy services contract (ESCO) due to incrassation of costs such as inflation rate, expert costs and energy auditing, maintenance costs of equipment, course review, training cost, and so on. It will be increased said costs so that it is predicated to take period of contract for 8 years.

The Project
On
Implementation of Pilot Projects to Introduce
ESCO for Government's Buildings
in
Islamic Republic of Iran

Completion Report (ANNEX)

Deliverables on technical cooperation activities

ESCO proposal for pilot project implementation

December 2018

Nippon Koei Co., Ltd

In the Name of God

Instructions for Measuring & Verifying Energy Saving Strategies

In the Building of Ministry of Economy & Finance

Employer:

Ministry of Economy & Finance

Consultant:

Asia Watt Engineering Co.

July 2016

Document code: EM/R/B33

1. Definitions

1.1. Option C

In order to determine the savings in the consumptions of energy carriers at the building of Ministry of Economy and Finance, by considering the saving resulted from the execution of all strategies, Option C (the entire property) presented in the protocol of IPMVP shall be used as the selected option for calculating the savings. In the Option C method of calculating the savings, all savings resulted from all the proposed strategies must be more than 10% of the consumptions measured with the counters in the time period of the base line.

1.2. Base line

It is an index for the energy performance that indicates the energy performance of the building of Ministry of Economy and Finance during a full operational period. By determining the base line, it is possible to calculate the savings in the reporting period.

1.3. Reporting period

Time periods agreed by all the beneficiaries after the execution of the strategies in order to calculate the savings and savings value.

1.4. Independent variable

They are parameters that change constantly and have considerable effects on the energy consumption of the said building. Such parameters must be measurable.

1.5. Fixed factors

They are parameters that affect the energy consumption of the building but they do not change constantly. In case of occurrence of any change in the fixed factors, the owner must notify the ESCO company of the changes and the base line be modified according to the agreed instructions. In case of failure of the owner to do so, and the supervisor of measuring and verifying discovers the changes during a periodical inspection, according to the said instructions, the owner will be fined and the base line will be modified.

1.6. Usual corrections

In case of occurrence of any changes in the independent variables during the reporting period in the building of Ministry of Economy & Finance, such changes shall be considered in the index of energy consumption in the base line.

1.7. Unusual corrections

The calculations in which the changes in the fixed factors within the measurement limits are considered regarding the base line.

1.8. Subject of measuring & verifying project

The subject of this project is the execution of saving energy strategies in order to reduce the energy consumption in the building of Ministry of Economy & Finance. The strategies of this project include the following items:

Table 1: The proposed saving energy strategies in the building of Ministry of Economy & Finance

No.	**Strategy**	**Predicted saving in gas (m3/yr.)**	**Predicted saving in electricity (kwh/yr.)**	**Saving value (Rial/yr.)**
1	Implementing the intelligent control system for water circulation pumps flowing in the cooling and heating circuits	---	420000	690/900/000
2	Implementing the intelligent control system for water circulation pumps flowing in the circuits of the chilling condensers of the compressive chillers	--	120000	197/400/000
3	Implementing the intelligent control system for hot water boilers	90000	--	135/000/000
4	Implementing the control system for the performance of fan coils	--	100000	164/500/000
5	Supervision and control on the utilizing of the installations	10000	120000	212/400/000
6	Changing the fluorescent bulbs with LED	--	150000	253/330/000
Total:		**10000**	**750000**	**1/653/530/000**

- In calculating the saving value, the average price of each khw of electrical energy consumption in the building of Ministry of Economy & Finance is considered as

1645 rials and the average price of each cubic meter of natural gas is considered as 1500 rials.

1.9. Base line

1.9.1. Time period of the base line

The time period of the base line shall be from 13 Jul 2013 to 10 Apr 2016 for 32 months.

1.9.2. Independent variables

The only independent variable that is considered in this project and is measurable, is the weather conditions (CDD & HDD)

1.9.3. Gas consumption in the period of the base line

Regarding the use of compressive chiller in the building of Ministry of Economy & Finance, the gas consumption of the building is in the heating equipment in the cold season. With the help of the data of the gas bills of the building for the period of the base line and the average HDD in the same period according to the periodical readings of the gas counter, the index for the thermal energy consumption will be calculated in the period of the base line. In order to formulate a mathematical relation for the period of the base line, the regression method is used for the consumption of natural gas and the extracted HDDs (for the bills with HDD>100°C). The base temperature is considered as 21°C in the cold season and the resulting equation and diagram is shown below.

Figure 1. The base line of natural gas consumption based on HDD

According to the diagram above, the base line of thermal energy consumption in the building of Ministry of Economy & Finance based on HDD is according to the relation (1).

(1) E_{th} (m3) = (308.62 x HDD_{Tin}) = 19721

1.9.4. Electricity consumption in the period of the base line

Regarding the use of compressive chiller in the cooling system and that the circulation pumps are active in the cold and hot seasons in the building of Ministry of Economy & Finance, the equipment in the engine room of the building consume a considerable amount of electrical energy both in cold and hot seasons. According to the data of the electricity bills of the building for the period of the base line and the average HDD and CDD in the periods of electricity bills, the index of electrical energy consumption will be calculated for the period of the base line. In order to formulate a mathematical relation proposed for the period of the base line, the regression method is used for electrical consumption and CDD, HDD and the number of days in each period of the bill (because the bill periods are not the same). The following relations indicate the equations of electrical consumption in the time period of the base line according to CDD, HDD, and number of days in each bill. The base temperature for hot seasons is considered as 23°C and for cold seasons as 21°C and the resulting equation is as below.

(2) Electrical energy consumption (kwh)

$$= (11005.65 \times \text{days}) + (1532.67 \times CDD_{Tin:\,23C}) + (27.91 \times HDD_{Tin:21C})$$

1.9.5. Fixed factors

All the fixed factors that are considered in the project of measuring and verifying in the building of Ministry of Economy & Finance are as below:

1. The thermal used area of the building

In case of increase or decrease in the thermal used area of the building and also use of heating and cooling equipment common in the building of Ministry of Economy & Finance, the heating and cooling consumptions shall be corrected in proportion to the increase or decrease.

(3) The corrected energy consumption = the energy consumption of the period of the base line before the change in the area x (1 + the added area/total initial area)

2. Type of the usage of the building

In case of change in the usage of the building, the owner must pay the entire costs of investment to the ESCO company.

3. **Number of the personnel and their working hours**

The effect of the number of personnel on the energy consumption is refrained. However, any change in the working hours will require an unusual correction and the energy consumption will be corrected as below.

(4) Corrected energy consumption = the energy consumption of the period of the base line before the change in the time x (1 + the added time/ initial time)

4. Number of electricity and gas counters of the building (whether major or minor)

In case of change in the number of electricity and gas counters of the building, if necessary, there will be unusual corrections in the energy consumption of the period of the base line.

5. Number and types of heating and cooling equipment

In case of any change in number and types of heating and cooling equipment, the amount of energy such equipment need, will be measured by M&V supervisor and applied in the base line as unusual corrections.

In order to measure the energy consumption of such equipment, if the equipment use electrical energy, the power required by the equipment will be measured and their working hours will be estimated on a mutually agreed basis (If necessary, the working hours are also measurable.) The energy consumption in one piece of equipment is calculated as below:

(5) Energy consumption = measured power x estimated (measured) working hour

In order to measure the energy consumption in the equipment that use thermal energy (natural gas), it would be enough to measure their fuel consumption in the reporting period or reach an agreement on the basis of their technical specifications in order to estimate their energy consumption. Thus, the energy consumption in the time period of the base line according to the calculated energy consumption for such equipment would be unusual correction.

6. The base temperature of the building

In case of a change in the base temperature of the building, the base line will be reformed according to the new base temperature (with changing CDD and HDD according to the new base temperature) and the resulting new equation shall be the basis for calculations.

7. Number of electrical equipment in the building (including computers, printers, copiers, study lamps, etc.)

In order to measure the changes in the energy consumption in case of change in the number of electrical equipment in the building, the power required by such equipment is measured and the working hours are agreed upon (if necessary, the working hours can be measured) and the base line will be corrected according to the changed energy consumption. The energy consumption in one piece of equipment is measured as below:

(6) Energy consumption = measured power x estimated (measured) working hour

8. The material of walls

The effect of change in this fixed factor is refrained and there is no need of unusual correction of the base line. In case of any change in the fixed factors, the owner is obligated to notify all the beneficiaries or the owner will be responsible for failure of accomplishment of the expected savings and the owner is obligated to pay the fine based on the agreement of all the beneficiaries.

