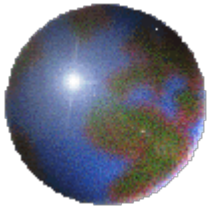
添付資料 2.A

経済分析・需要予測支援に使用した主な説明資料

（経済見通し）

Comments on World and VN Economy



1. *Methodology for Long Term Economic plan*
2. *World Economic Outlooks by IMF*
3. *Review for Current VN Economy*
4. *Comments on Economic Scenarios in EDF2050*
5. *Discussion points*

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1.1 Example for Long Term Economic Outlook

(1) Goldman Sachs studied “Dreaming with BRICs 2003” and “How Solid are the BRICs 2005”.

The method is “Solow Growth model”. Discussed variables are Labor force, Capital and Factor productivity, the model forecasts BRICs economic growth by 2020.

(2) By Deutsche Bank Research, “Global Growth Centers 2020” is studied in 2005.

The method is “Econometric model”, Discussed variables are the same to Goldman Sachs model, and the model forecasts BRICs economic growth by 2020.

(3) By Economic Social Research Institute (ESRI) in Cabinet Office, Japan, the “Long Term Economic Outlook of BRICs 2005” is studied.

The method is “Solow Growth model”. Discussed variables are Labor force, Capital, Human resources and Total productivity, the model forecasts BRICs economic growth by 2030.

1. Methodology for Long Term Economic plan

< BRICs Economic Growth Rate (2006 – 2020) as results >

	Brazil	Russia	India	China
Goldman Sachs	3.9%	3.6%	5.8%	6.2%
Deutsche Bank Research	2.8%	Less 4%	5.5%	5.2%

< BRICs Economic Growth Rate (2006 – 2030) by ESRI as results>

	GDP	Labor Pop.	Capital	Human quality	Total productivity
Brazil	2.7%	0.4%	0.8%	0.6%	1.0%
Russia	1.2%	-0.3%	0.6%	0.2%	0.8%
India	5.4%	0.6%	1.6%	0.6%	2.5%
China	6.6%	0.04%	2.3%	0.3%	4.0%
Brazil		0.4*(1.0%)	0.3*(2.5%)	0.3*(2.0%)	1.0*(1.0%)
Russia		0.4*(-0.8%)	0.3*(2.1%)	0.3*(0.6%)	1.0*(0.8%)
India		0.4*(1.4%)	0.3*(5.5%)	0.3*(2.1%)	1.0*(2.5%)
China		0.4*(0.1%)	0.3*(7.5%)	0.3*(0.8%)	1.0*(4.0%)

Upper: Real GDP and Contribution Lower: Contribution = Weight*(Component GR).

1. Methodology for Long Term Economic plan

< Important factors for Economic Development of VN>

(1) In the Four factors (Labor Population, Capital, Human quality and Total productivity, Total Productivity is the most effective factor to GDP growth rate. The next important factor is Capital.

(2) Labor population and Human quality factors do not increase immediately, and the growth rates are small and slow. Therefore, the impact to GDP also is small.

(3) Total productivity includes Governmental administration, Technical improvement, Traffic efficiency and Working environment.

(4) In EDF2050, it is said “The Government reform of regulatory, policies, administration is important in domestic factors ”. The factor will increase “Total productivity of VN” strength.

Labor population	Population in the range of 15 – 65 years old
Human quality	Education carrier, National Literacy, Worker’s conscientious
Capital	Total Investment including FDI
Total productivity	Social and political stability, Infrastructure, Private ownership Governance efficiency

1. Methodology for Long Term Economic plan

The followings are quoted from “Long Term Economic Outlook of BRICs 2005” by ESRI.

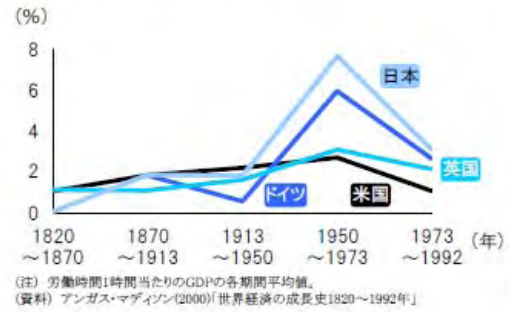
1.2 Innovated systems for Economic development

The developed countries have the following experiences for processing their economic development.

- Increasing productivity by Technical innovation
- Increasing capital stocks
- Improving quality of human resources

GR of Labor productivity

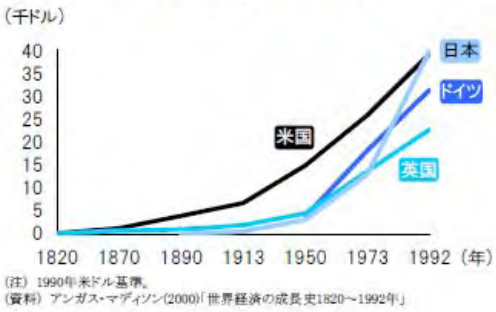
図表4-3 労働生産性伸び率



(注) 労働時間1時間当たりのGDPの各期間平均値。
(資料) アンガス・マディソン(2000)「世界経済の成長史1820～1992年」

Machine stocks per worker

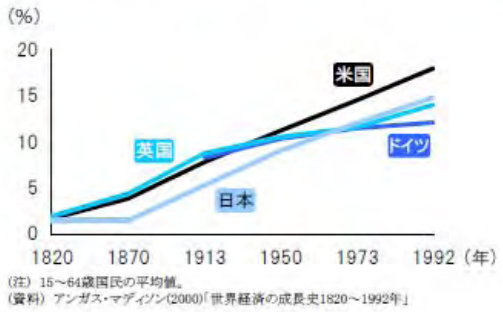
図表4-4 従業員1人当たり機械・設備ストック



(注) 1990年米ドル基準。
(資料) アンガス・マディソン(2000)「世界経済の成長史1820～1992年」

Average education rate

図表4-5 平均修学年数



(注) 15～64歳国民の平均値。
(資料) アンガス・マディソン(2000)「世界経済の成長史1820～1992年」

1. Methodology for Long Term Economic plan

1.3 Effective social systems

Innovations of social and political systems are required for realizing economic development.

1: Systems for fostering technical innovation ability	・Higher quality of Research & Development Institutes ・Technical Innovation Strategies of Company & University ・Protection of Intellectual Properties
2: Systems for enhancing Human capability	・Higher Literacy Rate ・Policies for increasing life expectancy ・health infrastructures
3:Systems for building infrastructures	・Traffic infrastructure (Road, Airway, Harbor, Parking) ・Energy infrastructure(Power, Oil, Gas and Coal)
4:Protection of private ownership	・Preparation of laws ・Independence of justice
5:System for promoting social linkages	・Make “Income gap” small between the rich and the poor ・Social and political stability
6:System of improving Governance efficiency	・Government administration ・Stop corruption

1.4 Evaluation of BRICs systems

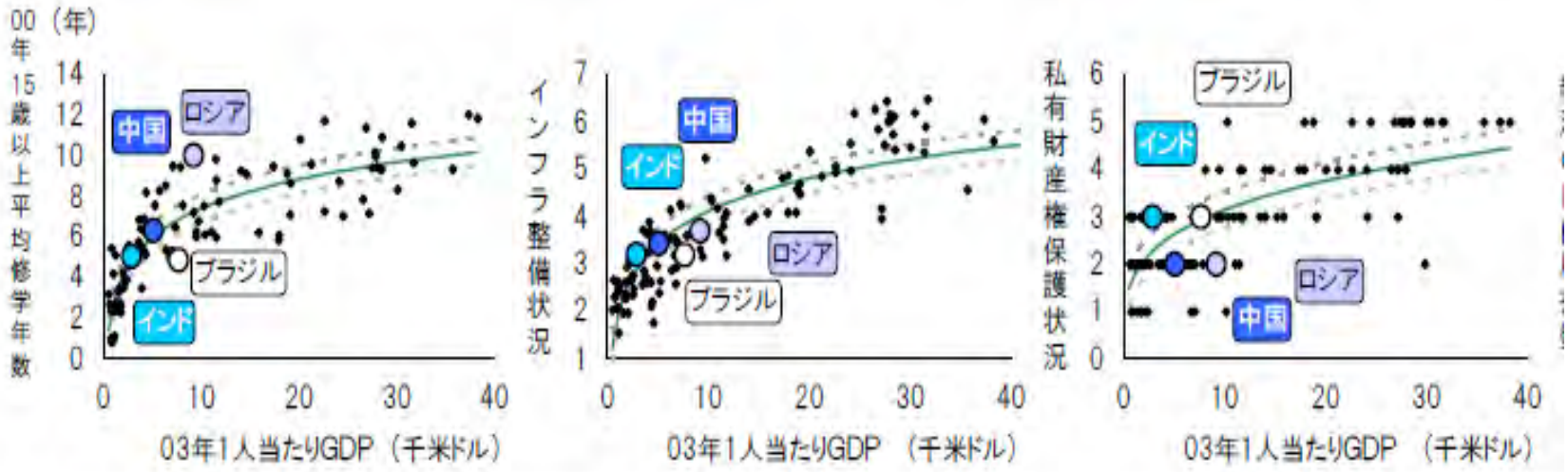
(1) Evaluation results of the factors selected by ESRI

Human Resources	・Brazil has big problems in education system. ・Russia does not prepare suitable chances for high educated persons.
Infrastructure conditions	・Brazil and Russia are delayed to prepare infrastructures comparing to their national incomes. ・India does not have enough infrastructures, and the infrastructure level is poor condition.
Private ownership	・The ownership levels of Russia and China are lower.
Economic Deregulation	・The deregulation levels in BRICs are lower except India.

1. Methodology for Long Term Economic plan

Current situation
of
Human resources, Infrastructures and Economic deregulation in BRICs

Y:Education rate X: GDP per capita	Y: Infrastructure X: GDP per capita	Y:Private asset laws X: GDP per capita



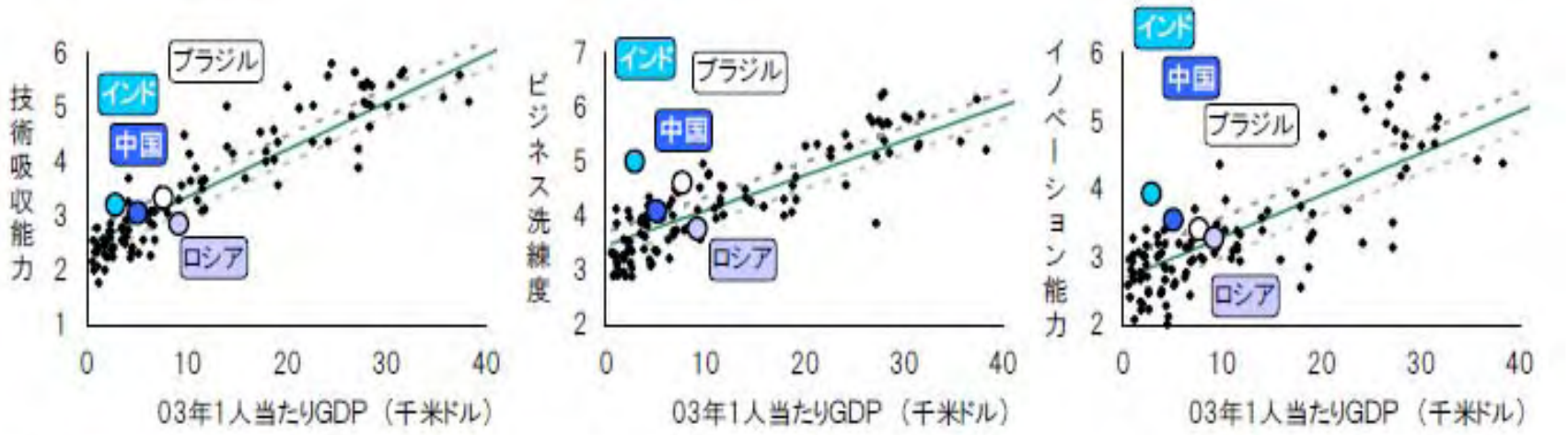
（資料）Barro and Lee, World Economic Forum(2005), Global Competitiveness Report 2005-2006, Miles, Feulner and O'Grady(2005), 2005 Index of Economic Freedom, The Heritage Foundation, 2005.

(2) Technical Innovation Capability

1: Technical absorption capability	・India has high evaluation., the capability level among workers and companies are big different.
2: Business Sophistication levels	・India and Brazil capability in point of marketing have high levels, the high competitiveness of BRICs is product costs and sales prices.
3: Innovation capability	・All counties in BRICs have high evaluation to innovation capabilities, Especially research quality. ・Number of registered patents is small when comparing to their population. ・The number of registered patents is too small comparing to Developed countries.

Current situation of Technical Innovation Capability

Y: Technical absorption capability X: GDP per capita	Y:Business sophistication X: GDP per capita	Y: Innovation capability X: GDP per capita

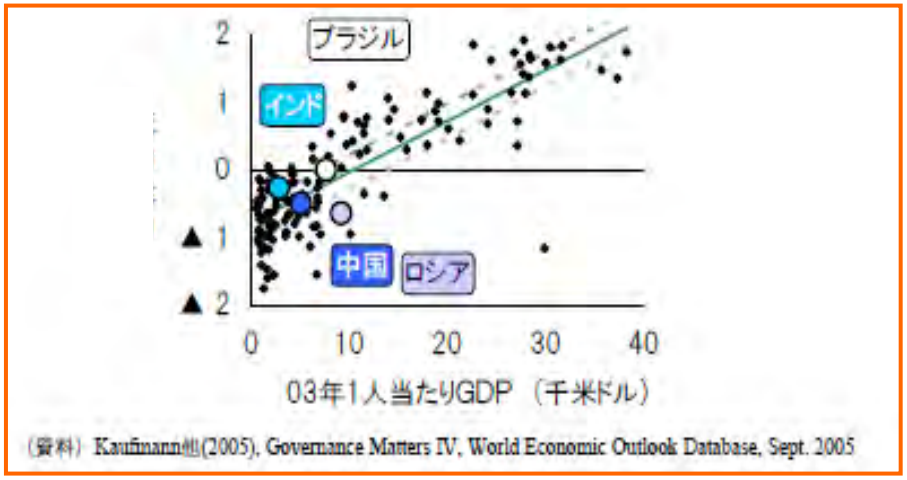


（資料）World Economic Forum(2005), Global Competitiveness Report 2005-2006, World Economic Outlook Database, Sept. 2005

(3) Quality of Governance in BRICs

Brazil	The quality of the governance equals to the world average level based on the GDP per capita.
Russia	The quality is rather low when it is compared to GDP per capita.
India	The quality value is low, but free-speech and governance by Laws are in warranty.
China	Free-speech and the government policy openness of China are pale against other countries.

Governance capability



Evaluation of Quality of Governance in BRICs

	Brazil	Russia	India	China
Efficiency of Government	△	△	○	○
Stability of Government	△	×	△	○
Governance by laws	△	×	○	△
Stop corruption	△	×	○	△
Quality of regulation	○	×	△	△
Free-speech and Openness	○	×	○	×

Note : The regression analysis between the evaluation points as Y and GDP per capita as X are made from many countries.

Note : At the deviation from the average,
More than +0.5 is ○ (Good), Less than -0.5 is × (No good)
In the range of ±0.5 is △ (Normal).

Source: Kaufmann (2005) Governance matters Ⅳ、World Economic Outlook 2005

1.4 Political problems for sustainable development in BRICs

Improvement of Social & Economic systems	
	・Open market ・Freedom of media ・Human capability enhancing by innovation of education systems ・India is lower open market. ・Russia and China regulate freedom of media ・India, Brazil and China are lower education level.
Improvement of the income gap and poverty	
	・In Brazil and China, big income gap between the rich and the poor exist. ・In India, big income gap do not exist, but so many poverties exist. ・In China, social safeguard system is not introduced. ・In Brazil, social safeguard system is introduced widely, but the gap in regions and occupational groups are wide.

2. World Economic Outlook by IMF

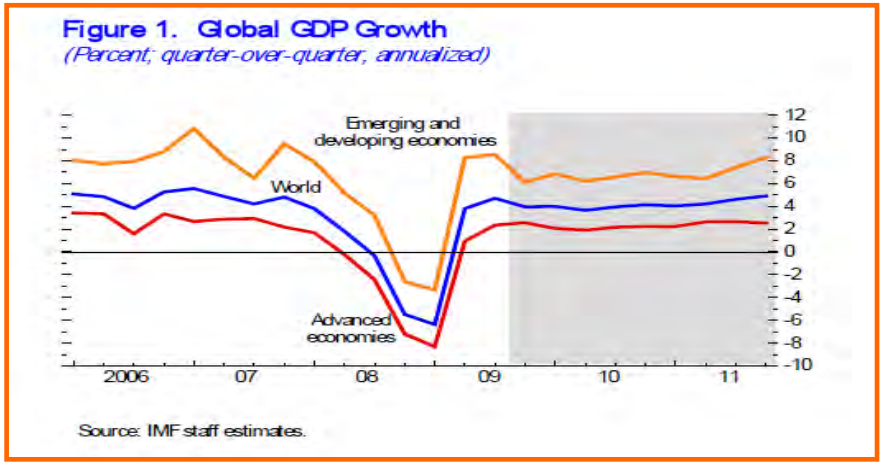
2.1 World economy situation in 2010

(1) The world economy is recovering with big scale encouraging economic policies by the Governments of some countries in 2010.

(2) Production and international trade activities in the world have returned to recovery stage since the latter half of 2009.

(3) In developed countries, stock cycles are improved in 2009. Its reason is why private consumption of USA is stronger than the expectation at the beginning.

(4) Emerging and Developing countries additionally have strong recovery of domestic consumption.



Global GDP growth Rate

Emerging and Developing countries

have around 8% from 2009 to 2011

By IMF estimation

2. World Economic Outlook by IMF

< Emerging & Developing countries: IMF definition>

Africa	Developing
Sub Sahara (South Africa)	Emerging
Central & East Europe	Emerging
CIS	Emerging
Russia	Emerging
Asian developing countries **(Myanmar, Lao, Nepal,,,)**	Developing
ASEAN-5 **(Indonesia, Philippines Malaysia Thailand and Vietnam)**	Emerging
China	Emerging
India	Developing
Middle East	Emerging
Brazil	Emerging
Mexico	Emerging

The Classification of Emerging countries and Developing countries is not clear.

Korea and Singapore are New Industrialized Country.

2.2 World Economic outlook by IMF

(1) IMF is announced the below revised version “World Economic Outlook” in Jan 2010.

(2) VN is included in ASEAN-5.

	2008	2009	2010	2011
USA	0.4%	-2.5%	2.7%	2.4%
EU	0.6	-3.9	1.0	1.6
Japan	-1.2	-5.3	1.7	2.2
Asia NIEs	1.7	-1.2	4.8	4.7
Russia	5.6	-9.0	3.6	3.4
China	9.6	8.7	10.0	9.7
India	7.3	5.6	7.7	7.8
ASEAN-5	4.7	1.3	4.7	5.3
Middle East	5.3	2.2	4.5	4.8

2.3 World economic trends in 2010 and 2011

(1) GDP growth rates in Developed countries will be estimated with 2% in 2010 and 2.5% in 2011.

(2) Unemployment rate and Financial deficit in Developed countries are so high, and Monetary systems are not recovered yet.

(3) In some Developed countries like Japan, Private consumption still be weak.

(4) High unemployment rate, Financial deficit, Monetary problems and Low private consumption in developed countries will be continued for several years. (US, EU and Japan)

(5) By the above reasons, the economic growth rate in Developed countries are not so high comparing to ones before world monetary crises.

(6) The low economic growth rate in developed countries will affect to the economies of Emerging and Developing countries.

2.4 High economic recovery in Emerging and Developing countries (E & D countries)

(1) E & D country's GDP growth rates are estimated with 2% in 2009 and 6% in 2010, and more high growth rate in 2011.

(2) E & D countries are recovering their economies by strong economic supports of the Governments.

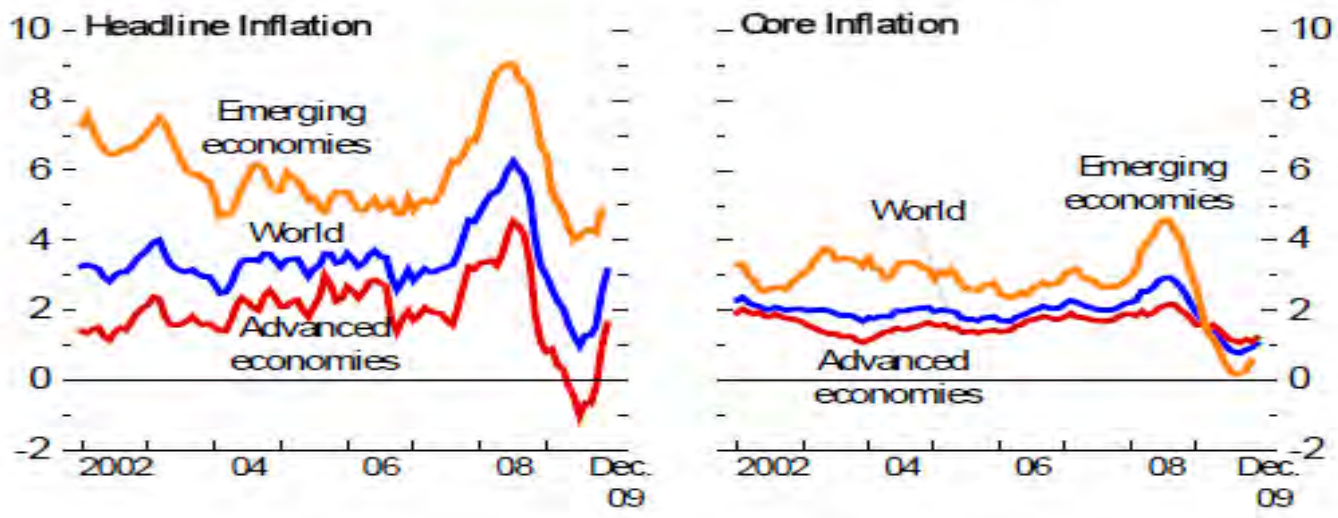
(3) World monetary shock is clarified,capital inflows from abroad are increasing in some E & D countries.

(4) Most E & D countries in Asia are starting to the above recovery, and Sub-Sahara countries will start the recovery in 2010.

(5) But some countries in EU, Middle East and CIS do not recover in 2010.

2.5 Inflation in Emerging and Developing countries

Inflation in E&D countries will be still high, it reaches the average 6.3% per year due that high capital inflow to the countries is kept.



Sources: Haver Analytics; and IMF staff calculations.

2.6 Simulation of IMF economic forecasts

(1) If recovery of monetary reliability comes back to International Monetary Markets earlier than the expectation, the world economy will increased with high speed more than the expectation.

(2) By the employment promoting polices of USA, recovery of world economy will be promoted.

(3) Before world economy recovery starts steadily, if developed governmental exit strategies from monetary crisis are implemented, world economy probably returns to the depression trend.

(4) When monetary system, housing market and high unemployment give negative impacts to the world economy more than our prediction, the recovery of world economy will be delay.

(5) Increase of Commodity price like crude oil might give negative impacts to the world economy, recent high crude oil price is danger sigh.

2.7 Future government policies for E&D countries

(1) Though E&D countries will have capital inflows in future, at the same time, the countries have the following problems.

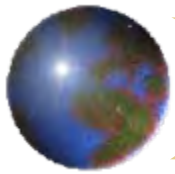
(2) The countries have to make an effort to decrease international trade surplus by increasing exchange rate. (like China)

(3) Some countries (to have high capital inflows) happen high inflation, the governments have to suppress the inflation.(like VN)

(4) In near future, low interest rate will be continued in world wide, at the aspect, housing and real estate bubbles are happened in E&D countries, the bubble has to be controlled. (like China and VN)

(5) But further future, interest rate may increase, government finance has to keep surplus for repayment of international deficit. (like Brazil)

(6) As one of international regulation to control capital inflows invested by hedge funds, US government is considering "Macro Pulldential Policy". By the policy, world hedge funds are investigated.



3. Review for Current VN Economy

3.1 VN economy since 2009 (by Diamond magazine, Japan)

(1) In HCMN, so many consumers come to shopping centers since summer in 2009. TV, AC and luxury goods are sold in the shopping centers. Current VN has business boom.

(2) At Sep 2009, sales amount growth rate of the retail and service sectors was increased with 10% to previous year. Companies have plans to invest for expanding their production lines in VN.

(3) Biggest factors for business recovery in VN is "Depressed inflation", the inflation rate is 28% in 2008, but it is estimated with 17% in 2009.

(4) Export of VN has been increased steadily since September 2009, Apparel goods, clothes and furniture are exported with high growth.

(5) In Southern region, so many companies in light industry sector are located, but in Northern region, automobile and precious industry are located. Northern region might is affected strongly by global monetary crises.

3.2 Future VN (Capital partners securities Co.,Ltd, Hong kong)

(1) VN population will increase to 100 million by 2020. And Indochina has population with 300 million. The area will become Big consumer market.

(2) East and West highway with length 1,450km becomes main transport routes in Indochina peninsula. New transportation road of Ho Chi Min route is under construction.

(3) Hanoi metropolitan area will have the population of 15,million by 2020. (Current is 6 million)

(4) HCMN also will have the population 15 million by 2020, and HCMN and the neighboring cities will become hub city connecting Singapore, Malaysia and Indonesia.

インドシナ経済圏と東西回路

3. Review for Current VN Economy

(5) Da-nang and Dun Quat oil refinery industry are centered in Central area. And also the cities supply the harbor to The republic of Lao.

(6) Cantong city located in Mekong delta will become connection center for Cambodia and the population will reach 17 million by 2020.

(7) Privatization of the big state companies will be finished by the end of 2010. The company's efficiency will be increased.

(8) All people will receive basic education by 2020. VN people living every where can use internets.

(9) Governmental Services can be accessed through internet in whole country.

(10) The above social economic plans will introduce high economic growth rate to future VN.

(Source: VN government plan, ADB, VN national Bank, and VN statistic Bureau)

3.3 VN economic outlook from Japan's articles

(1) Governmental innovation will be achieved by 2020, especially privatization will be finished by 2020.

(2) FDI will be increased further future. VN market includes Indochina countries, Cambodia, Laos and Myanmar. The population around 300 million by 2020.

(3) Infrastructure will be built up in line with government plan, even though happened little bit delay.

(4) Power shortage will be solved by financing of ODA, IPP and National and company bonds.

(5) It is possible that average GDP growth rates are 8% per year from 2010 to 2020.

4.1 About international economic environment

NO	Contents	Comments
1	Economic crisis is happened in 2007, economic cycle entered to new period of restoration.	Agree
2	It makes difficulty that developing countries get a competition of attractive resources.	Agree
3	Economies in the world become more and more depending on each other, and the risks become high.	Agree
4	Science and technology, especially information, biological technology will continue strongly impact on growth and change of global economic structure.	Agree
5	The deficits in trade balance of developed countries affects on investment capital flow to developing countries.	Agree
6	Tendency of globalization, reorganization will continue and cover most fields of socio,economic and life areas.	Agree

4.2 Basic consensus for international economy

NO	Contents	Comments
1	Growth of trading activities is good;	Agree
2	Investment is strongly increased, especially foreign direct investment (FDI); Official Development Assistance (ODA) and indirect investment tends to increase;	Agree
3	Financial sector becomes more and more important in promoting the world economic development.	Agree
4	Consumption is strongly increased, mainly in emerging markets;	Agree
5	World labor market will be affected by globalization process and changes of demography.	Agree
6	The above are for period 2011-2020 and then restoration and growth are happened in the period.	Agree

4.3 Opportunities for Vietnam economy in period 2011-2020

NO	Contents	Comments
1	Vietnam has conditions for faster development of economy due that VN is located in the Asian countries with high economic growth.	Agree
2	International economy will help VN expansion, and the big economies such as US, EU, Japan pay more attention to VN. And VN also keep strong relation of NAFTA, India and Korea.	Agree
3	The export market will be expanded, and more investment capital are attracted to VN, so there are many opportunities to participate in international laborers.	Agree
4	Restructure of the world economy, especially large economies, will give strongly and positively impact on VN economic structure.	Agree
5	Vietnam will have more options of technology transfer and technology renovation.	Agree
6	Opening markets, development and completion of market rules will facilitate for VN to access easily science and technology in the world, and increasing laborer productivity, production efficiency of VN economy, through this, infrastructure will be improved.	Agree

4.4 Challenges for Vietnam economy in period 2011-2020

NO	Contents	Comments
1	Many countries face with competitions in export markets, attracting capital investment, laborers and technologies, including VN.	Agree
2	Raise of large developing economies such as China, India and ASEAN countries makes more fierce competition to VN.	Agree
3	Development potential of VN is limited in terms of human resource (lack of high quality workers), weak infrastructure conditions, small economy scale, small enterprises and weak competitiveness.	Agree
4	Protection and commercial barriers are still applied by countries.	Agree
5	Actually, application of such measures is mainly from developed countries, big countries. Meanwhile, VN competitiveness capacity of goods and services is weak.	Agree
6	Understanding and application of international rules by VN enterprises are also weak. VN enterprises will meet many difficulties in overcoming this barrier to penetrate into international markets.	Agree
7	Another problem is the risk of losing domestic markets due to having to lift customs barrier in performing international commitments.	Agree

4.5 Factors of growth in period 2011-2020

NO	Contents	Comments
1	After economic crisis, the speed of capital release is reduced. If investment environments are not improved, FDI will be difficult to increase, and capital release is also difficult to increase.	Agree
2	ODA growth rate was 5% per year for 2001-2008. In period 2011-2020, it is difficult to maintain this level because of "Committed ODA will be reduced" and "The ODA in previous period will be released up to 2015.	Agree
3	In order to ensure economic growth rate, internal resources plays important role. It is anticipated that growth rate of social investment up to 2020 is 6-8%. In the next period, in order to keep growth rate of social investment, the share of domestic investment capital shall be higher.	Agree
4	Contribution of science and technology in economic growth rate is about 1.2%. Meanwhile, the share of contribution of developing countries is about 1.6-2% /year.	Agree

4. Comments on Economic Scenarios in EDF2050

4.6 Fast development scenario for VN

NO	High Scenario	Comments
1	World economy gets out from crisis and restore in 2010; ・International economic environment is stable. ・Energy market, especially oil market, is stable. ・Processing restructure of world economy, especially in large economies	Agree
2	VN will successfully overcome challenges of globalization and international economic integration.	Agree
3	Domestic actors will be mobilized at: ・ Reform of regulatory, policies, administration; ・ Continuous reforms are implemented up to 2020.	Agree
4	Policies are set for promotion of fast development of industries which create high added value, high technology, toward export.	Agree
5	Problem of laborers is satisfactorily solved.	Agree
6	Technical infrastructure system is formed.	Agree
7	Development of basic industries will be invested based on the economic capability and available in 2020.	Agree

4.7 Low development scenario

	Low Scenario	Comments
1	World economy will not get out from crisis and restoration of growth is slow; even more seriously than Asia financial crisis. ・International environment is less stable ・Energy market is not stable, oil price is highly increased.	Doubt
2	VN to meet many difficulties due to economic crisis, domestic economy to be depressed like being impacted by Asia financial crisis in 1997.	Doubt
3	Domestic actors will be mobilized at: ・The reform of regulatory, policies and administration is slow ・Domestic environment is not really favorable in serving economic development requirements; ・Implementation of comprehensive and continuous reforms is long.	Doubt
4	Moderate development of industries which create high added value, forwarding export, problem of laborer is not really resolved	Doubt
5	Problem of laborer is not really resolved.	Doubt
6	Development of infrastructure system at low level.	Doubt
7	Technical infrastructure system as well as basic industries is continuously invested.	Doubt?

4.8 Scenario setting

(1) Base case

- In this scenario, structure change is at the moderate and reasonable level.
- Share of agriculture in economic structure is gradually reduced to 17.2% in 2020
- Meanwhile shares of industry and service sectors are approximately 41 and 42% in 2020.
- In this scenario, laborers are well mobilized, with relatively high average productivity in direction of development and shifting laborers from rural areas to industry sector and service sector.

4. Comments on Economic Scenarios in EDF2050

< Growth Rate Scenario of Base Case >

Item	Unit	2008	2010	2015	2020	2030
Population	10^6 p	86	88	92	97	102
GDP (Current)	Bil USD	91	103	197	340	1,039
GDP Structure (current)	S%	100.0	100.0	100.0	100.0	100.0
Agri, forestry, fishery	S%	22.0	21.9	20.1	17.2	11.8
Industry – construction	S%	39.9	39.5	40.3	41.2	42.5
Services	S%	38.1	38.6	39.7	42.1	45.7
GDP/capita (Current)	USD	1,062	1,223	1,800	2,602	5,893
Japan ($34000/capita) 2007	S%	3.1	3.6	5.3	7.7	17.3
		09-10	11-15	16-20	21-30	31-40
Total GDP	G%	5.9	7.5	8.0	8.2	7.8
Agri, forestry, fishery	G%	3.7	3.6	2.8	2.8	2.8
Industry – construction	G%	6.3	8.8	8.8	9.1	8.4
Services	G%	6.4	7.6	8.0	8.2	7.7

(2) High case

- Change of economic structure is strong, because industry and construction and services sector have fast growth.
- Share of agriculture in GDP is reduced to 14.75% in 2020, even though growth rate of this sector is still relatively high.
- High case is connected to soon restoration of world economy, and Vietnam economy will be also fast restored and strong promotion of industry development in years before and after 2020.
- There is the strong change with fast development of service sector. The fast development brings human resource exploitation and increases labor productivity.
- Share of labor in agriculture is only 36% in 2020 and 17% in 2050.

4. Comments on Economic Scenarios in EDF2050

< Growth Rate Scenario of High Case >

Item	Unit	2008	2010	2015	2020	2030
Population	10^6 p	86	88	92	97	102
GDP (current)	Bil USD	91	103	214	396	1,437
GDP Structure (current)	S%	100.0	100.0	100.0	100.0	100.0
Agriculture, forestry, fishery	S%	22.0	21.7	18.5	14.8	8.5
Industry – construction	S%	39.9	39.5	40.3	41.2	38.4
Services	S%	38.1	38.8	41.2	45.4	53.1
GDP/capita (Current)	USD	1,062	1,234	1,950	3,035	8,150
Japan ($34000/capita) 2007	S%	3.1	3.6	5.7	8.9	24.0
		09-10	11-15	16-20	21-30	31-40
Growth rate (1994 price)	G%	6.38	9.11	9.58	9.82	9.25
Agriculture, forestry, fishery	G%	3.72	3.63	2.83	2.76	2.76
Industry – construction	G%	6.68	10.35	10.37	9.87	8.82
Services	G%	7.21	9.80	10.52	10.85	10.11

(3) Low case

- Industry & construction, Agriculture, Service sectors have relatively low growth rates for domestic market oriented.
- Growth rate of industry and construction increases with 8.8% in period 2011-2015 and about 8-9% for the next periods.
- Growth rate of agriculture is low and stable at 2.7-3.7% for the whole period.
- Growth rate of services is also at low level, on average 7-8% depending on periods up to 2050.
- Economic structure in Low case is changed with slow pace, and VN is difficult to achieve the targets.

