チュニジア国農業・水資源・漁業省
水資源開発公社（SONEDE）

チュニジア国
スファックス海水淡水化施設
整備事業準備調査

最終報告書
付属資料

平成 27 年 8 月
(2015 年)

独立行政法人
国際協力機構（JICA）

株式会社ＮＪＳコンサルタンツ
株式会社アンジェロセック
日本テクノ株式会社

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第 1 章 調査の目的と内容

1.2-1　インセプション・レポート協議議事録

Minutes of Meeting

on

Inception Report

of

Preparatory Survey

for

Sfax Seawater Desalination Plant Construction Project in Tunisia

Tunis, October 21, 2013

Hédi BELHAJ

Chief Executive Officer
Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE)

Takafumi KIGUCHI

Team Leader
JICA Survey Team

Khelil KAMMOUN

Director of Asia - Africa Bilateral Cooperation
Ministry of Development and International Cooperation (MDCI)

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Survey Team (hereinafter referred to as "the Team") to the Republic of Tunisia (hereinafter referred to as "Tunisia"). Since its arrival on September 28th 2013, the Team members and officials of the Government of Republic of Tunisia (hereinafter referred to as "GOT") had detailed discussions on the Inception Report (hereinafter referred to as "IC/R") of "the Preparatory Survey for the Sfax Seawater Desalination Plant Construction Project" (hereinafter to as "the Survey"). In the course of those discussions, both parties confirmed the major items described below. These minutes reflect the discussions held between September 28 and October 21.

1. Explanation of the Inception Report

On September 30th 2013 at the Ministry of Development and International Cooperation (hereinafter referred to as "MDCI"), the Team presented the IC/R to GOT. The Team set forth the basic concept, outline and the scope of the Survey proposed in the IC/R.

GOT agreed on the content of the IC/R and understood objectives, schedule, activities and methodology of the Survey. GOT pledged a close cooperation with the Team throughout the Survey.

Some items proposed by the IC/R, as stated in the paragraphs below, are still subject to discussion between the parties.

2. Implementation Schedule

The Survey will be carried out as per tentative schedule below. This schedule may be subject to change in the course of the Survey.

Implementation Tentative Schedule

	Phase1				Phase2 (2-1)			Phase2 (2-2)				
Year	2013				2014							
Month	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Work in Tunisia												
Work in Japan												
Reports	IC/R			IT/R1			IT/R2			DF/R		F/R S/FR

Legend: IC/R: Inception Report; IT/R1: First Interim Report; IT/R2: Second Interim Report; DF/R: Draft Final Report; F/R: Final Report; S/FR: Summary of the Final Report

3. Reports

The Team will prepare and submit reports to the SONEDE as per the following timeline:

a) Inception Report (IC/R): 5 copies in French – submitted on September 30, 2013.
b) First Interim Report (IT/R1): 5 copies in English and 5 copies in French – This report will be submitted three months after the beginning of the Preparatory Survey and will present the results of the Phase 1 of the Survey.

c) Second Interim Report (IT/R2): 5 copies in English and 5 copies in French – This report will cover the preliminary results and findings of Phase 2, at midterm. It is scheduled to be submitted in early April 2014.
d) Draft Final Report (DF/R): 5 copies in English and 5 copies in French – This report will be submitted by the end of Phase 2 of the Preparatory Survey, scheduled for early June 2014.
e) Final Report (F/R): 5 copies in English, 5 copies in French – This report will be submitted one month after receiving the comments on the Draft Final Report (DF/R). Its submittal is scheduled for the end of August 2014.
f) Summary of Final Report (S/FR): 5 copies in English, 5 copies in French – This report will be submitted along with the Final Report

.

The members of the Steering Committee (refer to paragraph 4, below) will submit their comments on reports a) to d) mentioned above within two weeks from the date of receipt of each corresponding report.

SONEDE requested to provide 10 copies of the French version of each report, as well as an electronic data as described in the minutes of meeting between JICA and GOT dated May 17, 2013. The Team stated that it informs JICA of this request.

4. Steering Committee

A Steering Committee will be established with representatives from MDCI, the Ministry of Agriculture, the Ministry of Finance, the Ministry of Foreign Affairs, the Ministry of Equipment and the Environment, SONEDE, JICA and the Team. The Committee shall be organized and chaired by SONEDE.

5. Scope of the Project

SONEDE asked the Team to carry out a feasibility survey for a seawater desalination plant with a production (desalination) capacity estimated at 200,000 m^3/day to cover the project demands of 2030. This plant is to be implemented in two stages. The first stage will include a 100,000 m^3/day water desalination plant, which is scalable up to 200,000 m^3/day, and following facilities for 200,000 m^3/day; water intake, brine discharge, water transmission pipeline, distribution reservoir, and water desalination plant site. The first stage shall be the object of a Japanese ODA loan. Source of fund for the second stage is not defined yet.

The Team proposed carrying out the Survey for a project horizon of 2035. SONEDE agreed to the proposal, and the Team agreed with the phasing and sizing stated in the paragraph above. SONEDE and the Team agreed, however, that the said phasing and sizing should be examined by the Survey.

6. Undertaking of the GOT

SONEDE will be the counterpart of the Team as well as the coordination body with other relevant organizations of GOT. The role of SONEDE will be to ensure a smooth implementation of the Survey.

SONEDE will provide, without causing supplementary costs to the Team, unless otherwise noted below, and in cooperation with other concerned organizations of GOT, the following services in support of the Survey:

a) Provide the Team the information related to the security as well as ensuring measures for Team's safety;
b) Inform and facilitate access to medical services to the Team- medical expenses will be covered by the Team;

c) Provide data and information related the Preparatory Survey;
d) Assign a counterpart from SONEDE for each specialist of the Team;
e) Prepare authorization letters;
f) Facilitate the access to the sites for the Team members to carry out the field studies;
g) Assist the Team to make travel arrangements and appointments with respect to the Survey;
h) Assist the Team with clearing customs and obtaining any applicable duty exemption with respect to equipment, instruments, tools and other articles brought into and/or took out of Tunisia in connection with the implementation of the Survey, according to Tunisian regulation and laws in force with the understanding that any eventual duties will be borne by the Team.
i) Organize public hearings, with the support of the documentation provided by the Team, for residents to be affected by the project;
j) Provide a space and office furniture in Tunis and Sfax for the Team (already implemented).

7. Team Engagements

The Team commits to respect the engagements indicated below:

a) The Team undertakes to not divulge the received information and documents from SONEDE to a third party, except the Team members and JICA.
b) The Team will respect the prescribed project schedule stated in paragraph 2.
c) The Team will do its best to improve the quality of the translation of its reports into French.
d) The Team will share the information about progress and technical decisions of the Study with SONEDE.

8. Selection of Desalination Treatment Plant Site

SONEDE proposed four (4) areas for construction of the desalination plant as follows:

1) No.1 El Amra - 27km north-east of Sfax
2) No.2 Sakiet Eddayer - 14km north-east of Sfax
3) No.3 Sfax Sud - 14km south-west of Sfax
4) No.4 La Chebba - 62km north-east of Sfax

Upon preliminary evaluation, the Team proposed 3 supplementary areas, because the sites Nos.1, 2, and 4 are located in areas with a flat and shallow seabed that would require lengthy and therefore expensive water intake and brine disposal pipelines. Newly proposed areas are as follows:

5) No. 5 Mahres Nord - 21km south-west of Sfax, 7km south-west of the site No. 3
6) No. 6 Chebba Nord - 68km north-east of Sfax, 6km north of the site No. 4
7) No. 7 Mahres Sud- 34km south-west of Sfax, 18km south-west of the site No. 3

SONEDE agreed to include these areas to the Survey.

Two to three candidate sites will be selected during the Phase 1 of the Survey. The final site selection will be done during the first stages of the Phase 2 of the Survey.

The Team presented to SONEDE the methodology and the criteria of the site evaluation and selection. The Team specified that the hydrogeological study will be conducted on the basis of the available data and documents. SONEDE requested the Team to conduct at least one test well boring with a depth of less than 50m at the site finally selected for the project in order to verify the findings of this analysis. The Team took note of it.

9. Other Discussed Points

(1) With regard to the Project implementation schedule, the Team explained its idea that the desalination plant will be operational in 2022 based on the past experience of ODA Loan projects in Tunisia. SONEDE insisted that this planning could not be accepted because of expected water shortages around 2018. SONEDE then proposed a plant startup in 2018.

To bridge the gap between the two parties, SONEDE has already made a verbal proposal to JICA mission, to accelerate the water desalination plant implementation schedule, and reminds this proposal in these minutes. This proposal includes: i) to delete the selection stage of the consultant (in charge of the Tender Document preparation), which will provide more-than-one-year gain with respect the schedule proposed by the Team, and ii) to change the scope of work of the Team, as follows: a) addition of the tender preparation, and b) elimination of some tasks (e.g. the social survey). The Team explained such change of scope of work is not acceptable as the terms of reference of the Survey are fixed, but that a way to shorten the implementation period will be studied in the Survey.

(2) SONEDE insisted that the social survey to assess the impact of the project on the affordability of the water via a questionnaire interview is not applicable, as Tunisia applies a nation-wide water tariff and that this tariff is subsidized. The Team explained that the social survey is not only for a tariff study but for other social related conditions, which would be supporting data to prove the necessity of the Project. Both parties agreed that the contents of the questionnaire shall be further discussed between SONEDE and the Team.

(3) The Team stated that the subcontractors will be selected through tendering process set in the Guidelines of JICA, and SONEDE agreed on it.

(4) Both parties agreed that the horizon of the Project is the year 2035.

(5) Both parties agreed to have weekly meetings between SONEDE and the Team will be held every Monday afternoon at 15:00 at SONEDE.

(6) SONEDE will provide the Team with the recent operation data for the existing desalination plants of Djerba, Zarzis and Ben Guerdane. The possibility of visiting the Gabes plant and the subsequent collection of its operation and maintenance data will be assessed by the Team. Both parties agreed on it.

(7) SONEDE will organize public hearings in order to keep residents affected by the construction and operation of the Water Desalination Project informed about the project. SONEDE will organize this public awareness activity, timely, in collaboration with local authorities and with the Team support. Both parties agreed on it.