Also, in case of a pre-determined development plan in the building, it is obligatory for the subscriber to notify the investor and in order to calculate the actual saving according to the protocol of IPMVP, it is necessary to install auxiliary counter(s) for the new section(s) while their construction. Otherwise, the owner will be responsible for failure to accomplish the expected saving and owner is obligated to pay the fine based on the agreement of all the beneficiaries.

1.9.6. Reporting period

The reporting period after the execution of the proposed and confirmed strategies will begin by the investor and the saving reports will be presented for maximum 42 months or equivalent to the maximum investment repayment in two-month intervals for the repayment.

1.10. Calculation of the amount and value of the avoided energy

The amount of accomplished savings will be calculated in two-month intervals subject to accessibility to the data of counter readings in those periods. The amount of accomplished savings are calculated based on the amount of avoided energy consumption as below.

1) The average daily temperature is extracted from meteorology organization and HDD and CDD for each period of counter reading are calculated during the reporting period by using the base temperature recorded in the base line of natural gas and electrical energy (according to the formula presented in the definitions section).

2) Then the HDD and CDD calculated for each new reading period (after execution of the strategies) are put in the equation for the consumption pattern of the natural gas and electrical energy base line period and the expected energy saving for each period of new counter reading is accomplished.

3) In order to calculate the savings in each new period of counter reading, the actual energy consumption of that period is deducted from the expected energy consumption gained from the previous period (step 2) and the resulting figure indicates the saving of natural gas in the said period of reading the counter.

4) (7) Avoided energy consumption = energy of the corrected base line period (±) unusual correction according to the conditions of the reporting period (-) energy of the reporting period

In the Name of God

Ref.: 5-958861

Date: 13 Aug 2016

Dear Dr. Doodabinejad

The Respectful Educational Deputy for Optimizing Energy Consumption

Subject: Proposal of Energy Services Contract (ESCO) Tehran City Electrical Power Distribution Co.

With Compliments;

Thank you for holding the meeting of talks on 10 Aug 2016 regarding the presentation of technical-economic assessment project and the M&V model of Energy Services Contract (ESCO) Tehran City Electrical Power Distribution Co. Please find in attachment the technical requirements for utilizing the installations, in response to the questions of Engineer Eshtehardian, the respectful supervisor of construction installations together with the M&V project and the proposed contract.

You are kindly required to have them reviewed and inform us the results.

Best regards;

Tooraj Bathaee

Chairman of the Board of Directors

Copy sent to Engineer Hashemi, the respectful CEO of Tehran City Electrical Power Distribution Co. for information and issuance of proper instructions

Attachment I

One of the effective methods stipulated in the draft of Energy Services Contract (ESCO) Tehran City Electrical Power Distribution Co. is the radio control of all fan coils and blowing equipment of the building which provides the technical conditions required for proper control of cooling-heating installations due to the possibility of online control and monitoring of all fan coils during the cold and warm seasons of the year.

1. Control of the hot water boiler in the cold season:

This design will shut down the pumps of circulating hot water and all the fan coils after the working hours of the building. In order to prevent the probability of occurrence of thermal tension in the boiler, will be in the standby status with a temperature of 30°C. In case of the employer's requirement, the temperature can be increased up to 35°C.

In this way, a considerable amount of saving will be done in the gas consumption due to the shut-down of pumps and fan coils, and also the hot water in the boiler is at a proper temperature in the standby position.

At the beginning of the next day, first the pumps of the circulating hot water are turned on and then after temperature of transfer lines are the same as the boiler, the fan coils are turned on one by one. In this way, during the time required and in proportion with the thermal increase of hot water, the boiler reaches operating temperature from standby position.

2. Control of compressing chiller for the warm season:

The control of compressed chiller for saving purposes at the time of building closure and weekends is as below:

- All the pumps of the chilled water and the tower fan are equipped with inverter and after the working hours, they are completely shut down and in the next morning, they are turned on one by one and in respect with the utilization of equipment. The pumps of the chilling tower will shut down with a timer after the end of the working hours of the building and in the next morning they are turned on according to the utilization conditions.

- The compressing chiller will also shut down with a timer after the working hours and the set of cooling installations and the chiller will be turned on in the next morning as it was described above for the boiler of hot water and after some time they will reach the proper working temperature in a way that the time of staring the work, the rooms have a proper temperature.

The execution of these measures shall be done after separating the cooling and heating usages of the spaces in the building which are always used.

Attachment II

The Project for Measuring and Verifying Energy Services Project at Tehran City Electrical Power Distribution Co.

Prepared by:

Maryam Shekari

(Pishran Energy Co.)

Table of contents

1. Introduction

Measurement and verification (M&V) is referred to the process of utilizing measurement for determining the actual savings created in the employer's property with the help of energy management projects which are achieved in a trustable manner. As saving energy is actually the same as not using energy, thus it can't be measured directly and it can be determined by comparing the energy consumption before and after the execution of energy saving project upon the insertion of the required corrections and in proportion with modifications in the conditions.

2. Description of the project

The project under study at this M&V project, is the energy services (ESCO) at Tehran City Electrical Power Distribution Co. with a built area of 6400 sq. m. and with office usage. The annual energy consumption at this company is about 122926 cubic meters of natural gas and also 803288 kwh (the average consumption of three years 2013-2015).

At this project, after doing the initial studies and collecting data required at the site of the building of Tehran City Electrical Power Distribution Co. and doing the relevant analyses, strategies for saving energy are proposed to be implemented in the framework of ESCO and the results will be studied and confirmed according to the agreed measurement and verification project.

3. Projects of energy efficiency improvement

The projects of energy efficiency improvement include the following items:

1- Separation of cooling and heating systems of Hall 121 and Dispatching Hall.

2- Switching off the cooling/heating engine room after the working hours

3- Using invertors on pumps of chilled water

4- Using invertors on pumps of chilling tower

5- Using invertors on fans of chilling tower

The predicted saving energy capacity is as shown in the following table. Also, the duration of the predicted project is shown in the table.

Prediction of saving electricity capacity per year	KWh	83274
Prediction of the cost of saving electricity capacity per year based on the tariffs of 2016	Rials	141062254
Prediction of saving gas capacity per year	m^3	15749
Prediction of the cost of saving gas capacity per year based on the tariffs of 2016	Rials	73735000
Annual income based on the tariffs of 2016	Rials	214797254
Prediction of the duration of the contract	4 years and 2 months	

4. The Proposed M&V Project

4.1. The proposed option and the measurement limits

Option C (the entire property) according to protocol IPMVP will be used in this project in order to determine the amount of savings. The reason to choose this option is that firstly, the amount of savings predicted in this project according to the list of saving measures in the table above is more than 10% of the total consumed energy and also, with this option, the counter effects existing among the proposed strategies shall be covered. The basis of calculations in this option is the amounts read from the main counters of the company.

4.2. Time period of the base line and its conditions

The time period of the base line in this project will be for 36 months from 21/03/2013 to 20/03/2016. The amounts of energy consumption in the period of the base line for each of the energy carriers have been shown in the tables of appendix A. The key conditions during the period of the base line that may be changed in the period of reporting are recorded in Appendix B. The fixed variables recorded in the project for the period of the base line include:

- Hot degrees day (HDD)

- Cold degrees day (CDD)

The amounts of HDD and CDD are extracted from the data available at Degreedays.net and according to the data of the nearest meteorological site with site of the project.

Also the fixed factors relating to the period of the base line include the following items:

- The area of the controlled sections in the building

- Type of usage of the building

- Number of personnel and working hours

- The type of materials of the building crust including walls, windows, …

- Number, types, and working hours of the electrical equipment of the building

- Number, types, and working hours of the heating and cooling equipment of the building

4.3. Reporting period

The reporting period after implementing the proposed strategies confirmed by the employer and the saving reports shall be presented every two months up to 60 months or equivalent to the maximum investment return in order to make the repayments.

4.4. Principles of corrections of the base line and method of analysis

The savings accomplished in the reporting periods (two months) shall be calculated subject to the accessibility of reading data at that period. The amounts of accomplished savings are calculated based on the amount of avoided energy consumption according to the following procedure:

The amounts of HDD and CDD for each reporting period are extracted from the data available at Degreedays.net and are used for the calculations and creation of the base line for each energy carrier.

Then, the amounts of HDD and CDD for each reporting period (after implementation of the strategies) are put in the equation of relevant consumption pattern of the period of the base line and the amount of energy consumption expected for each reporting period is achieved.

In order to calculate the savings in each reporting period, the actual consumption of that period is deducted from the expected consumption of the period extracted from the previous stage (the base line corresponding to that period) and the resulting figure is considered as the saving amount of energy carrier in the said period.