4. Comments on Economic Scenarios in EDF2050

< Growth Rate Scenario of Low Case >

Item	Unit	2008	2010	2015	2020	2030
Population	106 p	86	88	92	97	102
GDP (Current)	Bil USD	91	103	193	326	953
GDP Structure (Current)	S%	100.0	100.0	100.0	100.0	100.0
Agriculture, forestry, fishery	S%	22.0	22.0	20.5	17.9	12.9
Industry – construction	S%	40.0	39.7	41.2	43.0	46.3
Services	S%	38.1	38.3	38.3	41.3	40.8
GDP/capita (2008 price)	USD	1,062	1,216	1,762	2,495	5,408
Japan ($34000/capita) 2007	S%	3.1	3.6	5.2	7.3	15.9
		09-10	11-15	16-20	21-30	31-40
Growth rate (1994 price)	G%	5.61	7.09	7.66	7.58	7.45
Agriculture, forestry, fishery	G%	3.72	3.63	2.83	2.76	2.76
Industry – construction	G%	6.28	8.75	8.77	9.12	8.37
Services	G%	5.73	6.65	7.95	6.70	6.75

5. Discussion points

5.1 About ODA finance

(1) The governments of the developed countries are searching "Exit – emergency monetary policy" prepared for saving banking system damaged by world monetary crises.

(2) By the policy, World economy will be going the way to be recovered. But as the results, the governments will hold big financial deficits.

(3) As resolving the problem, when the governments want to cut their budgets, it is predicted that ODA budgets of the governments may be cut firstly.

(4) The half of the finance of VN infrastructure construction plan is owned to ODA, Therefore, VN can not expect that ODA finance come as much as the past years. So VN government need to consider new finance strategy including PDP.

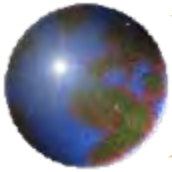
5.2 About GDP per Capita

In Base case, VN GDP per capita will increase, VN will reach the following countries' GDP per capita in 2007.

Indonesia in 2016, China in 2020, Brazil in 2032,
Korea in 2047, Japan in 2055 , Singapore in 2057

But it is too slow, some pre-conditions are problems, it may be GDP growth rate, Exchange rate and Population growth rate.

Item	2007year	2008	2010	2015	2020	2030	2040	2050
GDP/capita (VN/p)		1,062	1,223	1,800	2,602	5,893	13,088	27,621
Indonesia	$1,915/p	0.55	0.64	0.94	1.36	3.08	6.83	14.42
China	$2,566/p	0.41	0.48	0.70	1.01	2.30	5.10	10.76
Brazil	$7,017/p	0.15	0.17	0.26	0.37	0.84	1.87	3.94
Korea	$22,000/p	0.05	0.06	0.08	0.12	0.27	0.59	1.26
Japan	$34,000/p	0.03	0.04	0.05	0.08	0.17	0.38	0.81
Singapore	$36,000/p	0.03	0.03	0.05	0.07	0.16	0.36	0.77



Thank you

添付資料 2.B

経済分析・需要予測支援に使用した主な説明資料

（原油価格）

Crude oil Market
In
Short and Long term

May 2010

JICA Expert :Tomoyuki Inoue

CONTENTS

Part 1. Factors for Crude Oil Price increasing in 2008

1.1 Fundamental & Non-fundamental factors

1.2 Crude oil price on fundamental base

1.3 Short term Measures against oil price hike

1.4 Long term measures for oil demand reduction

Part 2. Global Oil market

2.1 Crude oil market in short term

2.2. Crude oil market in Long term

Part 1.

Factors for Crude Oil Price Hike in 2008

1.1 Fundamental & Non-fundamental factors on Oil price hike

Items	Reasons	Details
Fundamental factors	Demand increase	·Economic growth in China, India, Brazil and Russia
	Restrictive crude oil supply	·Stagnation of crude oil production capacity in OPEC & other counties ·Increase crude oil supply cost ·Resource nationalism
	Restrictive oil Refinery Capacity	·Shortage of oil refinery capacity in USA ·Gasoline demand increase in Asia
Non fundamental factors	Monetary market	· Excessive liquidity ·Investment from investment banks ·Subprime loan collapse ·Dollar devaluated
	Geopolitical risks In some countries	·Nuclear problems in Iran ·Un-stability in Nigeria ·Terror in oil producing countries

(1) Excessive liquidity

- Excessive Money supply (MS)

MS in EU and USA are increased from 1998. Usually growth rate of MS as much as growth rate of nominal GDP is suitable.

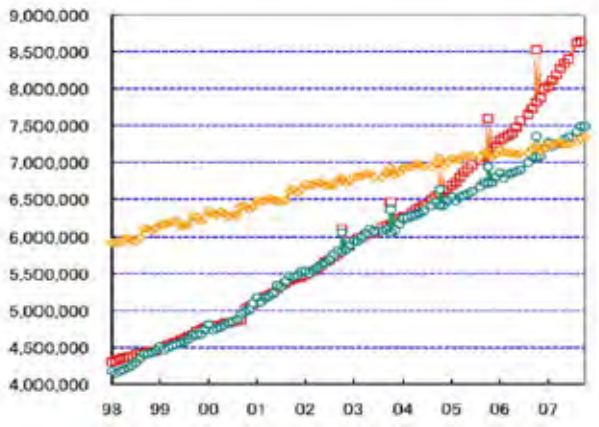
- Pension money

A part of Pension money with $22 trillion is invested to Commodity index funds. 70% of the commodity index are linked to energy prices like WTI.

- Sovereign Welfare Fund (SWF)

Governments directly operate the investment of SWF. The total of the funds are $2.5trillion, the funds will be increased to $15 trillion up to 2015.

Money Supply



Pension Money

- USA pension fund
- CalPERS ($240bilion)
- Norway pension fund
- GPF-Global ($380 Billion)

SWF

- Kuwait
- UAE
- Singapore
- China
- Russia

(2) Subprime loan Collapse

Excessive liquidity before the collapse

Before August 2007, the liquidity are invested to Stocks, Bonds and Commodity.

Subprime loan Collapse (August 2007)

The loan is prepared for low income families that want to get their homes. The payable interest of the loan is lower in first two years, however the interest increase after the term. By higher interest, many low income families cannot pay the interest and they give up to keep their houses.

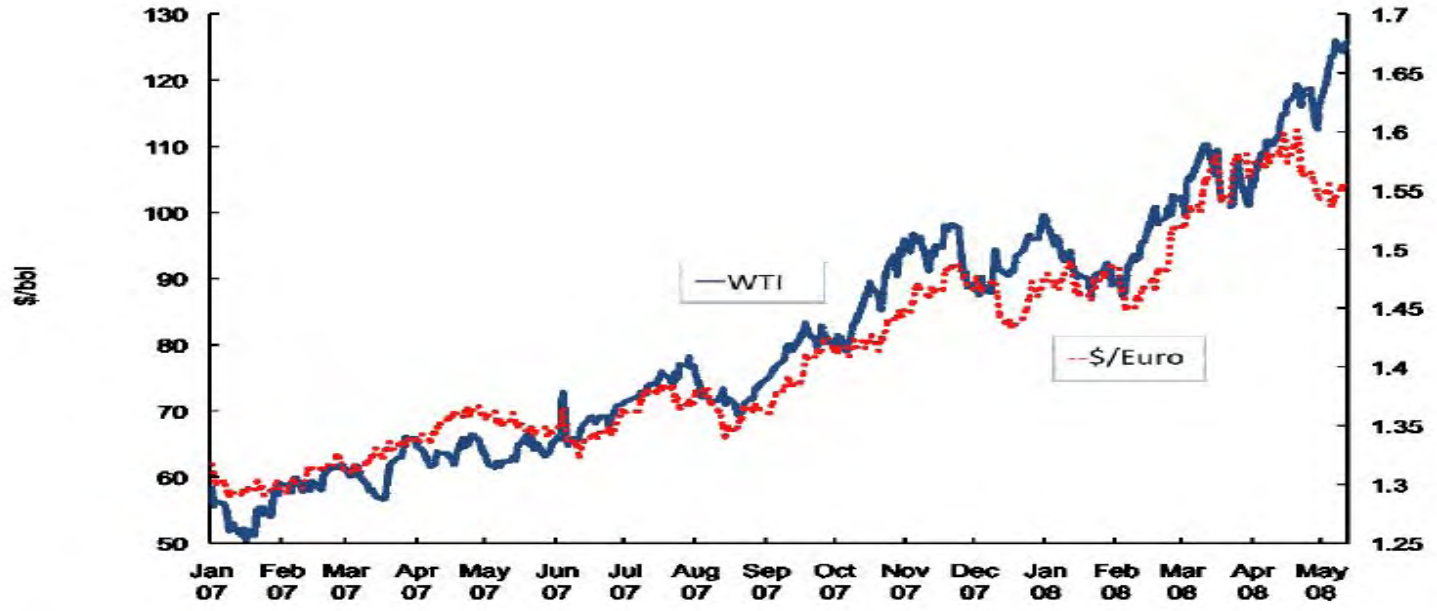
Excessive liquidity after the collapse

After August 2007, the excessive liquidity are invested to Commodity markets including crude oil and Petroleum products.

(3) Dollar devaluated

- Dollar continues to devaluate against other currencies like Euro
- Investors have to defense from devaluation of their assets.
- Investors are afraid of inflation in USA.
- When dollar devaluation is stopped, crude oil price hike will be stopped in the spot market.

Trend of WTI & $/euro



1.2 Crude oil price on fundamental base

- Fundamental crude oil price (F) in 2008 is estimated by the variables of oil demand, oil supply and oil price.

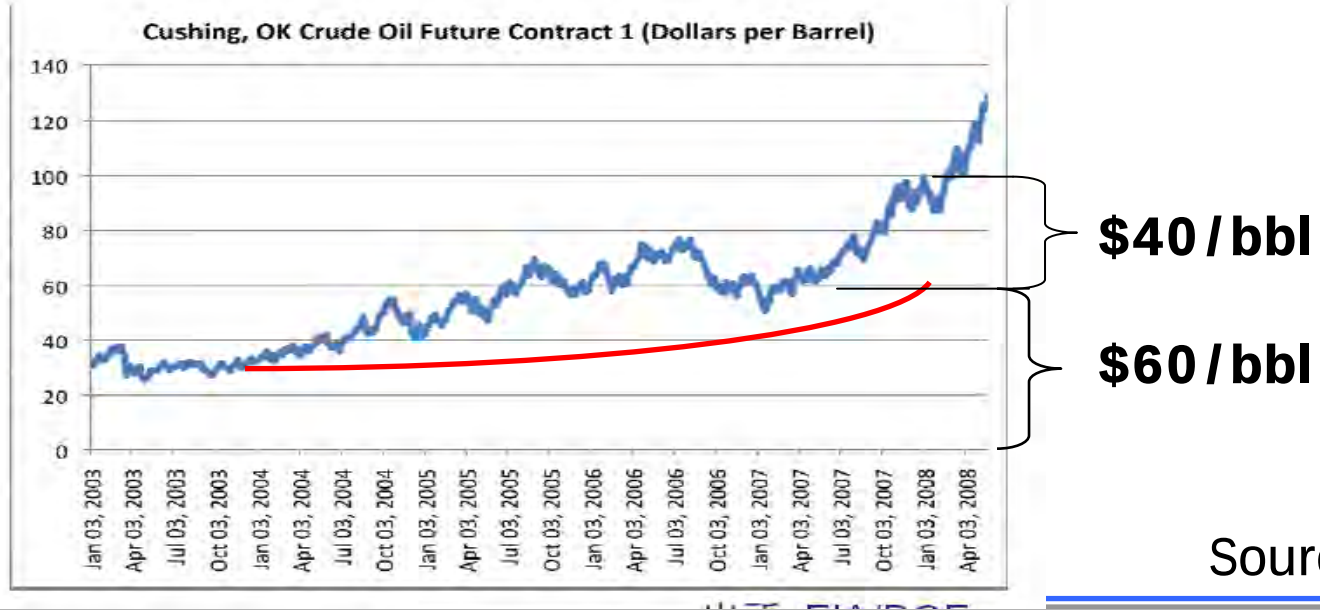
Variable **D** Oil demand: Annual growth rate of oil demand

Variable **S** Oil Supply : Annual growth rate of oil supply

Variable **P** Oil price : Logarithm of real oil price

$$F = a*D + b*S + c*P + d$$

- As the result, crude oil price of First quarter in 2008 is $60/bbl. Therefore Non-fundamental price is around $40 /bbl in 2008



Source : EDMC, IEEJ

1.3 Short term Measures against oil price hike

Category	Short term Measures	Countries
Increase Crude oil supply	·Express to increase oil production ·Offshore oil well exploitation ·Pipeline construction ·Shale Oil & Gas supply	KSA, Kuwait USA Kazakhstan USA
Suppress oil demand	Oil subsidy cut and oil price increase Hybrid cars Bio- ethanol Energy conservation	China, Malaysia Japan USA, Brazil UN, G8
Control hedge funds	Control of investment money Trading limitation of pension money	USA International

1.4 Long term measures for oil demand reduction

Fields	Long term Measures	Comments
Electricity	Gas fired plant (NG-GCC) Nuclear power Renewable (Wind, PV, Bio)	Efficiency: 50-60％
Transportation	Hybrid car Gasoline car to Diesel car, Electric car, Fuel cell car, H2 car,	Fuel efficiency:50％ up Fuel efficiency 20％ up No CO2 No CO2 No CO2
New Carbon energies	Tar-sand in Canada (200 Bil bbl) Orinoco tar Shale oil & Gas Methane hydrate (17,000TCF, JP260TCF)	KSA(260 Bil bbl) Venezuela (240 bil bbl) EU, China NG (6,300TCF)
C1 chemistry & Liquefaction	Natural gas to Liquid (diesel) Coal to Liquid (diesel) Bio to diesel	The diesel are used by vehicle
Energy Efficiency Conservation	Car efficiency up Appliance efficiency up EEC management	Conservation of Energies

Resource: Japan Petroleum Institute

Part 2.

No. 19 Global Oil Markets

Sponsor

Nippon Oil International advisory Committee

4th Feb 2010, in Japan

Panelists

Dr. Fereidun Fesharaki / Chairman of FACTS Global Energy Group

He was in charge of the chairman of Asia Oil And Gas Conference in 2004, and made presentation in the conference.

Dr. Guy Caruso / CEO of Center for Strategic & International Studies

He was the director of Energy Information Agency, USA, now he is famous as energy market analyst for USA and China.

Mr. Takayuki Nogami / Chief economist of JOGMEC

He is analyst of Crude oil demand/Supply of the world. He wrote many research papers on the above title.

Dr. Ken Koyama / Director of Energy Strategy and Industry in IEEJ

He is in charge of crude oil price forecasting in IEEJ, he is one of a few experts on the crude oil in Japan.

2.1 Oil market in short term range

(1) Current situation of crude oil price

- After World monetary crisis, crude oil demand is decreased by 5-6 million B/D comparing to base line demand in Feb 2010.
- Crude oil demand will be recovered with 1-2 million B/D per year after 2010.
- In OECD countries, crude oil stocks are in the situation of over flow. They have 59 days stocks at the days of Feb 2010.
- In normal years, they have crude oil stocks with 50-55 days to compare to their consumption.

- The Authority of Saudi Arabia has the recognition that recent crude oil price with $75/bbl is good position for oil suppliers.
- In recent years, OPEC can control crude oil price, when crude oil price is increasing, some OPEC countries produce crude oil more than their ceiling volume. While, the counties preserve their ceiling at time that crude oil is decreasing.
- Crude oil demand in China, India and Gulf countries increase, even though world economic recession.

(2) Oil consumption in USA

- USA has being been in economic recession since Lehman Shock (Sep 2008).
- USA's car owners have refrained from using their cars, and New cars become size down, as the results, a average car energy efficiency in USA is improved.
- EIA (Energy Information Administration in USA) said that USA gasoline demand was the peak in 2007, and the future demand in USA does not reach the same level.
- Current USA is the middle way from fossil energy country to renewable energy country.

(3) Monetary speculation (Hedge funds)

- The speculators have an intension to invest their funds to commodity markets under the current circumstances of money surplus situation.
- When increasing world stock prices, investors who have bountiful funds increase , and they invest big funds to new developed countries. As the results, US dollar is devaluated and oil export countries want to increase crude oil price for keeping dollar properties.
- If USA has inflation, US dollar becomes lower rate and worth of US dollar is going down. In the case of the condition, crude oil price increases.

- In recent days, EU is getting financial instability, current investors have prediction not to be able expect any profit from oil markets.
- Commodity Futures Trading Commission (CFTC) prepares some regulation to commodity market including spot oil trading markets. However, as current tops of CFTC used to be traders, the regulation is doubtful whether it is useful or not useful.
- The investors will change to other commodity when they stop their investment to crude oil .

Note:

Commodity Futures Trading Commission (CFTC) in 1974 was created as an independent agency with the mandate to regulate commodity futures and option markets in the United States. The agency's mandate has been renewed and expanded several times since then.

(4) Crude Oil Price in short term range

Dr. Fesharaki

- This year, the oil price is estimated in $65-$75/bbl. In two and three years, the price will be estimated in $60-$100/bbl.
- In two and three year, the price is not exceeded $100/bbl.

Dr. Caruso

- The average future price is $70/bbl, the range is in $60-$80/bbl.

Dr.Koyama

- When discussing WTI price, the price is in $70±$10/bbl
- It means the range of the price is in $60-$80/bbl.

2.2. Oil Market in Middle and Long term

(1) Crude oil Demand

・In future 20 years, World GDP growth rate is around 3.5%. The high growth rate is expected in Asian countries. The GDP growth rates in the world are the difference by region. (By IEA)

・Current crude oil demand is 85million B/D, and the demand increases with 1 million B/D every year.

・The higher demand countries are China and India located in Asian area. meanwhile it is decreased in USA, EU and Japan.

・There is the outlook that the crude oil demand in China will be decreased after 2020, due to the low birthrate policy.

・IEA estimates 1% per year as the crude oil demand growth rate, as it is seemed little bit higher, When setting 0.6% as the assumption of consumption growth rate, the crude oil demand in 2030 will be increased to 95million B/D from 85million B/D of the current demand in the world.

・Dissemination of Hybrid cars can not be desired when crude oil price is $70-$80/bbl, it can be realized when the price becomes double higher than current price.

・For implementing global warming measures, it is possible that energy will be changed from crude oil to Natural gas, Nuclear and Renewable energy.

(2) Future crude oil Supply

- Iraqi government has a plan to produce crude oil up to 10 million B/D in future 6 years. It's possibility is unclear in world oil experts.
- Iraqi crude oil production in the current year is 0.25million B/D, however there is a prediction that the country has the possibility to produce crude oil as much as 4 million B/D in the name of the right to "Iraqi Reconstruction".
- The current OPEC has the allowance of 6 million B/D, the crude oil demand in 2030 can be estimated by 95 million B/D. The shortage of the crude oil supply is 4 million B/D. The shortage can be supplied from Iraq and other countries.

(3) Future Natural Gas Supply

- Other wise, Natural gas supply increases in recent years from Middle east countries, PNG and Australia.
- In 2014, 13 million tons natural gas will be supplied from PNG and Australia. The supply will be increased year by year, it will be supplied up to 30 million tons.
- "Shale Gas Revolution in USA" makes LNG import from Middle east and Asian countries decease. USA no needs import LNG from the countries any more.
- USA made LNG import terminal construction plan revise downwards from 10TCF to 1TCF in 2015.
- In 2009, Large scale LNG facility in Quarter was started to operate, and Natural gas price in USA was decreased to $2.5/mmBUT in nowadays.

・Decrease of LNG price makes LNG projects in Middle east countries postpone rapidly.

・It is predicted that Middle east LNG prepared to USA is exported to Asian countries in near future. The volume will be as much as 30–36millions tons.

・In future two – three years, LNG contract price will become $8-$12/mmBTU in Japan, while natural gas contract price in EU and USA is $3-$5/mmBTU.

・The current LNG spot price in the world is around half of Japanese contract price, it is predicted that the difference between Japan and other countries will be bigger than the current year in future LNG markets.

(4) Shale Gas Renovation in USA

・Onshore gas production in USA has been increased rapidly since 2005. The production growth rate is around 4% per year. Recently Shale layer natural gas of USA can be developed economically due to technical revolution and recent high natural gas price.

・It is a big factor that so many small and medium enterprises had started to invest to develop shale gas production.

・It is forecasted due that shale gas is one of new energy resources, and the reserves and the potential in USA are so big when comparing other energies as crude oil and conventional natural gas. The future LNG supply and demand balance in USA is changed drastically.

- It is used to be considered that natural gas consumed in USA has to be imported from other countries in future.

- In USA, shale gas brings big changes in energy market, especially, upper oil industry has got big impacts. Recently the Change is called “Shale gas renovation”. The renovation is running through in the world, especially EU and China.

- It is estimated that the Shale gas reserves in the world is 5,000TCF – 16,000TCF. The reserves is so big and the expectation of concerned business becomes bigger and bigger.

- It is said that the development cost is $5-$7/mmBTU. (But future Natural gas price in USA may be $3-$5/mmBTU)

(5) Capacity of Oil refinery plants

- Current world oil refinery plants are over capacity comparing to the current and future demand. However new oil refinery plants are constructing and planning in developing countries.
- It is said that 7 million B/D in current world total capacity of 85million B/D have to be scraped by 2015.
- The oil refinery plants with 1.0 to 1.5 million B/D capacity in Japan have to be scraped. The other capacity may be scraped in EU and USA.

(6) crude oil price outlook in Long term range

Dr. Fesharaki

- The current crude oil price will continue by 2013, when estimating the price in long term range (10 year later), the price will be increased in $120-$180/bbl.
- Iraqi Government comment will not affect to the crude oil market.

Dr. Caruso

- In the viewpoint of long term outlook, the crude oil price is moved in the range of $100±$20/bbl.

Dr. Koyama

- Crude oil price is estimated $65 as the mean value and the moving range of the price is from $30 - $100/bbl.

Thank you

添付資料 2.C

経済分析・需要予測支援に使用した主な説明資料（PDP7 のポイント）

Recommendation
for
Power Demand Forecasting of PDP7

May 2010

JICA Expert :Tomoyuki Inoue

CONTENTS

[Ⅰ] Pre-conditions

1. Social & Economic Plans
2. Future externality of Energy & Power sector
3. Energy Conservation Plans

[Ⅱ] Simulation results

4. Results of Power demand Forecasts
5. Regional Power demand Forecasts
6. Energy Intensity by Sector
7. Discussion points

[I] Pre-conditions

1. Social & Economic Plans

1.1 Population

(1) Estimation method

- In 2008, population of Vietnam is 86.161 million people. Average population growth rate is 1.3%/year in period of 2001-2008.
- Growth rate of population will be declined moderately in future.
- Urban population is increased rapidly, compared to the country population. (1.0% to 0.5% per year in the country, but 2.1% per year in urban area from 2015 to 2030).

(2) Population in the country (million persons) as pre-condition

	2010	2011	2012	2013	2014	2015	2020	2025	2030
Country Population	88.8	89.7	90.6	91.5	92.4	93.3	97.6	100.2	102.8
Urban rate	29%	29%	30%	30%	31%	31%	34%	36%	39%

1.2 Exchange rate

(1) Estimation method

- Value of VND is decreased in recent years, Exchange rate to dollar basically is defined by the difference of the inflation rate between the two countries.
- In more than ten years, the inflation rate of VN is higher than US inflation rate, therefore, VND gradually becomes weak to USD.

(2) VND exchange rate to USD (VND/ US$) as pre-condition

	2010	2011	2012	2013	2014	2015	2020	2025	2030
VND/USD	18,400	18,440	18,480	18,520	18,560	18,600	20,000	22,500	25,000

1.3 Nominal & Real GDP

(1) Estimation method

- Growth rate of Real GDP is given.
- World economy improved, Industry and service sectors in VN realize high growth rate and Income per capita increase.
- Nominal GDP = Real GDP * inflation.
- US$ GDP = Nominal GDP / Exchange rate

(2) GDP as pre-condition (Billion VND, Million US$)

	2010	2011	2012	2013	2014	2015	2020	2025	2030
Nomi GDP	1,721	1,979	2,276	2,617	3,009	3,460	6,833	13,417	26,346
Real GDP	1,172	1,260	1,354	1,455	1,563	1,680	2,479	3,637	5,337
GR		7.5%	7.5%	7.5%	7.5%	7.5%	8.1%	8.0%	8.0%
US$ GDP	93	107	123	141	162	186	341	596	1,053

Nominal:Tri VND, Real GDP:Tri VND, US$ GDP: Bil US$)

1.4 Sectoral GDP

(1) Estimation method

GR of Sectoral GDP are defined by elasticity between Sectoral & Total GDP.

	1995	2000	2005	2010	2015	2020	2025	2030
Agriculture & Forestry	0.50	0.64	0.51	0.48	0.48	0.48	0.48	0.48
Mining	2.15	1.76	0.59	0.28	0.28	0.28	0.28	0.28
Manufacturing Light	1.44	2.20	2.45	1.52	1.52	1.52	1.52	1.52
Manufacturing Heavy	1.00	0.87	1.00	1.03	1.03	1.03	1.03	1.03
Commercial & Trade	1.00	0.87	1.00	1.03	1.03	1.03	1.03	1.03
Transport and communica	0.88	0.93	0.98	1.18	1.18	1.18	1.18	1.18
Service & Others	1.14	0.75	0.85	0.95	0.95	0.95	0.95	0.95
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(2) GR (%) of Sectoral GDP as pre-condition

	1995	2000	2005	2010	2015	2020	2025	2030
Agriculture & Forestry	4.1	4.4	3.8	3.1	3.6	3.9	3.8	3.8
Mining	17.6	12.2	4.4	1.8	2.1	2.2	2.2	2.2
Manufacturing Light	11.8	15.3	18.4	9.9	11.3	12.3	12.1	12.1
Manufacturing Heavy	8.2	6.0	7.5	6.7	7.7	8.3	8.2	8.2
Commercial & Trade	8.2	6.0	7.5	6.7	7.7	8.3	8.2	8.2
Transport and communica	7.2	6.4	7.4	7.7	8.8	9.5	9.4	9.4
Service & Others	9.3	5.2	6.4	6.1	7.1	7.6	7.5	7.5
Total	8.2	7.0	7.5	6.5	7.5	8.1	8.0	8.0

2. Future externality of Energy & Power sector

2.1 Crude oil Price

(1) Estimation method

- World Export Crude Oil Price (WEP) defined by IEA is used as Indicator.
- WTI is 8-10% higher than WEP.
- $5/bbl/year up from 2010 to 2013, the price move from $70/bbl to $85/bbl.
- After 2014, the price increase with 2.0% as much as USA inflation (=dollar devaluation)

(2) Crude oil price ($/bbl) as pre-condition

	2010	2011	2012	2013	2014	2015	2020	2025	2030
WEP	70	75	80	85	87	88	98	108	119
WTI	77	83	88	94	95	97	107	119	131

2. Future externality of Energy & Power sector

2.2 Power tariff

(1) Estimation method

- International coal price will increase in company with crude oil price.
- Coal price for power sector in VN reaches international coal market price by 2015.
- Power tariffs are increased with coal price growth rate multiplied by elasticity (0.8) after 2016.

(2) Power tariffs (VND/kWh) as pre-condition

	2010	2011	2012	2013	2014	2015	2020	2025	2030
Agriculture	1,053	1,116	1,178	1,239	1,300	1,392	1,507	1,632	1,767
Residential	1,109	1,175	1,240	1,305	1,368	1,466	1,587	1,718	1,860
Industry	1,324	1,403	1,481	1,558	1,634	1,750	1,894	2,011	2,134
Commercial	2,169	2,298	2,426	2,552	2,677	2,867	3,104	3,294	3,497

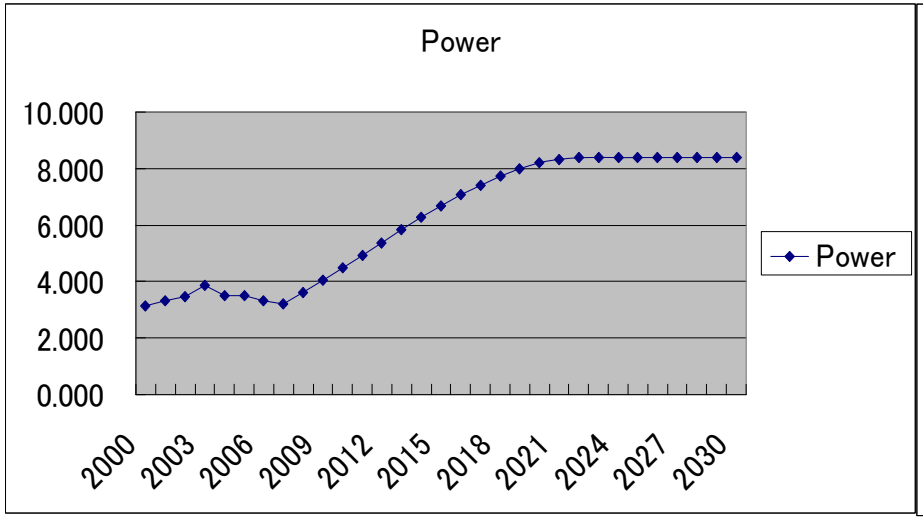
2. Future externality of Energy & Power sector

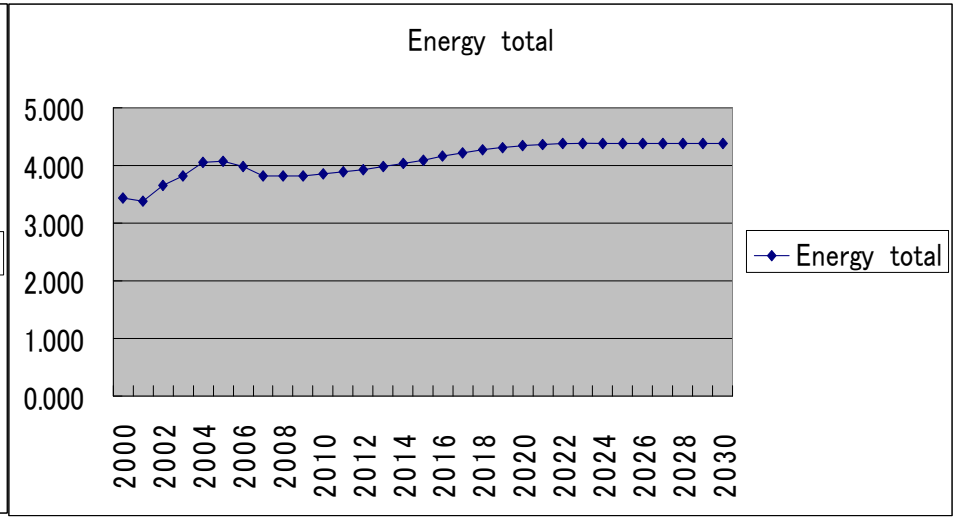
2.3 Energy Intensity of Agriculture

(1) Estimation method

	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power	3.322	3.216	3.618	4.040	4.478	6.682	8.194	8.400	8.400
MWh/ Bil Dn 2	-5.0	-3.2	12.5	11.68	10.84	6.67	2.50	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy	3.125	2.994	2.883	2.782	2.693	2.374	2.231	2.214	2.214
toe/ Bil Dn 200	-1.5	-4.2	-3.7	-3.48	-3.23	-1.99	-0.74	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy total	3.982	3.824	3.816	3.825	3.848	4.098	4.345	4.381	4.381
toe/ Bil Dn 2005price				0.23	0.61	1.48	0.81	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power Ratio	7.2	7.2	8.2	9.1	10.0	14.0	16.2	16.5	16.5

(2) Energy intensity as pre-condition (MWh/ Bil VND of Agri GDP),(ktoe/Bil VND)



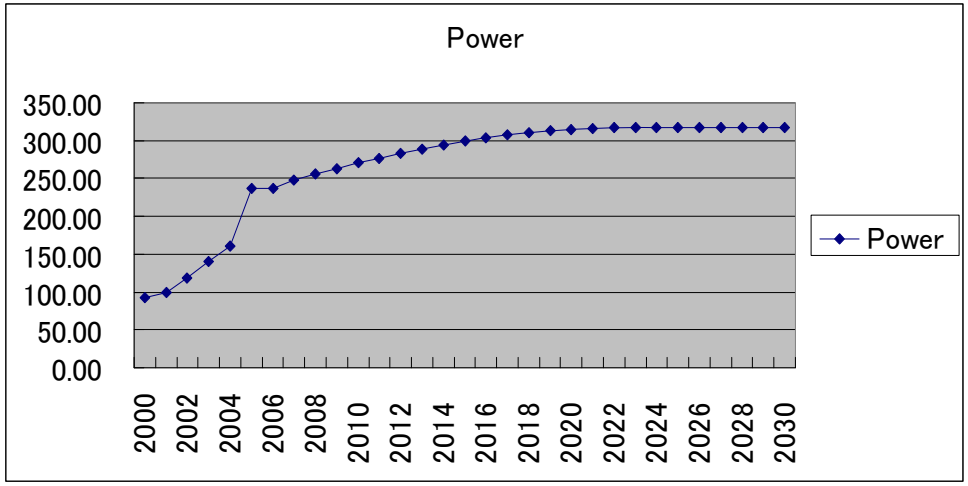


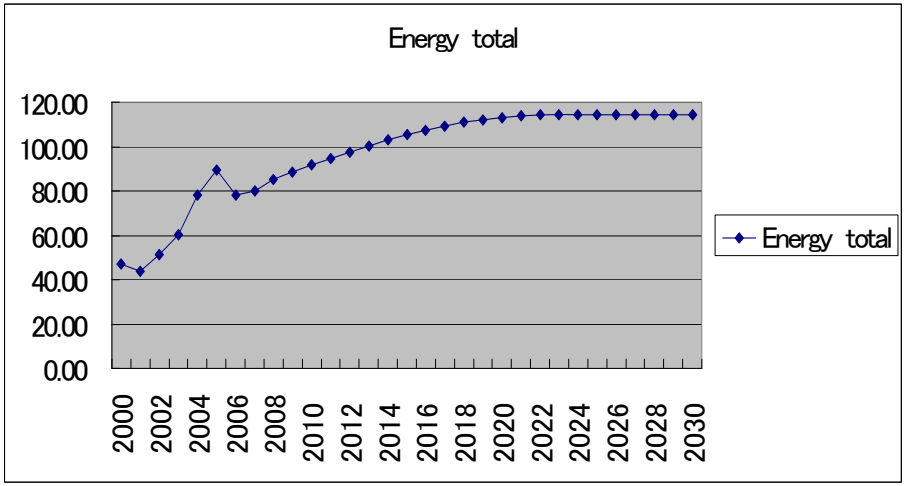
2.4 Energy Intensity of Light Industry

(1) Estimation method

	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power	237.27	248.46	256.09	263.4	270.4	299.3	314.9	316.8	316.8
MWh/ Bil Dinar 2005pri	-0.01	4.72	3.07	2.87	2.66	1.64	0.61	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy	22.35	17.63	19.01	20.40	21.78	28.07	31.92	32.42	32.42
toe/ Bil Dinar 2005price	-33.97	-21.11	7.82	7.29	6.77	4.17	1.56	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy total	78.00	79.87	85.08	88.36	91.55	105.29	113.17	114.17	114.17
toe/ Bil Dinar 2005price				3.86	3.61	2.30	0.88	0.00	0.00