(END)

1.2-2　インテリム・レポート 1 協議議事録

Minutes of Discussion

on

Interim Report 1

of

Preparatory Survey

for

Sfax Sea Water Desalination Plant Construction Project in Tunisia

Tunis, February 10, 2014

Hédi BELHAJ

Chief Executive Officer
Société Nationale d'Exploitation et de
Distribution des Eaux (SONEDE)

Takafumi KIGUCHI

Team Leader
JICA Survey Team

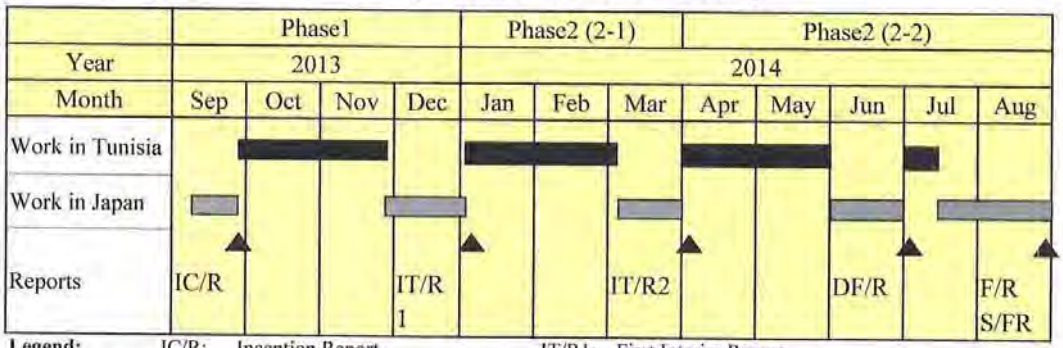
Khelil KAMMOUN

Director of Asia – Africa Bilateral
Cooperation
State Secretariat for Development and
International Cooperation
Ministry of Economy and Finance

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a survey team (hereinafter referred to as "the Team") to the Republic of Tunisia (hereinafter referred to as "Tunisia") from September 28th, 2013 to November 24th, 2013 to conduct the Phase 1 of "the Preparatory Survey for the Sfax Seawater Desalination Plant Construction Project" (hereinafter as "the Survey"). During the Phase 1 of the Survey period, the Team members and officials of the Government of Tunisia (hereinafter referred to as "GOT"), represented by the Ministry of Development and International Cooperation[1] (now "State Secretariat for Development and International Cooperation, Ministry of Economy and Finance", hereinafter referred to as "MDCI"), Ministry of Agriculture, Ministry of Equipment and Environment (now "Ministére de l'Equipment, de l'Aménagement du Territoire et du Développement durable"), Agence Nationale de Protection de l'Environnement (hereinafter referred as "ANPE"), Agence de Protection et d'Aménagement du Littoral (hereinafter referred to as "APAL"), and Société Nationale d'Exploitation et de Distribution des Eaux (hereinafter referred to as "SONEDE") had detailed discussions concerning confirmation of the necessity of the Sfax Seawater Desalination Plant Construction Project[2] (hereinafter referred to as "the Project").

Based on the discussion and findings in the Phase 1 of the Survey, the Team compiled the First Interim Report (hereinafter referred to as "IT/R1") in Japan through discussions with JICA as scheduled in the Minutes of Discussion on Inception Report shown below. This schedule is subject to change in accordance with the progress of the Survey.

Tentative Implementation Schedule of Survey



Legend: IC/R: Inception Report; IT/R1: First Interim Report; IT/R2: Second Interim Report; DF/R: Draft Final Report; F/R: Final Report; S/FR: Summary of the Final Report

The Team submitted the IT/R1, 5 copies in English and 10 copies in French to GOT, and a

[1] Name at the time of the discussion. It was changed to "State Secretariat for Development and International Cooperation (Secrétariat d'Etat au Développement et à la Coopération international)", Ministry of Economy and Finance, due to restructuring and consolidation in the Government of Tunisia after the time of the discussion. The new cabinet was formed on 29th January 2014. Names of other authorities presented on this Minutes of Discussion are also those at the time of the discussion.

[2] It consists of 200,000m^3/day capacity seawater desalination plant and its related facilities.

discussion meeting on IT/R1 was held at MDCI on January 20th, 2014. The Team with the local consultant members presented the IT/R1 to GOT with the presence of the JICA Mission.

On January 21st 2014 at SONEDE Sfax Office, at the presence of the JICA Mission, the Team discussed with APAL and SONEDE after visiting two candidate sites for the Project.

In the discussion meeting on IT/R1 and the meeting at the SONEDE Sfax Office, the Team confirmed the major points described below.

This Minutes of Discussion reflects the results of discussions held from 20th of January to 10th of February, 2014.

1. Confirmation of the Necessity of the Project

The Team explained GOT that; in the Phase 1 of the Survey, the quantities of water demand and supply in Sfax were confirmed through discussions with SONEDE, and the necessity of the Project was verified.

SONEDE commented that; in the IT/R1, a water shortage problem would happen in 2018 during the water demand peak season in Sfax; however, the situation is more critical and they are afraid of the water shortage problem would happen in 2014 during the water demand peak season.

The Team asked to compile their comments on IT/R1.

SONEDE agreed to put forward their comments to the Team up to the end of January 2014.

The Team stated that; they would confirm the comments on IT/R1 and take into considerations in the Phase 2 of the Survey, and would reflect the comments on the Interim Report 2, if necessary.

The Team emphasized that; in addition to the Project, the project of Saida Reservoir and Kalaa Kebira Reservoir with its water treatment plant is very important to increase water supply quantity in Sfax as shown on the water supply scenarios presented in the IT/R1.

The Team requested GOT to make the schedule of the two reservoirs construction projects clear and to precede the construction of them quickly.

GOT agreed that to make the construction schedule of the two reservoirs clear in the Phase 2 of the Survey.

Regarding the capacities of the facilities, SONEDE intends that capacity of the seawater desalination plant of the Project shall be 100,000m^3/day at first stage and other facilities such as water intake, transmission pipeline and etc. shall be 200,000m^3/day. GOT requested to the Government of Japan (hereinafter referred to as "GOJ") the facilities in the first stage as a candidate project of Japanese ODA Loan.

The Team stated that the staged construction and capacity of each stage would be decided based on the schedule of the project of Saida Reservoir and Kalaa Kebira Reservoir with its treatment plant. In 2012, GOT requested to GOT the facilities to be constructed in the first stage as a candidate

project of Japanese ODA Loan.

SONEDE and the Team agreed to clarify the schedule of the reservoir project based on the information provided by GOT.

The Team explained that; the financial situation of SONEDE, environmental aspects of the Project and power supply capability for the seawater desalination plant, will be further examined through discussions with GOT in Phase 2 of the Survey.

GOT agreed on it.

2. Main points to be examined in Phase 2 of the Survey

The Team explained to GOT that following points will be examined in Phase 2 of the Survey.

(1) Selection of the Site for the Sea Water Desalination Plant
(2) Possibility to add TOR of the Survey for review of bidding documents for the construction of the Plant
(3) Implementation schedule of the Project
(4) Consulting services in the Japanese ODA Loan
(5) Social study
(6) Topographic survey
(7) Geotechnical survey
(8) Establishment of TOR for Environmental Impact Assessment (EIA)
(9) Data collection for cost estimates
(10) Use of Japanese Technology

2.1 Selection of the Site for the Seawater Desalination Plant

(1) Site Selection

The Team explained that two candidate sites for the seawater desalination plant of the Project (hereinafter referred to as "the Plant"), i.e. Candidate site #5 and Candidate site #3, have been selected during the Phase 1 of the Survey.

APAL recommended Candidate site #3 as the site for the Plant because the environmental impact of Candidate site #3 will be less than that of Candidate site #5 as described in Annexes-1 attached herewith.

APAL mentioned that they would agree to provide permission though Candidate site #3 is located within the area of Public Domain of Maritime.

SONEDE and APAL agreed to select Candidate site #3 for the Plant (refer to Annexes -2 and -3).

(2) Exact Location of the Site for the Plant

Since the area of Candidate site #3 is around 50 hectares, SONEDE and the Team agreed that the exact location of the Site for the Plant shall be defined through following procedures.

1) The Team will submit SONEDE a plan for identification of the Site.
2) SONEDE will take GPS data on the Site and provide the data to the Team.
3) The Team will conduct topographic survey and sub-soil investigation in the defined site.

2.2 Possibility to add TOR of the Survey for review of bidding documents for the construction of the Plant

SONEDE requested to add TOR to review of the tender document for the contractor selection for the Plant by the specialist.

The Team explained that it is difficult to find the specialists in the Team to meet the following criteria proposed by SONEDE.

Desalination Specialist
Minimum Bac+5, Fluent French
Minimum 15 years professional experience
Minimum 2 study of sea water desalination projects
Procurement Specialist
Minimum Bac+5, Fluent French
Experience
Minimum 15 years professional experience for JICA's Guidelines for Procurement under Japanese ODA Loans

Finally, SONEDE decided that it will prepare the bidding documents by itself.

2.3 Implementation Schedule of the Project

SONEDE insisted on to start the operation of the Plant in 2018 because of fear of water shortage during water demand peak season in 2018. In the discussion at SONEDE Sfax office, it is confirmed that the water shortage issue is very critical and the situation requires SONEDE to take immediate action.

The Team explained the procurement procedure of the Japanese ODA Loan project in general in Tunisia in case of Single-Stage Two-Envelop Bidding without P/Q as follows;

- Preparation of Bidding Document and Request for Comments to JICA by SONEDE
- Request for JICA's Review and Concurrence by SONEDE
- Publication of Bid by SONEDE
- Preparations of Analysis of Technical Proposals by SONEDE
- Consultation with CSM by SONEDE
- Request for JICA's Review and Concurrence by SONEDE
- Preparation of Analysis of Bids and Proposal by SONEDE
- Consultation with CSM by SONEDE
- Request for JICA's Review and Concurrence by SONEDE
- Establishment of Contract with the Contractor to be selected as the first place
- Request for JICA's Review and Concurrence on a duly certified copy of the Contract before

executing a contract.

SONEDE requested that before the final signing JICA should review their draft contract. The Team stated that it will inform JICA of SONEDE's request.