The equation used for this, according to protocol of IPMVP is as follows:

Energy of the reporting period (-) unusual correction according to the conditions of the reporting period (±) corrected energy of the base line period – avoided energy consumption

4.5. Prices of energy carriers

The prices of consumed energy carriers, i.e. natural gas and electricity, in each of the reporting periods are as below according to the relevant tariffs provided that the energy tariffs would not become less than the 2016 prices. In such cases, the last tariffs before the reduction of the prices of energy shall be the basis for calculation of the avoided costs (savings).

Appendix A- The energy consumptions recorded at the period of base line

Table A-1-The amount of electrical consumption in various periods (KWh) 2013-14-15

Period	From	To	Days	Mid-load	High-load	Low-load	Read diamond	Calculating diamond	Total consumptions
9501	29/02/2016	20/04/2016	51	38100	10200	19800	60	284	68100
9412	30/01/2016	29/02/2016	30	28800	7500	14100	90	284	50400
9411	06/01/2016	30/01/2016	24	22200	5400	10800	120	284	38400
9410	13/12/2015	06/01/2016	24	24600	6000	11700	120	284	42300
9409	15/11/2015	13/12/2015	28	25200	6600	12900	90	284	44700
9408	21/10/2015	15/11/2015	25	23100	5400	10800	90	284	37500
9407	19/09/2015	21/10/2015	32	33300	8700	16200	150	284	58200
9406	25/08/2015	19/09/2015	25	33600	9000	16500	150	284	59100
9405	22/07/2015	25/08/2015	34	50100	12900	23400	150	284	86400
9404	21/06/2015	22/07/2015	31	46800	12000	22200	180	284	81000
9403	12/05/2015	21/06/2015	40	51000	12600	23700	180	284	87300
9402	22/04/2015	12/05/2015	20	9600	900	5700	0	284	16200
9401	02/03/2015	22/04/2015	51	43500	11700	22500	90	284	77700
9312	05/01/2015	02/03/2015	56	37200	8700	17100	60	284	63000
9311	16/12/2014	05/01/2015	20	23400	6300	11400	0	284	41100
9309	20/11/2014	16/12/2014	26	27600	7800	14400	120	284	49800
9308	21/10/2014	20/11/2014	30	31500	8700	16200	120	284	56400
9307	20/09/2014	21/10/2014	31	41400	11100	19200	180	284	71700

9306	23/08/2014	20/09/2014	28	50400	14100	25200	240	284	89700
9305	21/07/2014	23/08/2014	33	67500	17700	32100	180	284	117300
9304	22/06/2014	21/07/2014	29	58200	15300	27600	210	284	101100
9303	20/05/2014	22/06/2014	33	53400	13500	24000	180	284	90900
9302	23/04/2014	20/05/2014	17	34500	9300	16200	150	284	60000
9301	25/02/2014	23/04/2014	57	60300	17400	33900	120	284	111600
9212	02/02/2014	25/02/2014	23	28200	7500	14100	120	284	49800
9211	09/01/2014	02/02/2014	24	28200	8100	14700	120	284	51000
9210	18/12/2013	09/01/2014	22	28500	7500	13800	120	284	49800
9209	20/11/2013	18/12/2013	28	27900	7200	14100	120	284	49200
9208	21/10/2013	20/11/2013	30	31200	8400	15600	120	284	55200
9207	21/09/2013	21/10/2013	30	41400	10800	18300	210	284	70500
9206	21/08/2013	21/09/2013	31	56400	15600	28200	180	284	100200
9205	22/07/2013	21/08/2013	30	60000	16500	30600	180	284	107100
9204	22/06/2013	22/07/2013	30	59400	16500	29700	210	284	105600
9203	22/05/2013	22/06/2013	31	51900	13200	22800	210	284	87900
9202	24/04/2013	22/05/2013	28	33300	9000	16500	120	284	58800
9201	07/03/2013	24/04/2013	48	50100	147000	27900	120	284	92700

Table A-2 Amounts of consumption of natural gas for each period (according to gas bills)

From	To	Consumption (Nm3)	Days
12/03/2016	01/05/2016	25610	41
18/02/2016	12/03/2016	1060	23
12/01/2016	18/02/2016	21250	37
28/10/2015	12/01/2016	62360	76
29/09/2015	28/10/2015	2360	29

13/08/2015	29/09/2015	1458	47
09/05/2015	13/08/2015	2981	96
20/03/2015	09/05/2015	64694	41
19/02/2015	20/03/2015	11997	29
06/01/2015	19/02/2015	1765	44
06/12/2014	06/01/2015	27751	31
30/10/2014	06/12/2014	27942	37
24/09/2014	30/10/2014	3500	36
20/08/2014	24/09/2014	1999	35
17/07/2014	20/08/2014	1608	34
14/06/2014	17/07/2014	1244	33
14/05/2014	14/06/2014	4383	31
14/04/2014	14/05/2014	0	30
27/02/2014	14/04/2014	21091	38
22/01/2014	27/02/2014	31076	36
12/12/2013	22/01/2014	41118	41
11/11/2013	12/12/2013	21965	31
07/10/2013	11/11/2013	9736	35
31/08/2013	07/10/2013	0	37
23/06/2013	31/08/2013	3270	69
16/05/2013	23/06/2013	0	38
30/03/2013	16/05/2013	7562	47
18/02/2013	30/03/2013	24093	30

Appendix B-Fixed factors recorded at the period of base line

- The area of the controlled sections in the building: 6400 sq. m.

- Type of usage of the building: office building (including round the clock working section to use the 121 system and dispatching section)

- The type of materials of the building crust including walls, the windows are metal single glazed

- Number, types, and working hours of the electrical equipment of the building:

* Number of lights: 100 miniature switches in 7 electrical panels, each miniature switch (each line) on average 7 amperes with manual control system

- Number, types, and working hours of the heating and cooling equipment of the building:

* Number, capacity, and type of cooling system: 2 sets of compressive chillers with chilling capacity of 160 tons each with 4 compressors with chilling capacity of 40 tons and 2 unloaders on each chassis of chillers

* Number, capacity, and type of heating system: 2 steel boilers each a capacity of 500000 kc/h and the flamers each with a power of 246-581 kW with manual control system

* Number of sound chilled water pumps: 3

* Number of sound tower pumps: 3

* Number of tower fans: 2

* Number of fan coils of the building: around 200 sets (180 sets with wall thermostats and 20 sets without thermostats) with CFM capacity: 400-600

* Number of split conditioners: around 20 sets (cold and hot)

* Number of standing conditioners: 4 sets (3-phase) for meeting hall

- Number of personnel and working hours

The Project
On
Implementation of Pilot Projects to Introduce ESCO for Government's Buildings
in
Islamic Republic of Iran

Completion Report (ANNEX)

Deliverables on technical cooperation activities

The proposal regarding monitoring method of pilot project on government building

December 2018

Nippon Koei Co., Ltd

In the name of God

Report on saving natural gas during heating in the building of the Ministry of Economy and Finance

Employer:

Consultant: Asia watt Engineering Company

1 Measures taken during the reporting period to save energy in the second half of the year and with the shutdown of the cooling system and after the preparation of the plans for intelligent control schemes for circus pumps and hot water boilers, the implementation of the installation and commissioning of the control system was carried out. The following is a summary of the steps taken.

1. Preparation of electric control system for smart circle pumps and hot water boilers

2. Performing the necessary electrical changes in the power supply and control boards of the cold and hot water heating pumps.

3. Installing temperature and pressure sensors on the roundabouts along with the wiring

4. Perform electrical wiring for the transmission of steering signals and status to circulate pumps and hot water boilers.

5 Build a central control panel with electrical wiring

6. Perform a program control system

7. Preparing As built maps for control system

8. Testing and commissioning

9. Providing training to the exploiter group 10. Supervision over exploitation process.

In this period of saving along with the operation of installing the intelligent control system for the operation of circus pumps and hot water boilers, the renovation of the control panel of hot water boilers was placed in the unit building unit of the Ministry of Economy and Finance, which is the same as the boiler deck Gram No. 1 was replaced and changes needed to communicate with the central intelligent control system were carried out. In this period due to lack of financial resources, it was not possible to renovate the boilers no. 2 and 3.

Defective in the settings for the operation of the boiler water boiler unit (1) After delivery of the boiler number 1, this defect was not resolved by the contractor to construct the control panel, which caused the defect to increase the boiler operating time (as well as the lack of modernization of the hot water control panel number 2 and 3). In spite of the availability of software and hardware infrastructure, it is not possible to control the smart boilers of hot water and fuel saving in this period will not be as predicted and the intelligent control system will only control the operating schedule of the circus pumps.