(2) Energy intensity as pre-condition (MWh/ Bil VND of Light Ind),(ktoe/Bil VND)





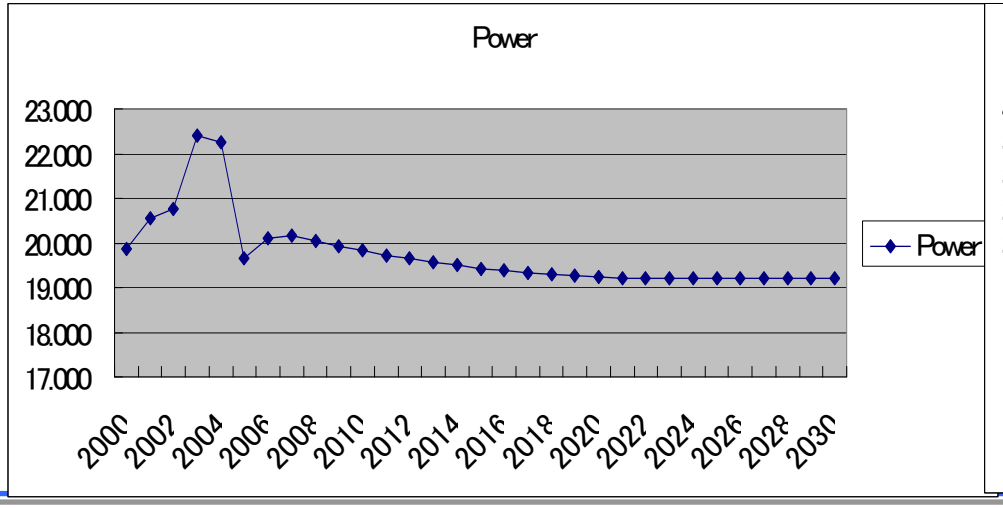
2. Future externality of Energy & Power sector

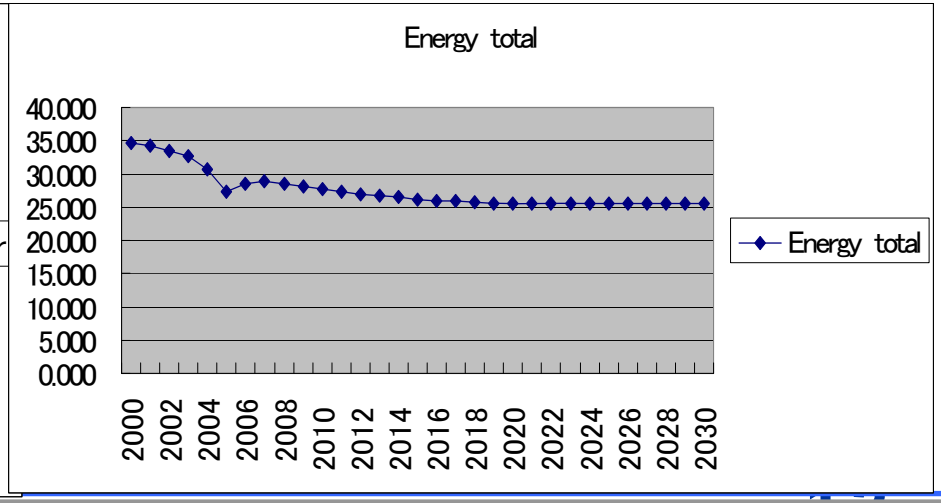
2.5 Energy Intensity of Heavy Industry

(1) Estimation method

	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power	20.113	20.161	20.040	19.928	19.825	19.432	19.238	19.215	19.215
MWh/ Bil Dinar 2005pri	2.34	0.24	-0.60	-0.56	-0.52	-0.32	-0.12	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy	23.391	23.757	23.321	22.923	22.558	21.214	20.573	20.498	20.498
ktoe/ Bil Dinar 2005pric	4.98	1.57	-1.83	-1.71	-1.59	-0.98	-0.37	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy total	28.580	28.958	28.492	28.06	27.67	26.23	25.54	25.46	25.46
ktoe/ Bil Dinar 2005price				-1.50	-1.39	-0.85	-0.32	0.00	0.00

(2) Energy intensity as pre-condition (MWh/ Bil VND of Heavy Ind), (ktoe/Bil VND)



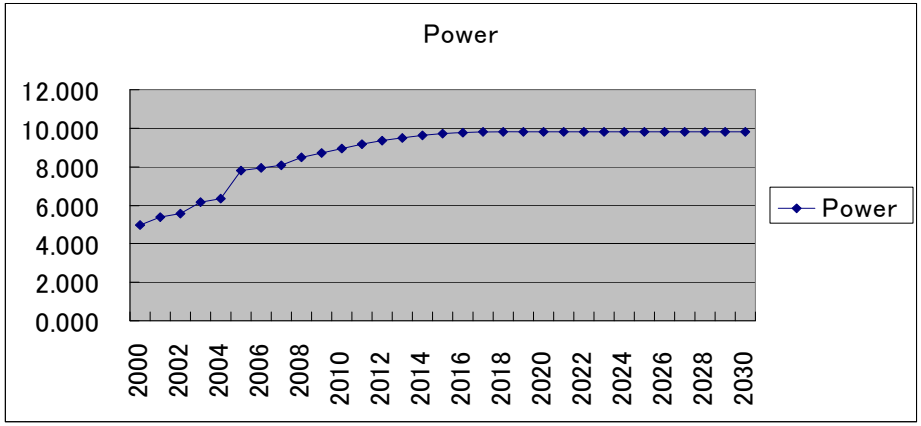


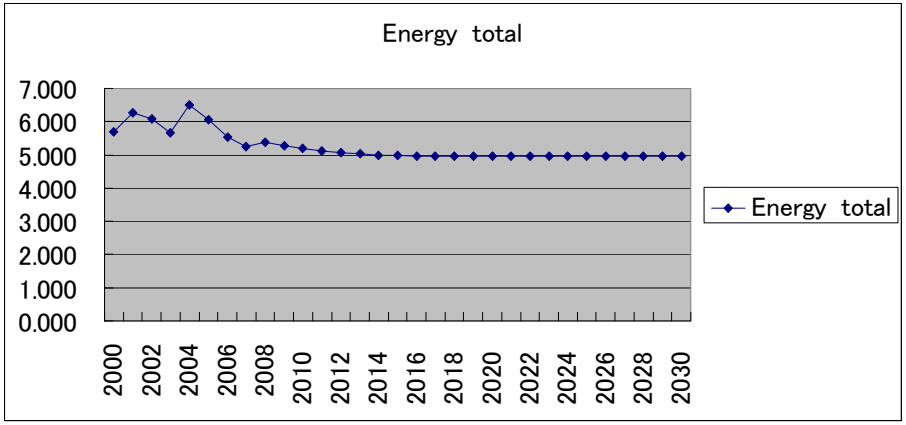
2.6 Energy Intensity of Commercial

(1) Estimation method

	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power	7.949	8.083	8.476	8.725	8.953	9.708	9.803	9.803	9.803
MWh/ Bil Dinar 2005pri	2.01	1.68	3.26	2.94	2.61	0.98	0.00	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy	3.613	3.238	3.195	3.024	2.879	2.475	2.431	2.431	2.431
ktoe/ Bil Dinar 2005pric	-14.58	-10.38	-5.96	-5.36	-4.77	-1.79	0.00	0.00	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy total	5.547	5.262	5.382	5.27	5.19	4.98	4.96	4.96	4.96
ktoe/ Bil Dinar 2005price				-1.99	-1.62	-0.42	0.00	0.00	0.00

(2) Energy intensity as pre-condition (MWh / Bil VND of Com GDP), (ktoe/Bil VND)



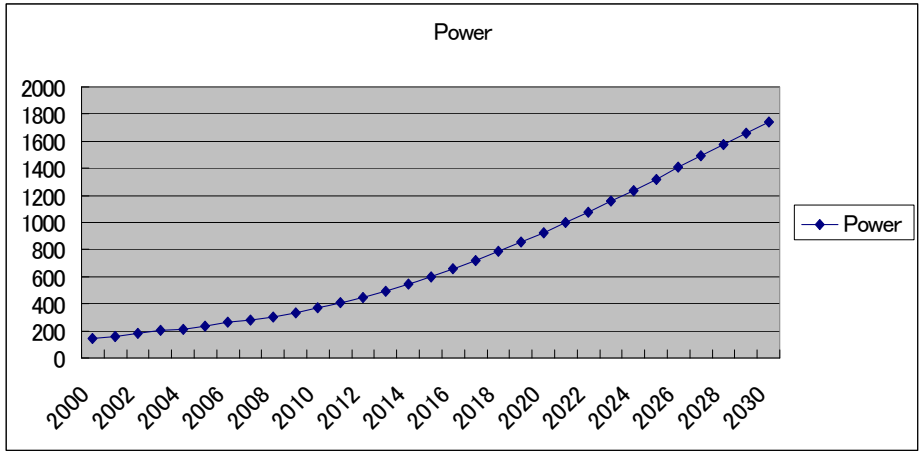


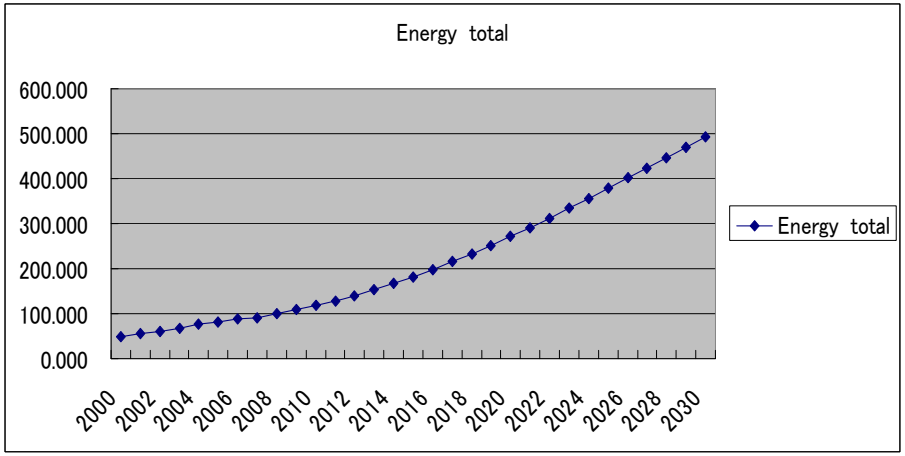
2.7 Energy Intensity of Residential

(1) Estimation method

	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power	263.0252	277.5522	305.5559	336.385	370.325	598.842	924.759	1321.320	1744.689
MWh/ 10000 person	10.22	5.52	10.09	10.09	10.09	10.09	8.41	6.73	5.04
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy	20.642	20.139	20.937	21.766	22.628	27.478	32.737	37.774	42.216
toe/ 1000 person	6.08	-2.44	3.96	3.96	3.96	3.96	3.30	2.64	2.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy total	88.503	91.748	99.770	108.55	118.17	181.98	271.32	378.67	492.35
toe/ 1000 person				8.80	8.86	9.12	7.77	6.30	4.78

(2) Energy intensity as pre-condition (MWh/ 1000 p toe/1000p)





2.8 Power Efficiency

(1) Estimation method

- Power efficiencies are estimated for VN power plants.
- The values were collected when PDP6 was studied.
- Improvement of power efficiencies are not considered.

(2) Power efficiencies as pre-condition

	1995	2000	2005	2010	2015	2020	2025	2030
Power from Thermal(Coal)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Power from Thermal(FO)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Power from Gasturbine(FO)	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Power from Gasturbine(GAS)	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Power from Gas steam	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Power from Diesel	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34

2.10 Power Supply conditions

(1)Estimation Method

- Decrease of Distribution loss is management target of EVN.
- Hydro power is flat from 2020 to 2030.
- Foreign trade balance comes from Energy M/P in 2008.
- Power from RE come from Energy M/P in 2008.
- Nuclear Power 2000MW in 2020, 6000MW in 2025 and 12,000MW in 2030.

(2) Power supply from the above items as pre-condition

		2008	2009	2010	2015	2020	2025	2030
Power distribution loss	S%	12.0	12.0	10.8	9.6	8.5	8.5	8.5
Power from Hydro	GWh	28,203	33,857	40,896	59,235	71,241	72,117	72,117
Power foreign trade balance	GWh	3,522	4,310	6,113	10,565	26,837	26,837	26,837
Power from Renewable energy	GWh	849	1,148	1,227	3,330	4,512	6,568	6,568
Power from Nuclear	GWh	0	0	0	0	12,264	36,792	73,584

3.1 Agriculture : EE&C & Power tariff elasticity

(1)Estimation method

- Technical Improvement are not set.
- As the elasticity Btw demand & tariff, -0.01 are set from 2006 to 2030.
- Power conservation rates are improved slightly.

(2) Power conservation for Agriculture sector

I	J	2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	99.9	99.6	99.6	99.5	99.4
Technical Improvement	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Elasticity to Power price		-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
Power intensity to GDP	MWh/Bil Don 2005	3.6	4.0	4.5	6.7	8.2	8.4	8.4

3.2 Light Industry : EE&C & Power tariff elasticity

(1)Estimation method

- Technical Improvement are set with –2.0% per year from 2015.
- As the elasticity Btw demand & tariff, -0.15 are set from 2010 to 2030.
- Power conservation rates are improved from 100.0 in 2009 to 66.6 in 2030.

(2) Power conservation for Light Industry sector

		2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	99.0	92.9	83.0	74.4	66.6
Technical Improvement	%	0.0	0.0	0.0	-2.0	-2.0	-2.0	-2.0
Elasticity to Power price		-0.15	0.00	-0.15	-0.15	-0.15	-0.15	-0.15
Power intensity to GDP	MWh/Bil Don 2005pri	256	263	270	299	315	317	317

3.3 Heavy Industry : EE&C & Power tariff elasticity

(1)Estimation method

- Technical Improvement are set with –2.0% per year from 2015.
- As the elasticity btw demand & tariff, -0.15 are set from 2010 to 2030.
- Power conservation rates are improved from 100.0 in 2009 to 66.6 in 2030.

(2) Power conservation for Heavy Industry sector

		2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	99.0	92.9	83.0	74.4	66.6
Technical Improvement	%	0.0	0.0	0.0	-2.0	-2.0	-2.0	-2.0
Elasticity to Power price		-0.15	0.00	-0.15	-0.15	-0.15	-0.15	-0.15
Power intensity to GDP	MWh/Bil	20.0	19.9	19.8	19.4	19.2	19.2	19.2

3.4 Commercial & Service : EE&C & Power tariff elasticity

(1)Estimation method

- Technical Improvement are set with 0% in all years.
- As the elasticity Btw demand & tariff, -0.20 are set from 2010 to 2030.
- Power conservation rates are improved from 100.0 in 2009 to 89.5 in 2030.

(2) Power conservation for Commercial & Services

		2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	98.7	93.2	91.7	90.6	89.5
Technical Improvement	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elasticity to Power price		-0.20	0.00	-0.20	-0.20	-0.20	-0.20	-0.20
Power intensity to GDP	MWh/Bil	8.5	8.7	9.0	9.7	9.8	9.8	9.8

3.5 Residential : EE&C & Power tariff elasticity

(1)Estimation method

- Technical Improvement are set with 0% in all years.
- As the elasticity Btw demand & tariff, -0.10 are set from 2010 to 2030.
- Power conservation rates are improved from 100.0 in 2009 to 94.9 in 2030.

(2) Power conservation for Residentials

		2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	100.0	97.2	96.4	95.6	94.9
Technical Improvement	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Elasticity to Power price		-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Power intensity to GDP	MWh/1000 p	306	336	370	599	925	1,321	1,745

[Ⅱ] Simulation results

4. Results of Power demand Forecasts

4.1 Power demand Forecasted by JICA & IE

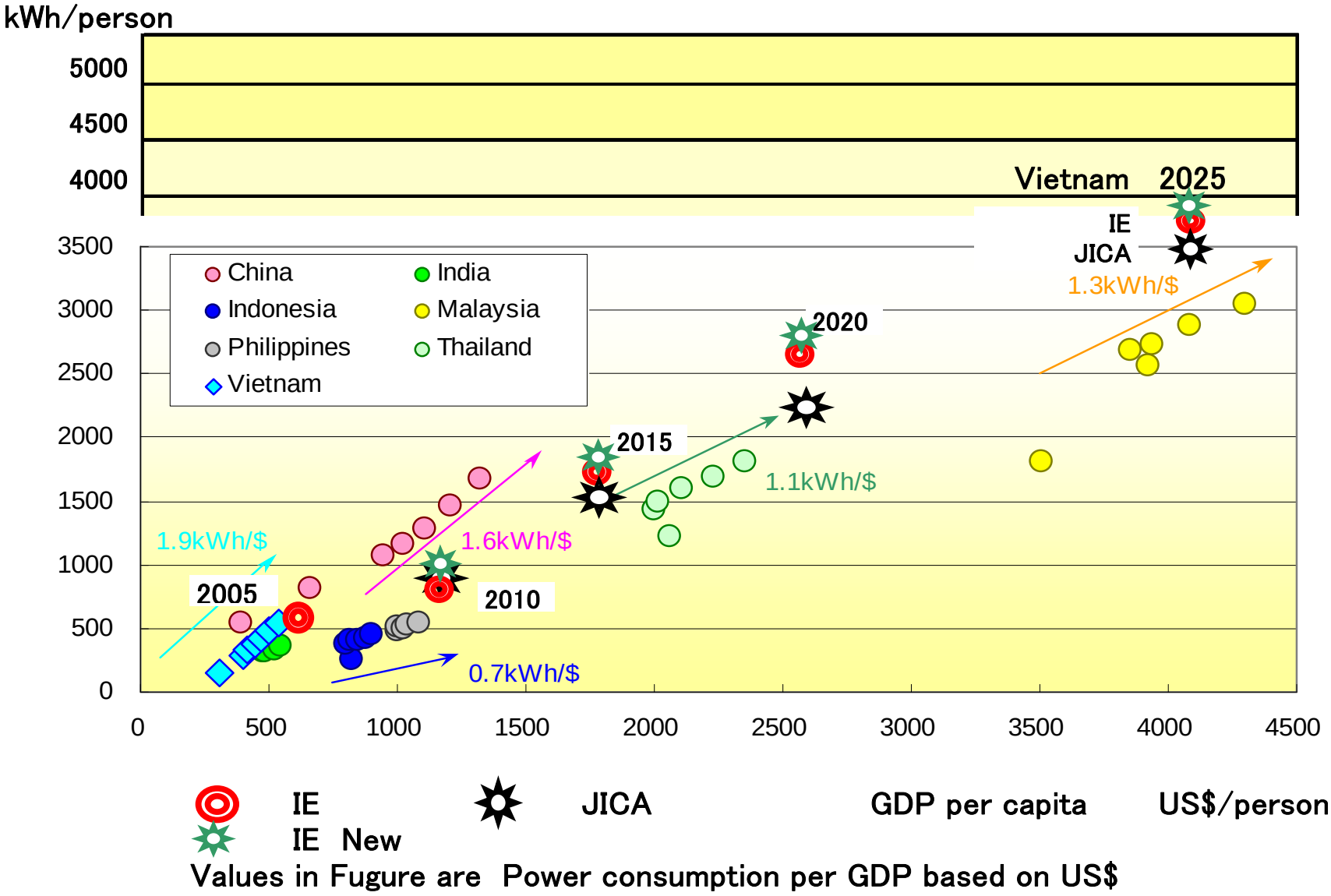
(1) Power demand by JICA TA team (GWh)

			2009	2010	2015	2020	2025	2030	2020/10	2030/20
Demand	(1)Agriculture	GWh	759	869	1,552	2,285	2,769	3,232	10.2	3.5
	(2)Industry	GWh	42,513	47,259	82,077	134,314	207,890	316,516	11.0	9.0
	(3)Commercials & Service	GWh	3,294	3,561	5,265	7,516	10,710	14,898	7.8	7.1
	(4)Residentials	GWh	29,248	32,171	50,658	78,417	111,514	147,699	9.3	6.5
	(5)Others	GWh	2,510	2,772	5,000	9,405	17,316	31,298	13.0	12.8
	Total	GWh	78,324	86,632	144,552	231,938	350,199	513,643	10.3	8.3
Elasticity	to GDP		2.0	1.9	1.4	1.2	1.1	1.0	1.3	1.0

(2) Power demand by IE (GWh)

			2009	2010	2015	2020	2025	2030	2020/10	2030/20
Demand	(1)Agriculture	GWh	700	789	1,528	1,843	1,951	2,046	8.9	1.1
	(2)Industry	GWh	38,501	44,708	89,805	145,052	210,596	294,039	12.5	7.3
	(3)Commercials & Service	GWh	3,512	4,181	9,268	12,939	16,858	22,267	12.0	5.6
	(4)Residentials	GWh	30,534	34,585	61,114	98,122	148,965	216,290	11.0	8.2
	(5)Others	GWh	2,799	3,402	8,106	14,745	23,284	34,456	15.8	8.9
	Total	GWh	76,046	87,665	169,821	272,701	401,654	569,098	12.0	7.6
Elasticity	to GDP		2.0	1.9	1.8	1.2	1.1	1.0	1.5	1.0

(3) Power demand by Country (kWh/p, GDP/p)



Values in Fugure are Power consumption per GDP based on US$

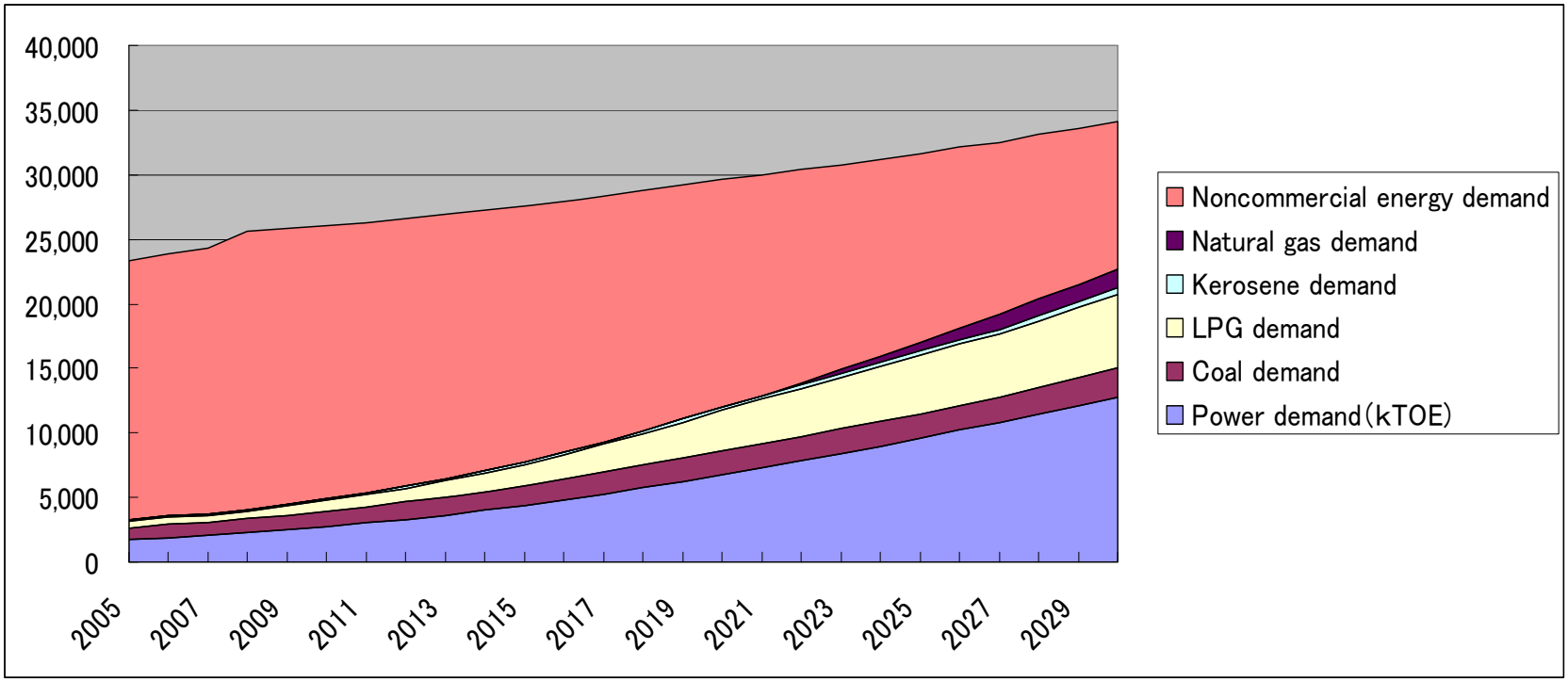
4. Results of Power demand Forecasts

(4) Growth rate of Power & Energies by JICA TA (%)

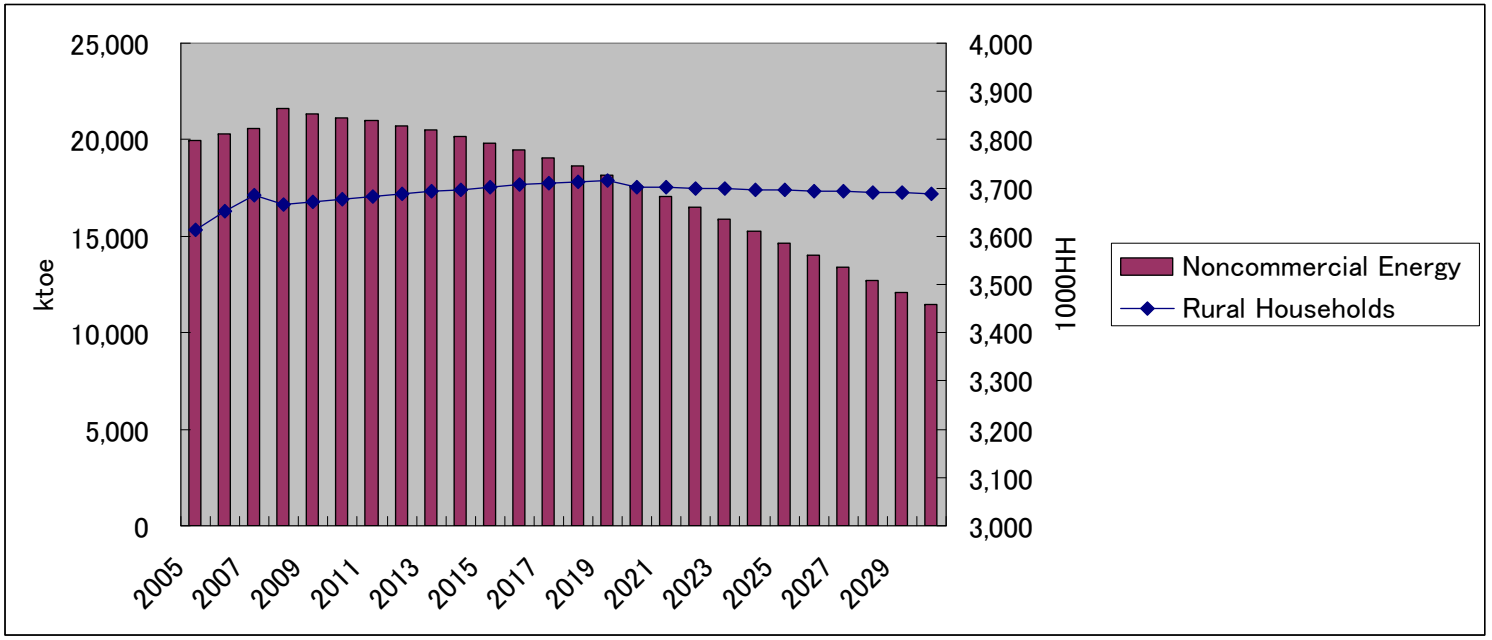
Base Case		2005/00	2010/05	2015/10	2020/15	2030/2020	2030/2010
Power demand in fina	Agriculture.Forestry.Fishery	6.0	8.6	12.3	8.1	3.5	6.8
	Industry Light	19.3	18.6	12.4	10.8	9.2	10.4
	Industry Heavy	18.1	7.4	6.1	5.6	5.3	5.6
	Transportation	6.7	18.3	21.3	19.0	15.6	17.8
	Commercials.Banking..Services.	14.8	10.5	8.1	7.4	7.1	7.4
	Residentials	12.5	10.2	9.5	9.1	6.5	7.9
	Other	19.7	7.4	8.2	8.9	8.8	8.7
	Total	15.5	13.5	10.8	9.9	8.3	9.3
	E.V. PWDMTOT/GDP	2.1	1.9	1.4	1.2	1.0	1.2
Final Energy Demand	Coal demand	9.4	5.7	8.3	7.6	6.5	7.2
	LPG demand	27.4	6.8	12.8	12.0	6.1	9.2
	Gasoline demand	14.4	6.1	3.4	2.3	2.0	2.4
	Jetfuel demand	8.2	3.7	6.1	6.2	5.5	5.9
	Kerosene demand	-1.9	-7.0	5.2	7.7	6.2	6.3
	Diesel demand	12.7	4.3	7.3	6.7	5.9	6.5
	Fuel oil demand	7.2	-6.8	3.1	6.5	6.2	5.5
	Petroleum total	12.3	3.4	6.5	6.5	5.3	5.9
	Natural gas demand	40.9	57.0	9.4	5.5	9.8	8.6
	Noncommercial energy demand	1.7	1.1	-1.3	-2.3	-4.2	-3.0
	Power	15.5	13.5	10.8	9.9	8.3	9.3
	Total(Coal+Petro+Renew+Power)	6.3	4.3	4.7	5.0	5.1	5.0
	E.V DEDTOT / GDP	0.8	0.6	0.6	0.6	0.6	0.6

(5) Energy demand of Residential

- Average growth rate of Residential is 1.3% from 2010 to 2030.
- Wood & Charcoal will be substituted by Electricity and LPG.
- As assumption, small amount of Natural gas is used from 2021 in South.



(6) Wood & Charcoal Demand in Residential



Demand of Wood & Charcoal is decreased by 3% per year.

21,000 ktoe in 2010 11,000 ktoe in 2030

Number of Household does not change during the targeted year.

3.6 Million HH in 2010 3.7 Million HH in 2030

4. Results of Power demand Forecasts

4.2 Sectoral Power demand shares of VN and JP

(1) Forecasted by JICA and IE

		2010	2015	2020	2030
JICA	Industry & Agriculture	55.4	57.6	58.6	62.1
(%)	Com, Service & Other	7.3	7.1	7.3	9.0
	Residential	37.3	35.3	34.0	28.9
IE	Industry & Agriculture	51.9	53.8	54.2	53.0
(%)	Com, Service & Other	8.6	10.2	10.2	10.1
	Residential	39.5	36.0	35.6	36.9

(2) Actual shares in Japan

		1980	1985	1990	2000
Japan	Industry & Agriculture	66.1	61.0	56.8	52.0
(%)	Com, Service & Other	11.2	14.4	17.1	18.3
	Residential	22.7	24.6	26.1	29.6
Japan	Industry & Agriculture	306	330	385	446
1000GWh	Com, Service & Other	52	78	116	157
	Residential	105	133	177	254
	Total	463	541	678	857

4.3 Power demand per Population and GDP in VN and JP

(1) Per Pop and GDP by JICA

	Unit	2010	2015	2020	2030
Population	Mil persons	89	93	98	103
GDP (US$ 2005 price)	Bil US$ 2005	73.4	105.3	155.3	334.5
Power demand per capita	kWh/person	972	1,539	2,361	4,974
Power demand per GDP	kWh/US$	1.17	1.36	1.48	1.53

(2) Per Pop and GDP in Japan

		2006
Population	Mil persons	128
GDP (US$ 2005 price)	Bil US$ 2005	5,088
Power Demand (Sales)	Bil kWh	927
Power demand per capita	kWh/person	7,200
Power demand per GDP	kWh/US$	0.18

4.4 Sectoral Power ratio in Final Demand

(1) Viet Nam

Power ratio in Final energy consumption

		2005	2010	2015	2020	2025	2030
Agriculture	%	8.7	8.9	9.0	9.2	9.2	9.2
Light Industry	%	35.4	52.5	48.5	46.9	47.3	47.9
Heavy Industry	%	7.1	7.3	7.5	7.7	7.9	8.1
Transoportation	%	0.4	0.7	1.5	2.9	5.1	8.3
Commercial & Services	%	12.6	19.8	23.3	23.4	23.9	24.0
Residential	%	51.3	55.8	55.6	55.7	55.8	55.9

(2) Japan

		1975	1985	1995	2005
Industry	%	15	19	20	22
Commercial & Service	%	20	36	43	49
Transportation	%				
Residential	%	31	33	39	43

5. Regional Power demand Forecasts

5.1 Regional Population & GDP

(1) Population

- South population share is not changed from 2009 to 2030.
- North population share is declined slightly.
- Central population share is increased.

Population & Regional shares

			2009	2010	2015	2020	2025	2030
Northern	Population	Million	38.0	38.3	40.0	41.6	42.4	43.3
	Shares. of Population	S%	43.2	43.1	42.9	42.6	42.4	42.1
	Urban Population	Million	8.2	8.4	9.8	11.2	12.09	12.99
	Shares of Urban	S%	21.5	22.0	24.5	27.0	28.5	30.0
Central	Population	Milliom	19.5	19.7	21.0	22.2	23.0	23.9
	Shares. of Population	G%	22.2	22.2	22.5	22.7	23.0	23.2
	Urban Population	Million	4.4	4.5	5.0	5.5	6.2	6.9
	Shares of Urban	S%	22.7	22.9	23.9	24.9	26.9	28.9
Southern	Population	Milliom	30.4	30.7	32.3	33.8	34.7	35.6
	Shares. of Population	S%	34.6	34.6	34.6	34.6	34.6	34.6
	Urban Population	Million	12.1	12.3	13.8	15.2	16.2	17.1
	Shares of Urban	S%	39.7	40.2	42.7	45.2	46.7	48.2

5. Regional Power demand Forecasts

(2)Regional GDP

- GDP share in Northern is 34% in 2010, to 32% in 2030.
- GDP share in Central is 11% in 2010, to 11% in 2030.
- GDP share in Southern is 56% in 2010, to 57% in 2030.