The Team reminded that SONEDE could announce a bid for the Project after the Pledge of GOJ, and JICA's concurrence on bidding documents subject to the effectuation of the Loan Agreement. SONEDE understood and agreed on it, however, SONEDE reminded that it will make a contract with the successful bidder after signing the Loan Agreement.

The Team also explained that it is quite difficult to start operation of the Plant in 2018.

SONEDE stated that they would make their all efforts to implement the Project in 2018.

SONEDE and the Team agreed that the detailed implementation schedule will be discussed and prepared in the Phase 2 of the Survey including EIA and other necessary procedures required for implementation of the Project.

2.4 Consulting Services in the First Stage of the Project

The Team explained SONEDE the necessity of hiring consultants for smooth implementation of a project under the Japanese ODA Loan.

SONEDE stated that it intends to hire the consultant only for the supervisory work for the Plant, since SONEDE is in charge of preparing bidding documents.

SONEDE and the Team agreed to discuss the Terms of Reference for consulting services for the first stage of the Project in the Phase 2 of the Survey.

2.5 Social Survey

SONEDE and the Team agreed to conduct the social survey in Phase 2 of the Survey. SONEDE stated that the contents of the questionnaires have to be confirmed by MDCI and the Team agreed on it.

SONEDE and the Team also agreed to prepare the questionnaires of the social survey, and then MDCI will confirm them.

2.6 Topography Survey

The Team explained that the purpose of the survey is for a feasibility study not for detailed design, and therefore, altitudes will be surveyed about 500 m intervals along the pipe lines in profile survey of the Phase 2 in the Survey.

SONEDE requested the highest and lowest attitude points shall be surveyed. The data of highest and lowest attitude points, the existing data of reservoirs site sites and underground utilities are reflected in the drawings. But these data don't need to be reflected in the cost estimation of the Project.

SONEDE proposed to the Team to provide information for the topographic survey about the existing reservoirs sites and underground utilities.

The Team and SONEDE agreed that the Team would conduct following survey.

- Longitudinal profile of transmission pipeline route
- Plan view
- Singular profile including major high and low points, rivers, road crossings…

2.7 Geotechnical Survey of Seabed

SONEDE insisted that the Team should conduct seabed geotechnical survey at eight points as described in the IC/R, and also stated that this is justified by the fact that the length of the sea pipeline is 4 km for each of the 2 pipes; conducting only one borehole for each pipe would not reflect at all the type of the seabed, which has a considerable influence on execution and hence on the cost of the project.

The Team explained that the purpose of the geotechnical survey is to collect sub-soil information for the feasibility study and the information of the two points is sufficient to estimate rough cost for appraisal of the loan amount and to assess the soundness of the foundation of the facilities to be constructed at the ends of marine pipe lines.

As a result of discussions, the Team stated that they will conduct the geotechnical survey at the ends of 2 marine pipelines, 1 point at the middle point of pipelines, 1 point at around 1/4 of the pipelines from the shoreline, and 1 point at shoreline. SONEDE agreed on the Team's plan (refer to Annex -4).

2.8 Establishment of TOR for Environmental Impact Assessment (EIA)

The Team explained that they would compile the TOR for the EIA study to be conducted by SONEDE.

SONEDE assumed the schedule of the EIA Study as; 6 months for selection of the consultant, 6 months for the study, and 3 months to obtain approval by ANPE.

SONEDE will coordinate the meetings with ANPE for the Team.

2.9 Data collection for cost estimates

The Team asked the basis of the SONEDE's cost estimates for the first stage of the Project. SONEDE asked to discuss the project cost apart from the SONEDE's primary estimation. SONEDE agreed that the Team will define the consistency of the Project and then will coordinate with SONEDE to determine the unitary cost of the Project.

The Team and SONEDE agreed to discuss on it in Phase 2 of the Survey.

2.10 Japanese Technologies

The Team explained that Japanese technologies are applicable to the Project and asked SONEDE to discuss on it in Phase 2 of the Survey.

3. Steering Committee for the Survey

The Team reminded to MDCI to invite the Ministry of Finance (now Ministry of Economy and Finance), the Ministry of Foreign Affairs, ANPE and APAL as Steering Committee members.

MDCI agreed on it.

(END)

Annex 1 : Minutes of Meeting between SONEDE and APAL

PV de la réunion en date du 21 janvier 2014

Objet : **visite des sites présélectionnés pour accueillir la station de Dessalement à Sfax**

Pièces Jointes :

- Plan de situation des deux sites
- Listes des présents

Suite à la visite des deux sites présélectionnés par « l'Etude Préparatoire Relative au Projet de Construction de la Station de Dessalement d'Eau de Mer de Sfax » réalisée par la JICA (Rapport Intérimaire 1, Janvier 2014), les présents ont convenu ce qui suit :

1- Site n°5 (Nakta) :

Ce site se localise à proximité du village de Nakta, sur la plage de ChaffarLekdim(ancien).

Il est caractérisé par sa fragilité et classé « Zone sensible littorale ». Il se présente sous la forme d'une zone humide occupée par une végétation halophile (terrain inondable), devant laquelle se développe une flèche sableuse qui se singularise par sa dynamique sédimentaire. Les fonds marins qui lui font face enregistrent la présence d'herbiers marins. Il est soumis à l'érosion marine et demeure sous la menace de l'élévation du niveau de la mer.

Site n°3 (Agareb) :

Ce site se localise à gauche de la route GP1 allant vers Gabès. Il se présente sous la forme de terrain en légère déclivité, occupé par une végétation halophile présentant suffisamment d'espace pour accueillir le futur site de la station de dessalement d'eau de mer. Relativement au site n°5, il présente moins de sensibilité écologique.

Conclusion :

Compte tenu de ce qui précède, il est recommandé de retenir le site n°3 (Agareb). L'APAL signifiera par écrit à la SONEDE la confirmation du choix de ce site au plus tard le 31 janvier 2014.

Pour la SONEDE	Pour l'APAL
Fethi Chaieb Directeur central travaux	MAHMOUD CHIHAOUI D.C APAL
SHEL Youssef Directeur régional Sud	Soha GUELLOUZ U. Gestion des écosystèmes
Abderrazak NOUICER Directeur de dessalement et de l'environnement	MORSI FEKI APAL. Sfax
Mabrouk Ben Salem Directeur territorial Sud	


Site 3
Domaine public maritime
Site 5
Ash-Shaffar
Site retenue de la Station de Dessalement
Domaine de l'état

Feuille de présence

(Reunion suite à la visite des deux sites proposés pour la SDEM à Sfax le 21 Janvier 2014) –

Nom et Prenom	organisme	Tel - e-mail	Signature
Skel Youssef	SONEDE		
Chaieb Fethi	SONEDE		
Abderrazak Nouiga	SONEDE		
KEFI Koutima	JICA-Tunisie		
HARA Naomi	JICA-HQ		
Shogo Asaoka	JICA HQ		
Takafumi KIGUCHI	JICA Study Team		
Taiko FUNAHOTO	JICA Study Team		
Riadh Benkraïem	SONEDE		
SEFI Nouri	SONEDE		
MAHLEJ Med Fathi	SONEDE		
Yahyaoui Ridha	SONEDE		
Ben Hassen Mohsen	Sonede		
GUELLOUZ Sabah	A.P.A.L		
MORSI FEKI	A.P.A.L		
Yahyaoui Ridha	SONEDE		
Frajchi Wafa	SONEDE		
Cherif Sonia	SONEDE		
Med SHELL	SONEDE		
Mabrouk Mohamed	SONEDE		
Mabrouk B. Salem	SONEDE		
Mahmoud CHTIOUI	Directeur Général APAL		

非公開資料

Annex 2 : Letters of SONEDE to ANPE and APAL

الشركة الوطنية لاستغلال وتوزيع المياه
SOCIETE NATIONALE D'EXPLOITATION ET DE DISTRIBUTION DES EAUX

80396 . تونس في 23 . جانفي 2014 . . . .

إلى السيد

المدير العام للوكالة الوطنية لحماية المحيط

الموضوع: دراسة انجاز محطة تحلية مياه البحر بصفاقس بسعة 200 ألف م^3/يوم.

المصاحيب: محضر جلسة بتاريخ 21 جانفي 2014.

تحيّة طيّبة،

و بعد، في اطار انجاز محطة تحلية مياه البحر بصفاقس تم القيام بزيارة ميدانية للمواقع المقترحة في الدراسة التحضيرية المعدة من طرف الوكالة اليابانية للتعاون الدولي، و قد تم اختيار الموقع عدد3 لتركيز المحطة و ذلك حسب محضر الجلسة المصاحب.

و السّلام.

الرئيس المدير العام

الهادي بلحاج

مدير التحلية والتأثيرات البيئية

عبد الرؤوف نويصر 23/1/14

TRANSMISSION ASSUREE
PAR EXPEDITEUR
NOM:
VISA:

شارع سليمان بن سليمان
المنار II - تونس 2092
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R.C. . C 0111892008 السجل التجاري س ت ش
Matricule Fiscal 1455 J/A/M/000 معرف الجبائي

Société Nationale de Distribution des Eaux

Tunis, January 23, 2014

To the kind attention of the Director General

National Agency for the Protection and Development of the Coastline

Subject: Study for the construction of a seawater desalination station with a capacity of 200,000 m^3/day

Attachments: Minutes of visit dated January 21, 2014

Dear Sir,

Further to our field visit to sites suggested in the Preparatory Study designed by the Japanese International Cooperation Agency concerning the construction of a seawater desalination station in Sfax (Interim Report 1, January 2014), we ask you to please confirm Site n°3 for the installation of the station with reference to the attached Minutes.

Best greetings

Central Executive Officer

Hedi Belhaj

الشركة الوطنية لاستغلال وتوزيع المياه
SOCIETE NATIONALE D'EXPLOITATION ET DE DISTRIBUTION DES EAUX

80396

تونس في .... 23 جانفي 2014.

إلى السيد المدير العام

للوكالة الوطنية لحماية و تهيئة الشريط الساحلي

الموضوع: دراسة انجاز محطة تحلية مياه البحر بصفاقس بسعة 200 ألف م^3/يوم.

المصاحيب: محضر جلسة بتاريخ 21 جانفي 2014

تحيّة طيّبة،

و بعد، تبعا للزيارة الميدانية للمواقع المقترحة في الدراسة التحضيرية المعدة من طرف الوكالة اليابانية للتعاون الدولي و المتعلقة بإنجاز محطة تحلية مياه البحر بصفاقس (Rapport Intérimaire1, Janvier 2014)، نطلب منكم تأكيد اختيار الموقع عدد3 لتركيز المحطة و ذلك حسب محضر الجلسة المصاحب.