During the heating period, which included 6 gas bills from 6/8/1396to 1/2/1397, because of the inability to control the smart boilers of the hot water, the saving of natural gas consumption was not as predicted and in accordance with the observed gas consumption in the mentioned period has decreased by 16827.5 cubic meters compared to baseline consumption. According to the plan for measuring and verifying energy savings, the Rial's value of saving natural gas in the building of the Ministry of Economic Affairs and Finance is calculated in accordance with the following equation.

The total amount of gas saved $\frac{96/08/06}{97/02/01}$ (Rials)=

gas saved$\frac{96/08/06}{96/09/01}$m3 $\times$ Gas price period$\frac{96/08/06}{96/09/01}$

+ gas saved$\frac{96/09/02}{96/10/03}$$m3$ $\times$ Gas price period$\frac{96/09/02}{96/10/03}$

+ gas saved$\frac{96/10/04}{96/11/01}$$m3$ $\times$ Gas price period$\frac{96/10/04}{96/11/01}$

+ gas saved$\frac{96/11/02}{96/11/30}$$m3$ $\times$ Gas price period$\frac{96/11/02}{96/11/30}$

+ gas saved$\frac{96/12/01}{96/12/26}$$m3$ $\times$ Gas price period$\frac{96/12/01}{96/12/26}$

+ gas saved$\frac{96/12/27}{97/02/01}$$m3$ $\times$ Gas price period$\frac{96/12/27}{97/02/01}$

= + 20783.44 $m3$ × 2918.26$\frac{Rial}{m3}$

+ −6621.73 $m3$ × 1869.35$\frac{Rial}{m3}$

+ −11080.95 $m3$ × 1779.05 $\frac{Rial}{m3}$

+ −18143.64 $m3$ × 1779.05 $\frac{Rial}{m3}$

+ −144.85 $m3$ × 1779.05 $\frac{Rial}{m3}$

+ 32035.24 $m3$ × 2592.33$\frac{Rials}{m3}$ = 79069389.95 rials

In (1), the amount of gas saved from equation (2) is calculated

(2) [Unusual adjustments based on reporting period $\pm$Baseline corrected gas consumption-Gas consumption reporting period] $\frac{96/08/06}{96/09/01}$

+ [Unusual adjustments based on reporting period $\pm$Baseline corrected gas consumption-Gas consumption reporting period] $\frac{96/09/02}{96/10/03}$

+ [Unusual adjustments based on reporting period $\pm$Baseline corrected gas consumption-Gas consumption reporting period] $\frac{96/10/04}{96/11/01}$

+ [Unusual adjustments based on reporting period $\pm$Baseline corrected gas consumption-Gas consumption reporting period] $\frac{96/11/02}{96/11/30}$

+ [Unusual adjustments based on reporting period $\pm$Baseline corrected gas consumption-Gas consumption reporting period] $\frac{96/12/01}{96/12/26}$

+ [Unusual adjustments based on reporting period $\pm$Baseline corrected gas consumption-Gas consumption reporting period] $\frac{96/12/27}{97/02/01}$

$= \text{Gas saved}\frac{96/08/06}{97/02/01}$

$= [(48343.44) \pm (0) - (27660)]\ \frac{96/08/06}{96/09/01}$

$+ [(139092.27) \pm (0) - (145714)]\ \frac{96/09/02}{96/10/03}$

$+ [123801.05 \pm (0) - (134882)]\ \frac{96/10/04}{96/11/01}$

$+ [(138844.36) \pm (0) - (156988)]\ \frac{96/11/02}{96/11/30}$

$+ [(69922.14) \pm (0) - (70067)]\ \frac{96/12/01}{96/12/26}$

$+ [(57704.24) \pm (0) - (25669)]\ \frac{96/12/27}{97/02/01} = (16827.52)\ \frac{96/08/06}{97/02/01}$

In relation (1), the gas tariff for each billing period is calculated in accordance with equation (3)

$\text{Gas Price Period}\frac{96/08/06}{96/09/01} =$

$$\frac{\text{Gas prices + Continuous Services (Aboneman) + Complications + Complications of supplying to the villages}}{\text{Consumption period}}$$

$= \frac{58846649 + 9808767 + 6178986 + 5884665}{27660}$

$= 2918.26\frac{Rial}{m3}$

$\text{Gas Price Period}\frac{96/09/02}{96/10/03} =$

$\frac{217842430 + 12072329 + 20692327 + 21784243}{145714} = 1869.35\frac{Rial}{m3}$

Gas Price Period$\frac{96/10/04}{96/11/01}$=

$$= \frac{201648590 + 0 + 18148372 + 20164859}{134882} = 1779.05 \frac{Rial}{m3}$$

Gas Price Period$\frac{96/11/02}{96/11/30}$=

$$\frac{234697060 + 0 + 21122735 + 23469706}{156988} = 1779.05 \frac{Rial}{m3}$$

Gas Price Period$\frac{96/12/01}{96/12/26}$=

$$\frac{104750165 + 0 + 9427514 + 10475017}{70067} = 1779.05 \frac{Rial}{m3}$$

Gas Price Period$\frac{96/12/27}{97/02/01}$ =

$$\frac{55918083 + 0 + 5032626 + 5591809}{25669} = 2592.33 \frac{Rial}{m3}$$

Also, in relation (2), the energy consumption of the base line period is calculated in accordance with the energy savings measurement and verification scheme (4).

$E_{\text{natural gas}}\, m3\, \frac{96/08/06}{96/09/01}$= 6380.697 + (480.32 ×CDD) + (312.704 × HDD)

= 6380.697 + (480.32 × 7.3) + (312.704 × 123.3) = 48443.44

$E_{\text{natural gas}}\, m3\, \frac{96/09/02}{96/10/03}$= 6380.697 + (480.32 ×CDD) + (312.704 ∗ HDD)

= 6380.697 + (480.32 × 0) + (312.704 × 424.4) = 139092.27

$E_{\text{natural gas}}\, m3\, \frac{96/10/04}{96/11/01}$== 6380.697 + (480.32 × CDD) + (312.704 ∗HDD)

= 6380.697 + (480.32 × 0) + (312.704 × 375.5) = 123801.05

$E_{\text{natural gas}}\, m3\, \frac{96/11/02}{96/11/30}$== 6380.697 + (480.32 ×CDD) + (312.704 ∗ HDD)

= 6380.697 + (480.32 × 0.2) + (312.704 × 423.3) = 138844.06

$E_{\text{natural gas}}\, m3\, \frac{96/12/01}{96/12/26}$= 6380.697 + (480.32 ×CDD) + (312.704 ∗ HDD)

= 6380.697 + (480.32 × 0) + (312.704 × 203.2) = 69922.14

$E_{\text{natural gas}}\, m3\, \frac{96/12/27}{97/02/01}$= 6380.697 + (480.32 ×CDD) + (312.704 ∗HDD)

= 6380.697 + (480.32 × 10.58) + (312.704 × 148) = 57704.24

With the operationalization of the smart circle pump control system, a report on the saving of natural gas during the heating period, including bills received from the Ministry of Economic Affairs and Finance, and the calculation of savings, are presented in the table below.