RGDP 2005 price

			2009	2010	2015	2020	2025	2030
Northern	RGDP	Billion Dol	174	184	257	373	548	814
	Industry	Billion Dol	69	75	117	190	306	494
	Commercial	Billion Dol	75	79	106	146	200	273
	Agriculture	Billion Dol	30	30	33	37	41	46
Central	RGDP	Billion Dol	55	58	85	131	195	293
	Industry	Billion Dol	17	18	29	48	76	121
	Commercial	Billion Dol	23	25	38	60	92	140
	Agriculture	Billion Dol	15	15	18	22	27	33
Southern	RGDP	Billion Dol	285	304	440	659	985	1,475
	Industry	Billion Dol	132	141	209	321	488	743
	Commercial	Billion Dol	109	117	174	266	406	618
	Agriculture	Billion Dol	44	45	57	72	91	114

5.2 Regional Power demand

(1) Power demand and Shares

- Northern share does not change from 2010 to 2030.
- Central share increases with 1% from 2010 to 2030.
- Southern share decreases with 1.4% from2010 to 2030.

Reginal Power Demand (Power: GWh, Share; %)

		2005	2010	2015	2020	2025	2030
Power demand	North	17,805	31,029	51,500	82,797	125,895	186,365
	Central	4,442	8,346	14,378	24,028	36,600	53,907
	South	23,355	47,257	78,674	125,113	187,705	273,371
	Total	45,603	86,632	144,552	231,938	350,199	513,643
Share	North	39.0	35.8	35.6	35.7	35.9	36.3
	Central	9.7	9.6	9.9	10.4	10.5	10.5
	South	51.2	54.5	54.4	53.9	53.6	53.2
	Total	100.0	100.0	100.0	100.0	100.0	100.0

5. Regional Power demand Forecasts

(2) Power demand by Region and Sector

・Growth rates of Industry and Other (Transportation) are the highest in the sectors.

Regional Power Demand (GWh)

		2005	2010	2015	2020	2025	2030	30/10
Northern	N-total	17,805	31,029	51,500	82,797	125,895	186,365	9.4
	Agriculture.Forestry.Fishery	339	425	771	1,098	1,258	1,379	6.1
	Industry & Construction	7,662	15,061	26,513	44,443	70,909	111,446	10.5
	Commercials & Services.	620	983	1,345	1,760	2,303	2,937	5.6
	Residentials	8,483	13,607	21,188	32,393	45,775	60,450	7.7
	Others	700	953	1,683	3,103	5,650	10,152	12.6
Central	C-total	4,442	8,346	14,378	24,028	36,600	53,907	9.8
	Agriculture.Forestry.Fishery	54	76	119	169	205	241	5.9
	Industry & Construction	1,573	3,571	6,603	11,442	18,045	27,923	10.8
	Commercials & Services.	192	362	550	818	1,181	1,668	7.9
	Residentials	2,416	4,032	6,507	10,384	14,852	19,781	8.3
	Others	207	304	598	1,214	2,316	4,295	14.2
Southern	S-total	23,355	47,257	78,674	125,113	187,705	273,371	9.2
	Agriculture.Forestry.Fishery	180	368	661	1,018	1,306	1,612	7.7
	Industry & Construction	12,068	28,627	48,961	78,429	118,936	177,147	9.5
	Commercials & Services.	1,350	2,215	3,370	4,939	7,226	10,293	8.0
	Residentials	8,931	14,532	22,963	35,639	50,887	67,468	8.0
	Others	826	1,515	2,719	5,087	9,350	16,851	12.8
whole	Country total	45,603	86,632	144,552	231,938	350,199	513,643	9.3
	Agriculture.Forestry.Fishery	574	869	1,552	2,285	2,769	3,232	6.8
	Industry & Construction	21,302	47,259	82,077	134,314	207,890	316,516	10.0
	Commercials & Services.	2,162	3,561	5,265	7,516	10,710	14,898	7.4
	Residentials	19,831	32,171	50,658	78,417	111,514	147,699	7.9
	Others	1,734	2,772	5,000	9,405	17,316	31,298	12.9

(3) Load factor & Peak demand by Region

- Load factor in Southern is the highest in the regions.
- Peak demand in the country is 90GW in 2030 from 16GW in 2010.

Load Factors (%)& Peak demand(MW)

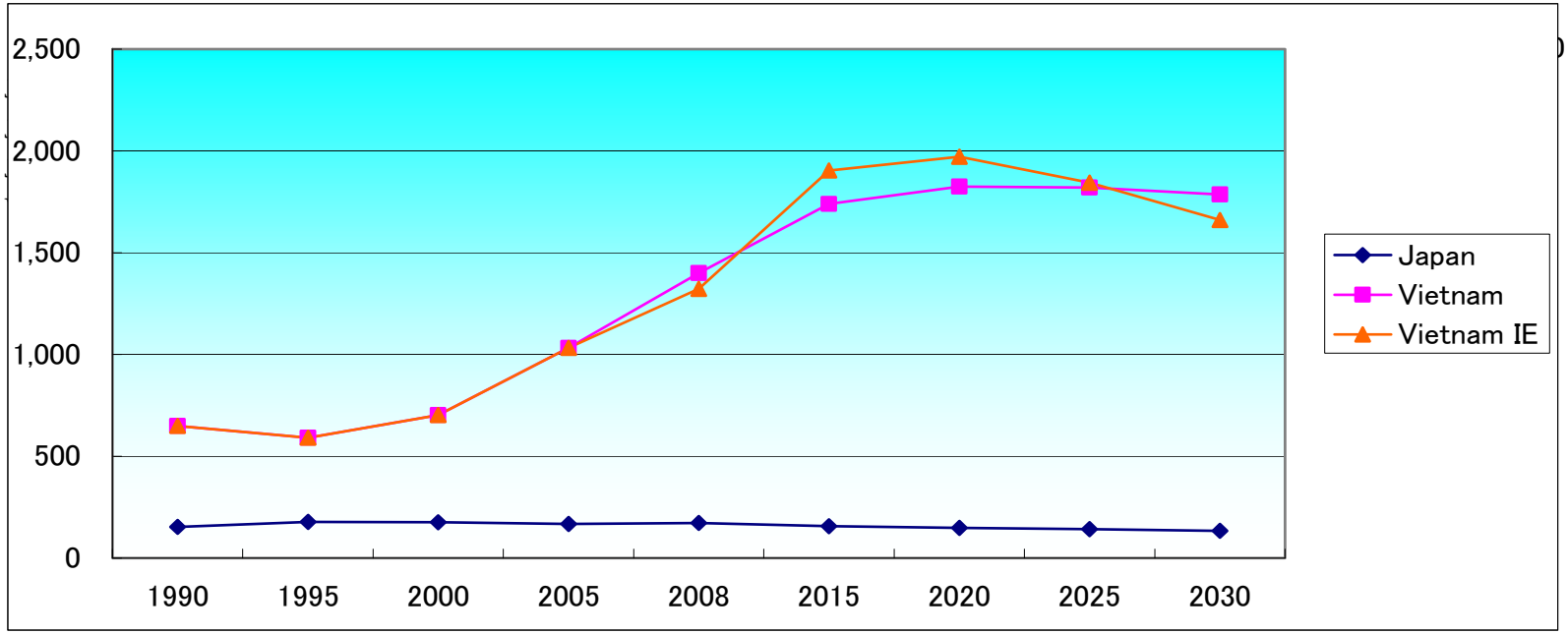
		2005	2010	2015	2020	2025	2030	30/10
Northern	Load factor (%)	58	59	62	64	67	69	0.8
	Peak demand (MW,	3,925	6,652	10,477	16,024	23,448	33,453	8.4
Central	Load factor (%)	59	61	62	64	66	66	0.4
	Peak demand (MW,	958	1,737	2,887	4,658	6,921	10,194	9.3
Southern	Load factor (%)	64	66	67	69	71	71	0.3
	Peak demand (MW,	4,644	9,085	14,620	22,493	32,977	48,027	8.7
Country	Load factor (%)	63	70	70	70	70	70	0.0
	Peak demand (MW,	9,255	15,654	25,836	41,039	61,964	90,884	9.2

6.1 Industry : Power & Energy Intensity

(1) Power Intensity to Industrial GDP

Power intensity to Industrial GDP (GWh/Billion US$)

	1990	1995	2000	2005	2008	2015	2020	2025	2030
Japan	154	177	175	167	172	156	148	141	134
Vietnam	649	591	703	1,032	1,400	1,740	1,825	1,821	1,787
Vietnam IE	649	591	703	1,032	1,322	1,904	1,971	1,844	1,660



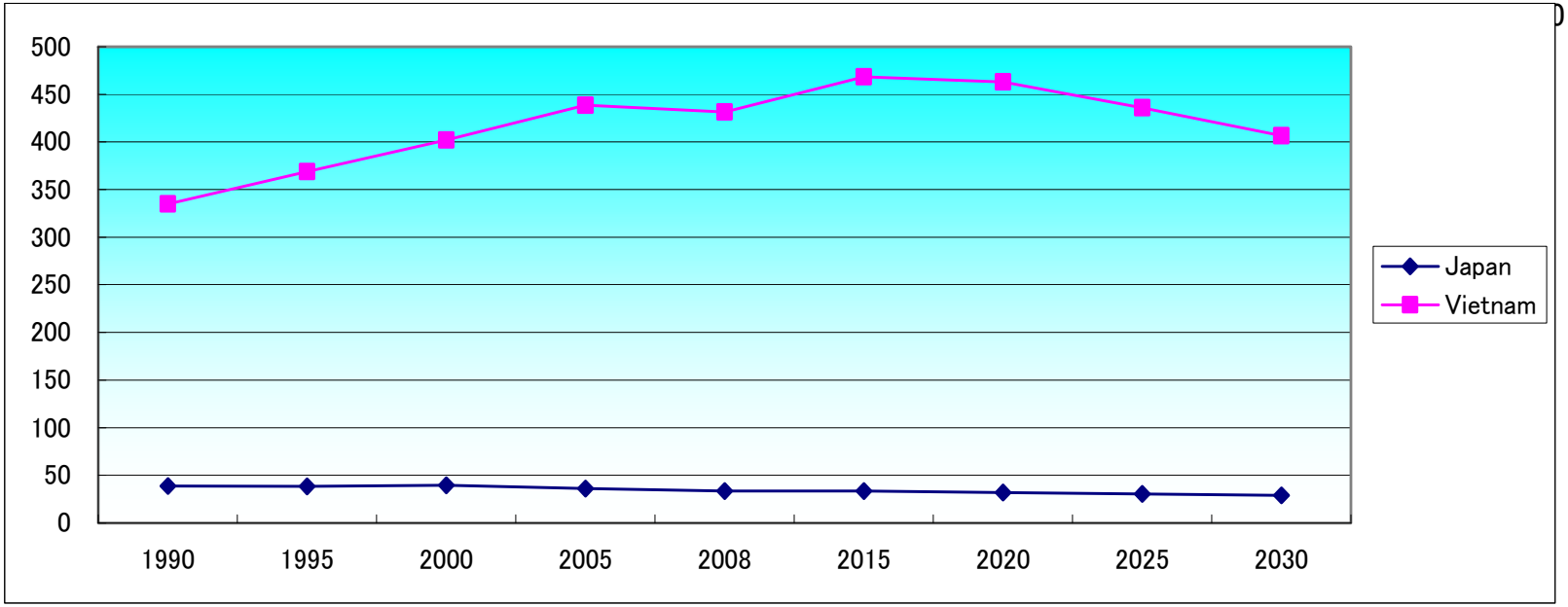
Japan's Intensities are improved with 1% per year.

Vietnam's Intensities are estimated by IE and JICA TA.

(2) Energy Intensity to Industrial GDP

Energy intensity to Industrial GDP (TOE/MillionUS$)

	1990	1995	2000	2005	2008	2015	2020	2025	2030
Japan	39	39	40	36	34	34	32	30	29
Vietnam	335	369	402	439	431	468	463	436	407



Japan's Intensities are improved with % per year.

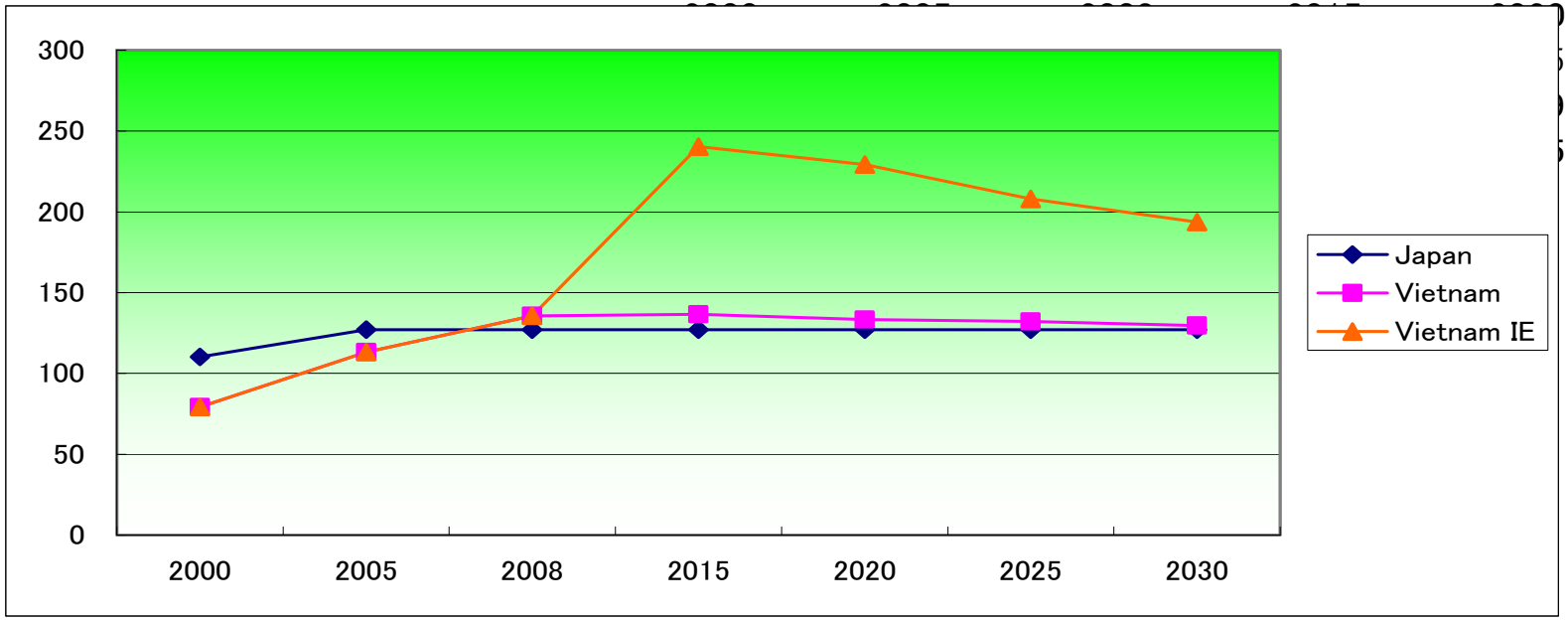
Vietnam's Intensities are estimated by JICA TA.

6.2 Commercial & Service : Power & Energy Intensity

(1) Power Intensity to Commercial & Service GDP

Power intensity to Commsercail & Service GDP (GWh/BillionUS$)

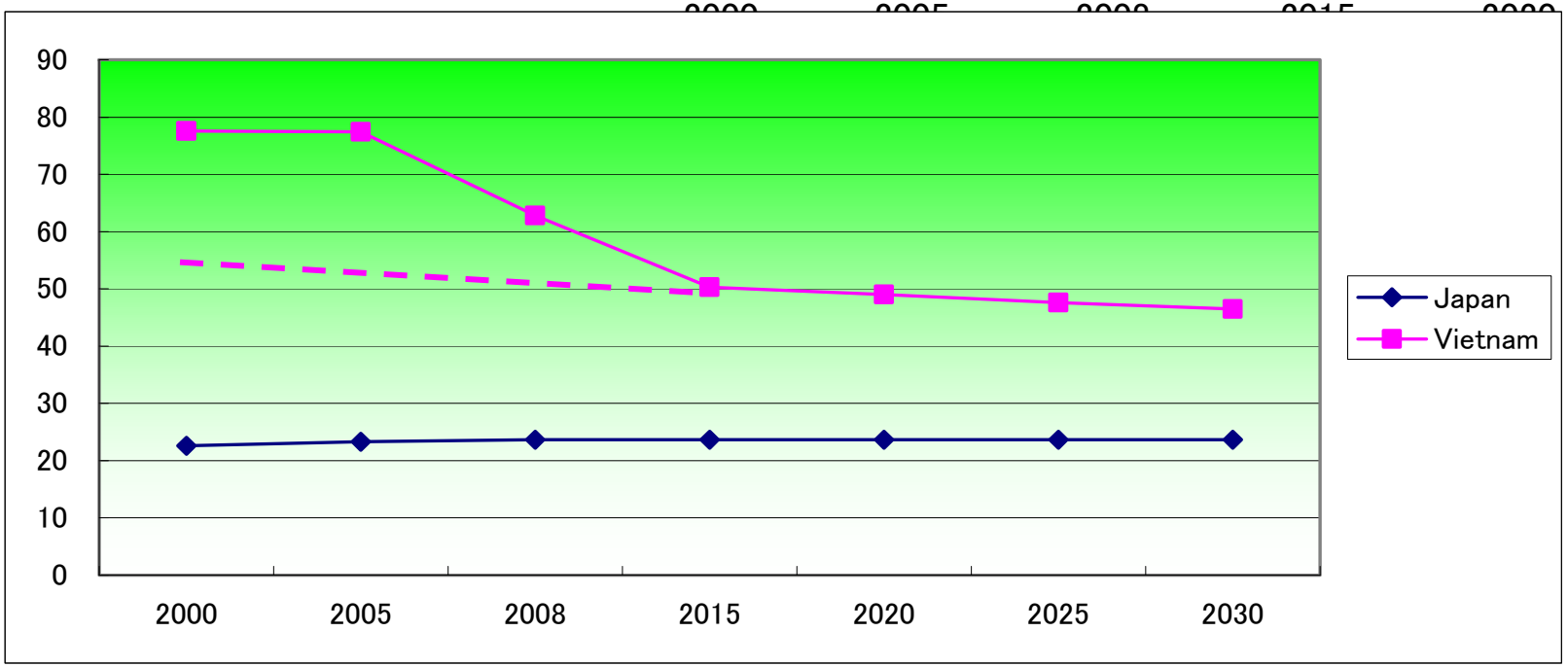
	2000	2005	2008	2015	2020	2025	2030
Japan	110	127	127	127	127	127	127
Vietnam	79	113	136	137	133	132	130
Vietnam	79	113	136	240	229	208	194



(2) Energy Intensity to Commercial & Service GDP

Energy intensity to Commsercail & Service GDP (TOE/MillionUS$)

	2000	2005	2008	2015	2020	2025	2030
Japan	23	23	24	24	24	24	24
Vietnam	78	77	63	50	49	48	47

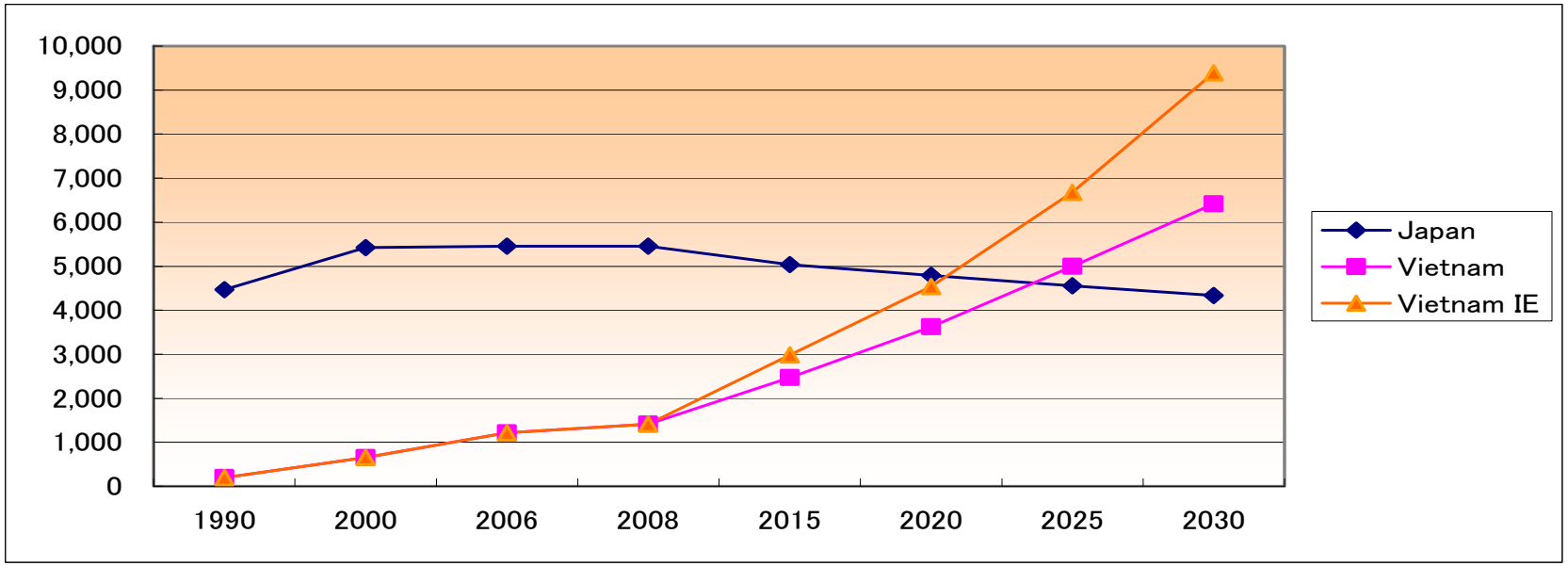


6.3 Residential : Power & Energy Intensity

(1) Power Intensity to Household

Power intensity to Household (kWh/HH)

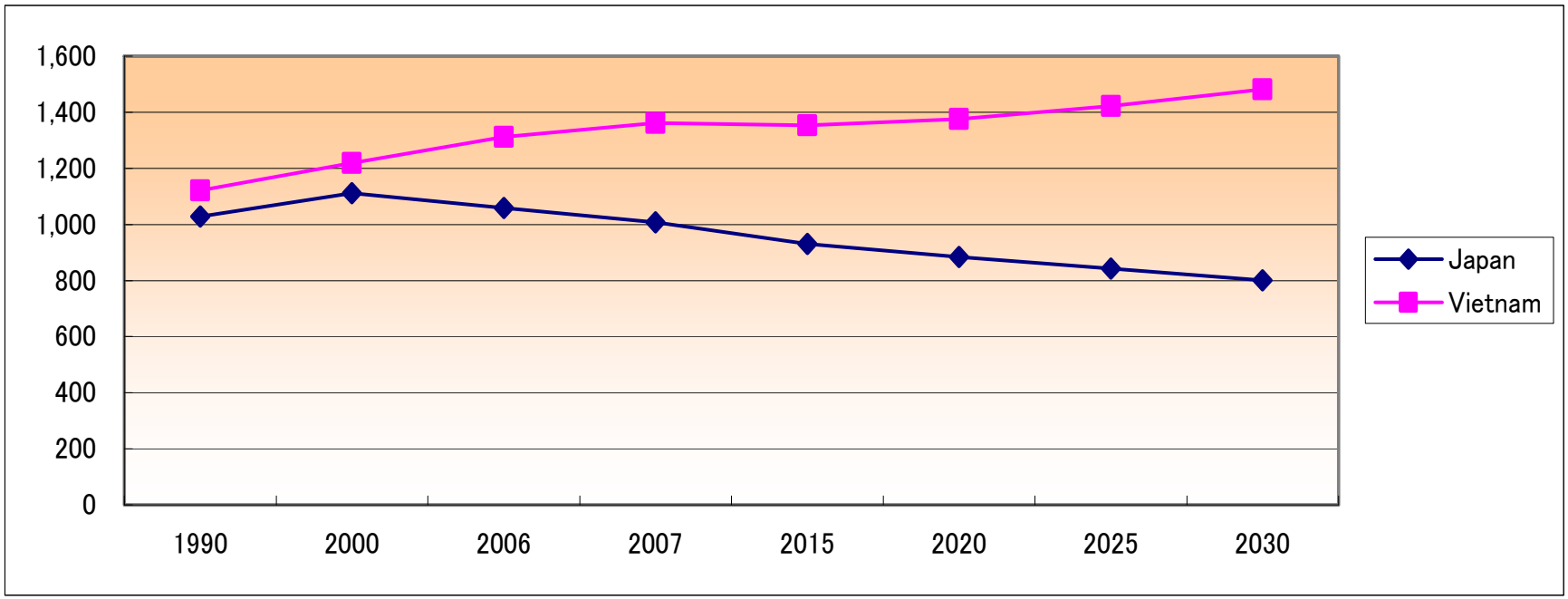
	1990	2000	2006	2008	2015	2020	2025	2030
Japan	4,470	5,420	5,456	5,450	5,033	4,789	4,556	4,335
Vietnam	194	653	1,214	1,410	2,471	3,626	4,997	6,413
Vietnam IE	194	653	1,214	1,410	2,981	4,537	6,675	9,392



(2) Energy Intensity to Household

Energy intensity to Household (TOE/1000HH)

	1990	2000	2006	2007	2015	2020	2025	2030
Japan	1,029	1,111	1,058	1,007	930	885	842	801
Vietnam	1,122	1,219	1,312	1,362	1,353	1,375	1,423	1,481



7. Discussion points

When Power demand by JICA TA is adjusted by Large scale projects, the Power demand are changed to the following table.

		2005	2009	2010	2015	2020	2025	2030
Model forecast	GWh	46,045	78,324	86,632	144,552	231,938	350,199	513,643
Planned	GWh			12,000	30,000	55,000	80,813	98,321
Achievement	%			10	70	60	50	40
Additional demand	GWh			1,200	21,000	33,000	40,407	39,329
Total demand	GWh	46,045	78,324	87,832	165,552	264,938	390,606	552,972
(GR)	%			13.8	13.5	9.9	8.1	7.2
IE demand	GWh		76,046	87,665	169,821	272,701	401,654	569,098
(GR)	%			13.7	14.1	9.9	8.1	7.2

7.1 About Power demand growth rate from 2010 to 2015

Power demand during 2010-2105 has to be testified by using other material and data.

7.2 About Industrial energy intensity to GDP

Industrial energy intensity to GDP increases from 2010 to 2030, however Japanese energy intensity in Industrial sector relatively is lower than estimated industrial intensity in VN.

7.3 Energy demand in Residential sector

Current energy demand in Residential sector is 1.3% up from 2010 to 2030, more high growth rate can be considered, it is around 2% during the years.

7.4 Industrial power intensity

Power intensity of Light industrial sector may go moderately down, comparing to current power intensity to GDP.

7.5 Commercial & Service power intensity to GDP

IE estimation of Commercial & Service sector is little bit strange when comparing it to power intensity of JICA TA.

Thank you

添付資料 2.D

経済分析・需要予測支援に使用した主な説明資料

（大型施設調査結果）

A Large-Scale Facility

Survey
&
power demand forecast

The JICA TATeam

Tatsuyuki ASAKURA

2/June,2010

1.1 Objective of survey

This survey was done to make the power demand from 2010 to 2030 using forecasting model.
This model can make a forecast in steady economic status.

But the model cannot reflect the power demand from a new large scale facility in the low GDP stage.

So the power demand from a new large scale facility should individually be estimated and added into the result from the forecasting model.

In order to estimate the power demand of a large scale facility we have to get its information.

1.2 Survey procedure

We wanted to ask local consultants to survey of a large scale facility development plan.

We selected 1 local consultant from 3 candidates.

We selected and entrusted the local consultant to survey.

We got the report from that consultant.

1.3 Survey field

The field of survey is as follows.

1 Industrial zones
2 Commercial facilities
3 Harbor and Airport
4 Resort
5 Railway and subway
6 Street light
7 Academic city

2.1 Survey result-industrial zone

This is the sample of result of industrial zone in south area.

No	Name	Category	Province	Capacity or area	Power demand (MW)			
					2008	2010	2015	2020
1	Hoa Khanh	CIZ	Da Nang	423.5 ha	28	40	45	50
2	Hoa Khanh	CIZ	Da Nang	207 ha			4	6
3	Lien Chieu	CIZ	Da Nang	373,5 ha	20	30	37	45
4	Hoa Cam	CIZ	Da Nang	125 ha	3	6	13	18
5	Da Nang	CIZ	Da Nang	41 ha	3	4	7	8
6	Tho Quang seafood service	CIZ	Da Nang	77 ha	5	5	9	12
7	Thanh Vinh industrial cluster	CIZ	Da Nang	22	2	3	4	4
8	Thanh Vinh II industrial cluster	CIZ	Da Nang	27				4

If the power demand in 2008 is greater than 0, this zone is not new. So this project should be neglected.

2.2 Survey result-commercial

No	Name	Organization	Location	Land area	Investment
1.	PVN tower	Petrovietnam& Ocean Group	Hanoi	NA	US$1 billion
2.	Associates International building	Associates International	HCMc	NA	US$1,2 billion
3.	Keagnam tower	Keangnam Vina	Hanoi	46.000 m2	US$500 million
4.	Long Giang building	Long Giang co.,	Hanoi	11.235 m2	VND800 million
5.	Thanh Binh hotel	PVEP	Thái Bình	10.045 m2, GFA 44.702 m2	VND503 million
6.	Harmony Tower	EVN Land	Da Nang		VND850 million

Schedule of Construction	Facility	Capacity
Commision in 2015	Office building	102 floors
Commision in 2014	Office building	
Commision this year	Office, Apartment	
Start construction in Q3/2010; Commission in Q4/ 2013	Office, Apartment, Supermarket	
Start construction in Q1/2010; Commission in 2013	Hotel, Office, Apartment, Supermarket	
Start construction in Q1/2010; Commission in Q3/2012		

2.3 Survey result-resort

No	Name	Organization	Location	Region	Land area
1.	Ho Tram Resort	Asian Coast Development Corp, Canada	Ba Ria – Vung Tau	South	170 ha
2.	Bai Dai Resort	Starbay Holdings, England	Phu Quoc	South	
3.	Le Meridien Danang Resort & Spa	Saigon-Danang investment co.,	Da Nang	Central	12ha; GFA-125.000 m2
4.	Good Choice resort	American Good Choice	Ba Ria – Vung Tau	South	
5.	Bai Truong		Phu Quoc	South	155ha

Investment	Schedule of Construction	Facility	Capacity
US$4,2 Billion	First stage will finish in 2010; First stage will finish in 2013	Hotel, casino, entertainment, expro, …	1114 rooms
US$1,64 Billion		Hotel, villa, entertainment	2 5-star hotel and 150 villa
US$110 million	Operate in 2013	Hotel, villa	149 apartment, 48 villa
US$1,3 Billion		Hotel, villa, entertainment	
VND 800 billion	Commission in 2013	Hotel, villa	

Golf field 70 is approved by 2020.