و السّلام.

الرئيس المدير العام

الهادي بلحاج

REMISE MESURÉE PAR EXPÉDITEUR
NOM:
VISA:

شارع سليمان بن سليمان
المنار II - تونس 2092
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البريد الالكتروني E-mail sonede@sonede.com.tn

السجل التجاري س ت ش R.C. . C 0111892008
المعرف الجبائي Matricule Fiscal 1455 J/A/M/000

Société Nationale de Distribution des Eaux

Tunis, January 23, 2014

To the kind attention of the Director General

National Agency for the Protection of the Environment

Subject: Study for the construction of a seawater desalination station with a capacity of 200,000 m^3/day

Attachments: Minutes of visit dated January 21, 2014

Dear Sir,

In the framework of the execution of a seawater desalination station in Sfax, a field visit was conducted to sites suggested in the Preparatory Study designed by the Japanese International Cooperation Agency. Site n°3 was selected for the installation of the station with reference to the attached Minutes.

Best greetings

Central Executive Officer

Hedi Belhaj

Annex 3 : Letter of APAL to SONEDE

APAL
وكالة حماية و تهيئة الشريط الساحلي
AGENCE DE PROTECTION
D'AMENAGEMENT DU LITTOR

2014 جانفي 30

من المدير العام
لوكالة حماية وتهيئة الشريط الساحلي
إلى
السيد الرئيس المدير العام
للشركة الوطنية الإستغلال المياه

2014 / 127 - 4

الموضوع : دراسة إنجاز محطة تحلية مياه البحر بصفاقس
المرجع : مكتوبكم عدد 80396 بتاريخ 23 جانفي 2014

وبعد ،

تبعا للزيارة الميدانية للمواقع المقترحة في الدراسة التحضيرية المعدة من طرف الوكالة اليابانية للتعاون الدولي و المتعلقة بإنجاز محطة مياه البحر بصفاقس يشرفني أن أعلمكم بالموافقة المبدئية على الموقع الذي تم إختياره خلال الزيارة المذكورة على أن يتم إعداد الدراسات التكميلية ودراسة المؤثرات على المحيط .

هذا و تجدر الإشارة أنه يجب إدراج توصيات و عناصر مثل التصرف البيئي الذي ستسفر عنه دراسة المؤثرات على المحيط في ملف طلب العروض الذي يعنى بإحداث محطة تحلية مياه البحر.

والسلام

المدير العام
محمود الشيخ

مع محمد رشيد رضا - 1002 تونس البلفيدير
هاتف: 577 906 71 (216+)
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APAL

COASTLINE DEVELOPMENT AND PROTECTION AGENCY

2014/127

Tunis, January 30, 2014

From the Director General of the Coastline Development and Protection Agency (APAL)

To the kind attention of Mr. Central Executive Officer

Of the National Company for the Exploitation and Distribution of Water

Object: Execution Study of the Seawater Desalination Station in Sfax

Reference: Your mail N°83816 dated January 23, 2014

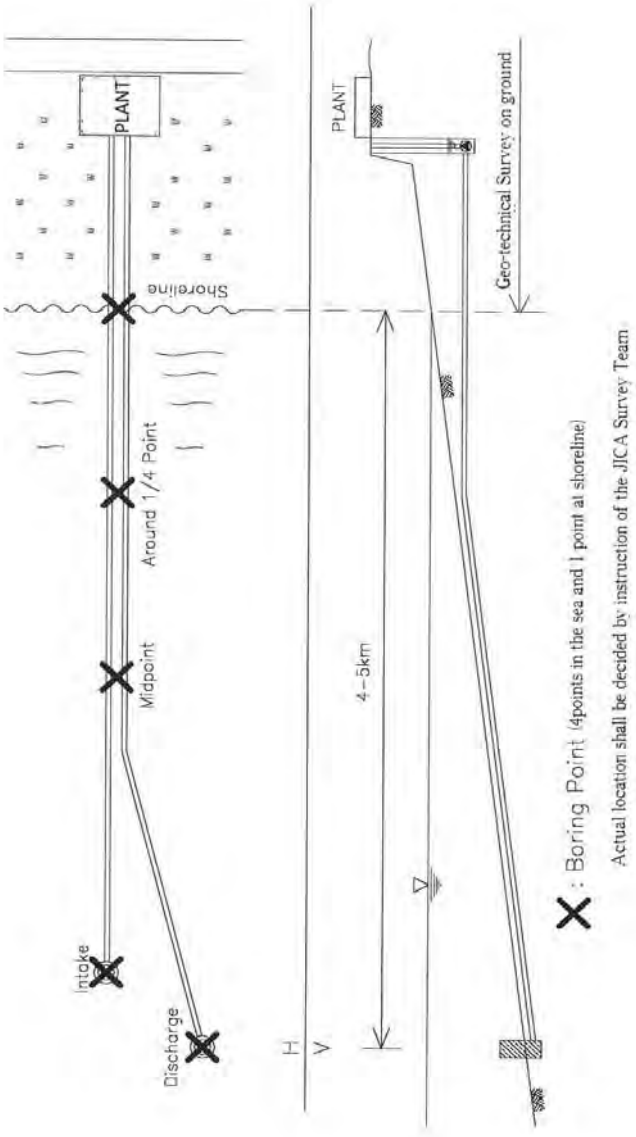
Further to the visit to sites suggested in the preparatory study conducted by JICA concerning the execution of the seawater desalination station in Sfax, we are pleased to inform you of our in-principle agreement for the site selected during this visit provided additional studies for the project and the Environment Impact Assessment (EIA) are conducted.

It should be noted that recommendations and elements of the Environmental Management Plan (EMP) that will be developed by the Environment Impact Assessment Study need to be integrated in the Bidding Documents related to the seawater desalination station.

Best regards.

DIRECTOR GENERAL
Coastline Development and Protection Agency (APAL)
Signed

Annex 4 : Plan of Seabed Soil Investigation for Marine Pipelines



1.2-3　インテリム・レポート 2 協議議事録

Minutes of Discussion

on

Interim Report 2

of

Preparatory Survey

for

Sfax Sea Water Desalination Plant Construction Project in Tunisia

Tunis, May 13, 2014

Hédi BELHAJ
Chief Executive Officer
Société Nationale d'Exploitation et de
Distribution des Eaux (SONEDE)

Takafumi KIGUCHI
Team Leader
JICA Survey Team

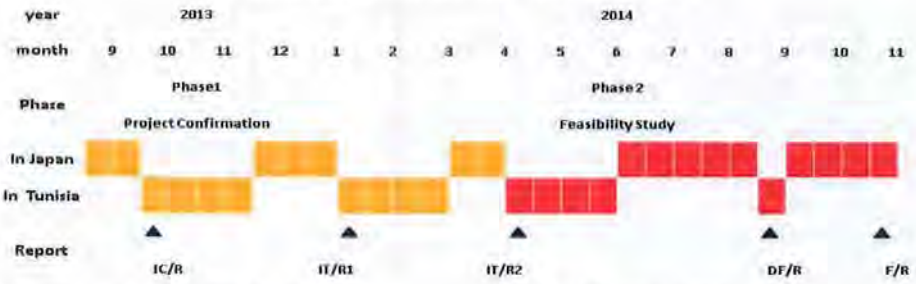
Khelil KAMMOUN
Director General,
General Direction of Bilateral Cooperation,
State Secretariat for Development and
International Cooperation,
Ministry of Economy and Finance

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a survey team (hereinafter referred to as "the Team") to the Republic of Tunisia (hereinafter referred to as "Tunisia") from September 28th, 2013 to November 24th, 2013 to conduct the Phase 1 and January 13th, 2014 to March 6th, 2014 to conduct the Second Survey in Tunisia (the first part of the Phase 2) for "the Preparatory Survey for the Sfax Sea Water Desalination Plant Construction Project" (hereinafter as "the Survey"). During the first part of the Phase 2 of the Survey period, the Team members and officials of the Government of Tunisia (hereinafter referred to as "GOT"), represented by State Secretariat for Development and International Cooperation, Ministry of Economy and Finance, hereinafter referred to as "SEDCI", Ministry of Agriculture, Ministry of Equipment, Spatial Planning and Sustainable Development, Agence Nationale de Protection de l'Environnement (hereinafter referred as "ANPE"), Agence de Protection et d'Aménagement du Littoral (hereinafter referred to as "APAL"), and Société Nationale d'Exploitation et de Distribution des Eaux (hereinafter referred to as "SONEDE") had detailed discussions concerning confirmation of the necessity of the Sfax Sea Water Desalination Plant Construction Project[1] (hereinafter referred to as "the PROJECT").

Based on the discussion and findings in the Phase 1 and the Second Survey in Tunisia (the first part of the Phase 2), the Team compiled the Second Interim Report (hereinafter referred to as "IT/R2") in Japan through discussions with JICA.

Following to the IT/R2 the Survey is scheduled as shown below. This schedule is subject to change in accordance with the progress of the Survey.

Tentative Implementation Schedule of Survey



Legend:
IC/R: Inception Report
IT/R1: First Interim Report
IT/R2: Second Interim Report
DF/R: Draft Final Report
F/R: Final Report
S/FR: Summary of the Final Report

The Team submitted GOT the IT/R2, 2 copies in English on 21st of April and 10 copies in French on 25th of April, and a discussion meeting on IT/R2 was held at SEDCI on April 21st, 2014. The Team made a presentation about the summary of IT/R2 to GOT with the presence of the JICA Mission.

In the discussion meeting on the summary of IT/R2 on 21st of April, and discussions held till 12th of May, 2014, the Team confirmed the major points described below.

This Minutes of Discussion reflects the results of discussions held from 21st of April to 12th of May, 2014.

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[1] It consists of 200,000m^3/day capacity sea water desalination plant and its related facilities.

1. Discussion on the Summary of the IT/R2

In the presentation on April 21st, 2014 the Team explained the summary of the IT/R2, then GOT and the Team discussed and confirmed following points.