Table 1: Report on Natural Gas Conservation Report during Heating

Row	Specifications		Unit	amount	Source
1	Beginning of Gas Billing Reporting	Period1-1	_	96/08/06	gas bill
		Period1-2		96/09/02	
		Period1-3		96/10/04	
		Period2-1		96/11/02	
		Period2-2		96/12/01	
		Period2-3		96/12/27	
2	The end of the Gas Billing Reporting Period	Period1-1		96/09/01	gas bill
		Period1-2		96/10/03	
		Period1-3		96/11/01	
		Period2-1		96/11/30	
		Period2-2		96/12/27	
		Period2-3		97/02/01	
3	Cool day	Period1-1	Centigrade degree	7.3	www. degreedays .net
		Period1-2		0	
		Period1-3		0	
		Period2-1		0.2	
		Period2-2		0	
		Period2-3		10.5	
4	Cool day	Period1-1	Centigrade degree	123.3	www. degreedays .net
		Period1-2		424.4	
		Period1-3		375.5	
		Period2-1		423.3	
		Period2-2		203.2	
		Period2-3		148	
5	Gas consumption per period	Period1-1	$m3$	27660	gas bill
		Period1-2		145714	
		Period1-3		134882	
		Period2-1		156988	
		Period2-2		70067	
		Period2-3		25669	
6	Gas consumption in the same period of the	Period1-1	$m3$	48443.44	Measurement and monitoring report
		Period1-2		139092.27	
		Period1-3		123801.05	
		Period2-1		138844.36	

	base line model	Period2-2 Period2-3		69922.14 67704.24	
7	Routine corrections			no	Measurement and monitoring report
8	Routine corrections			no	Measurement and monitoring report
9	Savings		$m3$	16827.5	Measurement and monitoring report
10	gas cost	Period2-1 Period2-2 Period2-3 Period3-1 Period3-2 Period3-3	$\frac{Rial}{m3}$	2918.26 1869.35 1779.05 1779.05 1779.05 2592.33	Gas bill
11	Saving value			79069389.95	Measurement and monitoring report

There is no change in the reported factors in this reporting period

Table 2: Summary Table of calculations for saving natural gas consumption during the heating period at the Ministry of Economic Affairs and Finance

Second and Third Reporting Period	Start date	End date	CDD (℃.day)	HDD (℃.day)	Real consumption (M3)	Base line Consumption in the course (M3)	Saving (M3)	Saving value (Rials)
Bill 1-2	98/8/6	96/9/1	7.3	123.3	27660	48443.44	20783.44	60651481.61
Bill2-2	96/9/2	96/10/3	0	424.4	145714	139092.27	-6621.73	-12378330.98
Bill3-2	96/10/4	96/11/1	0	375.5	134882	123801.05	-11080.95	-19713565.79
Bill 1-3	9611/2	96/11/30	0.2	423.3	156988	138844.36	-18143.64	-3227843565.79
Bill2-3	9612/1	96/12/26	0	203.2	70067	69922.14	-144.85	-257695.75
Bill3-3	96/12/27	97/2/1	10.5	148	25669	57704.24	32035.24	83045936.08
Total	-	-	18	1697.7	560980	577807.5	16827.5	79069389.95

As it is clear, with the implementation of the proposed strategy, in this report consumption in the reporting period has decreased by 79069389.95 Rials compared to the baseline period under the same conditions as the reporting period. That is, if the solution was not implemented, the amount of the bill in this period increased by 79069389.95 Rials

First report on M & V energy performance in the energy services project of Tehran Electric Power Distribution Company

Energy Transmission Company

Contents

summary of the report:

The present report is the first energy and power saving report of Shiraz building, Tehran Power Distribution Company, for the period from 24/5/96 to15/7/96. The gas savings report (due to the failure to issue gas bills over the period covered by this report) and water savings (due to significant water overflow from the cooling towers of this complex) have not been reported.

The amount of savings achieved in the building's electricity consumption from the date of launching the smart systems of the cooling system (4/6/96) to 15/7/96 is shown in Table 1, respectively.

Table 1. Energy savings achieved during the reporting period

Electric saving (kWh)	Description	Row
15356	Chiller No.2off	1
4886	Chilled Water Pump Off	2

10407	Cooling tower pumps off	3
5235	Cooling Tower Fan Off	4
2305	Fan Coil off	5
3881	Saving chiller number 2 during working hours	6
42070	Total Power Savings in Reporting Period (kWh)	

In this way, the Rial savings achieved in this reporting period are based on the agreements made in accordance with Table 2. Also, at the end of this report, a detailed description of the problems encountered in the operation of the engine room installations that has been observed during the reporting period in this building and is expected to be undertaken by the employer to resolve the problems in order to obtain the conditions for obtaining Provisional savings.

Total Amount (Rials)	cost (Rials)	Volume	Description	Row
---	1,500	---	**Saving rate of gas consumption (cubic meter)**	1
75,768,070	1,801	42,070	**saving rate of power Consumption (kW / h)**	2
---	14,460	---	**saving rate of water Consumption (cubic meter)**	3
75,768,070	Total amount of savings (Rials)			

1. Introduction

Measurement and verification (M & V) process is used to determine the real savings created on the employer's property through energy management projects in a credible manner. Since saving water and energy is in fact a lack of energy consumption, it cannot be measured directly and therefore, by comparing the costs before and after implementing energy saving project, and taking into account the required and appropriate corrections to the changes in the circumstances under consideration. It turns out.

2. Description of the actions taken so far

The phase of reviewing the existing building and its audit was carried out in 1395, and the necessary technical and legal meetings were held to finalize the applicable solutions in this building and the M & V project, and the contract between the company Osko (consultant) and Tehran Electricity Distribution Company until April of this year It lasted. At the same time as the contract was approved by the parties, the project's implementation phase, which included the installation of the following solutions, began on 30/3/96. It should be noted that the contract date for this project is 27/4/96.

The description of the activities carried out during the project implementation phase is as follows:

Implementation Phase

- Installation of two intelligent power control systems on two chillers in the engine room (from 30/3/96 to 3/4/96)
- Installing a Smart Thermal Control Device along with a heating engine engineer monitoring system (from 30/3/96 to 3/4/96)

• Fan coil control system installation includes a radio transmitter with 122 two way radio receivers and a fan-coil monitoring system (from 4/4/96 to 19/4/96)

• Purchase and install the trays and their accessories in the engine room and complete the cabling required for intelligent control systems in the engine room (15/4/96)

• Installation of two monitoring systems for two chillers in the building engine room and the completion of the control systems for intelligent control and monitoring of the building and the hotbed (from 20/4/96 to 25/4/96)

Phase of Operation Solutions

• The boiler control system was launched on 24/5/96and was defined in the boiler's initial setting from 5:00 to 17:00, after which, at the request of Mr. Rezaei (due to the need to maintain The boiling water temperature was increased after 6:00 pm to 7:00 pm, after which the burner was extinguished for use by the units of follow-up and 121). It should be noted that boiler operating hours on Thursdays and Fridays are also defined from 6:00 to 19:00 due to the lack of separation of the spa using room 121 as well as the dispensing tracking section.

The spa hot water temperature is set to 40 ℃ by the intelligent system. The thermostat temperature of the boilers was initially set at 55 ℃ but continued due to problems with the use of the spa in the building (described at the end of the report) and, at the request of Mr. Rezai, the temperature of the thermostats was 60℃ increased.

• Installing a water meter on the water supply path of the cooling towers and delivery of the water meter readout checklist to Mr. Rezai on 28/5/96

• Setting up intelligent control systems for cooling the cooling towers of chillers, pumps and fans during non-operating hours on 4/6/96 (due to the lack of separation of the dispatcher tracking section and the need for the cooling system in spite of its readiness) The energy company was not able to launch this solution, and only during the working hours the chiller function was controlled by the outside air temperature.

• Launch of the fan coil radio control system on 5/6/96 with the definition of the working hours from 5:30 to 19:00 for weekdays (from Saturday to Wednesday) and fan coils blackout on Thursdays and Fridays. Also in the process of improving the performance of the radio system, four radio receivers (in addition to 127 receivers installed) were installed to amplify the radio signal in the blind spot of the building in order to prevent a possible signal transmission between senders and receivers.

• Setting the hours of the fan coil in rooms based on inquiries from residents of the rooms and then confirming the project management on 26/6/96 (in 7 different groups, ending hours from 16:30 to 19:00).

• Complete commissioning of the cooling control system, chiller and other components of the cooling system, taking into account all technical considerations on 1/7/96. The hours worked for chiller operation on working days (including pre-launch) are defined from 5:00 to 19:00, and the cooling system switches off on Thursdays, Fridays and Sundays.

• Due to the problem with fan coils, the building pumps remained unchanged during the working hours of 3/7/96, so that the cause of the problem was identified and resolved.

3. Working hours arrangements in the energy performance measurement and verification scheme compared to existing conditions

Based on the arrangements made in the energy performance measurement and verification plan annexed to the contract, the working hours of the equipment during the weekdays, together with the nominal power consumption of each of the following, are given in the table below.
It should be noted that out of a total of chiller units, only two 45-kW compressors were active during the day, and even before the implementation of the solution during the night, only one active compressor was disabled in the non-operating hours with the help of the intelligent control system.