2.4 Survey result-railway

N o.	List	Length (km)	Total investment (VND billion)	Up to 2010	
				Investment contents and scale	Fund (VND billion)
B1	On major axes		307,297		7,500
1	Yen Vien - Pha Lai - Ha Long -Cai Lan	128	8,708	Building of new single-track railway	5,500
2	Bien Hoa - Vung Tau	79	15,168	Electrified dual-track of a gauge of 1,435 mm	1,000
3	Lao Cai - Hanoi -Hai Phong (Lao Cai - Yen Vien -Hai Phong)	381	91,200	New electrified dual-track of a gauge of 1,435 mm	1,000
4	Dong Dang -Hanoi (Dong Dang - Yen Vien)	156	30,000		
5	Railway for bauxite exploitation (Dak Nong - Binh Thuan)	253	14,336		

During 2011-2020		Up to 2030		
Investment contents and scale	Fund (VND billion)	Invest-ment contents and scale	Fund (VND billion)	Projected capital sources
	205,459		94,338	
Building of new single-track railway	3,208			Govern-ment bonds
Electrified dual-track of a gauge of 1,435 mm	14,168			State budget, enterprises or BOT
New electrified dual-track of a gauge of 1,435 mm	90,200			State budget, enterprises or BOT
Electrified dual-track of a gauge of 1,435 mm	30,000			State budget, enterprises
Electrified dual-track of a gauge of 1,435 mm	14,336			Enter-prises or BOT

2.5 Survey result-sea port

No	Name of port	Current status		Classification	Development plan By 2015		By 2020	
		Status of operation	Size of ship (thousand DWT)		Capacity (million tons/year)	Size of ship (thousand DWT)	Port capacity (million tons)	Size of ship (thousand DWT)
I	Group of northern Vietnam seaports (group 1)							
1	Van Gia port	Operational	2 ÷ 5	Local general, grade II	1.5 ÷ 2	5 ÷ 10	3.5 ÷ 4.5	5 ÷ 10
2	Hai Ha port	Not yet constructed		Specialized, with general wharf		30 ÷ 50		30 ÷ 80
3	Van Hoa port. Mui Chua	Operational	2 ÷ 3	Local general, grade II	0.5 ÷ 1	3 ÷ 5	2 ÷ 2.5	3 ÷ 5
4	Cam Pha port	Operational	30 ÷ 50	Specialized, with general wharf	20 ÷ 22	20 ÷ 70	25 ÷ 27	20 ÷ 80
5	Hon Gai port	Operational		National general, key regional, grade I				
a	Cai Lan wharf area	Operational	10 ÷ 40	General, container	10 ÷ 12	20 ÷ 50	15 ÷ 18	20 ÷ 50
b	Thang Long cement wharf. Ha Long; Ha Long electricity	Operational	10 ÷ 20	Specialized cement, clinker, coal	3 ÷ 3.5	10 ÷ 20	3 ÷ 3.5	10 ÷ 20
c	B12 oil port	Operational	10 ÷ 40	Specialized liquid cargo	2.5 ÷ 3	10 ÷ 40	-	-
d	Hon Gai passenger wharf	Operational		Specialized international tourists, North-South	0.4 ÷ 0.5 million passengers	80 ÷ 100 GRT	0.6 ÷ 0.7 million passengers	80 ÷ 100 GRT

2.6 Survey result-river port

No	Name	Province/Region	Current		Adjustment. Supplementation (by 2020)	
			Maximum Ship tonnage	Capacity	Maximum Ship tonnage	New Capacity
I	Cargo ports	North	(T)	10^3 tons/ year	(T)	10^3 tons/year
a	Adjustment of the size of some ports					
1	Hanoi port	Hanoi	1,000	1,200	1,000	500
	Khuyen Luong port	Hanoi	1,000	1,225	1,000	1,680
3	Viet Tri port	Phu Tho	400	1,250	600	2.500-3.000
4	Ninh Binh port	Ninh Binh	1,000	1,570	1,000	2,500
5	Ninh Phuc port	Ninh Binh	1,000	2,430	3,000	
6	Hoa Binh port	Hoa Binh	200	550	300	550
7	Da Phuc port	Thai Nguven	400	300	300	700
b	Supplementat ion of the planning on ports	North				
1	Phu Dong port	Hanoi	400	2,300	600	1,100
2	Chem port	Hanoi	400	400	400	400
3	North Hanoi port (new)	Hanoi	1,000	4,500	400	2,000
4	Chu Phan port	Vinh Phuc	200	510	200	800
5	Duc Bac port	Vinh Phuc			200	500
6	Vinh Thinh port	Vinh Phuc			400	500

2.7 Survey result-airport

No	Name	Promotion Organization	Location	Area	New capacity
1.	Noi Bai expansion (Station T2)	MOT	Noi Bai, Ha noi close to existing Noi Bai airport (T1)	GFA 138.000m2 (T2 only)	20 – 25 million passengers/year, 260.000 ton of freight/year by 2020 (included T1)
2.	Noi Bai expansion (Station T3)	MOT	Noi Bai, Ha noi, at the South of T1	NA	50 million passengers/year (included T1 and T2)
3.	Cat Bi international airport (upgrade)	MOT	Hai Phong, North	491,13 ha	2 million passengers/year, 17.000 ton of freight/year by 2015; 4 million passengers/year, 82.000 ton of freight/year by 2025
4.	Da nang international airport (upgrade)	MOT	Danang, Central	NA	6 million passengers/year, 400.000-1 million ton of freight/year

Runway	Investment	Schedule of construction
02 – width 23m, 43 aircraft packing pots (included T1)	US$804 million (of which US$630 million ODA)	Start in 2-2011, Commission at the end of 2013, (now it's under ground clearance)
03 – width 23m (included T1 and T2)	US$1.200 Million	After 2020
Upgrade 01- 3050 x 50m.	VND 960,8 billion through 2010; VND 291,9 billion during 2011-2015; VND451,9 billion during 2016-2025. Total 1.704,6 billion	to be confirmed
upgrade 01- 3500 x 50m	US$74 million	under construction, commistion at the end of this year

2.8 Survey result-road

This data comes from the magazine “Vietnam Ecomic News 2009/11/15”

	Length（km）
South-East Highway 2 roads	3,262
Highway in northern district	1,099
Highway in central district	264
Highway in south district	984
Coast road	3,127
Road along the national border	4,432
合計	13,168

2.9 Survey academic city

No	Name	Organization	Location	Land area (ha)	Investment	Schedule of Construction	Facility
1	Hoa Lac hi-tech park	MOST	Hanoi	1,500	US$96 million	In operation	University, Collge, Institute, Production, Office, Hotel
2	Sai Gon hi-tech park	MOST	HCMc	913	VND 8.000 billion	In operation	University, Collge, Institute, Production…
3	Nam Thang Long biological hi-tech park	MOST	Hanoi	280.39	VND 400 billion	In operation	Institute, Production…
4	Da nang hi-tech park	Danang people committe	Danang	1,400	NA	Tobe confirmed	Educating center, Institute, Production…in biological, new material, IT

New project is just only one, but start year is not decided yet.

3.1 Power demand of Facility – method

Data of facility development plan is not enough in order to estimate power demand . But the power demand should be estimated from limited data.

1 Search the similar existing facility to facility under consideration.

2 Get the scale and power demand of existing facility

Scale can be represented by floor area, length, passenger, cargo etc.

3 Get the power demand per unit scale of the existing facility

index = power demand / scale

4 Estimate power demand of facility under consideration

power demand = scale * index

3.2 Power demand index list

Facility	scale Unit	Index	per year
Industrial park	area	1.276	GWh/ha
	worker	7	MWh/person
Hotel	floor area	424	KWh/m2
	room	7	MWh/room
Office	floor area	175	KWh/m2
Shopping center	floor area	324	KWh/m2
House		1.4	MWh/HH
Villa		0.7	MWh/villa
Golf field		489	MWh/golf
Railway	length	80	MWh/km
Metro	length	6	GWh/km
Port	cargo	0.98	KWh/ton
	passenger	1.24	KWh/ton
Airport	passenger	0.19	KWh/person
High way road	length	11.6	MWh/km

3.3 Power demand index – office and shopping center

Data of power consumption of various buildings.

office ： 788 MJ／m2・year

shopping center： 1,458 MJ／m2・year

(statistical data in Tokyo in 2000)

modify point：energy saving 20% after 10 years

unit change ： 1KWh = 3.6 MJ

office = 788/3.6*0.8 = 175 KWh/m2

shopping center = 1458/3.6*0.8 = 324 KWh/m2

3.4 Power demand index – house and apartment

Vietnam statistical

Residential sector : power demand 26,504 GWh in 2008

18.8 million households

→ **26504/18.8 = 1.4 MWh/HH**

assumption 1 household area = 100 m2/HH

Then unit area(1m2) of household : power demand is

$$\frac{\text{1.4 [MWH]}}{\text{[HH]}} \Big/ \frac{\text{100 [m2]}}{\text{[HH]}} = \text{14 KWh/m2}$$

Ex) Vietcombank Tower(HCMc) power demand at 2013

scale = 3200 m2

office power demand = 3200/3 * 175 = 0.19 GWh/year

super market = 3200/3 * 324 = 0.35 GWh/year

apartment = 3200/3 * 14 = 0.015 GWh/year

3.5 Power demand index – hotel(floor area, room no)

Niigata hotel in Japan

floor area : 12,890m2
room number : 309
power demand : 5.465 GWh / year

index(floor area) : 5.465/12890 =424 KWh/m2/year

Assumptions : ratio of guest room area to total area : 40%

Then 1 room area : 12890*0.4/309 = 16.6 m2

index (room): 0.424*16.6 = 7MWh/room/year

3.6 Power demand index – hotel (area, investment)

Ex1) Ho Tram Resort(Bia Ria-Vung Tau)
170ha, investment US$4.2 billion, 1114 rooms

Power demand : 7 MWh/room * 1114 = 7.798 GWh/year

To estimate the other index of resort hotel by using this data

unit area : 7.798 GWh / 170ha = 45.9 MWh / ha

unit investment : 7.798 GWh / 4.2 US$billion
= 1.86 GWh /1 US$billion

3.7 Power demand index – villa, golf field

Assumption : Villa is equivalent to household with 50% load

index(villa) : 1.4 MWh/HH* 0.5 = **0.7 MWh / 1villa**

Ex2) Hotel De Royale Da Lat : 2 hotel x 100 rooms, 69 villa
Power demand : 7MWh*2*100 + 69*0.7MWh = 1.45 GWh/year

Index of golf field
Maximum area of golf field in Vietnam is limitted by 100ha
Hachiouji golf field in Japan : area 100 ha
index(golf field) : **0.489 GWh / 1 golf**

Ex) 70 golf fields are supposed to be approved by 2020
power demand = 70*0.489 = 34 GWh / year at 2020

3.8 Power demand index – transportation

Transportation sector power demand in 2008 ＝539 GWh

railway + port + airport + road

This sector consumes mainly power by lightning. The port also consumes power by treating cargo and supplying power to a ship staying in wharf.

Assumption of power demand in each transportation means

Railway = 539 / 3 = 180 GWh/year

Port = 539 / 3 = 180 GWh/year : cargo = 184,259,000 ton

Road = 539 / 3 = 180 GWh/year : length = 160,089 km

Airport = 0 (Number of airport is now not so big)

3.9 Power demand index – railway and metro

Railway :

Total length of railway= 2,256km

Index(length) : 180 /2256 = 80 MWh / km

Metro

Sample : Metro in Bangkok in 2005

total length = 20 km

station number = 18

power demand = 120 GWh/year

index(length) 120 / 20 = 6 GWh / km

Ex) New Can Giuoc car terminal - Ho Chi Minh City bridge

total 17km by 2011-2020

power demand : 17 * 6 = 102 GWh/year at 2020

3.10 Power demand index – port

Total cargo = 184,259,500 ton
（by Statistical Yearbook of Vietnam 2008)

Index(cargo) : 180 / 184,259,500 = 0.98 KWh/ km

Ex) Eastern Mekong River delta area
14 ~ 16 million ton by 2015
26 ~ 28 million ton by 2020

Power demand : (14+16)/2 * 0.98 = 14.7 GWh / year at 2015
(26+28)/2 * 0.98 = 26.5 GWh / year at 2020

3.11 Power demand index – air port

Haneda airport data in Japan at 2004

passengers	62,876,182	persons
cargo	651,387	ton
power demand	11.9	GWh

The cargo is so small that passenger number should be used as index.

power demand index = 11.9*10**6/62,876,182
= 0.19 KWh/person

Ex) Long Thanh international airport
50 million passengers by 2015
so power demand = 0.19 * 50 * 10**6 / 10**6
= 9.5 GWh at 2015

3.12 Power demand index – road

The Power : lightning in street light and gasoline stand.

Total length = $160{,}089$ (Yearbook of Vietnam 2008)

Assumption 1: Power consumption come from all gasoline stand so far.

index(length) 180 / 160,089 = 1.1 MWh/km

(30.4 MWh/1 gasoline stand in Japan)

If we can get total number of gasoline stand in Vietnam, we can estimate the total power demand by gasoline stand.

Assumption2: on street light

1 Light is set on both side of road

2 interval of between lights = 100m

3 light capacity = 120W

4 lightning time 12 hours / day

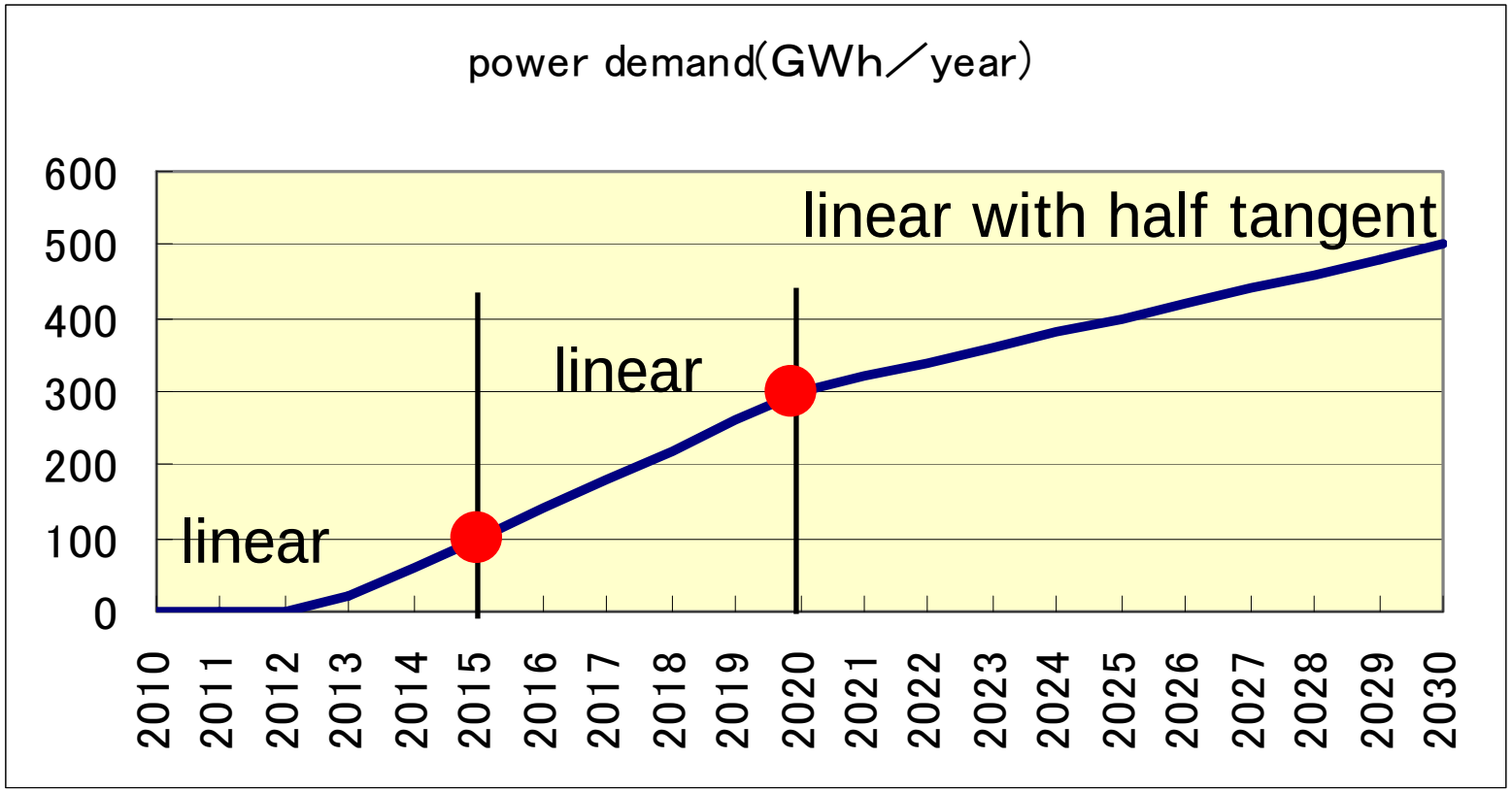
Index(length) :1000/100*2*120*12*365/1000000=10.5MWh/km

Total index(length) = 1.1 + 10.5 = 11.6 MWh / km

3.13 Power demand by year

The target year of a plan is usually 2015 or 2020.

We want to get power demand by year from 2010 to 2030.
The method is used by using linear interpolation or extrapolation



4 Total power demand by large scale facilities

district	facility	2010	2015	2020	2025	2030
Northern	industrial zone	6,590	19,782	42,731	54,206	65,681
	commercial	53	97	128	155	183
	transportation	9	108	212	274	344
	total	6,652	19,987	43,071	54,635	66,208
		2010	2015	2020	2025	2030
Central	industrial zone	373	3,297	7,754	9,982	12,210
	commercial	2	11	41	67	97
	transportation	4	128	253	344	436
	total	379	3,436	8,048	10,329	12,675
		2010	2015	2020	2025	2030
Southern	industrial zone	10,636	24,160	38,590	45,804	53,019
	commercial	8	60	99	133	167
	transportation	37	154	896	942	989
	total	10,681	24,375	39,585	46,879	54,174
		2010	2015	2020	2025	2030
Grand total	industrial zone	17,598	47,239	89,074	109,992	130,910
	commercial	63	169	268	355	446
	transportation	51	390	1,361	1,560	1,769
	total	17,712	47,798	90,704	111,907	133,125
ratio of industrial zone		99%	99%	98%	98%	98%

Acknowledgement

Thank you !

添付資料 2.E

経済分析・需要予測支援に使用した主な説明資料（解析結果）

Power Demand Forecasts for PDP7

June 2010

JICA Expert
Tomoyuki Inoue

CONTENTS

[Ⅰ] Base Case p03

[Ⅱ] High Case p17

[Ⅲ] Low Case p31

[I] Base Case

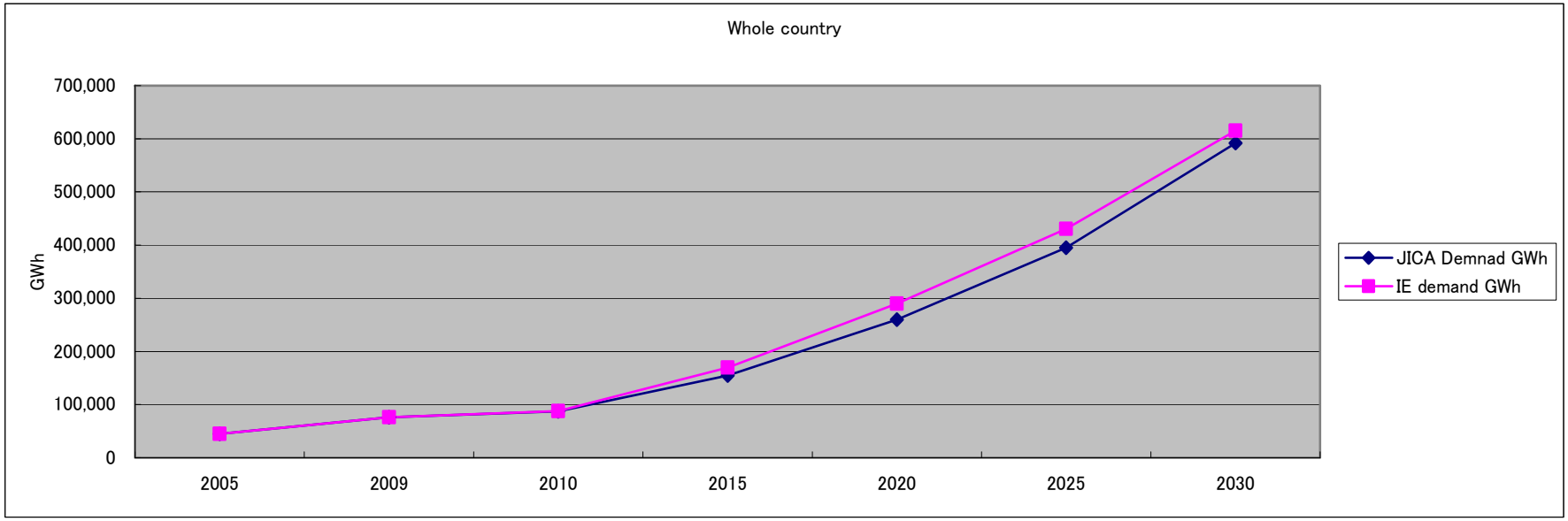
Base: Whole Country Power demand

Whole country

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	44,832	76,046	87,111	154,576	260,000	395,033	592,211
IE demand	GWh	44,832	76,046	87,665	169,821	289,882	430,867	615,205

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		14.1	14.2	12.2	11.0	8.7	8.4
IE demand	%		14.1	14.4	14.1	11.3	8.2	7.4

JICA Demnad	GWh	44,832	76,046	87,111	154,576	260,000	395,033	592,211
Model Forecasts	GWh	44,832	76,046	83,580	140,315	231,662	361,643	552,485
Additional demand	GWh			3,531	14,261	28,338	33,390	39,726
Additioanl rate	%			**4.1**	**9.2**	**10.9**	**8.5**	**6.7**

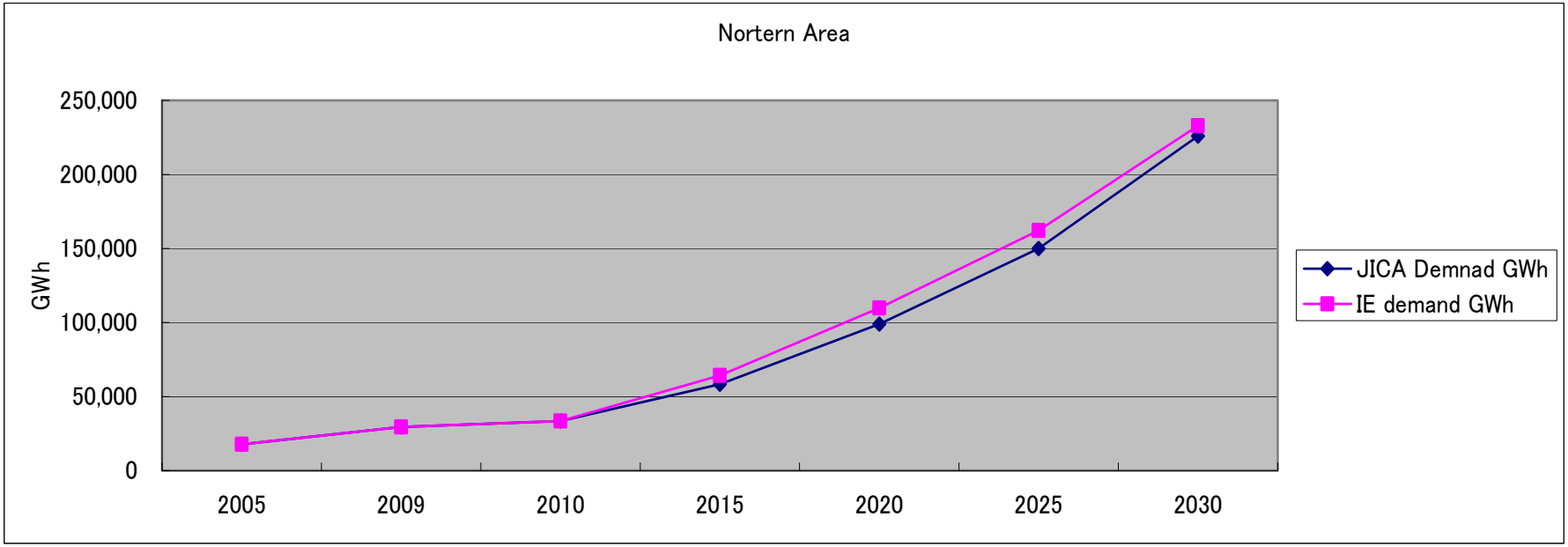


Base: North Power demand

Northern

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	17,805	29,445	33,554	58,409	98,906	150,081	225,932
IE demand	GWh	17,805	29,445	33,537	64,153	109,756	162,031	232,747

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.4	13.5	11.7	11.1	8.7	8.5
IE demand	%		13.4	13.5	13.9	11.3	8.1	7.5

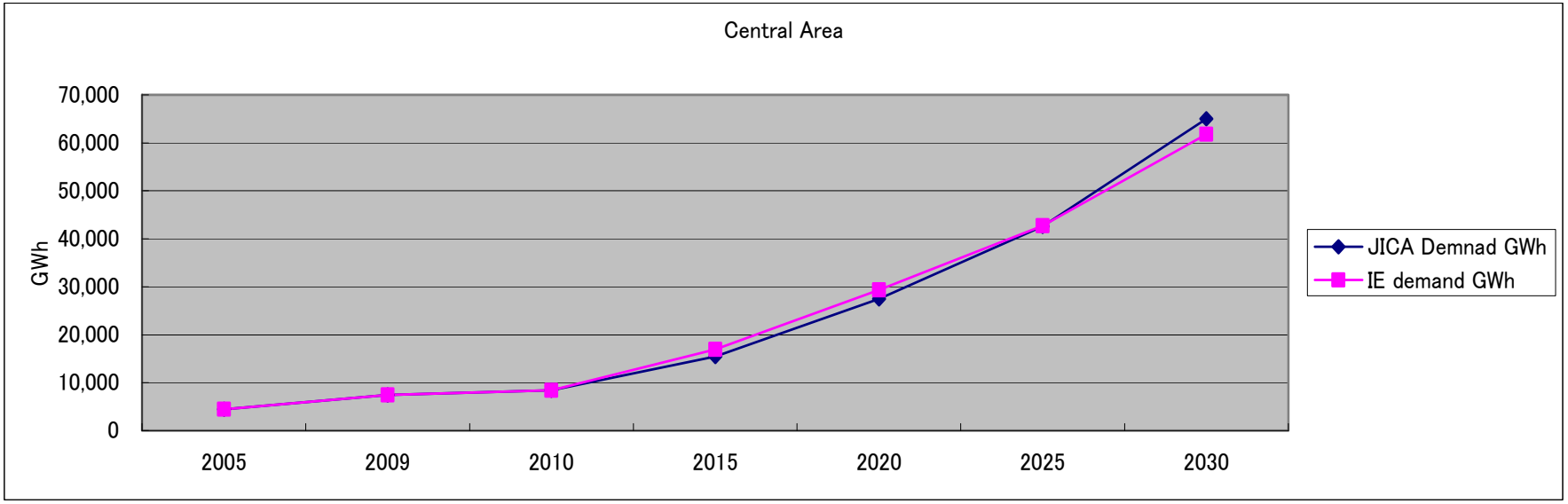


Base: Central Power demand

Central

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	4,442	7,426	8,392	15,476	27,494	42,579	65,026
IE demand	GWh	4,442	7,426	8,403	16,936	29,324	42,754	61,812

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.7	13.6	13.0	12.2	9.1	8.8
IE demand	%		13.7	13.6	15.0	11.6	7.8	7.7

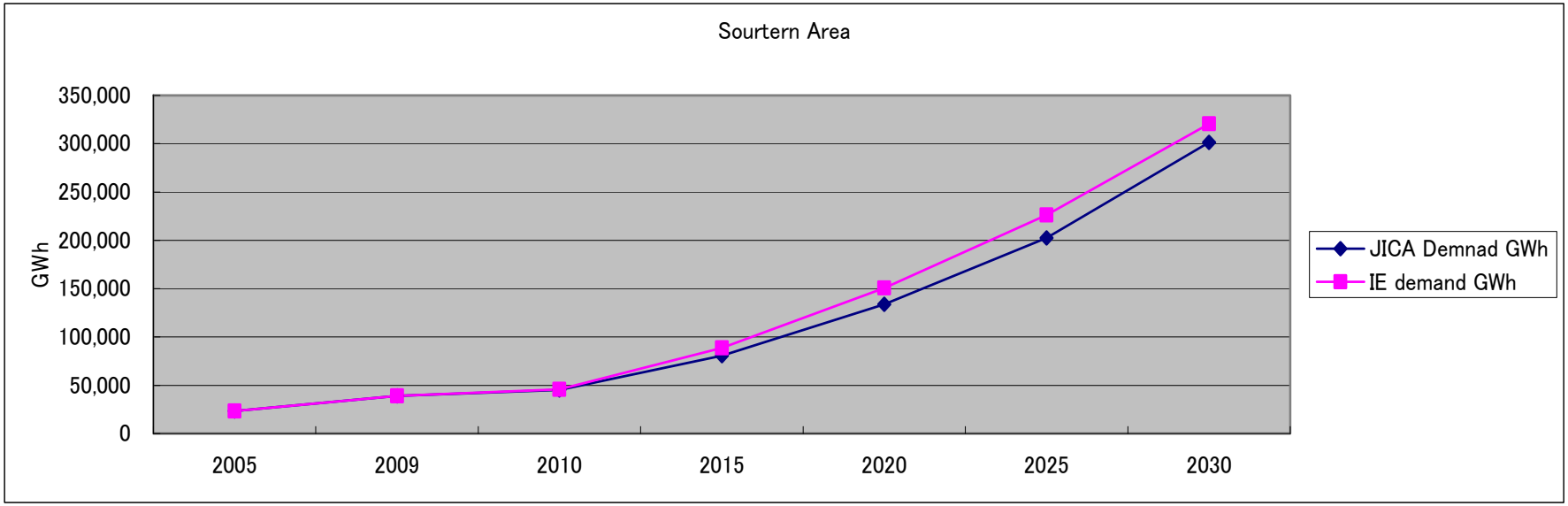


Base: South Power demand

Sourtern

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	23,355	39,175	45,165	80,692	133,599	202,373	301,253
IE demand	GWh	23,355	39,175	45,724	88,733	150,802	226,082	320,646

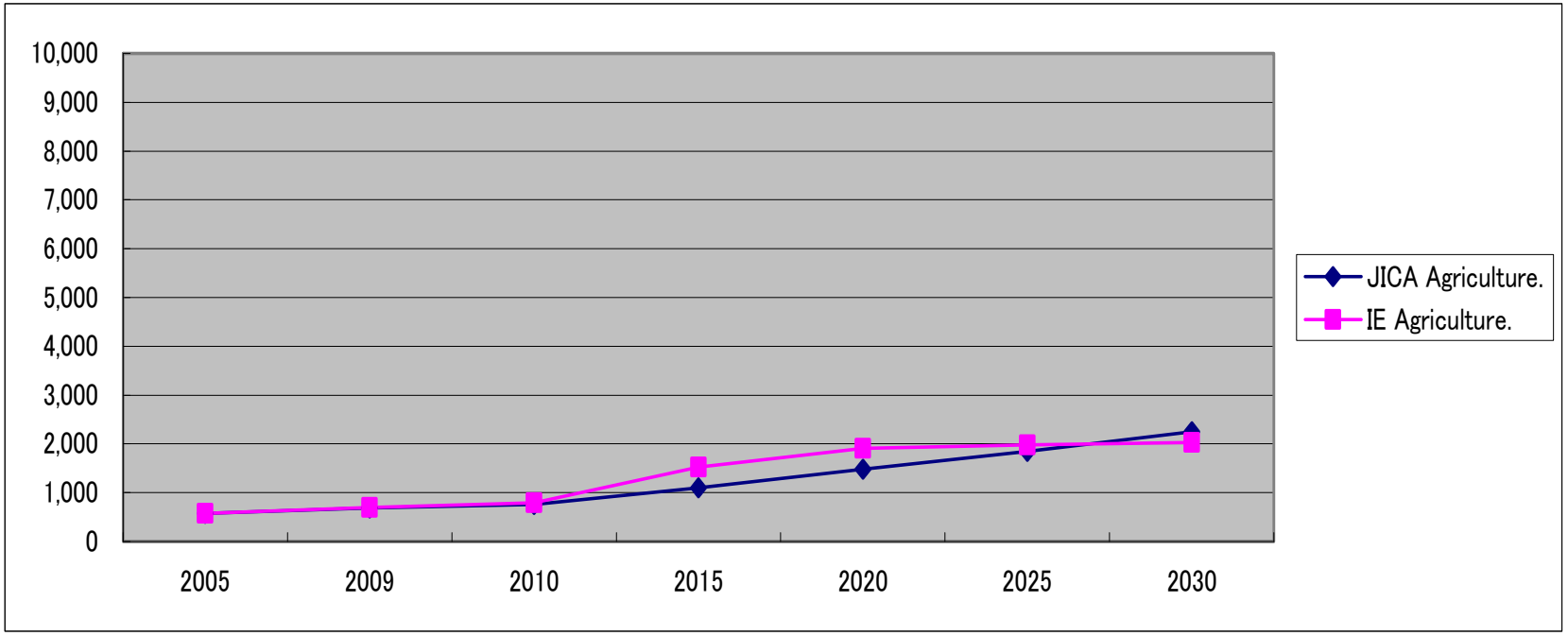
		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.8	14.1	12.3	10.6	8.7	8.3
IE demand	%		13.8	14.4	14.2	11.2	8.4	7.2



Base: Agriculture sector Power demand

Agriculture & Forestry in Whole

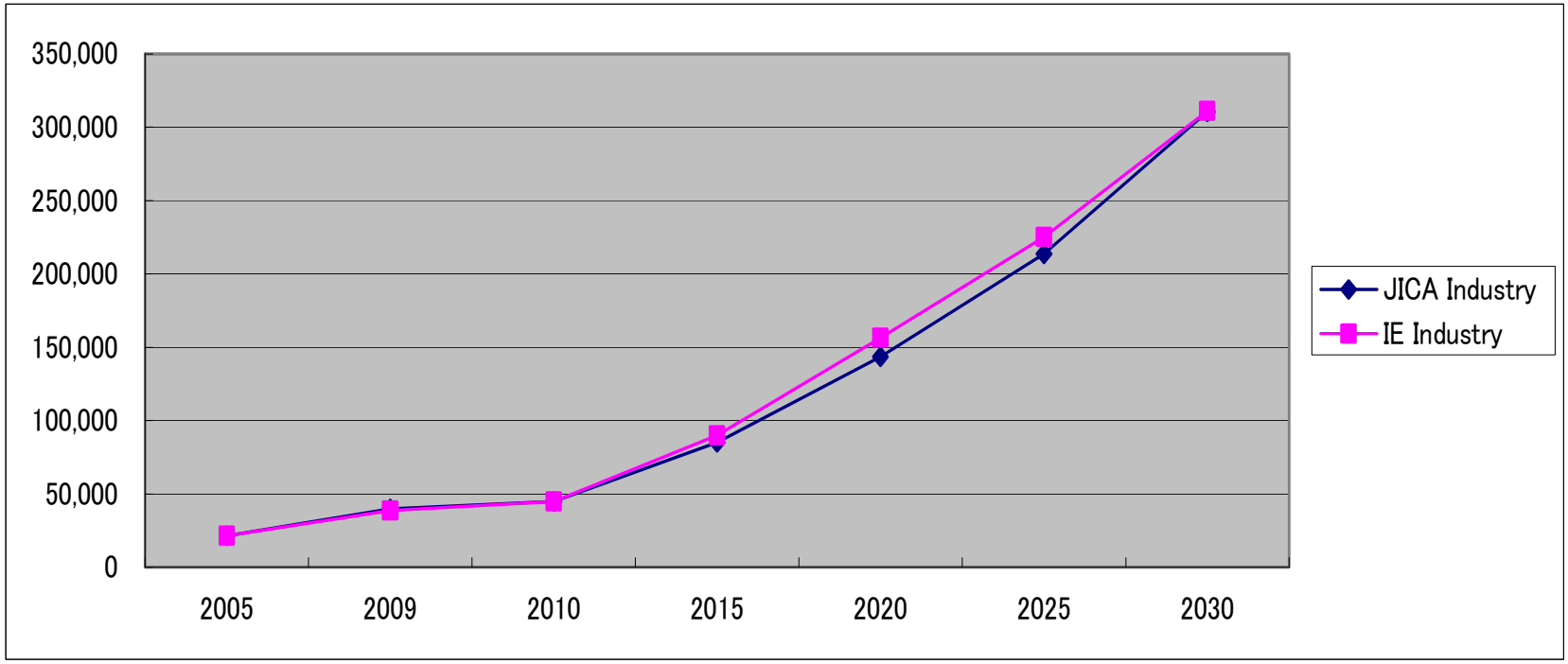
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Agriculture.	574	690	761	1,094	1,484	1,848	2,249	6.9
IE	Agriculture.	574	700	789	1,528	1,908	1,978	2,026	9.2