1.1 Water Demand and Supply Analysis

The Team explained to GOT that in their First and the Second Surveys in Tunisia, the quantities of water demand and supply in Sfax were confirmed through discussions with SONEDE, and the necessity of the PROJECT was verified.

SONEDE explained to the Team that regarding the gap between water demand and supply in 2015 and in 2016, SONEDE has already planned to fill it by rationalization of the water management of the Northern Water Transfer System.

The Team and GOT agreed to discuss further about necessary measures for the gap between water demand and supply after 2017 until the commencement of the sea water desalination plant operation.

1.2 Procurement Package Plan

The Team explained to GOT their draft procurement packages.

The Team and SONEDE discussed and agreed to update the draft procurement package plan in accordance with the SONEDE's request.

The Team and SONEDE discussed and agreed the procurement packages for the Phase 1 of the PROJECT (herein after referred to as "the Project") as follows.

No.	Content	Procedures	Method	Prequalification	Remarks
Lot 1	Desalination Plant (including Intake/Discharge Pipelines and Transmission Pump Facility)	ICB	Design-Build	Required SPD (*1) shall be applied.	SBD (*2) shall be applied.
Lot 2	Transmission Pipe Procurement	ICB	-	-	SBD (*3) shall be applied.
Lot 3	Valve and Other Equipment Procurement	LCB	-	-	
Lot 4	Transmission Pipe Installation	LCB	-	-	Detailed design by SONEDE
Lot 5	Reservoir Construction (including water arriving structures)	LCB	-	-	Detailed design by SONEDE
Lot 6	Relay Pump Facility Construction	ICB	Design-Build	-	Basic design by SONEDE SBD (*2) shall be applied.
Lot 7	Power Service Line Installation	STEG	-	-	Direct contracting. JICA's concurrence is required

Note: Procedures: ICB; International Competitive Bidding, LCB; Local Competitive Bidding,
STEG: Direct contracting with STEG (La Société Tunisienne de l'Electricité et du Gaz)
SPD (*1): Standard Prequalification Documents under Japanese ODA Loans
SBD (*2): Standard Bidding Documents under Japanese ODA Loans, Procurement of Plant Design, Supply and Installation
SBD (*3): Standard Bidding Documents under Japanese ODA Loans, Procurement of Goods

SONEDE asked the Team to convey it's request to JICA that it shall be authorized to use a limited budget for contingencies. The Team agreed on it and explained that contingencies will be included in the project cost to some extent and it may be disbursed subject to approval of JICA.

SONEDE requested the Team to leave possibility of merge two or more lots in one. The Team took note the request, and promised to convey the request to JICA.

1.3. Water Transfer Plan

The Team explained to GOT their draft water transfer plan in IT/R2, which was planned to supply the desalinated water to keep Total Dissolved Solid (TDS) concentration of each reservoir at less than 1500mg/l.

The Team stated that a conceptual analysis for water transfer plan shall be conducted to ensure the acceptable range of TDS concentration in reservoirs in Sfax.

SONEDE reminded the Team to conduct the analysis to ensure the same quality of the distributed water.

The Teams agreed to conduct the conceptual analysis to materialize the request as far as possible, and requested SONEDE to make their decision within one week after the submission of the analysis result.

SONEDE agreed on it.

1.4. Scope of Work for the Project

The Team and GOT agreed to discuss further about the scope of work for the Project after the discussion on the conceptual analysis result.

1.5. Selection of the Site for the Sea Water Desalination Plant

The Team explained to GOT the process of site selection, then the Team and GOT agreed on the result of the selection.

1.6. Facility Plan of Desalination Plant

The Team explained to GOT the basic concepts of the sea water desalination plant including intake & discharge facilities.

The Team and GOT agreed to discuss further about the design conditions for the sea water desalination plant such as recovery ratio, water intake and discharge pipe materials, diameters, and their construction method, etc.

1.7. Water Hammer Prevention Measures

The Team explained the necessity of water hammer prevention measures.

SONEDE requested the Team to provide the outline of the pipelines, hydraulic calculation result and locations of the structure for water hammer prevention measures.

The Team agreed on it.

1.8. Social and Environmental Considerations

The Team explained to GOT the procedures and schedule for the EIA (Environmental Impact Assessment) finalization. SONEDE agreed on it.

The Team explained that it had already submitted their draft scoping report to SONEDE, ANPE and APAL.

SONEDE, with the support of the Team, will continue the discussion with ANPE in order to finalize the draft of scoping.

1.9. Information on Underground Utilities along Transmission Pipe Route

SONEDE provided the information of different authorities on the existing underground utilities along the proposed transmission pipe routes.

Based on the provided information, the Team will examine and identify the locations for test pit excavation and soil investigation surveys, and SONEDE will take necessary action to get approvals for the surveys from relevant authorities.

2. Main Points to be examined in the Third Survey in Tunisia

The Team explained the points to be examined in the Third Survey in Tunisia, and GOT confirmed them as follows;

2.1. Water Demand & Resources and Water Transfer Plan

- ✓ To prepare an integrated realistic projects implementation schedule of Sfax Sea Water Desalination Project including Saida/Kalaa Kebira Projects for water demand & resources analysis
- ✓ To conduct a conceptual analysis to ensure the acceptable range of TDS concentration in reservoirs
- ✓ To identify the components of the Project based on the water transfer plan including transmission, pumps and the measure facilities against water hammer

2.2. Preliminary Design and Cost Estimation

- ✓ To identify necessary land for desalination plant, transmission, water hummer prevention measures, and to conduct outline design for feasibility study based on the result of survey and soil investigation
- ✓ To discuss basic technical conditions for preliminary design
  - ➢ Submerged water intake & discharge pipes (diameters, materials, construction method, etc.)
  - ➢ Recovery ratio for desalination plant
  - ➢ Trenchless technology for transmission pipe
  - ➢ Type for reservoir
  - ➢ Pump plan
  - ➢ Transmitted water receiving structure
- ✓ To calculate capital cost

- ✓ To calculate Operation and Maintenance (O&M) cost
- ✓ To compare the estimated cost and SONEDE's assumed cost. SONEDE agreed to provide their latest cost information for that purpose.
- ✓ To calculate compensation cost for land acquisition, import tariff, tax and administrative cost, etc.
- ✓ To confirm the demarcation of SONEDE's work and STEG's work for power service line installation with their costs
- ✓ To recommend opportunities for renewable energy utilization in the Project

2.3. Project Implementation Plan

- ✓ To make an implementation schedule of the Project taking into account necessary periods for; approval of "La Commission Supérieure des Marchés" (CSM, Higher Commission for Procurements), that of consultant selection, if necessary, approval of EIA by ANPE, establishment of concession agreement between SONEDE and APAL, concurrence of JICA, etc.

2.4. Consulting Services

- ✓ To discuss the opportunity to hire consultants for detailed design, tender documentation, tendering support, super vision, etc. in accordance with JICA's Guidelines and to prepare TOR for consulting services, specialist hiring plan and man-month (M/M) assignment schedule under the Japanese ODA Loan.

  In this regard, GOT requested the Team to provide a JICA's technical assistance for smooth implementation of the Project. The Team took note of it, and agreed to convey the request to JICA.

2.5. Contract Lots for Project

- ✓ To discuss details with SONEDE to clarify issues in accordance with JICA's Guidelines and Standard Bidding Documents if necessary

No.	Content	Procedures
Lot 1	Desalination Plant (including Intake/Discharge Pipelines and Transmission Pump Facility)	ICB
Lot 2	Transmission Pipe Procurement	ICB
Lot 3	Valve and Other Equipment Procurement	LCB
Lot 4	Transmission Pipe Installation	LCB
Lot 5	Reservoir Construction (including water arriving structures)	LCB
Lot 6	Relay Pump Facility Construction	ICB
Lot 7	Power Service Line Installation	STEG

Note: Procedures: ICB; International Competitive Bidding, LCB; Local Competitive Bidding, STEG: Direct contracting with STEG.

2.6. Environmental and Social Considerations

- ✓ Scoping and consultant contract TOR for EIA will be finished up to the end of April, 2014.
- ✓ SONEDE will try to issue Request for Proposal (RFP) in the beginning of July, 2014 after confirmation by ANPE and JICA

- ✓ To assist SONEDE to organize a stakeholders meeting in Sfax to explain the draft of scoping for EIA.
- ✓ To confirm the procedures and duration for EIA approval by ANPE
- ✓ To confirm the impact raised by the PROJECT and mitigation measures
- ✓ To prepare drafts of Environmental Management Plan and Monitoring Plan
- ✓ To prepare a Land Acquisition Plan (including schedule and cost)
- ✓ To confirm the condition of approval by ANPE to reflect it to bidding documents especially for necessary measures

2.7. Organization for the Project Implementation and Operation and Maintenance (O&M) Plan

- ✓ To confirm SONEDE's organization for implementation of the Project, and to make necessary recommendations
- ✓ To confirm the O&M capability of SONEDE, and to clarify the necessities and then make a proper O&M plan

2.8. Project Evaluation

- ✓ To calculate the cost of the water produced by the sea water desalination plant with its breakdown
- ✓ To evaluate the Project economically and financially based on the result of the social survey
- ✓ To calculate EIRR (Economic Internal Rate of Return) and FIRR (Financial Internal Rate of Return)
- ✓ To determine project performance indicators with their reference values and target values

2.9. On-going programs of Sub-Contract Survey

The Team explained the status of Sub-Contract Survey as follows.

- ✓ Current Situation
  - ➢ Natural Condition Survey
    - ✧ Meteorology and Hydrology Survey: finished
    - ✧ Bathymetry Survey: finished
    - ✧ Seabed soil investigation: temporary suspended due to weather conditions in Sfax coastal area
    - ✧ Water quality survey: finished
    - ✧ Tidal flow/Current survey: ongoing
    - ✧ Soil Investigation: partially finished
    - ✧ Test pit excavation and soil investigation survey along transmission route will be done after getting necessary approval for the works
    - ✧ Topographic Survey: field survey finished and compiling in drawing is ongoing
  - ➢ Social Condition Survey
    - ✧ 1000 sample surveys have been done and analysis is ongoing
    - ✧ Environmental Condition Survey: ongoing
- ✓ Issues to be Clarified
  - ➢ Result of Sub-Contract Surveys
    - ✧ SONEDE requested the Team to provide all the list of the sub-contract surveys and electronic data of the result of the survey. The Team took note the request, and promised to convey the request to JICA.