Table 3. Working hours agreed upon in the design and verification plan

Working hours Thursday and Friday	working hours from Saturday to Wednesday	Power consumption or capacity	Number	Equipment Name	ROW

Off	17:00-6:00	kW 4×45	1	Compressor Chiller 1	1
Off	17:00-6:00	kW 4×45	1	Compressor Chiller 2	2
Off	17:00-6:00	kW 3.5	3	Child water pumps	3
Off	17:00-6:00	kW 7.5	2	Cooling tower pumps	4
Off	17:00-6:00	kW 7.5	2	Cooling tower fans	5
Off	17:00-6:00	kW 0.13	127	Fan coils	6
Off	17:00-6:00	---	2	Boiler	7

However, the settings made in the period related to this report, due to some of the limitations in the distribution of electricity distribution are as follows:

Table 4. Working hours applied in Shiraz building Power distribution by 15/7/96

Working hours Thursday and Friday	Working hours from Saturday to Wednesday	Power consumption or capacity	Number	Equipment Name	Row
Off	19:00-5:00	kW 4×45	1	Compressor Chiller1	1
Off	19:00-5:00	kW 4×45	1	Compressor Chiller2	2
Off	19:00-5:00	kW 3.5	3	Chiller water pumps	3
Off	19:00-5:00	kW 7.5	2	Cooling tower pumps	4
Off	19:00-5:00	kW 7.5	2	Cooling tower fans	5
Off	17:00-6:00	kW 0.13	127	Fan coils	6
19:00-6:00	19:00-6:00	---	2	Boiler	7

Thus, with regard to the above mentioned calculations, the amount of savings from the start of each set of solutions is presented.

4. Calculation of power saving in the equipment off mode

According to the project's M & V project, the cost savings are calculated by simplifying the calculation methods for solutions that are used to save energy through the outage of energy consuming equipment.

Since the hours of operation defined for the equipment in the present condition (according to Table 4) are, according to the Employer's considerations, different working hours agreed upon in the Project Measurement and Validation Plan, so that in order to avoid the lack of benefit of the consulting company (OSCO) Savings calculations have been made since the launch of each solution, as agreed in Table3

4-1 compressed chiller `s off after working hours in week days and off on all Thursdays and Fridays.

There are currently two chiller chassis in the engine room of the building, each chassis equipped with four compressors (45 kW). After the installation of the cooling control system in the engine room, the chiller chassis No. 1 was removed from the circuit by the authorities of the building, and only the chiller number 2 was placed under the control of the system. In other words, chiller number 1 has not been controlled by the intelligent system due to its inactivity during the time period of issue.

The power consumption of this chiller is based on the measurements taken at the time intervals before and after working hours, as shown in Table 5

Table 5. Average power consumption of chiller recorded by Power Analyzer

After working hours	**During working hours**	**period**
22	44	**Power consumption chiller (kW)**

In this way, the amount of energy savings obtained from the chiller is derived from Equation 1:

Equation 1

The amount of energy saving chiller during the period (kWh)=
Power consumption of chiller (kW) × Off time during period (hours)

Considering that the commissioning time of the smart control system of the cooling system by the power transmission company is 4/6/96, but due to the considerations of the employer, it is not possible to outage the cooling equipment during non-working hours, in order to avoid the lack of support of the company, the amount The savings for the period from 4/6/96 to the beginning of the day of 15/7/96 are calculated as follows.

Number of days of the time period: 41 days

Number of days off: 15 days

Number of working days: 26 days

Number of hours offset for each working day: 13 hours

The total duration of chill outage during the course is as follows:

698 = (15 × 24) + (13 × 26) = Off time period (hours)

15356 = 228 × 698 = Chiller power saving during kWh

4-2 Child water pumps off after working hours during weekdays and off on all Thursdays and Fridays.

There are currently four Childe Water pumps (each of 3.5 kilowatts) in the building, and from these four pumps, most of the time, three pumps, and at the beginning and end of the two pumps series. These pumps have been used in the past, so the equation 2 is used to calculate pump savings.

<u>Equation 2</u>

<u>Power Consumption of Childurate Pumps during the period (kWh)=</u>
<u>Number of pumps used during the period × Power consumption per pump (kW) × Off time period (hours)</u>

Since the study period in this report is related to the end of the season, so during this period, two pumps were active during the day and thus the resulting savings calculations are as follows:

Number of days of the time period: 41 days

Number of days off: 15 days Number of working days: 26 days

Number of hours offset for each working day: 13 hours

The total duration of the child water pump exits during the period is as follows:

698 = (15 × 24) + (13 × 26) = Off time period (hours)

4886 = 2 × 3.5 × 698 = Power saving time for electric motors for chill and electric motors (kWh)

It should be noted, however, that during the reporting period, although the relevant period was located at the end of the season, but all three building pumps were active, but savings calculations were made according to the same 2 pumps. Cooling tower pumps off after working hours during weekdays and their blackouts during the whole of Thursday and Friday. The cooling towers of the building are equipped with three pumps, of which two pumps are used, with a pump capacity of 7.5 kW. These pumps have been working before, so to calculate their energy savings, Equation 3 is used.

Equation 3

The amount of power savings of cooling tower pumps during the period (kWh)= Number of pumps used during the period × Power consumption per pump (kW) × Off time period (hours)

In this way, the calculations for cooling the cooling tower pumps are as follows:

Number of days of the time period: 41 days

Number of days off: 15 days

Number of working days: 26 days

Number of hours offset for each working day: 13 hours

The total duration of pump exits during the period is as follows: 698 = (15 × 24) + (13 × 26) = Off time period (hours) 10407 = 2 × 7.5 × 698 = Power savings of cooling tower pumps during the period (kWh)

4-4. Cooling tower fan exhaust after working hours in daylight hours and their blackouts during the whole of Thursday and Friday.

The cooling towers of the building are equipped with two fans. Depending on whether the chiller compressors are turned on or off, one or two fan towers are used, with an absolute power of one of these fans of 7.5 kW. These fans have been working before, so to calculate the energy savings of cooling tower fans, Equation 4 is used.

Equation 4

The amount of power savings for cooling tower fans during the cycle (kWh)=

Number of fans used during the period × power consumption of each fan (kW) × duration of power outage during the period (hours)

In this way, the calculations of cooling fan fans are as follows:

Number of days of the time period: 41 days

Number of days off: 15 days

Number of working days: 26 days

Number of hours offset for each working day: 13 hours

The total duration of fan extinguishing during the period is as follows:

698 = (15 × 24) + (13 × 26) = off time period (hours)

In the study period, two fan cooling towers were only one active fan, so the savings achieved are as follows:

5235 = 1 × 7.5 × 698 = Power saving factor of cooling tower fans during the period (kWh)

4-5- Fan coil shutdown after working hours during weekdays and their blackouts during the whole days of Thursday and Friday in warm and cold seasons.

At present, 127 fan coils are in control of the building. The measurements on the current of the electromotor of a number of fan coils indicate that the power consumption in the average range of the samples is 130 W (equivalent to 0.13 kW). Field surveys also show that about 20% of fan coils remain clear after working hours, but with the help of the radio control system, it is possible to turn off all of the fan coils after the office hours as well as on holiday days. Accordingly, the calculation of the energy saving fan coil in the warm and cold seasons of the year is given by Equation 5.

Equation 5

The amount of power saving fan coils during the period (kWh)= 0.2 × Total fan coils × Power consumption of each fan coil (kW) × Off time during the period (h) In this way, fan coil working hours are based on the arrangements made in the measurement and validation plan, as follows:

Number of days of the time period: 41 days

Number of days off: 15 days Number of working days: 26 days

Number of hours offset for each working day: 13 hours

The total duration of the fan coils that stayed bright during the period is as follows: 698 = (15 × 24) + (13 × 26) = Off time period (hours) The amount of fan coils is as follows: 2305 = 0.2 × 127 × 0,13 × 698 = Fan coil power savings during the period (kWh)

4-6. calculating the energy savings achieved during the work of the chiller

Part of the savings that can be made by the proposed solutions in this project comes at the time of the operation of the equipment. In the strategy of improving the compressor chiller performance using an intelligent cooling control system, since the chiller function is controlled by the outside air temperature, a portion of the power saving is achieved at this interval. The method of calculating power savings during chiller operation will be as follows:

1. Measure the power consumption of a chiller in one day from the beginning / end of the warm season and during working hours (without activating control systems) and compare it with the power consumption of the cooling system during working hours, on the same day In terms of average temperature (by activating all control systems)

2. Calculate the amount of savings achieved during working hours, in the early days (and the end) of the heating season, by deducting the "consumption rate measured in the use of control systems" from the "consumption rate measured without using Control systems "in the early days of the heating season

Thus, considering that the study period in this report only includes the days of the year, the consumption of chiller condensation power in different operating modes was done using a power analyzer and the consumption of chiller in different modes in table 6 Has been.