Base: Industry sector Power demand

Industry & Construction in Whole

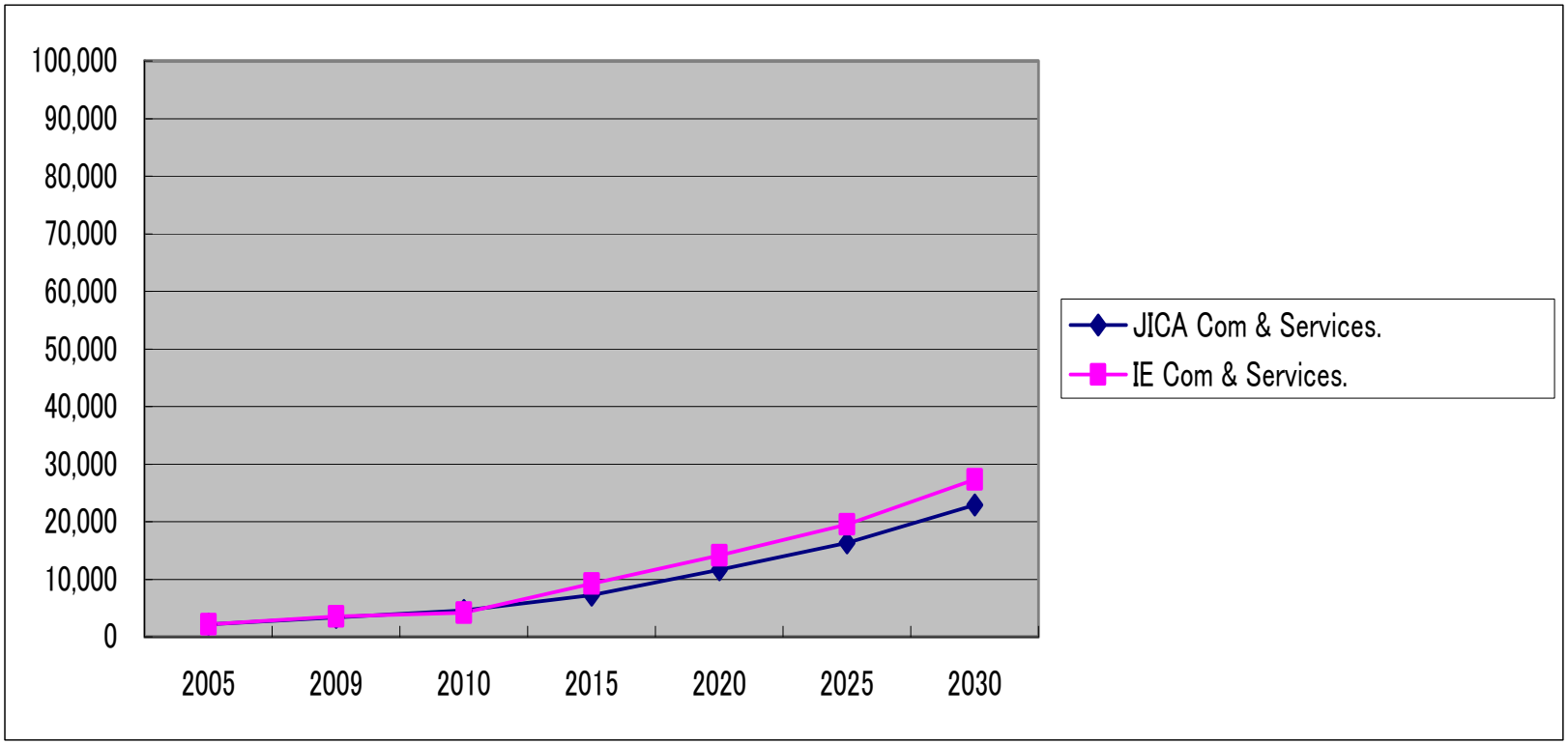
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Industry	21,302	39,822	44,895	85,201	143,341	213,534	310,457	12.3
IE	Industry	21,302	38,501	44,708	89,805	156,458	225,264	311,052	13.3



Base: Commercial sector Power demand

Commercial & Services

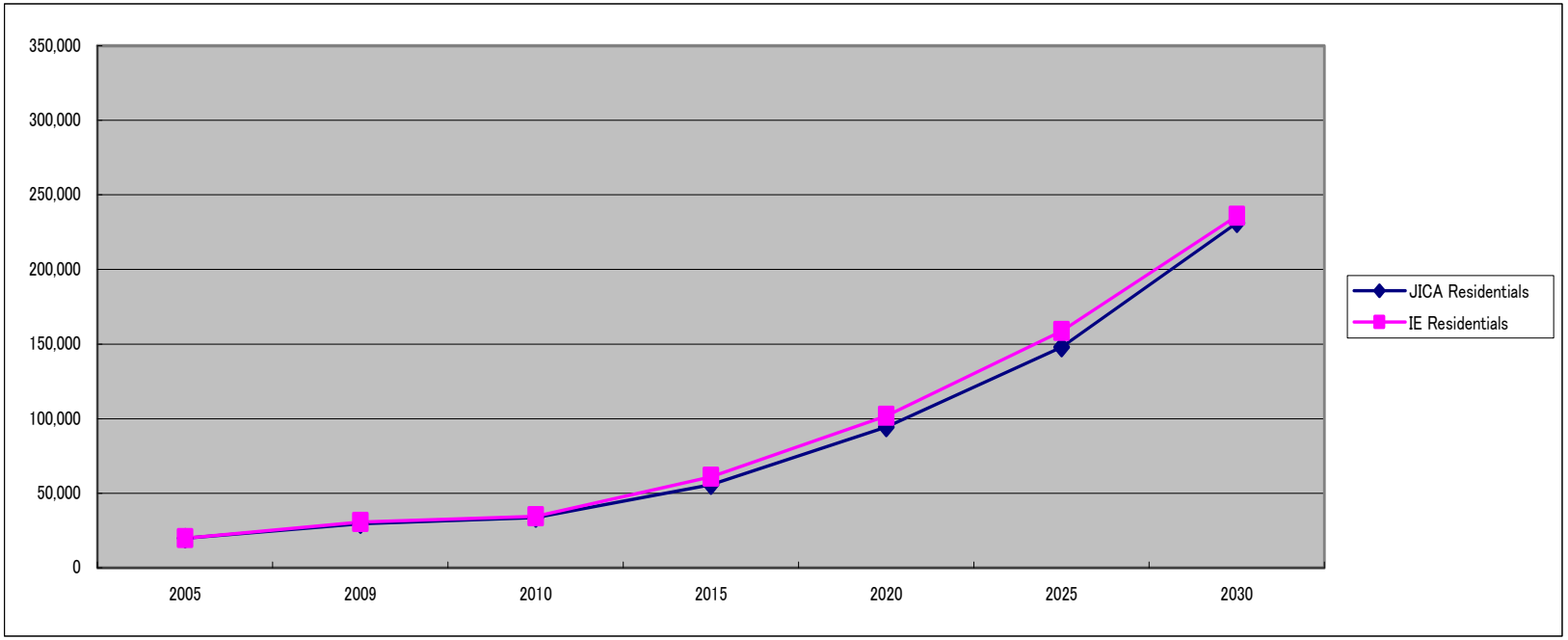
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Com & Services	2,162	3,412	4,559	7,261	11,649	16,335	22,870	9.8
IE	Com & Services	2,162	3,512	4,181	9,268	14,146	19,516	27,344	13.0



Base: Residential use Power demand

Residential in Whole

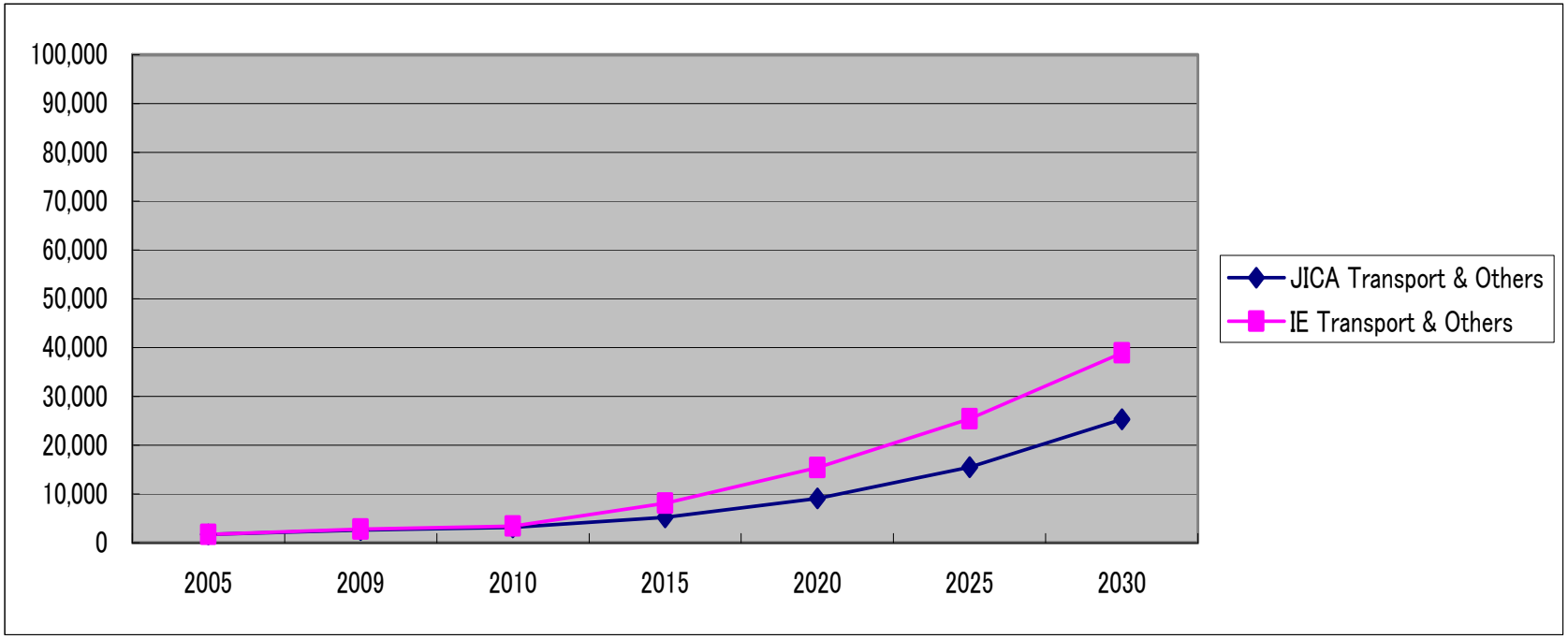
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Residentials	19,831	29,534	33,780	55,760	94,399	147,865	231,280	10.8
IE	Residentials	19,831	30,534	34,585	61,114	101,924	158,687	235,897	11.4



Base: Transport & Other use Power demand

Other in Whole

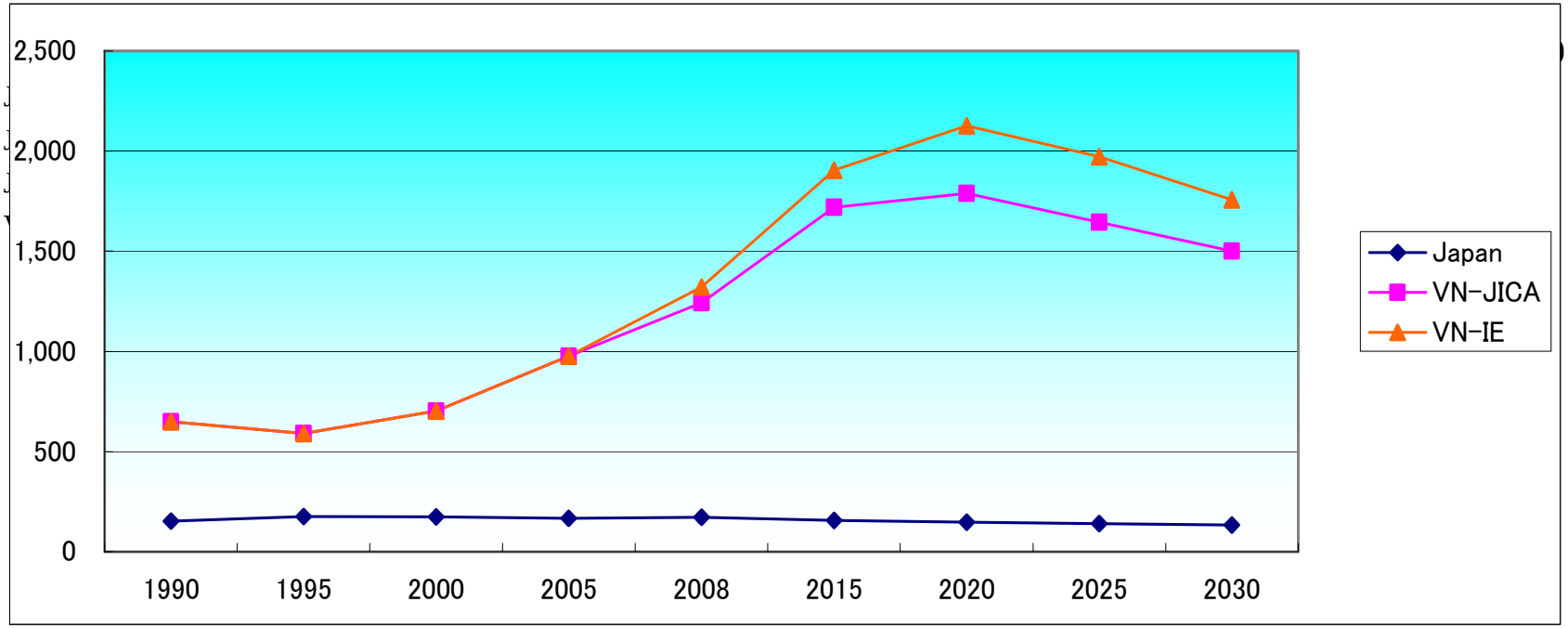
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Transport & Ot	1,734	2,589	3,116	5,261	9,127	15,451	25,356	11.3
IE	Transport & Ot	1,734	2,799	3,402	8,106	15,446	25,421	38,886	16.3



Base: Industrial Sector Power Intensity

Power intensity to Industrial GDP (GWh/Billion US$)

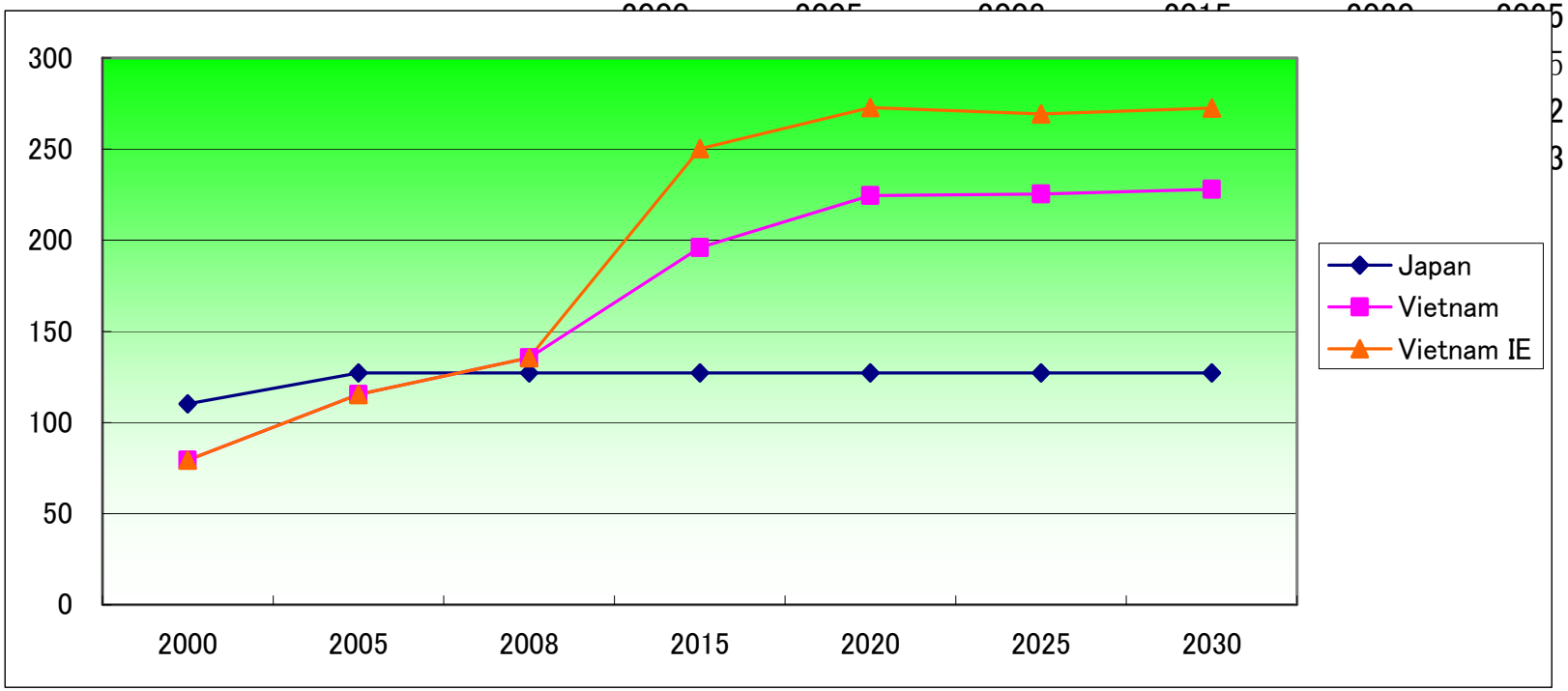
	1990	1995	2000	2005	2008	2015	2020	2025	2030
Japan	154	177	175	167	172	156	148	141	134
VN-JICA	649	591	703	976	1,242	1,720	1,788	1,645	1,501
VN-IE	649	591	703	976	1,322	1,904	2,126	1,973	1,756



Base: Commercial Sector Power Intensity

Power intensity to Commsercail & Service GDP (GWh/BillionUS$)

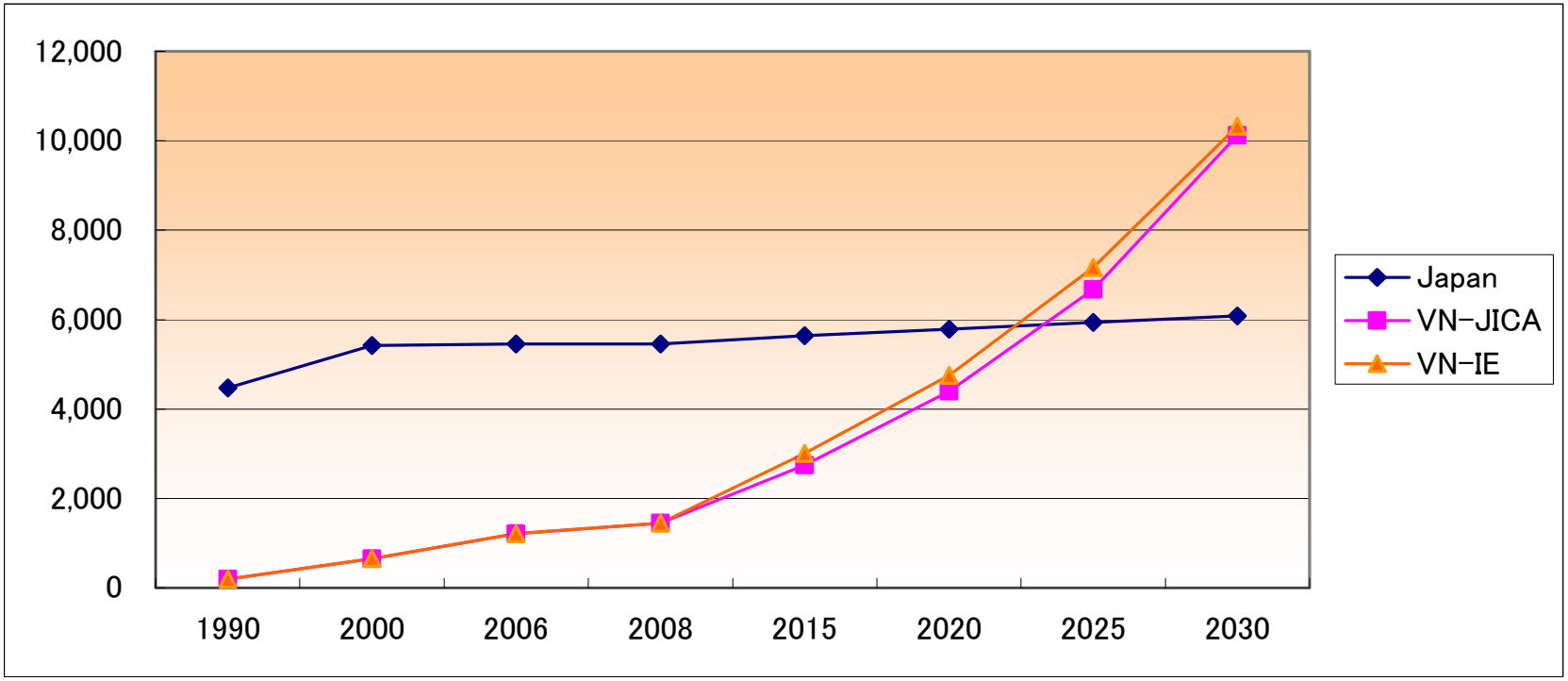
	2000	2005	2008	2015	2020	2025	2030
Japan	110	127	127	127	127	127	127
Vietnam	79	115	136	196	225	225	228
Vietnam	79	115	136	250	273	269	273



Base: Household Use Power Intensity

Power intensity to Household (kWh/HH)

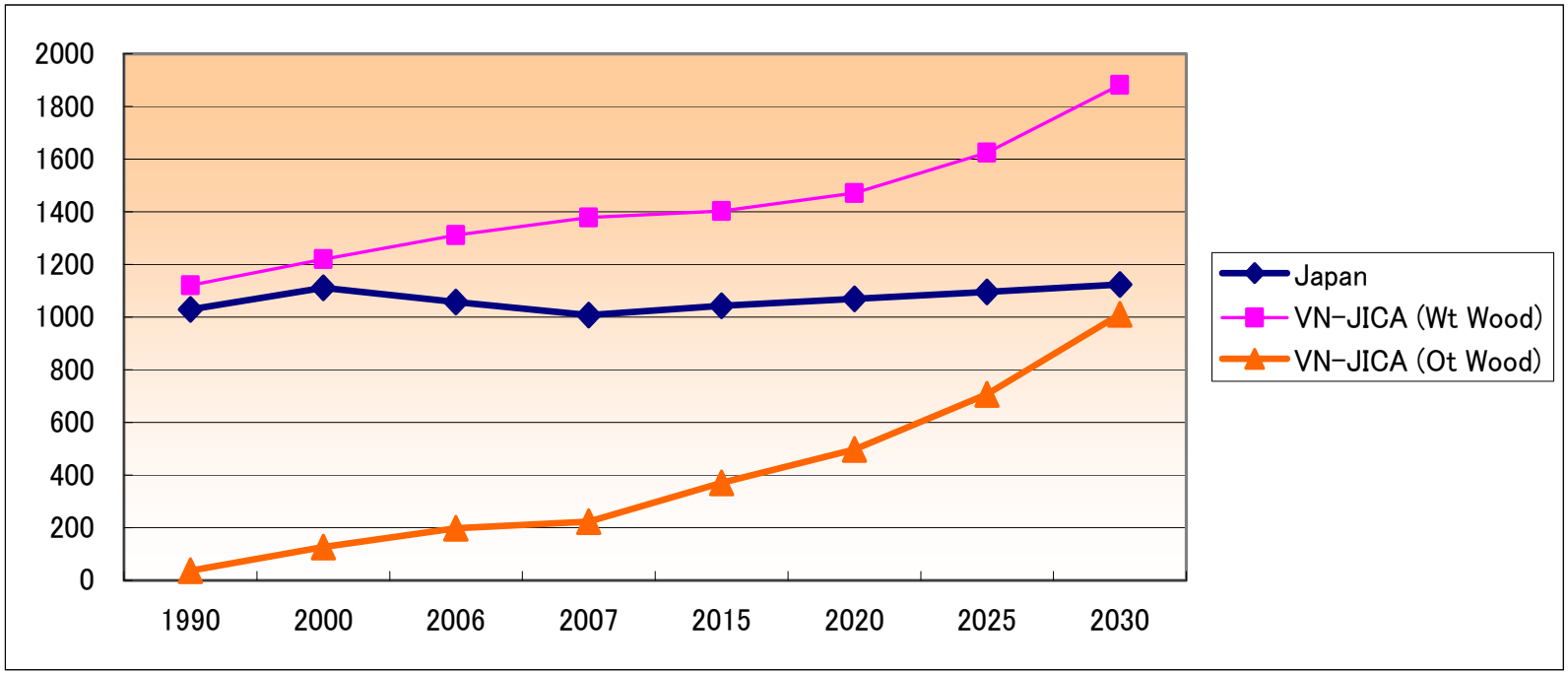
	1990	2000	2006	2008	2015	2020	2025	2030
Japan	4,470	5,420	5,456	5,450	5,644	5,786	5,932	6,082
VN-JICA	194	653	1,208	1,449	2,740	4,398	6,676	10,119
VN-IE	194	653	1,208	1,449	3,004	4,749	7,165	10,321



Base: Household Use Energy Intensity

Energy intensity to Household (TOE/1000HH)

	1990	2000	2006	2007	2015	2020	2025	2030
Japan	1029	1111	1058	1007	1043	1069	1096	1124
VN-JICA (Wt Wood)	1122	1219	1312	1378	1403	1472	1625	1882
VN-JICA (Ot Wood)	37	127	199	223	371	497	707	1010



[Ⅱ] High Case

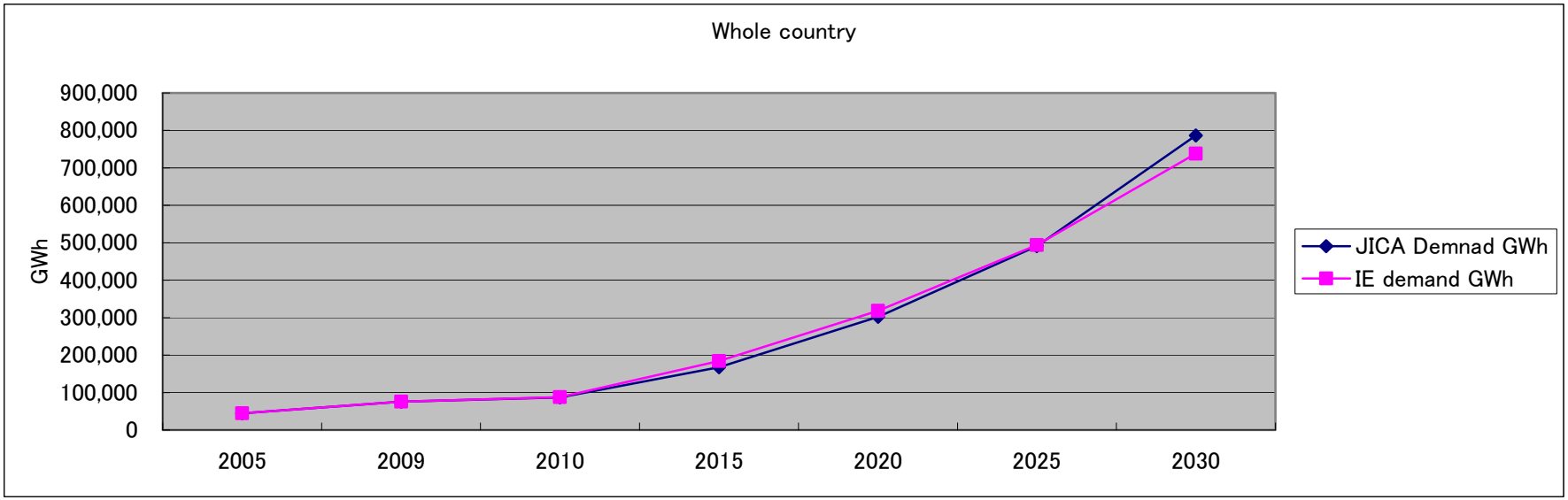
High: Whole Country Power demand

Whole country

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	44,832	76,046	87,108	167,487	301,929	490,817	786,407
IE demand	GWh	44,832	76,046	87,665	184,284	318,511	494,126	737,928

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		14.1	14.2	14.0	12.5	10.2	9.9
IE demand	%		14.1	14.4	16.0	11.6	9.2	8.4

JICA Demnad	GWh	44,832	76,046	87,108	167,487	301,929	490,817	786,407
Model Forecasts	GWh	44,832	76,046	83,577	153,226	273,592	457,427	746,681
Additional demand	GWh			3,531	14,261	28,338	33,390	39,726
Additioanl rate	%			**4.1**	**8.5**	**9.4**	**6.8**	**5.1**

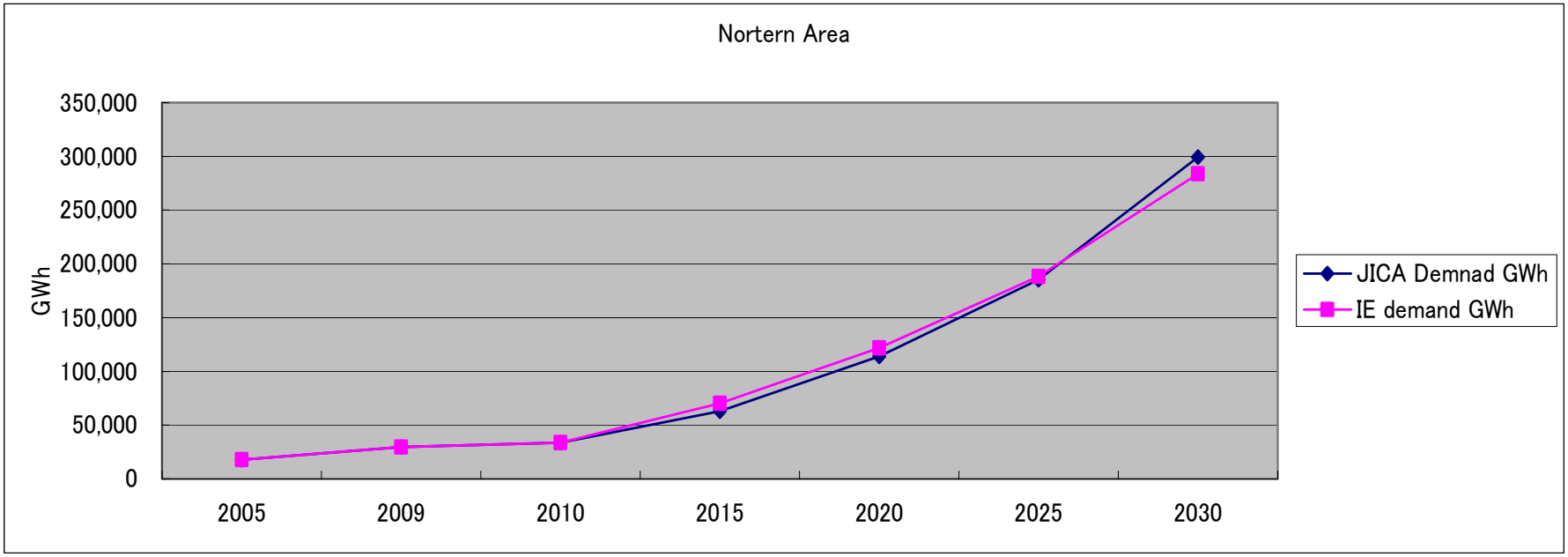


High: Northern Power demand

Northern

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	17,805	29,445	33,553	62,966	113,988	185,347	299,460
IE demand	GWh	17,805	29,445	33,537	70,231	121,817	188,408	283,877

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.4	13.5	13.4	12.6	10.2	10.1
IE demand	%		13.4	13.5	15.9	11.6	9.1	8.5

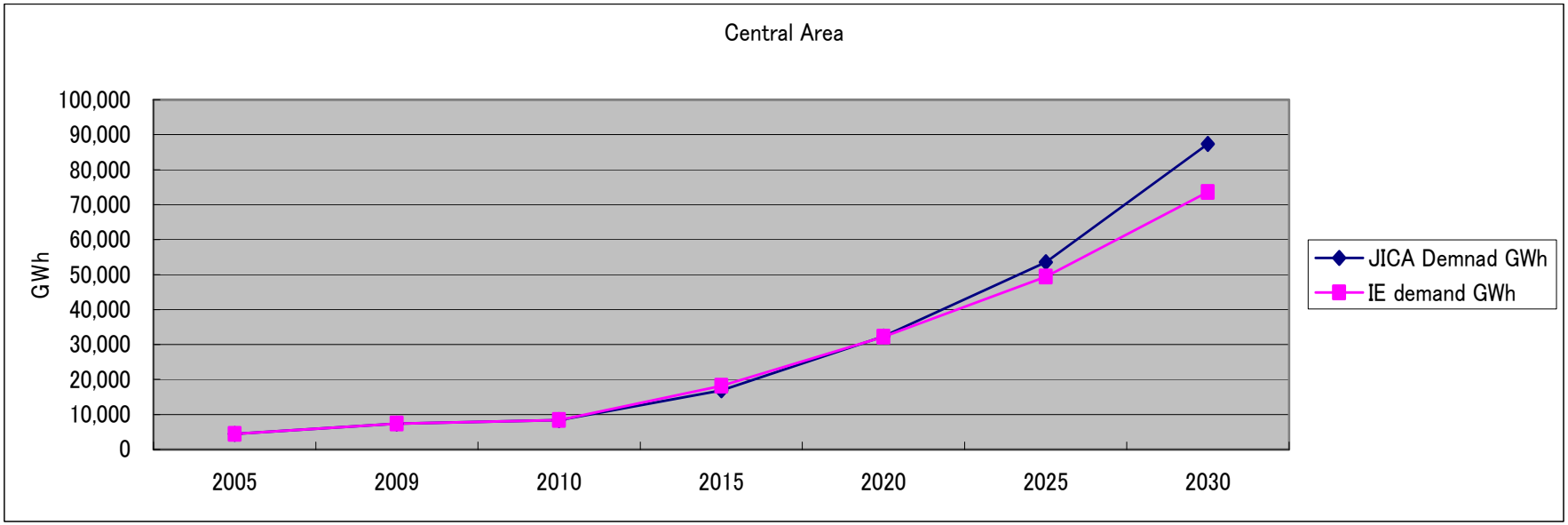


High: Central Power demand

Central

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	4,442	7,426	8,391	16,898	32,362	53,566	87,340
IE demand	GWh	4,442	7,426	8,403	18,185	32,255	49,409	73,603

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.7	13.6	15.0	13.9	10.6	10.3
IE demand	%		13.7	13.6	16.7	12.1	8.9	8.3