The Team explained to SONEDE that major data submitted by the sub-contractors to the Team are as follows:

- Bathymetry Survey
- Seabed soil investigation
- Tidal flow/Current survey
- Soil Investigation
- Topographic Survey

✧ The Team stated that all reports, studies, plans and digital data produced by subcontractors as listed above will be transmitted to SONEDE along with the Final Report. The Team requested SONEDE that such data and information shall be utilized upon approval of JICA because the copyrights of them are owned by JICA. SONEDE agreed on it.

➢ Parceling Survey

✧ SONEDE requested the Team to conduct a parceling survey to identify ownership of the land along the transmission pipeline. The Team explained to SONEDE that they cannot conduct it because of the policy of JICA. The Team also took note of the request, and promised to convey it to JICA.

2.10. Japanese Technology Adoption

✓ To discuss about possibilities to adopt Japanese technology in the Project
In this regard, GOT suggested to hold a project seminar for Japanese Companies. The Team took note of it and agreed to convey it to JICA. The Team informed that the second seminar will be held by JICA in the end of August 2014 in Japan as the first one organized in December 2013.

2.11. Sharing of Information in Tunisian Side

✓ GOT proposed SONEDE to hold a seminar to make a preliminary presentation about the Project in the middle of May 2014.

3. Steering Committee for the Survey

The Team reminded SEDCI to invite the Ministry of Economy and Finance, the Ministry of Foreign Affairs, Ministry of Agriculture, ANPE and APAL as Steering Committee members for the discussion meeting to be held in September 2014.

SEDCI agreed on it.

(END)

1.2-4　ドラフト・ファイナル・レポート協議議事録

Minutes of Meetings

on

Draft Final Report

of

the Preparatory Survey

for

Sfax Sea Water Desalination Plant Construction Project in Tunisia

Tunis, 2 October 2014

Saad SEDDIK
Chief Executive Officer,
Société Nationale d'Exploitation et de Distribution des Eaux (SONEDE)

Takafumi KIGUCHI
Leader,
JICA Preparatory Survey Team

Khelil KAMMOUN
Director General,
General Direction of Bilateral Cooperation,
Ministry of Development and International Cooperation

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a survey team (hereinafter referred to as "the Team") to the Republic of Tunisia (hereinafter referred to as "Tunisia")from 28th September to 24th November 2013, from 13th January to 4th March 2014, and from 13th April to 11th June 2014 for "the Preparatory Survey for the Sfax Sea Water Desalination Plant Construction Project" (hereinafter referred to as "the Survey").

In the series of dispatches, the Team and officials of the Government of Tunisia (hereinafter referred to as "GOT"), represented by Ministry of Development and International Cooperation (hereinafter referred to as "MDCI"), Ministry of Foreign Affairs, Ministry of Agriculture, Ministry of Equipment, Spatial Planning and Sustainable Development, National Agency of Environmental Protection (hereinafter referred as "ANPE"), Coastal Protection and Planning Agency (hereinafter referred to as "APAL"), and National Water Distribution Utility (SociétéNationaled'Exploitation et de Distribution des Eaux, hereinafter referred to as "SONEDE") had detailed discussions concerning confirmation of the necessity of the Sfax Sea Water Desalination Plant Construction Project[1] (hereinafter referred to as "the Project").

Based on the Survey, the Team compiled the Draft Final Report (hereinafter referred to as "DFR") and submitted it to GOT with 2 copies in English and 10 copies in French on 25th September. GOT understood and agreed in principle the contents of DFR and both sides confirmed the major points described below.

1. Comments on the Draft Final Report

The Tunisian side will submit its comments on DFR to the Team by 31st October 2014. The Team will compile the Final Report reflecting the comments and the results of a discussion with a fact finding mission, and necessary revision on it after consultation with JICA. Delayed comments will not be reflected on the Final Report. The Final Report is expected to be delivered to GOT by 31st December 2014. GOT agreed on it.

2. Major Component of the Project

The Team explained the major component of the Phase 1 of the Project which would produce 100,000 m^3/day of treated water as follows.

1) Sea Water Desalination Plant

- Desalination plant: capacity; for 100,000 m^3/day, space is kept for 200,000 m^3/day
  - ✓ Pretreatment process: Sand filtration, but membrane type process shall also be accepted as "Alternative", if competitive.
  - ✓ Desalination process: RO membrane process
  - ✓ Product water quality: less than 500 mg/L in Total Dissolved Solid (TDS)
  - ✓ Recovery Ratio: 45%
- Intake Pipeline: capacity; for 444,400 m^3/day, with 2 pipelines and 2 intake

[1] It consists of 200,000m^3/day capacity seawater desalination plant and its related facilities.

towers

- Brine Discharge Pipeline: capacity; for 244,400 m^3/day, with 1 pipeline and discharge tower
- Marine pipe material: HDPE (High Density Polyethylene)
- Post Treatment: pH adjustment, and disinfection

2) Transmission Pump Facility: 4 places
(Sea Water Desalination Plant, PK11, PK10, and PK14)

3) Transmission pipeline: capacity; for operation of 200,000 m^3/day
Ductile Cast Iron Pipe, diameter 400-1400 mm, about 45 km
(Sea Water Desalination Plant to PK11, PK11 to Bou Merra, PK11 to PK10, PK10 to PK14, and PK14 to Sidi Salah EH)
3 One-way Surge Tanks

4) Receiving / mixing chamber: 5 chambers, at PK11, Bou Merra, PK10, PK14, and Sidi Salah EH

5) Distribution reservoir: 1 distribution reservoir with a capacity of 10,000 m^3 at PK11

3. Water Transmission Plan

The Team explained to SONEDE a water transmission plan in DFR, which was planned to supply the desalinated water keeping TDS of each reservoir at less than 1500 mg/L and equalized within the difference of 20%. SONEDE agreed on it.

4. Increase of Water Tariff

The Team explained that water tariff increase was taken into account in the project design not only for sustainable operation and maintenance of the Sfax Sea Water Desalination Plant but also for sustainable water supply service by SONEDE. SONEDE understood it. The Team also mentioned that the expected tariff increase was 19.2% in total to cover O&M cost and capital cost, which could be accomplished with affordable percentage of increase in several years. SONEDE requested the Team to provide simulated scenarios for tariff increase. The Team agreed on it.

5. Environmental and Social Considerations

Both sides agreed that there would be environmental and social adverse impacts caused by the Project. SONEDE explained necessary measures would be taken according to results of the Environmental Impact Assessment (EIA) by the Tunisian side. SONEDE also explained the procedures and schedule of the EIA, and that announce for procurement of EIA consulting services would be made at the beginning of October 2014.

Both sides agreed that authorization to use or acquisition of required land would be needed for the sea water desalination plant, pipelines and one-way surge tanks. SONEDE understood to take necessary procedures for authorization or acquisition of lands. Information about

location and size of required land for one-way surge tanks with accuracy at a feasibility study level will be provided by the Team.

6. Tidal Flow Survey

The Team explained to SONEDE that the Tidal Flow Survey was cancelled due to possibility of damage of survey equipment by illegal fishing activities. Both sides agreed that a theoretical simulation study using calculated tidal flow velocity could be accepted instead of the surveyed data at the level of preparatory survey.

7. Survey Data

SONEDE requested the Team to submit all the reports, drawings and digital data prepared by the subcontractors prior to submission of the Final Report by 8th October 2014, in order that SONEDE could start the detailed pre-project survey and prepare bidding documents by itself as early as possible. The requested items are as follows:

- Bathymetry Survey
- Seabed soil investigation
- Soil Investigation
- Topographic Survey

The Team and JICA accepted the request and reminded SONEDE that SONEDE would be responsible for their own works utilizing these reports and digital data. SONEDE also was reminded that all copy rights of these reports and digital data were reserved by JICA.

(END)

1.4-1　既存淡水化施設の状況

目 次

1.4-1　既存淡水化施設の状況

SONEDE は多くの淡水化施設を所有しているが、南部のガベス、ジェルバ、ザルジス、ベン・ゲルデンの 4 個所に主要な淡水化施設を有している。これらは全て塩分を含む地下水を原水とした淡水化施設であり、今回計画の海水淡水化施設ではない。海水の塩分濃度(TDS)は約 40000mg/ℓ であるのに対し、既存施設の原水の塩分濃度はガベスで 3000 mg/ℓ、ジェルバで 5500 mg/ℓ、ザルジスで 6000 mg/ℓ、ベン・ゲルデンで 14400 mg/ℓ と大きな違いを有する。一方、淡水化の方式は今回の海水淡水化施設で採用されると想定される逆浸透（RO）膜方式となっており、原水の浸透圧の差により RO 膜の種類、RO の運転圧力の違いは生じるものの、砂ろ過と RO ユニットで構成されるシステム、機械設備や電気設備、運転方法、維持管理方法等共通点が非常に多い。

このため、前記 4 個所の淡水化施設の運転、維持管理状況について、現地調査を行った。それぞれの淡水化施設の概略仕様、施設位置は以下のとおりである。

表 1 既存淡水化施設

場所	施設規模（m^3/日）	プロセス	原水	運転開始年
ガベス	34,000	RO	かん水	1995
ジェルバ	20,000	RO	かん水	1999
ザルジス	15,000	RO	かん水	1999
ベン・ゲルデン	1,800	RO	かん水	2013

出典：JICA 調査団

１．ガベス淡水化施設

(1)　施設概要

本施設はガベス市街の西側郊外に位置しており、運用開始は 1995 年である。生産水量は最大で 34,000m^3/日（8,500m^3/日×4 系列）であるが、原水取水量の不足から現状では生産水量は 1 系列分の 8,500m^3/日となっている。また、取水については 2 系統からなっており、一つは 45km 離れた Chatt Fejij の 7 本の井戸から取水した地下水を Aziza 配水池経由で本施設に送水している系統であり、他の一つは Chanchou の 2 本の井戸から取水した地下水を本施設に直接送水している系統である。

処理水は淡水化前の同量の水と混合し、合計 17,000 m^3/日をガベス周辺地域の Mnara, Madine, Bouchama, Rema, Wedhref 配水池へ送水している。