Table 6. Power consumption of chiller power consumption

Average temperature (℃)	Power consumption (kWh) over the working hours (17:00-6:00)	Control mode	Date of measurement	Row
29.8	**370.9**	**Manual (thermostatic)**	**31/5/96**	**1**
30.0	**221.4**	**Smart**	**15/6/96**	**2**
29.5	**221.8**	**Smart**	**20/6/96**	**3**

Given that:

Number of working days during the reporting period: 26 days

Therefore, the amount of savings obtained during chiller hours will be as follows:

3881.8 = 26 × (370.9-221.6) = The amount of power saving chillers during operating hours (kWh)

5. Natural gas saving calculations

Launch of the building-related gas consumption guidelines (Smart Heating Control System) on 96/5/24 The basis for calculating gas savings in this project is gas bills, and surveys show that the latest gas bill issued to Tehran's power distribution company by this date is 96/59, so it is possible to calculate the amount of gas savings in this There is no report.

6- Calculating water saving

In this project, the cooling tower fans will be able to achieve savings in cooling water towers. In order to calculate the water saving, by installing the water meter on the waterway of the cooling towers, their water consumption was analyzed and analyzed. Reading numbers from the water meter installed in this project are described in Table 7.

Table 7 Read the readings on the meter mounted on the water path of the cooling towers

Average temperature (℃)	Number read on meter (cubic meter)	Reading time	Reading date
30.4	**59.808**	**8:40**	**1/6/96**
27.2	**72.794**	**9:15**	**2/6/96**
30.0	**104.654**	**9:30**	**4/6/96**

In this way, the water consumption for cooling towers in the data collection intervals is according to Table 8.

Table 8 read numbers from the meter installed on the water path of the cooling towers

Average consumption per hour (cubic meter per hour)	Consumption (Cubic meters)	Duration (hours)	period
0.528	**12.986**	**24:35**	**1/6/96 to 2/6/96**
0.660	**31.86**	**48:15**	**2/6/96 to 4/6/96**

As you can see, the average consumption of water in the cooling towers in the building ranges from 528 to 660 liters, while according to estimates, the normal consumption of these towers should be in the range of 300 liters per hour. The reason for the high water consumption in the towers is a significant drop in water from the cooling tower, which was first observed by experts of the energy company on 25/4/96, and then the observations were reported in the presence of the meeting, but the related problem Until the date this report was submitted. In Figure 1, the water jet is well visible from the cooling tower.

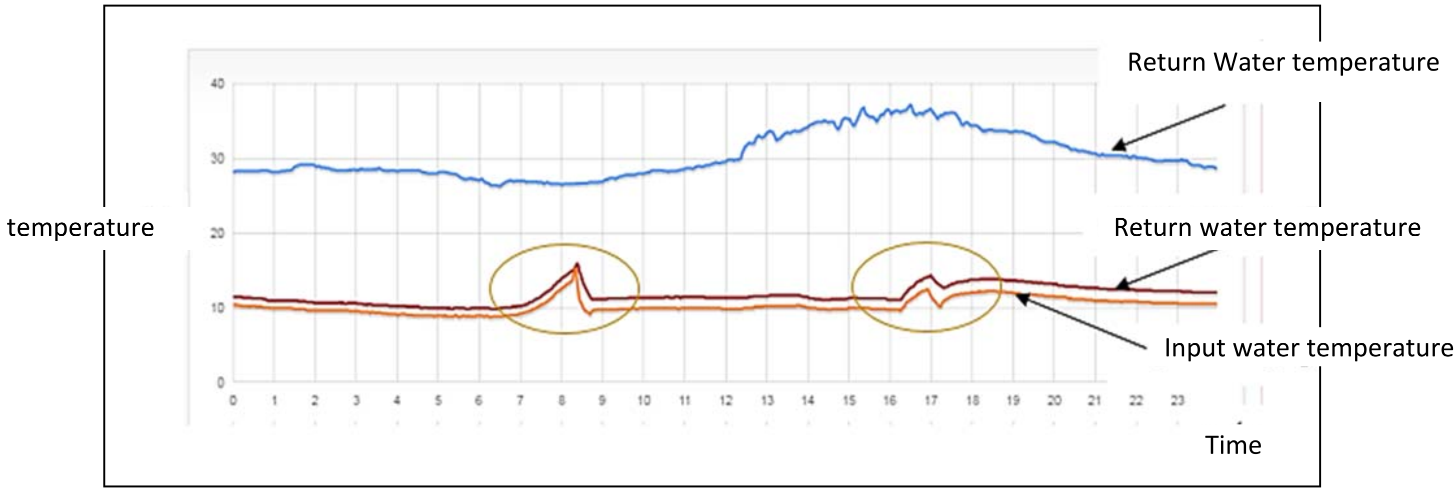
Given the unreasonable consumption of water in this building, it was not possible to calculate the water saving during this period, and therefore, it is expected that in the following year, by solving the observed problem, the lack of support of the energy transport company in the reporting period, saving the calculation Added to that year so that real savings achieved during this period are also reported.

Figure 1. Water overflow from the cooling tower

7. Description of the observed problems in the operation of the engine room installations
During the period covered by this report, there have been some problems with the operation of the engine equipment, which disrupts the projected savings in this project and will cause energy losses. The description of two main problems is given below.

1-7 - The problem of chiller

shutdown in the preliminary studies performed after the installation of the cooling system monitoring system, the problem of the chiller shutdown was observed during manual control, examples of which are shown in the following figures.



[i]Figure 2 - Chiller Offsets at around 7am and 16am on 26/04/96

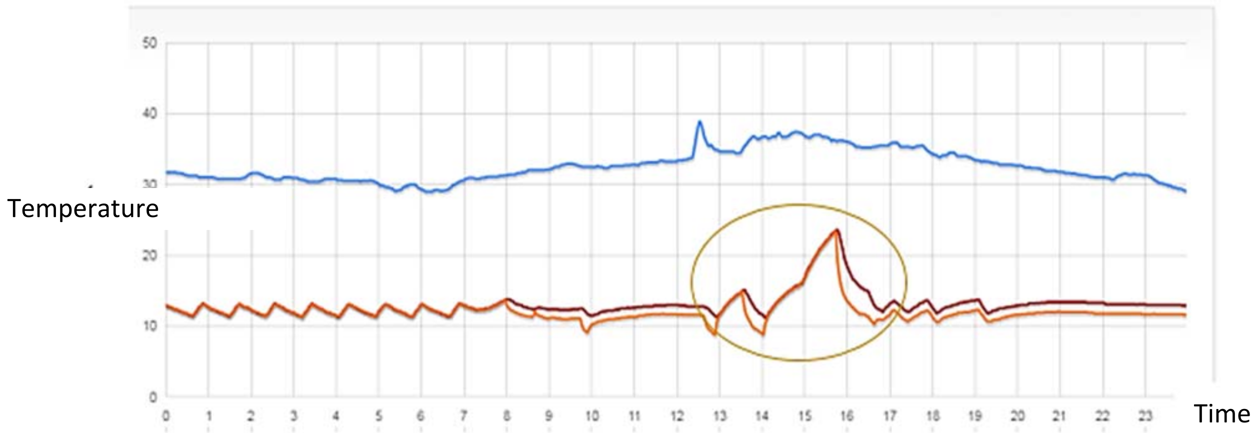


Figure 3 - Chill overshoot at around 13 and 14 on 8/5/96

Mr. Rajabi (contractor representative) said that this problem was caused by an anti-freeze system error, and by the announcement of the problem observed by the Energy Transmission Company at a joint meeting of 22/05/96, in order to prevent the impairment of the intelligent control system of the cooling system, This issue will be corrected, which will be followed by these reforms and the observed issue will not be repeated.

2-7-Fan coil fan conditioning problem and expansion cooling source status

By setting up a smart control system for the chiller cooling and exhaust system and the cooling system in the building engine room, from the first day of October, the chillers and building pumps and cooling tower pumps were shut off at the end of the working hour (19:00).

But, according to Mr. Rezaie, the representative of the employer, it was requested that two building pumps (each of them on the one side of the building), after the hour, were asked about the burning problem on a number of fan coils in the second floor of the building. Stay clear.

Investigations show that fan coils are usually caused by the reduction in water volume and the lack of replacement by the expansion source.

The presence of the problem in the expansion of the expansion source was observed by the presence of the person and the necessary examinations. Due to the shortage of circulating water in the fan coils (due to leakage in the pipes or repairs or other reasons), the water level in the source The expansion of the cooling system is low and due to the closure of the floating feed valve, the expansion source (common to expansions of the heating system and the expansion source of the cooling system), compensatory water has not been introduced and the air system has been taken.