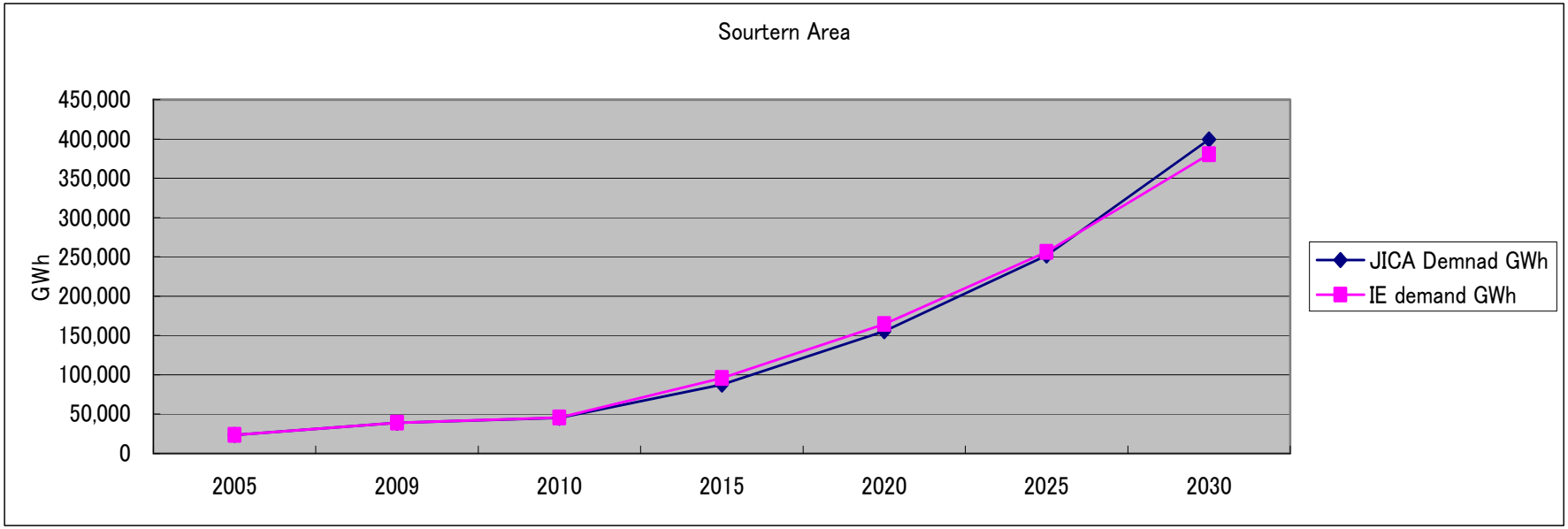


High: Southern Power demand

Sourtern

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	23,355	39,175	45,163	87,623	155,579	251,904	399,607
IE demand	GWh	23,355	39,175	45,724	95,868	164,439	256,309	380,448

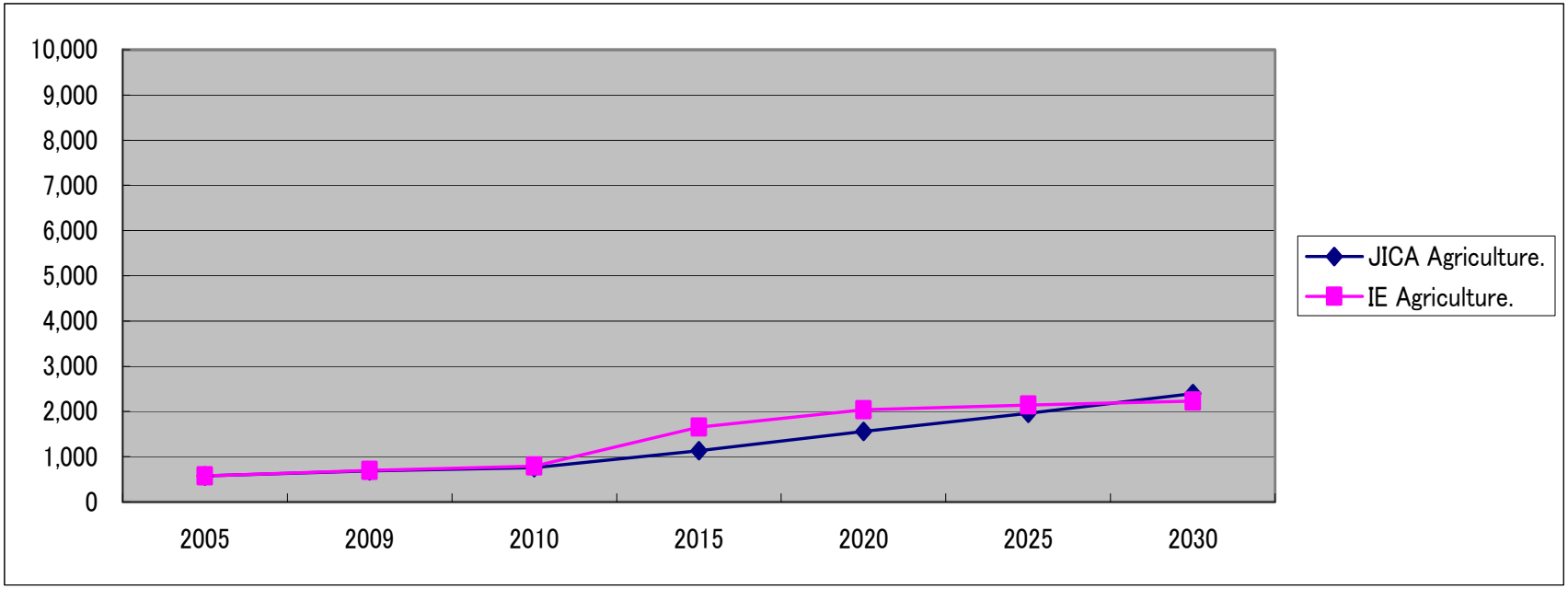
		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.8	14.1	14.2	12.2	10.1	9.7
IE demand	%		13.8	14.4	16.0	11.4	9.3	8.2



High: Agriculture Sector Power demand

Agriculture & Forestry in Whole

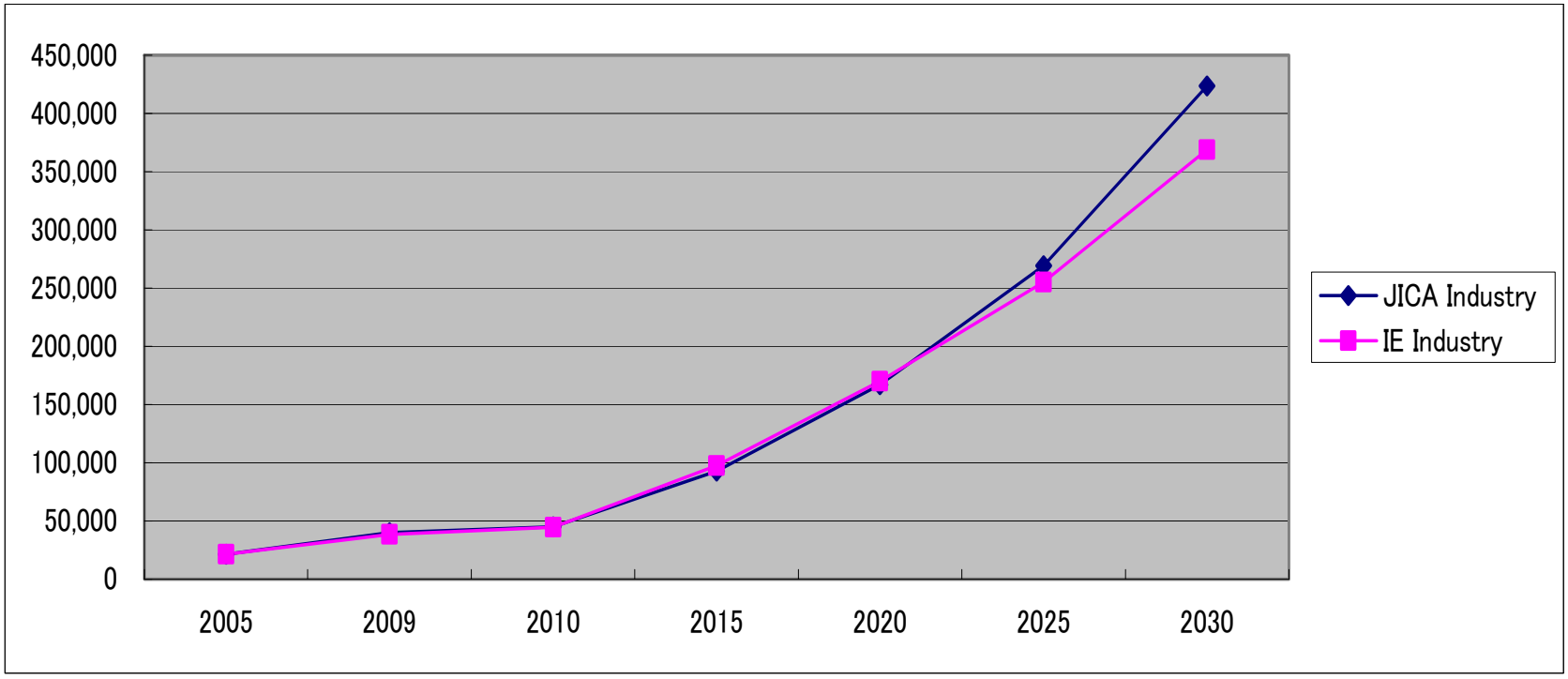
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Agriculture.	574	690	761	1,129	1,564	1,959	2,394	7.5
IE	Agriculture.	574	700	789	1,659	2,040	2,147	2,233	10.0



High: Industry Sector Power demand

Industry & Construction in Whole

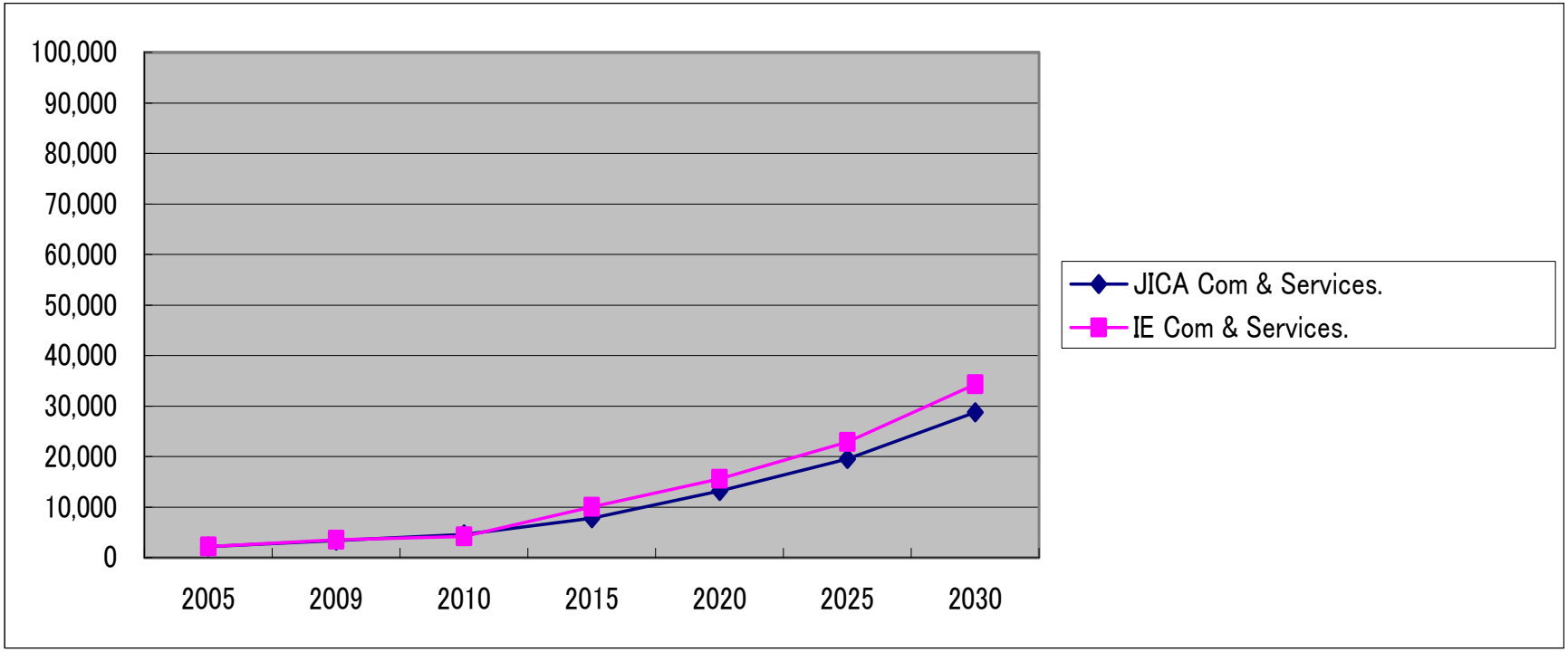
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Industry	21,302	39,822	44,892	92,617	167,018	269,311	423,485	14.0
IE	Industry	21,302	38,501	44,708	97,454	169,962	255,253	368,694	14.3



High: Commercial Sector Power demand

Commercial & Services

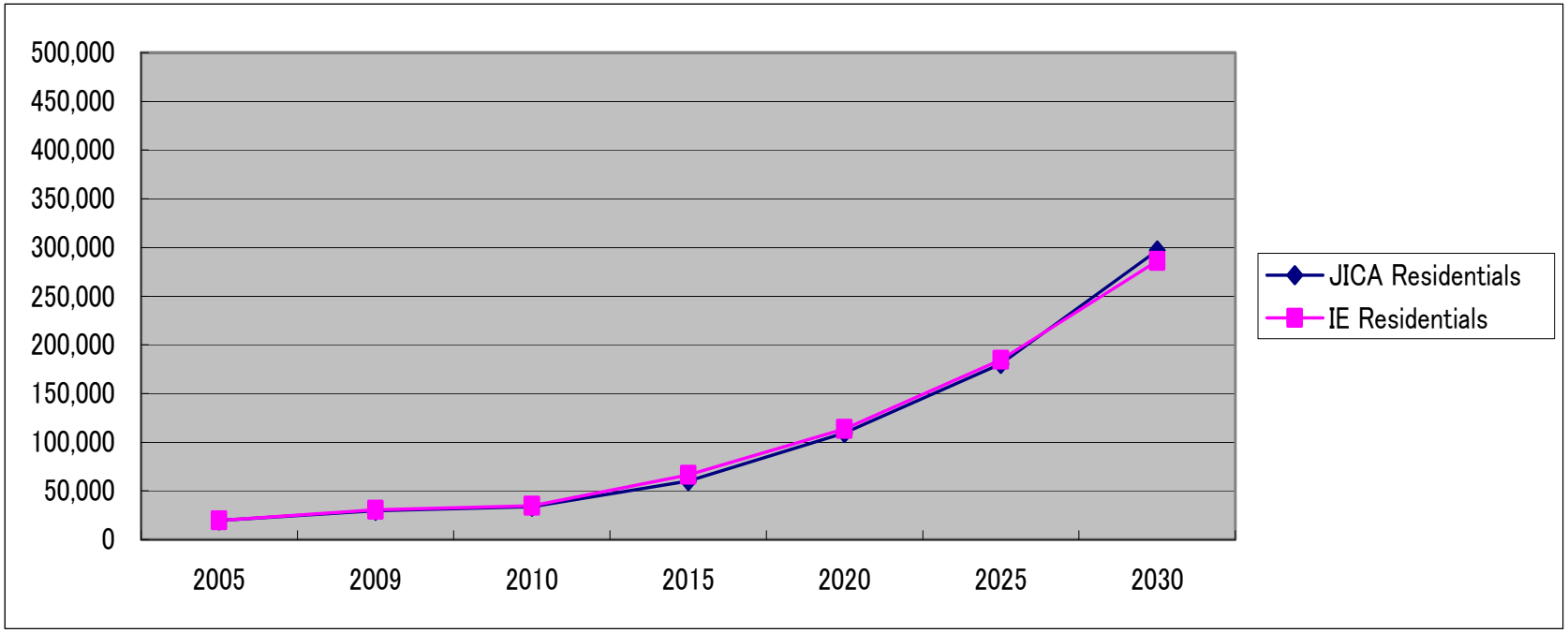
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Com & Services	2,162	3,412	4,559	7,771	13,178	19,517	28,781	11.2
IE	Com & Services	2,162	3,512	4,181	10,057	15,605	22,930	34,337	14.1



High: Residential Use Power demand

Residential in Whole

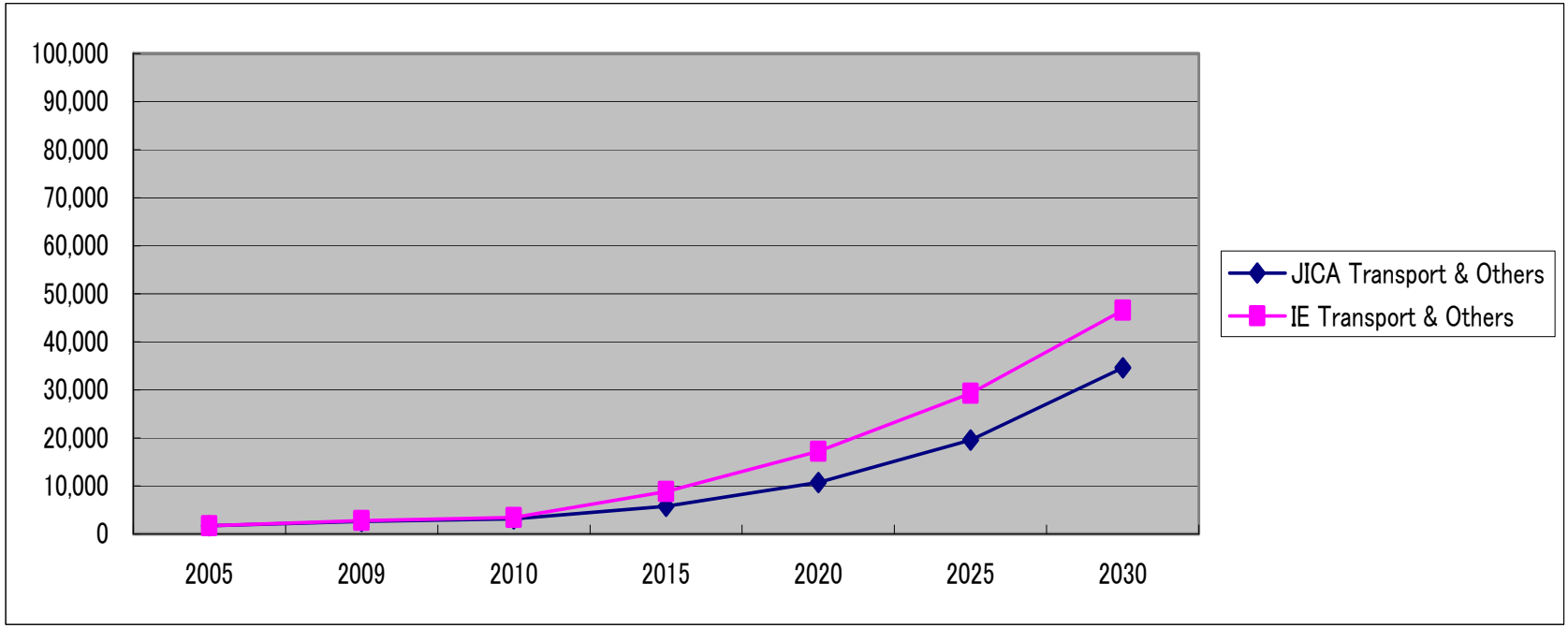
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Residentials	19,831	29,534	33,780	60,245	109,470	180,506	297,198	12.5
IE	Residentials	19,831	30,534	34,585	66,319	113,728	184,501	286,051	12.6



High: Transport & Other Use Power demand

Other in Whole

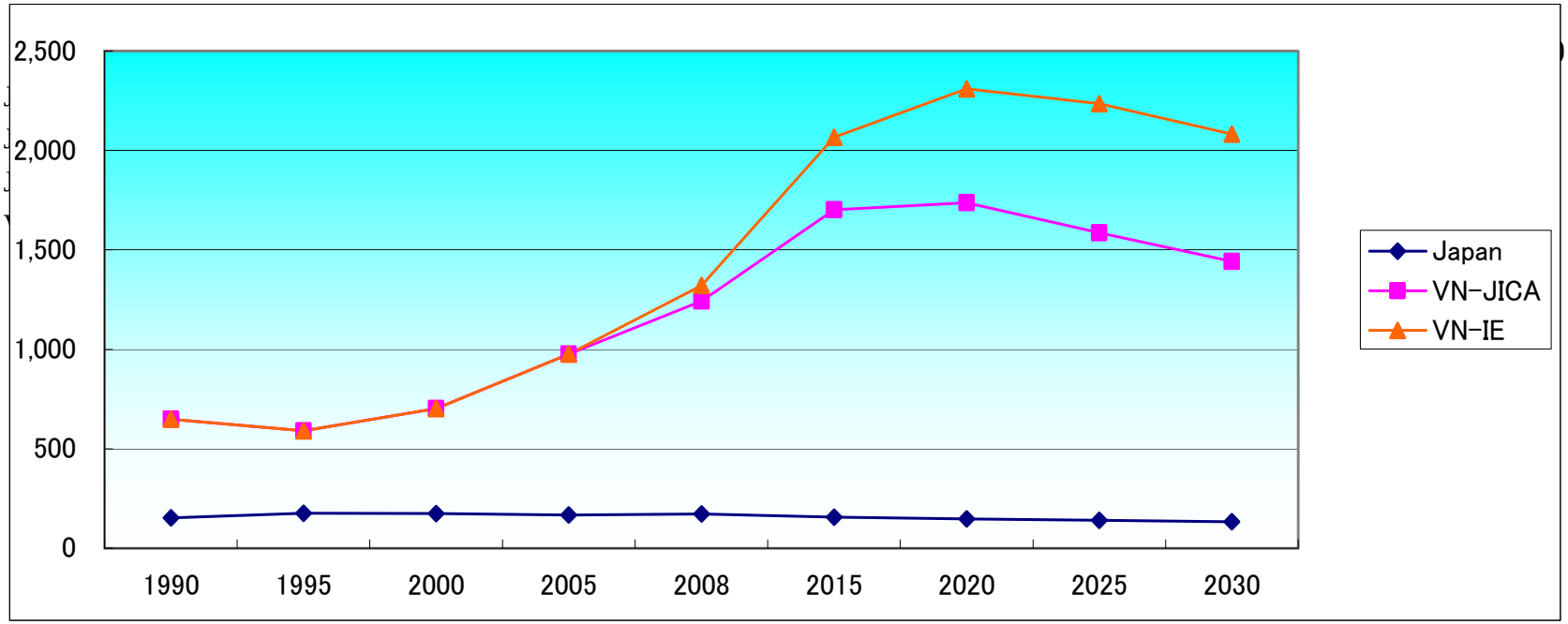
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Transport & Ot	1,734	2,589	3,116	5,725	10,699	19,524	34,550	13.1
IE	Transport & Ot	1,734	2,799	3,402	8,796	17,177	29,295	46,612	17.6



High: Industrial Sector Power Intensity

Power intensity to Industrial GDP (GWh/Billion US$)

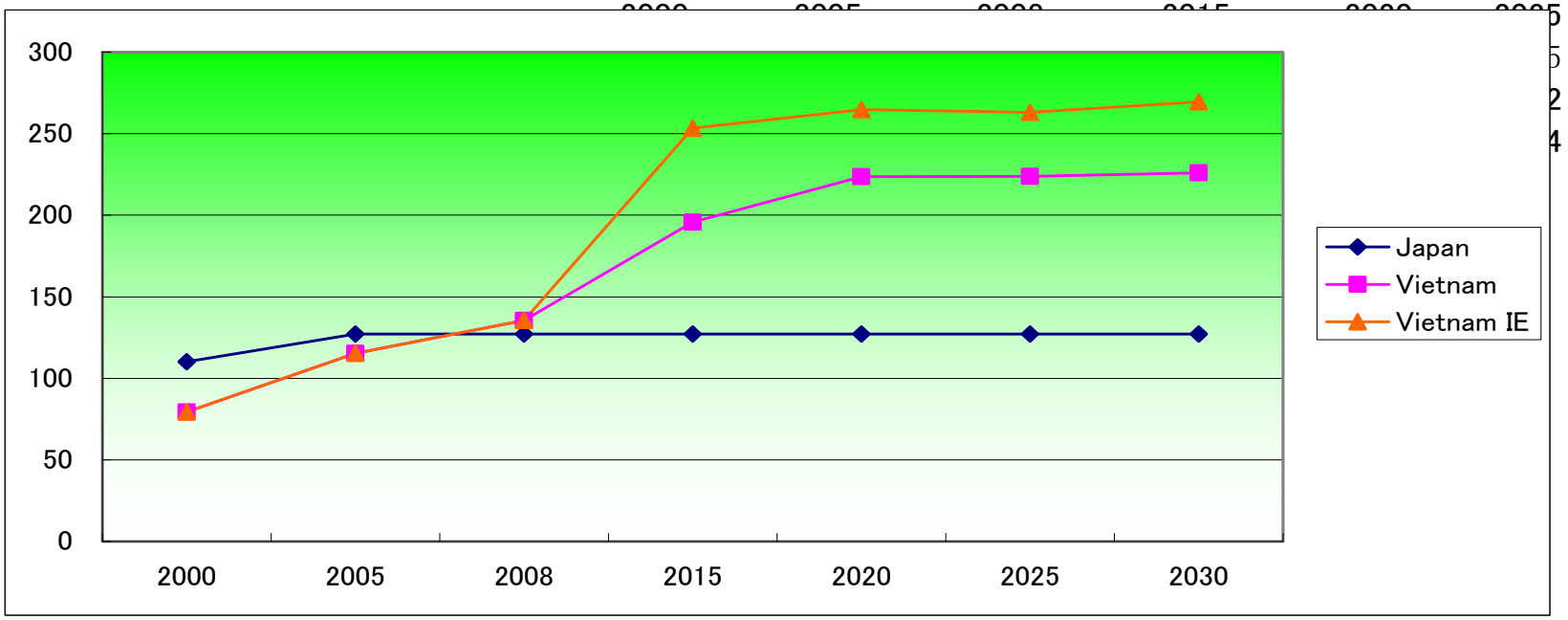
	1990	1995	2000	2005	2008	2015	2020	2025	2030
Japan	154	177	175	167	172	156	148	141	134
VN-JICA	649	591	703	976	1,242	1,701	1,738	1,586	1,442
VN-IE	649	591	703	976	1,322	2,066	2,309	2,235	2,082



High: Commercial Sector Power Intensity

Power intensity to Commsercail & Service GDP (GWh/BillionUS$)

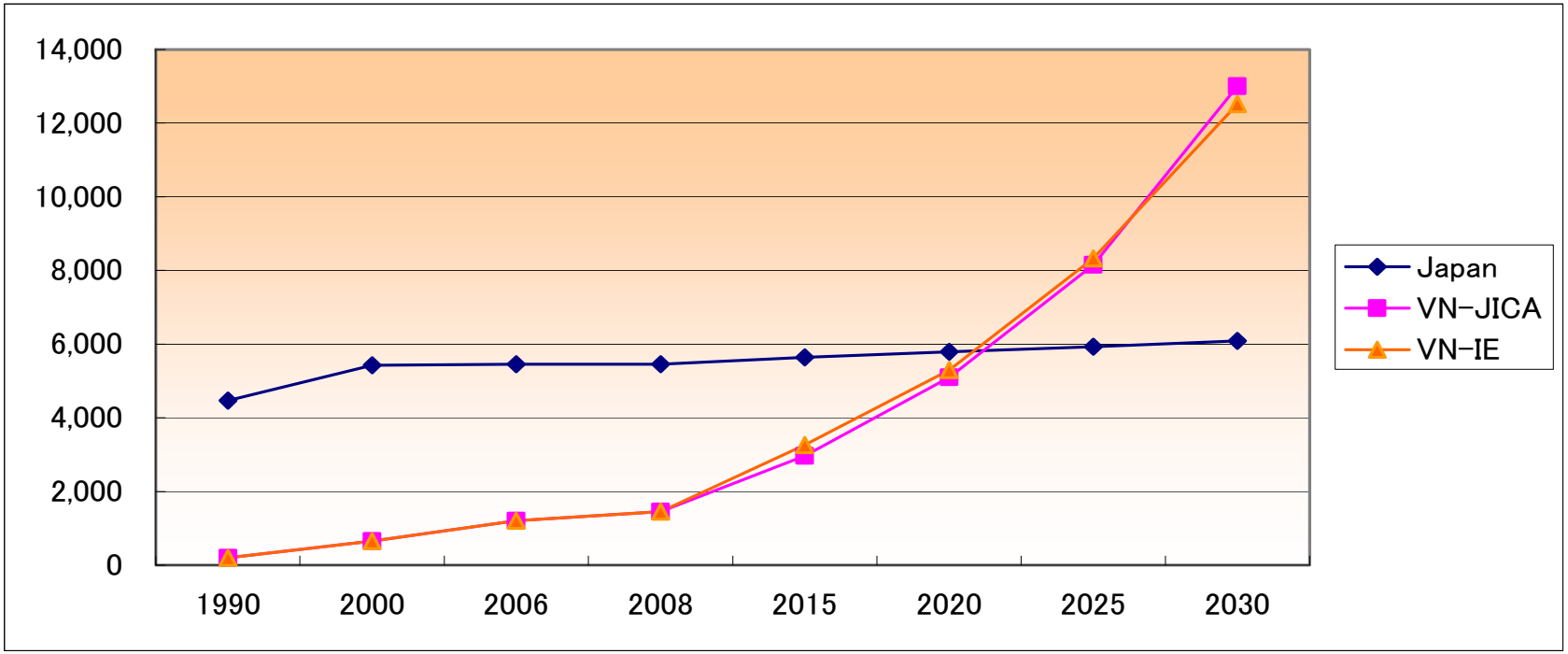
	2000	2005	2008	2015	2020	2025	2030
Japan	110	127	127	127	127	127	127
Vietnam	79	115	136	196	224	224	226
Vietnam	79	115	136	253	265	263	270



High: Residential Use Power Intensity

Power intensity to Household (kWh/HH)

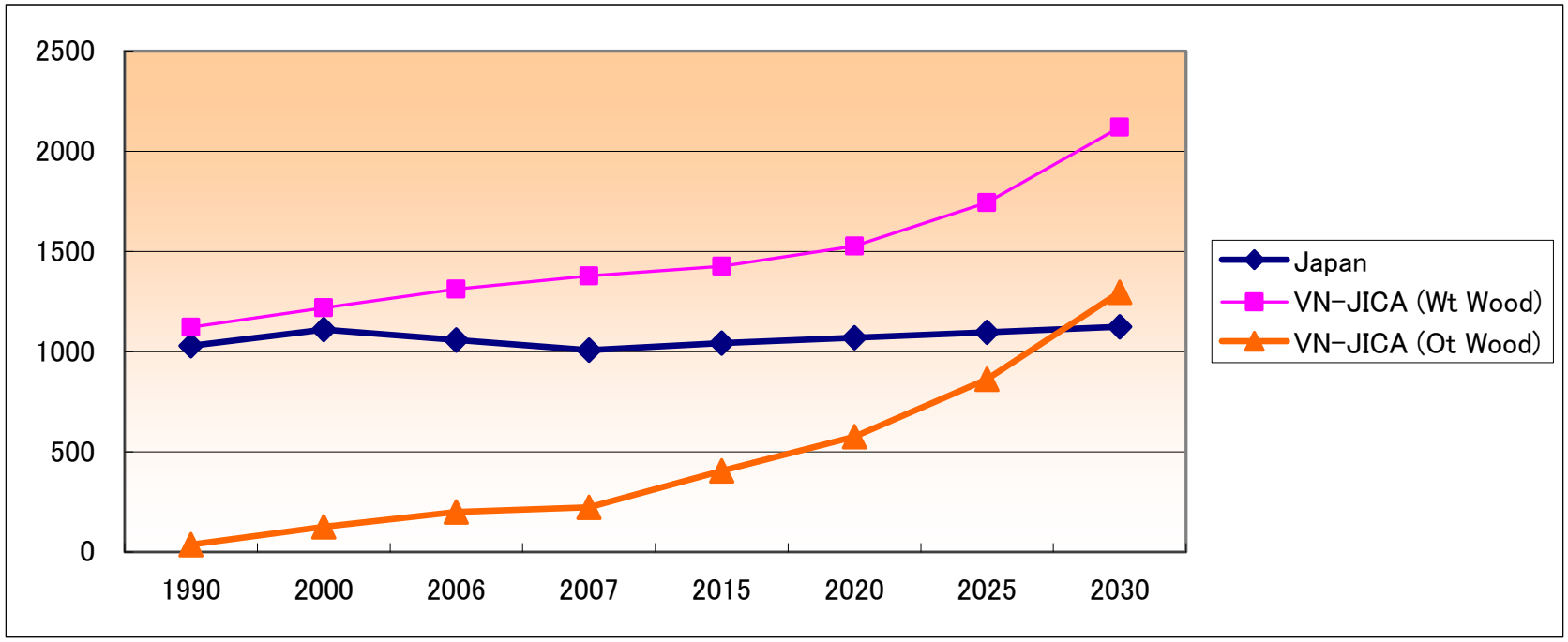
	1990	2000	2006	2008	2015	2020	2025	2030
Japan	4,470	5,420	5,456	5,450	5,644	5,786	5,932	6,082
VN-JICA	194	653	1,208	1,449	2,961	5,100	8,150	13,003
VN-IE	194	653	1,208	1,449	3,259	5,299	8,330	12,515



High: Household Use Energy Intensity

Energy intensity to Household (TOE/1000HH)

	1990	2000	2006	2007	2015	2020	2025	2030
Japan	1029	1111	1058	1007	1043	1069	1096	1124
VN-JICA (Wt Wood)	1122	1219	1312	1378	1426	1528	1744	2120
VN-JICA (Ot Wood)	37	127	199	223	406	576	863	1297