具体的には塩分濃度がチュニジア国の飲料水水質基準（2500 mg/ℓ）以下である 1500 mg/ℓ を目標とし、処理水（100 - 500 mg/ℓ）を淡水化前の水（3000 mg/ℓ）と混合させて調整している。塩分濃度の調整については、その他の 3 個所の既存淡水化施設の場内配水池でも同様の処置を行っている。原水の TDS は 3000 mg/ℓ、処理水が 100-500 mg/ℓ であり、RO ユニットの回収率（処理水量/原水量）は 75%である。

(2)　機械設備

浄水システムは、エアレーション＋砂ろ過＋5μm カートリッジフィルター＋1μm カートリッジフィルター＋逆浸透(RO)ユニット＋配水池から構成される。

ろ過池は重力式である。カートリッジフィルターから RO ユニットまでは 4 系列設置されている。RO ユニットは 1 段方式で設置されていたが、現在運転されている 1 系列は、他の 3 施設同様の方式である、1 段目 RO の濃縮水を再加圧し 2 段目 RO に通水する 2 段方式に改造されている。

使用されている薬品は、原水が濃縮される RO におけるスケール生成抑制の目的で使用するスケール防止剤と RO 処理水の pH 上昇のための NaOH のみである。$FeCl_3$、NaClO、$NaHSO_3$ 等は長年の運用実績により無注入でも問題ないことが確認され、使用されていない。

主要消耗品であるカートリッジフィルターは年 2 回交換されている。RO 膜の交換頻度は運転条件により変動しているが、13 年以上も交換していない膜もある。

写真 1 カートリッジフィルター

写真 2 ろ過池

ポンプ設備については、ろ過池洗浄用の逆洗ポンプ、カートリッジフィルター用ポンプ、RO 膜用高圧ポンプ等が設置さており、運用開始から 18 年程度が経過しているが大きな故障等はない。ただし、ポンプ銘板を確認すると 2000 年や 2005 年のものもあり、定期的な更新が行われている。

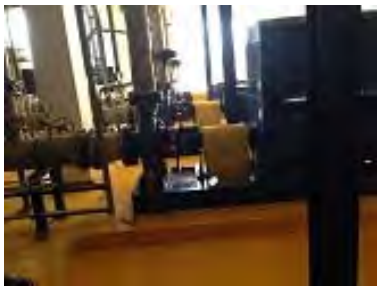

写真 3 RO 用高圧ポンプ

写真 4 RO ポンプ銘板

写真 5 逆洗用ポンプ

(3) 電気設備

受電は 30kV、2 回線（常用-予備）引き込みである。STEG 配電線の最寄り鉄塔は施設の敷地外にあり、最寄り鉄塔からケーブルで地中引き込み経路にて施設受電室に受電している。

主変圧器として 30kV/5.5kV が 1000kVA×2 基、及び 30kV/400V が 1000kVA×2 基がある。自家発電設備は設置していない。受電室の受電しゃ断器盤までが STEG の運営管理範囲となっている。

監視室には監視操作盤（デスク形）、及び監視ディスプレイ装置が設けられており、施設設備の運転監視操作とプロセスデータの監視・記録が行われている。

写真 6 受電 STEG 鉄塔

写真 7 受電 STEG 鉄塔

写真 8 受電室配電盤

写真 9 監視操作盤

写真 10 監視操作盤

写真 11 ディスプレイ監視装置

(4) 維持管理体制と運転状況

運転監視要員は 11 人、保守点検要員は 4 人である。

過去には微生物による詰りの問題があったとのレポートもある。しかし、RO 膜の寿命は一般的に 4-5 年であるが、本施設には 13 年間交換していない RO 膜があることや、カートリッジフィルターの交換頻度も 2 回/年と通常の 1 /2 程度であることから、現状は良好な運転及び維持管理がされているものと考える。

2. ジェルバ淡水化施設（円借款事業）

(1) 施設概要

ジェルバ島南側に位置する本施設は、1999 年に生産水量 15,000 m^3/日で運転を開始し、2007 年に 5,000 m^3/日を増設し、現在は 20,000 m^3/日の生産能力を有している。原水は本施設から 16km 程度離れた井戸から取水している。当初 12 本の井戸を掘ったが、そのうち 5 本は硫化水素（H_2S）が発生するため使用せず、残り 7 本の井戸から取水している。

原水の TDS は 5500 mg/ℓ、処理水が 320 mg/ℓ であり、RO ユニットの回収率（処理水量/原水量）は 75%である。

(2) 機械設備

浄水システムは、エアレーション＋沈澱池＋砂ろ過＋1μm カートリッジフィルター＋逆浸透(RO)ユニット＋配水池から構成される。

沈澱池は 2 池、ろ過池は重力式で 4 池、カートリッジフィルターから RO ユニットまでは 3 系列となっており、全ての系列が運転されている。RO ユニットは 1 段目 RO の濃縮水を再加圧し 2 段目 RO に通水する 2 段方式が採用されている。

使用されている薬品は、原水が濃縮される RO におけるスケール生成抑制の目的で使用するスケール防止剤と RO 処理水の pH 上昇のための NaOH のみであり、$FeCl_3$、NaClO、$NaHSO_3$、H_2SO_4 は使用されていない。$FeCl_3$ は原水が低濁度のため注入が中止され、NaClO、NaHSO3 は原水にバクテリアが検出された場合に注入していたが、長年の運用実績から注入不要と判断された。また、スケール防止剤の注入量を増加させることにより H_2SO_4 の注入も中止された。

主要消耗品については、カートリッジフィルターが年 2 回、RO 膜が 10-20%/年程度で交換されている。

写真 12 RO ユニット

写真 13 ろ過池

処理水は場内の配水池に送水されている。RO 処理水に残留圧力があるためポンプは使用されていない。ポンプの日常的なメンテナンスは行っておりその記録もつけられている。ポンプの大きな故障はスファックスにある SONEDE のメンテナンスショップにて対応している。

(3) 電気設備

受電は 30kV、2 回線（常用-予備）引き込みである。STEG 配電線の最寄りの鉄塔は施設の敷地外にあり、その鉄塔からケーブルで地中引き込み経路にて施設内の電気室に受電している。

写真 14 受電 STEG 鉄塔

写真 15 受電 STEG 鉄塔

写真 16 電気室配電盤

現状の使用電力量は 18,790kWh/日で、主変圧器は 800kVA×3 台で運転している。また、自家発電設備は設置しておらず、ごく短時間の停電を除いて過去の停電発生はほとんど無い。

低圧電気室には動力制御盤類が設置されており、盤からの発熱対策のために空調設備を設置しているものの、空調能力が不足しているため配電盤扉を開放して運転されている。

監視室には監視盤（壁掛形）、操作盤及び監視ディスプレイ装置が設けられており、施設設備の運転監視操作とプロセスデータの監視・記録が行われている。また、防犯対策として監視カメラモニターを設けている。

写真 17 取水流量計

写真 18 低圧電気室

写真 19 監視室操作盤

写真 20 監視室操作盤

写真 21 ディスプレイ監視装置

写真 22 監視カメラモニタ

(4) 維持管理体制と運転状況

運転監視要員は 8 人（2 人×4 チーム×3 交代/日）、保守点検要員は 5 人で運用されている。

硫化水素(H_2S)の発生により使用できない井戸があるが、他の井戸により原水量を確保している。

RO 膜の寿命は一般的に 4-5 年であるが、本施設での RO 膜の交換量は 10-20%/年であり、通常以上の寿命を保っていることや、カートリッジフィルターの交換頻度も 2 回/年と通常の 1 /2 程度であることから良好な運転及び維持管理がされているものと考える。

3. ザルジス淡水化施設（円借款事業）

（1）施設概要

ザルジス淡水化施設はザルジス市街地北西の郊外に位置し、運用開始は 1999 年である。生産水量は 15,000m^3/日、5km 離れた Khaoula Ghdir 浄水場内の 7 本の井戸から揚水した原水を処理しているが、さらに、本施設内の 1 本の井戸（Z8）からも取水している。Khaoula Ghdir 浄水場内の井戸からは最大で約 700 m^3/時 、Z8 からは約 194.4 m^3/時を取水している。本施設は前述のジェルバ淡水化施設とほぼ同一の設計及び施設配置となっている。

原水の TDS は 6000mg/ℓ、処理水が 320mg/ℓ であり、RO ユニットの回収率（処理水量/原水量）は 75%である。

（2）機械設備

ジェルバ淡水化施設とほぼ同一である。

処理システムは、エアレーション＋沈澱池＋砂ろ過＋1μm カートリッジフィルター＋逆浸透(RO)ユニット＋配水池から構成される。

沈澱池は 2 池、ろ過池は重力式で 4 池、カートリッジフィルターから RO ユニットまでは 3 系列となっており、全ての系列が運転されている。RO ユニットは 1 段目 RO の濃縮水を再加圧し 2 段目 RO に通水する 2 段方式が採用されている。

使用されている薬品は、原水が濃縮される RO におけるスケール生成抑制のために使用するスケール防止剤と RO 処理水の pH を上昇のための NaOH のみであり、$FeCl_3$、NaClO、$NaHSO_3$、H_2SO_4 は使用されていない。原水が低濁度のため $FeCl_3$ の注入が中止され、NaClO、$NaHSO_3$ は原水にバクテリアが検出された場合に注入されていたが、長年の運用実績から注入不要と判断された。またスケール防止剤の注入量を増加させることにより H_2SO_4 の注入も中止された。

主要消耗品は、カートリッジフィルターは年 2 回、RO 膜は 10-20%/年程度交換されている。

RO 処理水はジェルバ淡水化施設同様に、処理水が有する残留圧力を利用して場内の配水池に送水されている。ポンプは使用されていない。メンテナンス状況においても他の淡水化施設同様に日常的なメンテナンスが行われている。なお、NaOH を貯蔵する FRP 製タンクで漏水があった為、市販のポリタンクに変更されている。

写真 23 場内送水ポンプ

写真 24 FRP 製タンク

写真 25 ポリタンク

（3）電気設備

受電は 30kV、2 回線（常用-予備）引き込みである。STEG 配電線の最寄りの鉄塔は施設の敷地内にあり、その鉄塔からケーブルで地中引き込み経路にて施設受電室に受電している。

受電室への引込みケーブルは STEG が施工している。現状の使用電力量は 16,257kWh/日で、主変圧器は 800kVA×3 台で運転している。また、自家発電設備は設置しておらず、過去の停電発生実績は