According to the design principles of the building, during the operation of the water valve supply system, the expansion source should not be closed except during repairs, but the closing of the supply valve of the expansion vessel was repeatedly recalled by the presence of experts in the energy transport company, which was once also attended Shift personnel at the facility (Mr. Arjmandi, on Monday, 96/7/10, after seeing this problem and opening the water valve supply source, the person in charge deployed the source flocculation regulator.

Additionally, in visits to the building's engine room, one of the building pumps (Chilled Water) has a fairly significant leak.

With the measurements taken from the expansion spring in the roof of the building, the net water found in the expansion tank of the cooling system is 150 liters (source dimensions: 50 × 50 × 80 cm3).

With the chiller and pumps being switched off at 19:00 and the system clear at 5:00 AM the next day, the total system shutdown time was 10 hours a day. If it is assumed that in the ideal state of the water supply is discharged within 10 hours (without compensating water), 15 liters per hour is required to be reduced from the source, which is equivalent to 250 ml per minute. As can be seen, due to the leakage of the pumped building pump (as one of the reasons for the drain of the circulating cooling system) and the closure of the source feed milk, the drain of the source during the period of pump shutdown and the lack of water compensation of the source and finally Fan cooled ventilation is easily predictable.

Fig. 4: Valve in the pipe connection pipe to the expansion chiller No. 2

Another case that is seen in the building system is the existence of a valve in the main path of expansion of the cooling system as well as in the expansion paths of the heating system (as shown in Figures 4 to 6), while in accordance with clause 14.7-8 2. Section 14 of the National Building Regulations, "Installing the valve or any other obstacle on the pipe connection between the heating system and the expansion tank is not permitted". This clause is related to the heating system, but the same applies to the cooling system, and if this valve is closed, a system malfunction can be created, and this can definitely be done in the heating system, irreparable risks.

Fig. 5: The presence of valve in the pipe connection pipe expansion line to chiller No.1

Fig. 6: Valve in the direction of the pipe connection of the expansion vessel to the boilers

3-7. Problems in supplying the building's spa

Intelligent water control system was installed in the building engine room24/5/96. The initial settings of this system include the operation of boilers from 5:00 to 17:00 (according to the minutes of 22/05/96). The water temperature of the spa using the intelligent system is 40 ° C and the temperature of the boiler thermostat is 55 ° C.

However, due to the inability of the system to provide a health spa with a minimum temperature of 40 ° C, as well as because of the lack of isolation of sanitary spa section 121 and follow-up from the building engine room, on 7/6/96, at the request of Mr. Rezaei, the boiler operation time At 6:00 to 19:00, the mechanical boiler thermostat was increased to 60 ° C. A review of the performance of the sanitary health spa system shows that there are problems with the system, as described below.

According to the observations made using the heating system monitoring system (18/7/96), the heating temperature of the outlet from two sources of water is about 3 ° C (as shown in Fig. 7). Due to the fact that the rotary helix path in two coils of the same sources is the same, there should be no temperature difference between the two sources. It seems that the reason for this is the presence of more sediment in the coil of the spa source number 1. Placement of sanitary spa supplies in the building's engine room is shown in Figure 8.

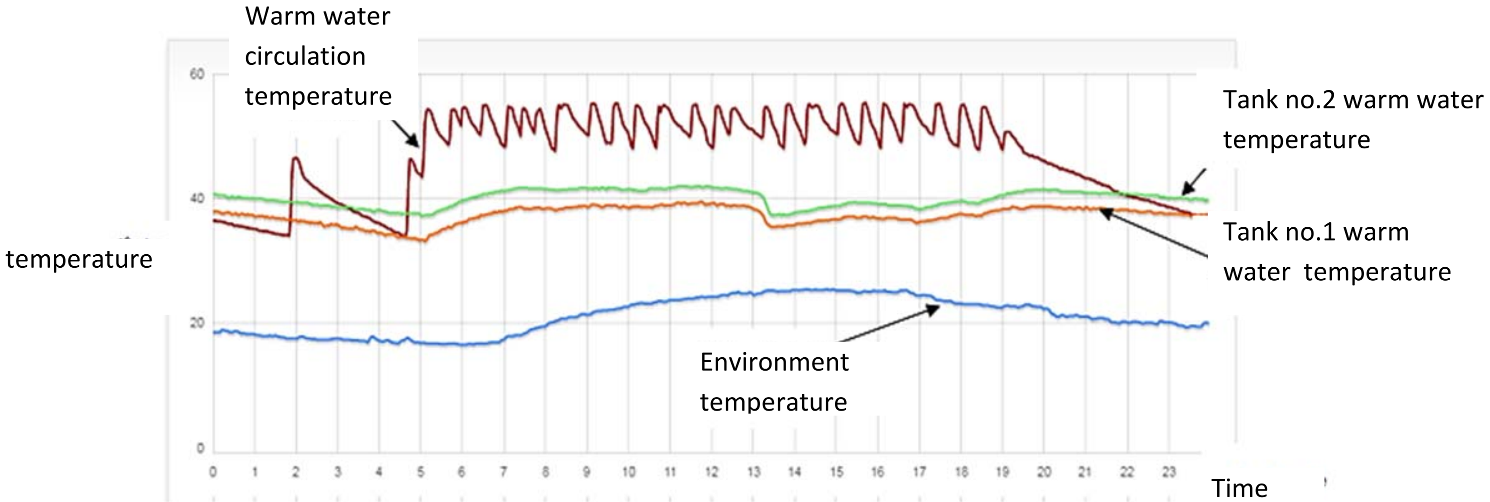


Figure 7. The difference between the heating water temperature between the two sources of the spa

Figure 8 - Locating two sources of spa water

Pumps intended for rotational spin rotation in the coil of hot water supplies, two pumps of the Grand foot model 2540. According to surveys, these pumps do not have the ability to circulate water with the required flow rate for proper heat exchangers inside the coil.

This is evidenced by the current flow of the existing 2540 pumps (in their minimal operating conditions) and the temperature difference above 10 ° C between the rotary spawning medium and the average spawning temperature of the outflow of the two sources in the graph shown 18/7/96(As shown in Figure 9).

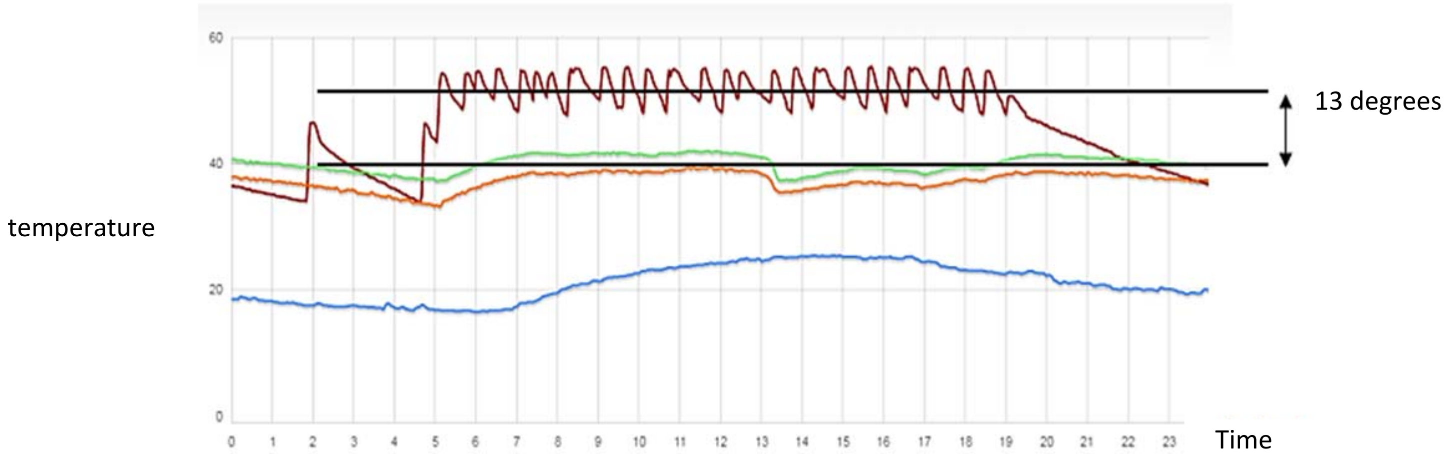


Figure 9 - Temperature difference between rotary spawning with average heating water consumption of the building

Another important suggestion: Due to the forthcoming cold season and the reduction of air temperature and insolation of hot water and other water supply routes in the engine room, it is expected that the temperature of the spa hot water in hot springs, in non-working hours, which boilers off They should be remarkable. Therefore, equipping sections 121 and the Follow-up Office with a separate water heater will be necessary to provide water for these two parts during non-working hours and holidays.

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