ごく短時間の停電を除いてはほとんど無い。

低圧電気室には動力制御盤類が設置されており、盤からの発熱対策のために空調設備を設置しているが、空調能力が不足しているため配電盤扉を開放して運転されている。



写真 26 受電 STEG 鉄塔　　**写真 27 受電室**　　**写真 28 受電室配電盤**

監視室には監視盤（壁掛形）、操作盤及び監視ディスプレイ装置が設けられており、施設設備の運転監視操作とプロセスデータの監視・記録が行われている。防犯対策として監視カメラモニタを設けている。



写真 29 動力制御盤　　**写真 30 動力制御盤**　　**写真 31 監視室操作盤**

（4）維持管理体制と運転状況

運転監視要員は 8 人（2 人×4 チーム×3 交代/日）、保守点検要員は 2 人で運用されている。

RO 膜の寿命は一般的に 4-5 年であるが、本施設の RO 膜の交換頻度は 10-20%/年程度であり、通常以上の寿命を保っていることや、カートリッジフィルターの交換頻度も 2 回/年と通常の 1 /2 程度であることから良好な運転及び維持管理がされているものと考える。

4. ベン・ゲルデン淡水化施設（日本政府無償資金協力事業）

(1) 設備概要

本施設はベン・ゲルデン市街の北に位置し、運用開始は 2013 年 6 月である。生産水量は 1,800 m^3/日で、場内の井戸から深井戸水中モータポンプによって取水している。

原水の TDS が 14400mg/ℓ と今回調査した 4 施設のなかでは最も高く、処理水 TDS は 130mg/ℓ である。RO ユニットの回収率（処理水量/原水量）は 70%である。

本施設では原水の水温が 45℃である為、冷却設備（クーリングタワー）にて 32℃程度に冷却し、処理している。

(2) 機械設備

処理システムは、深井戸ポンプ＋クーリングタワー＋砂ろ過＋10μm カートリッジフィルター＋逆浸透（RO）ユニットから構成される。

深井戸水中モータポンプは水深 160m に設置している。砂ろ過装置は圧力式で予備なしの 2 基、クーリングタワーや RO ユニットは予備を 1 系列含んだ 3 系列が設置されている。

本施設と他の 3 施設の違いは以下の 2 点である。

1 点目は鉄の酸化方法である。他の 3 施設ではエアレーション設備により空気酸化方法としているが、本施設では薬品（NaClO）により行っている。

2 点目は RO の濃縮水の処理方法である。他の 3 施設では海域放流としているが、本施設の近隣海域はラムサール条約での保護地域となっているため、プラントエリアに隣接する天日乾燥ピットに移送し、蒸発処理する方法を採用している。

使用されている薬品は、原水が濃縮される RO におけるスケール生成抑制のためのスケール防止剤と RO 処理水の PH 上昇のための NaOH については他の施設と同様であるが、本施設ではその他に前述したように鉄の酸化剤としての NaClO、更に RO 膜の酸化劣化防止のため RO 入口前で NaClO を還元する目的で $Na_2S_2O_5$ を使用している。

写真 32 天日乾燥ピット

写真 33 クーリングタワー

処理水は 6km 離れた配水池へポンプで送水されている。最近運用開始されたため、機械設備の故障は未だなく、パイプからの水漏れが多少あった程度である。また、取水井戸が自噴しているため、取水ポンプのメンテナンス時の原水逃がし用配管を SONEDE が取水配管に追加している。

写真 34 取水井戸　　**写真 35 ろ過水ポンプと逆洗ポンプ**

(3)　電気設備

受電は 30kV、1 回線引き込みである。STEG 配電線の最寄りの鉄塔は施設の敷地内にあり、その鉄塔からケーブルで地中引き込み経路にて受電室に受電している。

写真 36 受電 STEG 鉄塔　　**写真 37 受電室**　　**写真 38 RO 膜処理設備**

本施設には、付帯設備として定格 210kW の太陽光発電設備が設置してある。これは、本淡水化プラントの必要電力の 1/2 に相当する。現状の使用電力量は、太陽光発電による電力供給を考慮に入れない場合の計算では、9,600kWh/日で、主変圧器は 400kVA×2 で運転している。自家発電設備は設置しておらず、過去に約 8 時間程度の停電が 1 回発生している。

低圧電気室には動力制御盤類が設置されており、盤からの発熱対策のために空調設備を設置している。制御盤は盤面に監視ディスプレイを設置している。監視室には監視ディスプレイ装置が設けられており、施設設備の運転監視操作とプロセスデータの監視・記録が行われている。

写真 39 動力制御盤　　**写真 40 制御盤**　　**写真 41 ディスプレイ監視装置**

(4) 維持管理体制と運転状況

現状では 3 人の運転監視要員で運用されているが、24 時間管理が必要であることを考えると他の施設と同様の 8 人体制への増員の要望は適当と判断される。保守点検要員は 1 人で運用されているが 2 名に増員される予定である。

本施設は運用開始時、施工業者により約 1 か月間の運転指導がされている。現在はその指導に沿った運転及びデータ採取等の維持管理がされており、今後は徐々に運転員を増加させ、適切な運転操作と維持管理を継続していくものと思われる。

また、約 8 時間の停電が発生した際には、運用開始直後のため運転経験も充分ではでない状況にもかかわらず、停電復旧後は短時間でプラントの運転を再開しており、自家発電設備設置は不要と判断されている。

主要消耗品であるカートリッジフィルターや RO 膜は、2013 年 6 月に運用が開始されたばかりであるため、まだ交換されていない。

5. 既存淡水化施設の運転・維持管理状況のまとめ

調査した 4 施設の運転・維持管理状況をまとめると以下のとおりである。

(1) 運転状況

現在まで、設計緒元どおりの処理水量・処理水質が確保できる良好な運転が継続されている。

(2) 維持管理状況

運転監視要員は施設の十分な知見を持っており、適正な維持管理がされているため、カートリッジフィルターや RO 膜の交換量も少ない。また、運転実績に応じ薬品の注入を中止する弾力的運用がなされている。現在までの不具合又は問題点としては、ガベスの施設における微生物による詰りが過去にあったことと、淡水化施設の不具合ではないが、ジェルバの施設で硫化水素が発生し使用できない井戸が 5 本あるという 2 点である。

以上のとおり、既存の 4 淡水化施設では良好な維持管理がなされていると判断する。

既存の 4 淡水化施設の運転及び維持管理状況を表 2 にまとめて示す。

表 2 運転及び維持管理状況一覧表

施設			ガベス	ジェルバ	ザルジス	ベン・ゲルデン
システム	エアレーション池 沈澱池 ろ過池 カートリッジフィルター RO ユニット		1 池 なし 重力式 5, 1μm 4 系列	1 池 2 池 重力式 4 池 1μm 3 系列	1 池 2 池 重力式 4 池 1μm 3 系列	なし なし 圧力式 2 池 10μm 3 系列
処理量		m^3/日	34,000 (現状 8,500)	15,000＋5,000	15,000	1,800
原水	塩濃度(TDS)	mg/ℓ	3,000	5,500	6,000	14,400
	濁度	NTU	0.5	3	3	5
	水温	℃	35	28-30	28-30	45→32
処理水	全溶解性物質(TDS)	mg/ℓ	500	320	400	130
薬品注入量	NaOH	mg/ℓ	5	2	2	2
	ｽｹｰﾙ防止剤	mg/ℓ	2.9	2.7	2.7	4.2
	NaClO	mg/ℓ	0	0	0	4
	$NaHSO_3$	mg/ℓ	0	0	0	1.7
RO ユニット回収率		%	75	75	75	70
消耗品交換	カートリッジ	回/年	2	2	2	運用開始直後のため 0
	RO 膜	%/年	状況で変動	10-20	10-20	
RO 濃縮水処理			海域放流	海域放流	海域放流	蒸発処理
運転・維持管理体制	運転監視員	人	11	8	8	3(要望 8)
	保守点検員	人	4	5	2	1→2

出典：JICA 調査団

6. 既存淡水化施設の電気設備のまとめ

既存の 4 淡水化施設の電気設備の状況を表 3 に示す。

表 3 既設電気調査結果

場所	ガベス	ジェルバ	ザルジス	ベン・ゲルデン
受電電圧 （kV）	3Phase 30kV	3Phase 30kV	3Phase 30kV	3Phase 30kV
需要電力 （kW/時）	430/unit (計算値)	783 (回答値)	677 (回答値)	400 (計算値)
使用電力量 （kWh/日）	10,320/unit	18,790	16,257	9,600
変圧器容量 （kVA）	1000×2 台 （30/5.5kV） 1000×2 台 （30kV/400V）	800×3 台	800×3 台	400×2 台
受電回線数 （回線）	2 （常用-予備）	2 （常用-予備）	2 （常用-予備）	1
受電引込方式	地中	地中	地中	地中
自家発電有無	無	無	無	無
停電発生実績	回答無し	ほとんど無し	ほとんど無し	8h×1 回

出典：JICA 調査団

7. その他の淡水化施設

SONEDE の主要な地下水淡水化施設は前記の 4 施設の他に以下の 2 施設がある。

- ケルケナ島淡水化施設:1983 年運用開始、3,300m^3/日
- ジェルバ浄水場増設施設：2007 年運用開始、5,000m^3/日、スペインの業者施工

また、ジェルバ地区に 50,000m^3/日の海水淡水化施設の建設プロジェクトが進行中である。

8. SONEDE の淡水化施設運用能力

SONEDE は 1983 年に最初の淡水化施設であるケルケナ島の施設を運用開始させており、30 年間の淡水化施設の運用実績を有している。

1999 年には最大能力を持つジェルバ淡水化施設並びにザルジス淡水化施設を運用開始させている。両施設は運用開始から 14 年が経過している現在においても、設計緒元どおりの処理水量や処理水質を確保できる良好な運転がされている。また消耗品であるカートリッジフィルターや RO 膜の交換量も一般的な数値以下であることから、良好な維持管理がなされているものと判断される。

上記した状況から、SONEDE は淡水化施設運用に関し十分な経験、知見、実績を有しており、施設完成時に適切な運転指導を行うことにより、本事業の海水化淡水化施設の運用にも問題なく対応できる能力を持つと判断する。