[Ⅲ] Low Case

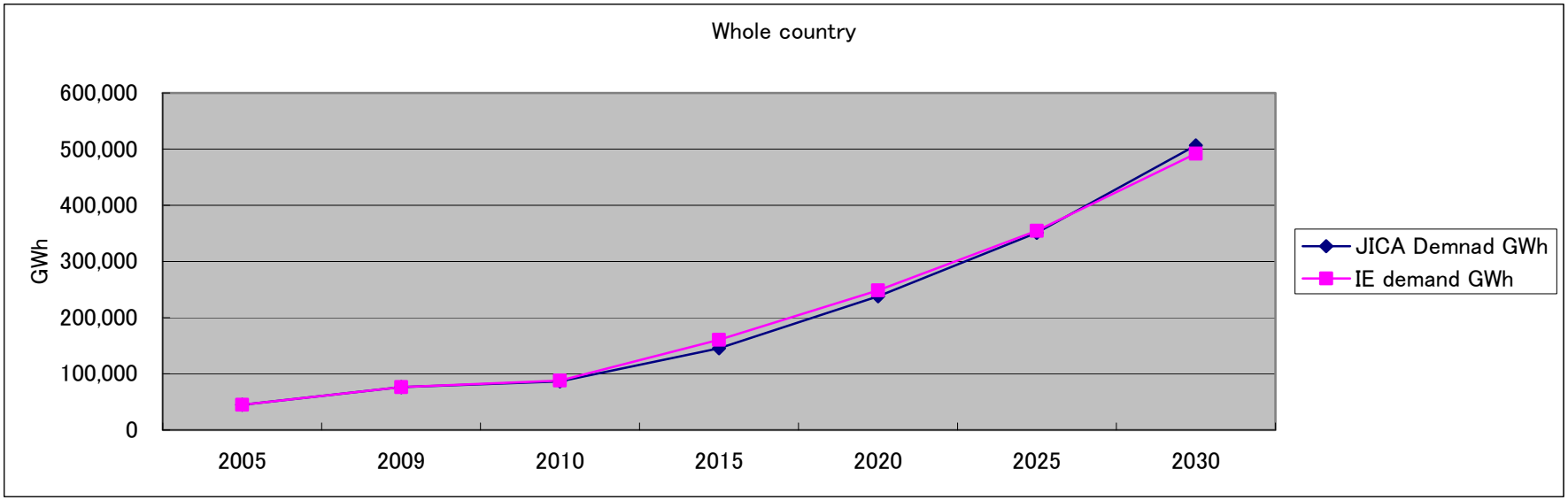
Low: Whole Country Power demand

Whole country

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	44,832	76,046	86,477	145,541	237,719	350,864	506,567
IE demand	GWh	44,832	76,046	87,665	160,783	248,240	354,378	492,169

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		14.1	14.0	11.0	10.3	8.1	7.6
IE demand	%		14.1	14.4	12.9	9.1	7.4	6.8

JICA Demnad	GWh	44,832	76,046	86,477	145,541	237,719	350,864	506,567
Model Forecasts	GWh	44,832	76,046	82,946	133,650	214,196	323,134	473,568
Additional demand	GWh			3,531	11,891	23,523	27,730	32,999
Additioanl rate	%			**4.1**	**8.2**	**9.9**	**7.9**	**6.5**

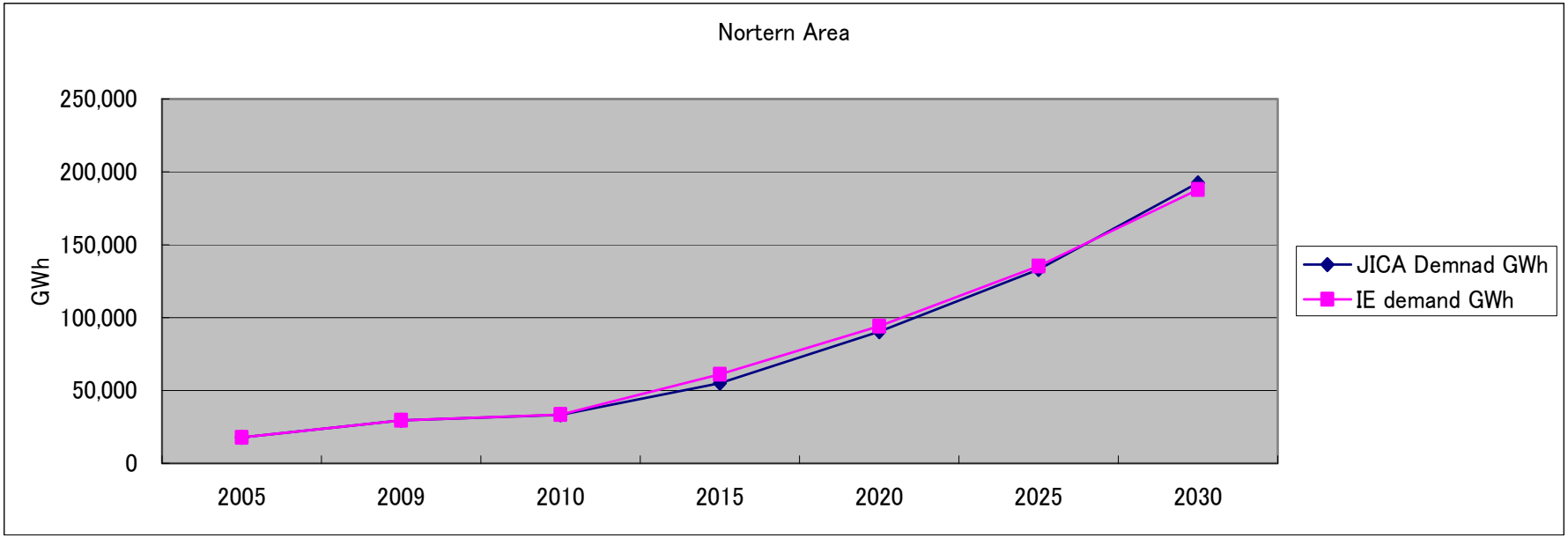


Low: North Power demand

Northern

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	17,805	29,445	33,334	55,029	90,310	133,046	192,484
IE demand	GWh	17,805	29,445	33,537	61,169	94,130	135,337	187,872

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.4	13.4	10.5	10.4	8.1	7.7
IE demand	%		13.4	13.5	12.8	9.0	7.5	6.8

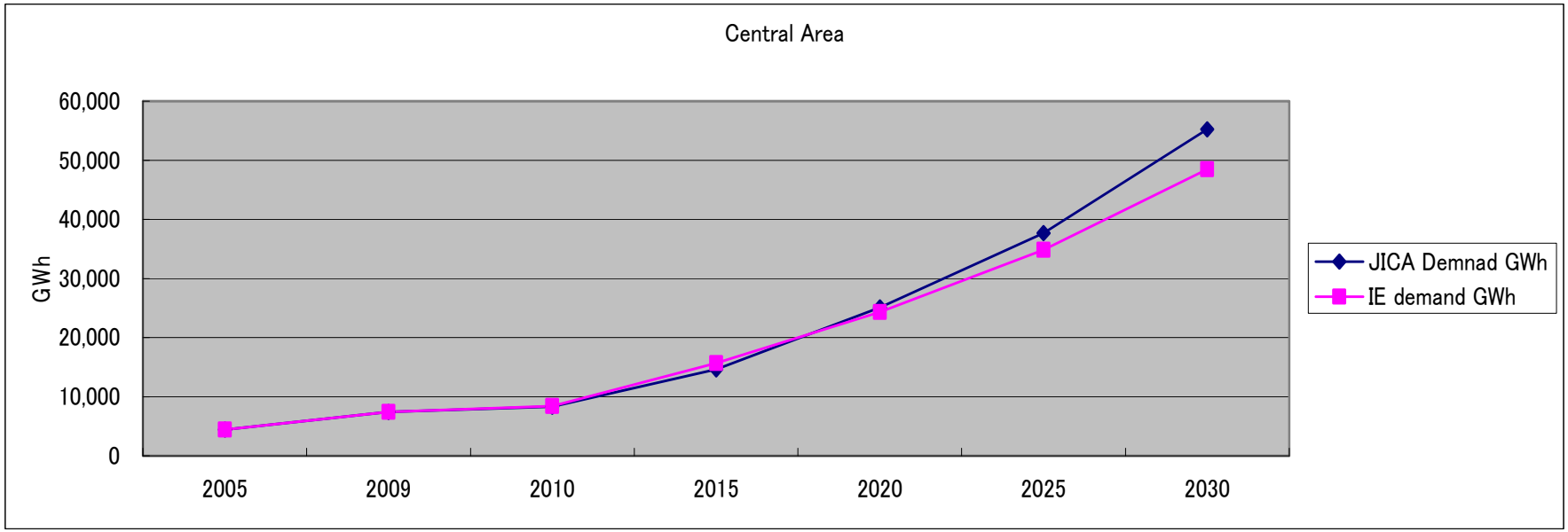


Low: Central Power demand

Central

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	4,442	7,426	8,331	14,602	25,102	37,698	55,263
IE demand	GWh	4,442	7,426	8,403	15,692	24,304	34,863	48,455

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.7	13.4	11.9	11.4	8.5	8.0
IE demand	%		13.7	13.6	13.3	9.1	7.5	6.8

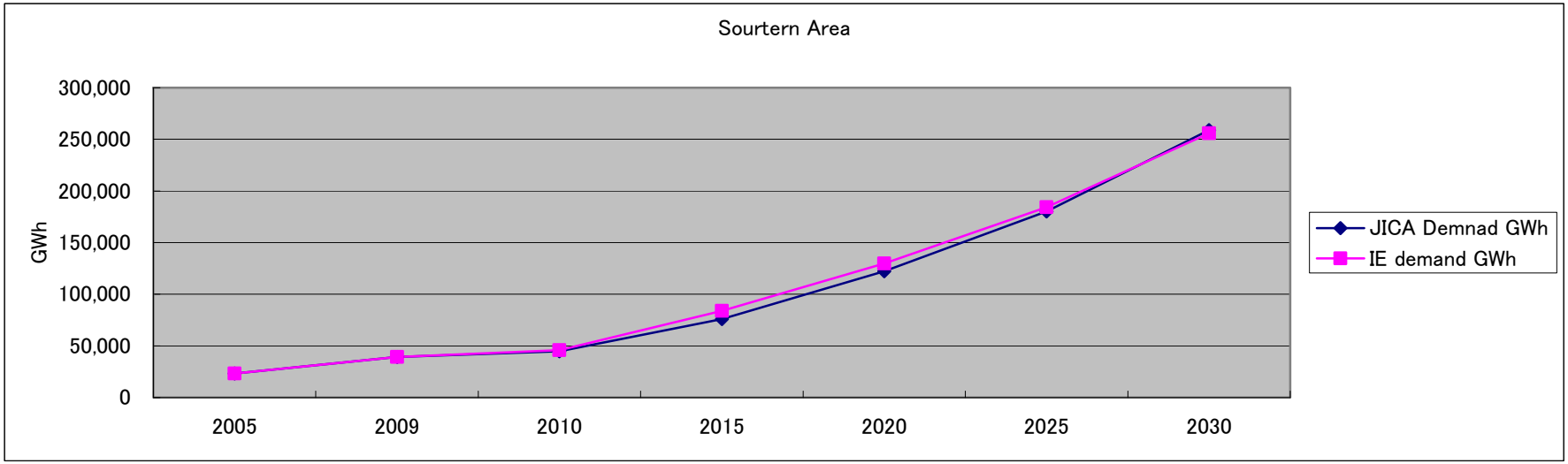


Low: South Power demand

Sourtern

		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	GWh	23,355	39,175	44,812	75,910	122,307	180,120	258,821
IE demand	GWh	23,355	39,175	45,724	83,922	129,806	184,178	255,842

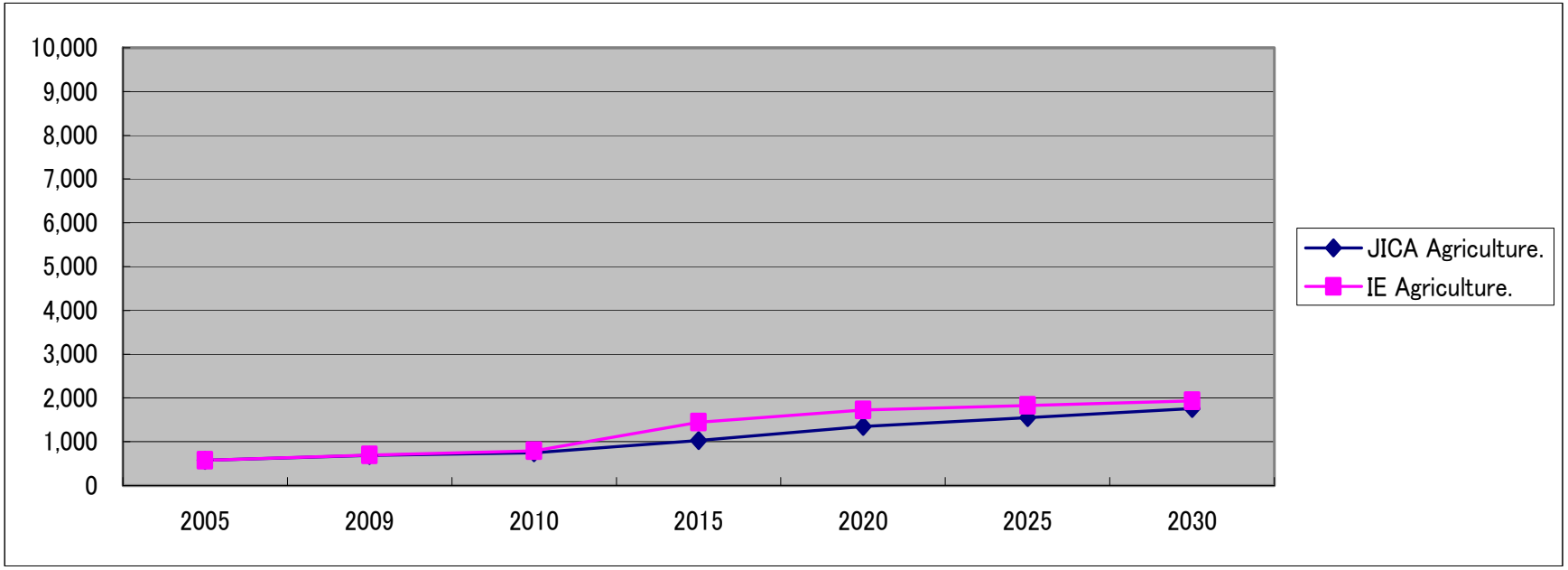
		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		13.8	13.9	11.1	10.0	8.0	7.5
IE demand	%		13.8	14.4	12.9	9.1	7.2	6.8



Low: Agriculture Sector Power demand

Agriculture & Forestry in Whole

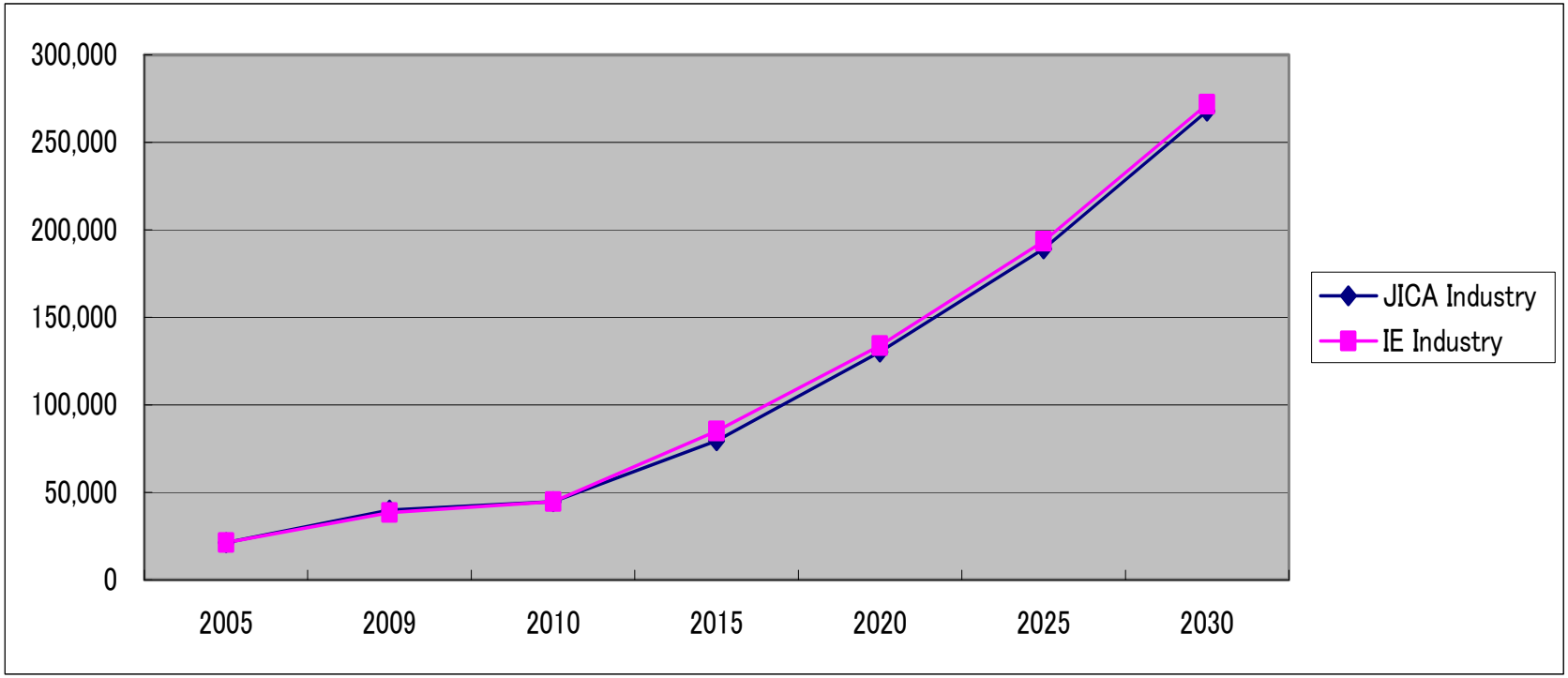
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Agriculture.	574	690	746	1,028	1,354	1,549	1,760	6.1
IE	Agriculture.	574	700	789	1,447	1,722	1,832	1,932	8.1



Low: Industry Sector Power demand

Industry & Construction in Whole

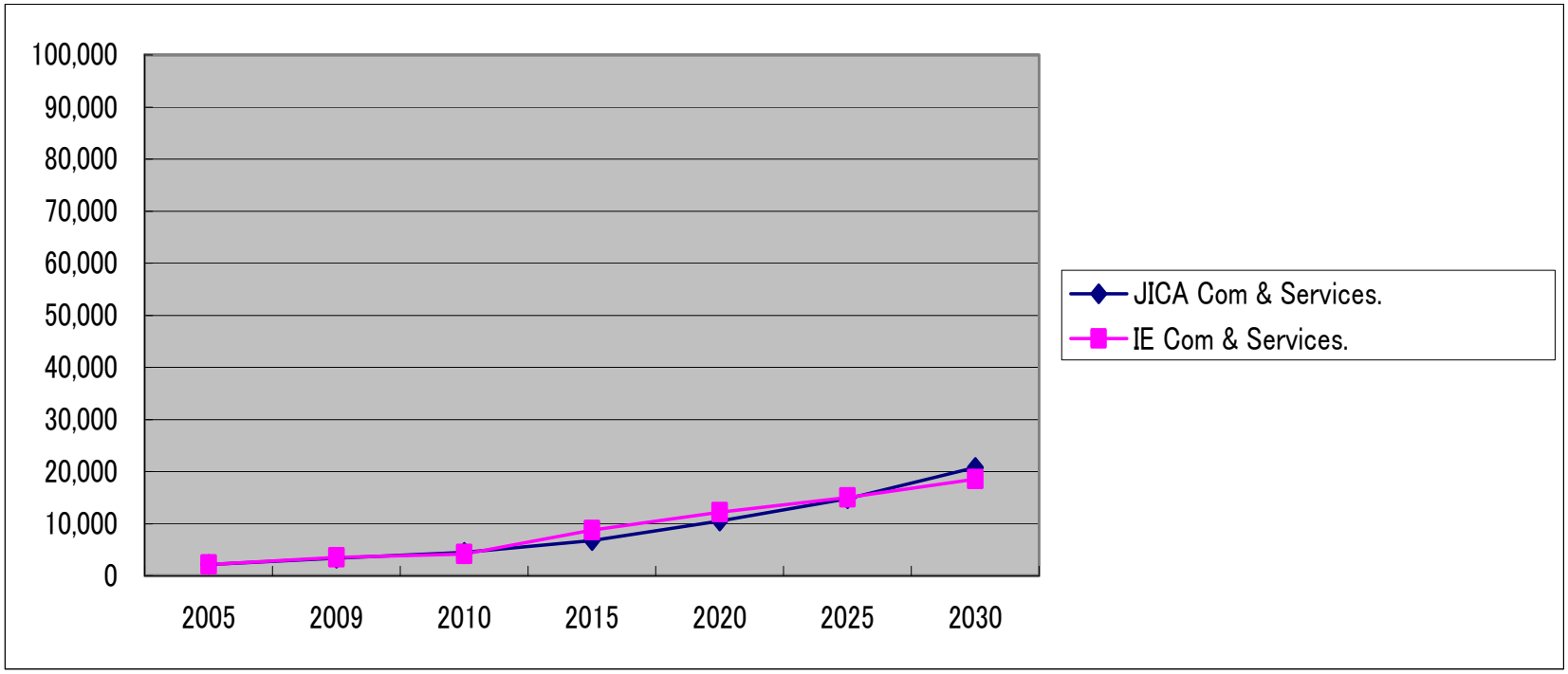
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Industry	21,302	39,822	44,566	79,527	130,296	189,096	267,872	11.3
IE	Industry	21,302	38,501	44,708	85,025	133,783	193,523	271,685	11.6



Low: Commercial Sector Power demand

Commercial & Services

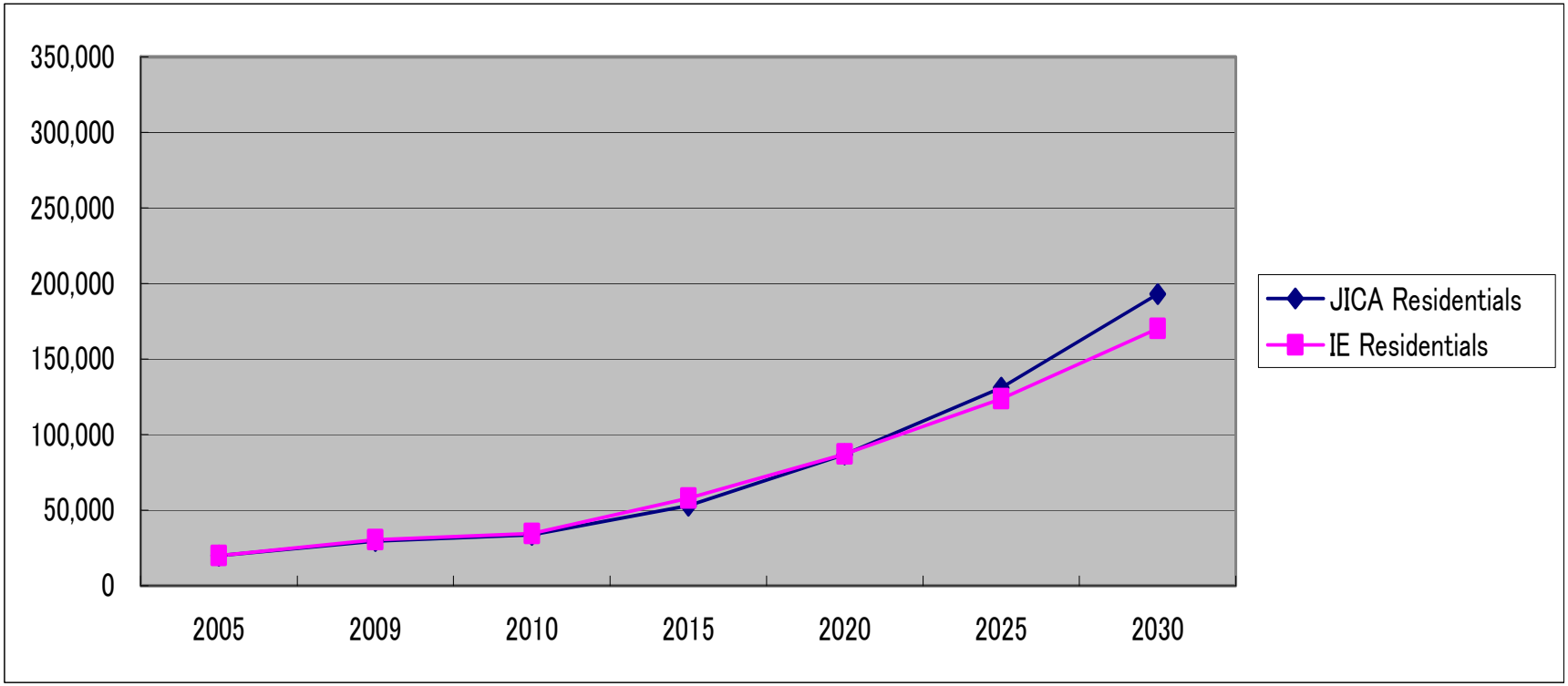
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Com & Services	2,162	3,412	4,472	6,761	10,504	14,815	20,810	8.9
IE	Com & Services	2,162	3,512	4,181	8,775	12,195	14,986	18,568	11.3



Low: Residential Use Power demand

Residential in Whole

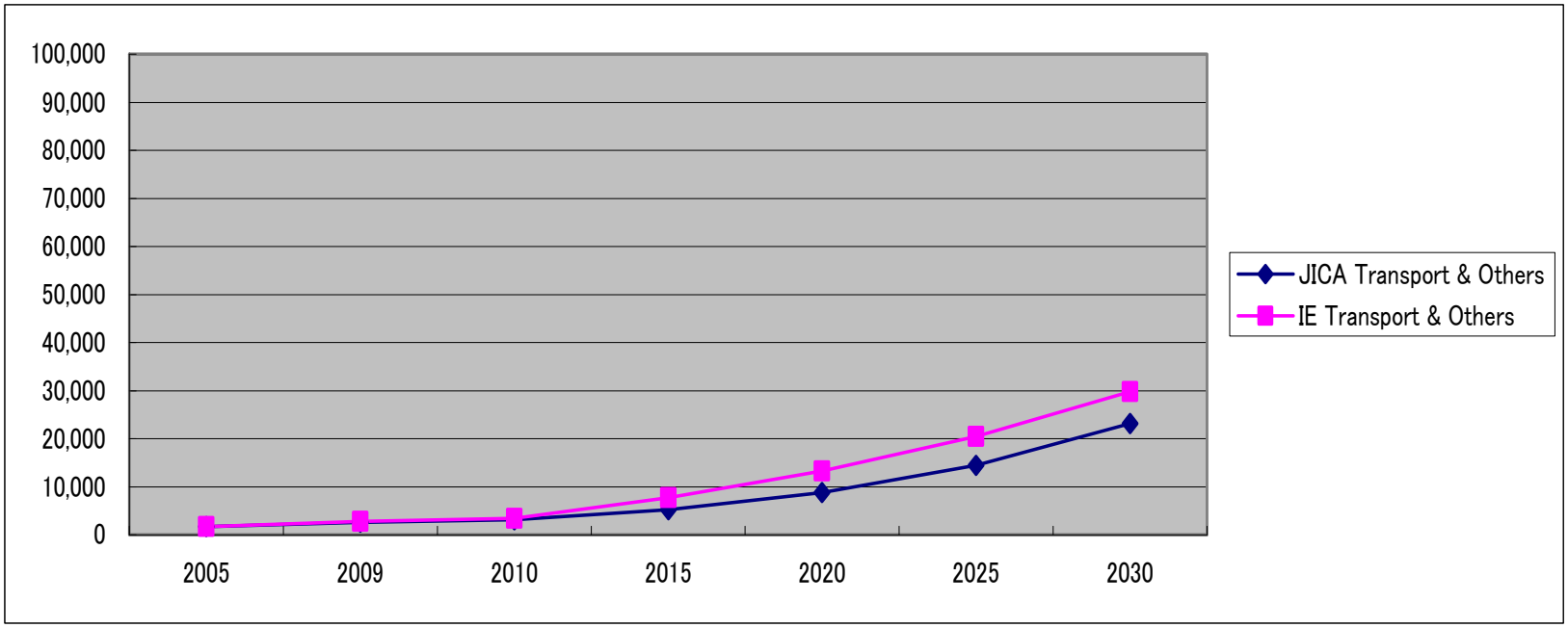
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Residentials	19,831	29,534	33,576	53,063	86,741	130,985	192,980	10.0
IE	Residentials	19,831	30,534	34,585	57,862	87,260	123,549	170,210	9.7



Low: Other Use Power demand

Other in Whole

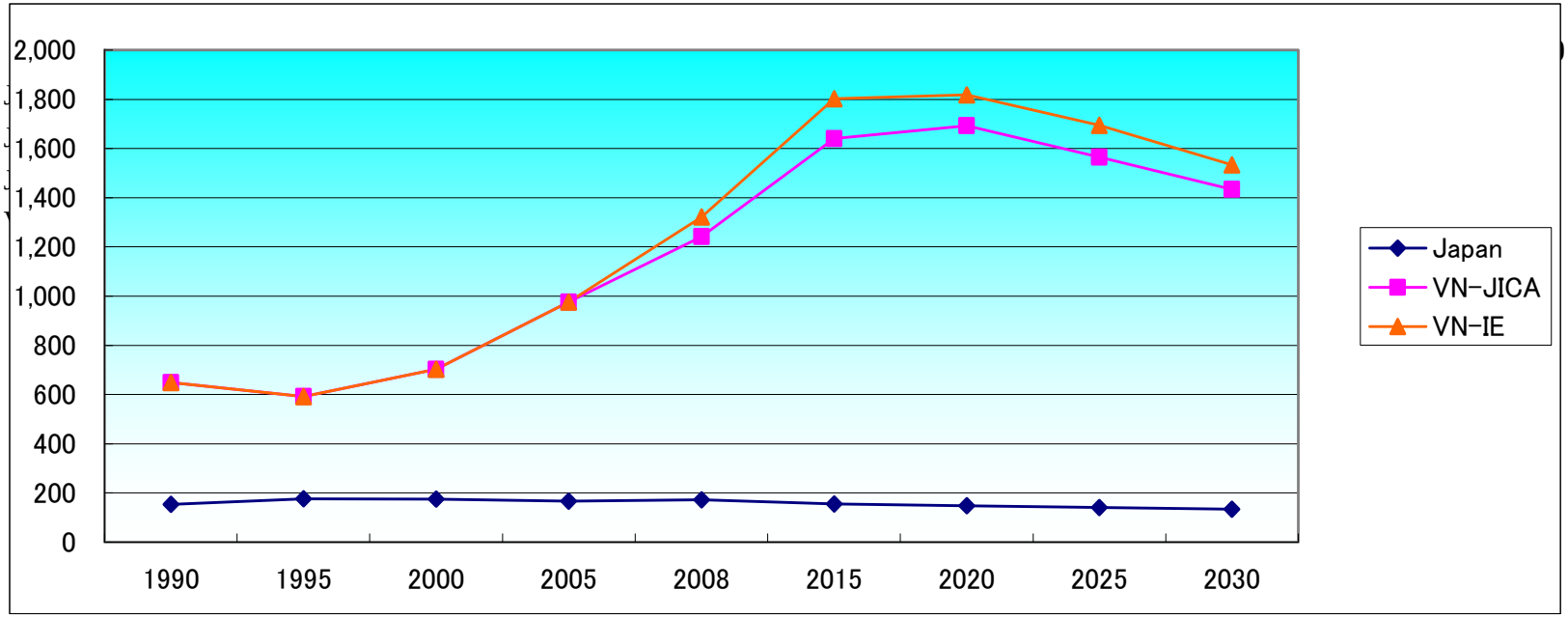
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Transport & Ot	1,734	2,589	3,117	5,163	8,824	14,419	23,144	11.0
IE	Transport & Ot	1,734	2,799	3,402	7,674	13,280	20,489	29,774	14.6



Low: Industrial Sector Power Intensity

Power intensity to Industrial GDP (GWh/Billion US$)

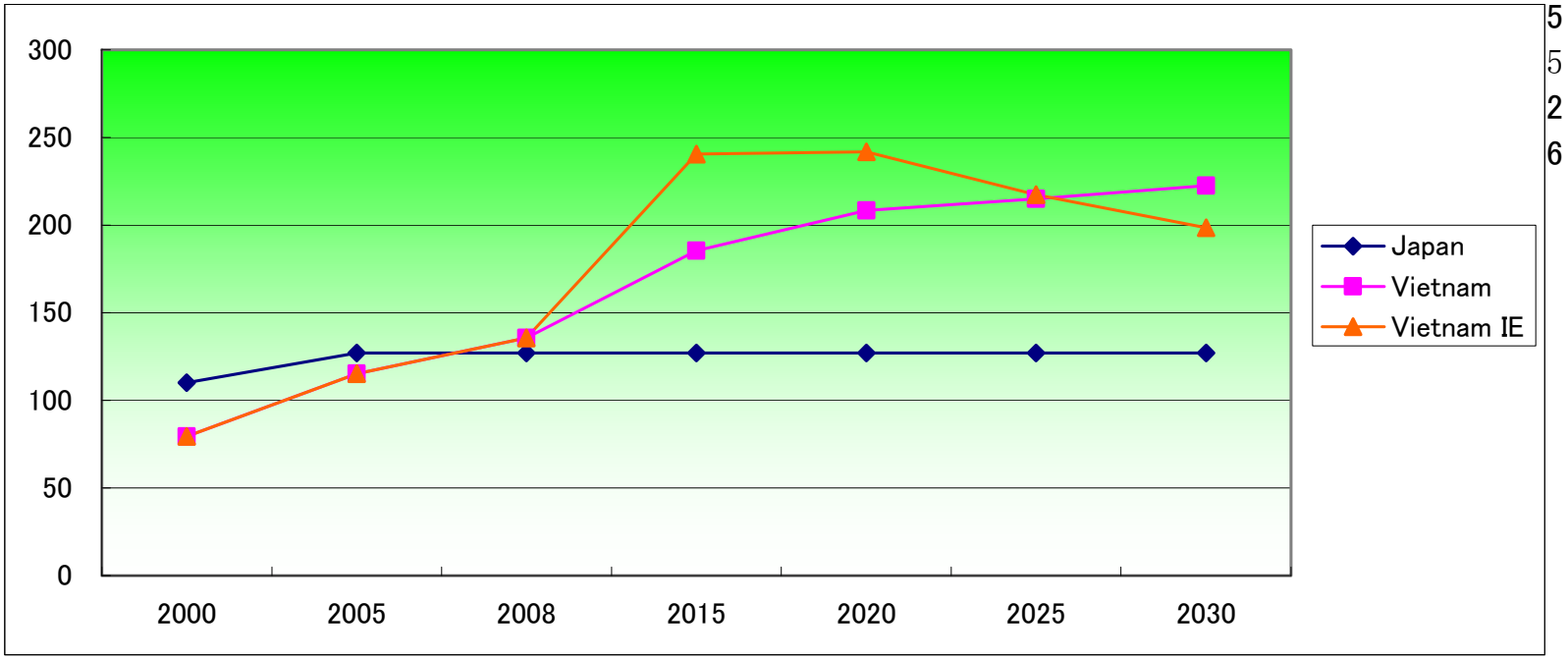
	1990	1995	2000	2005	2008	2015	2020	2025	2030
Japan	154	177	175	167	172	156	148	141	134
VN-JICA	649	591	703	976	1,242	1,640	1,692	1,565	1,434
VN-IE	649	591	703	976	1,322	1,803	1,818	1,695	1,534



Low: Commercial Sector Power Intensity

Power intensity to Commsercail & Service GDP (GWh/BillionUS$)

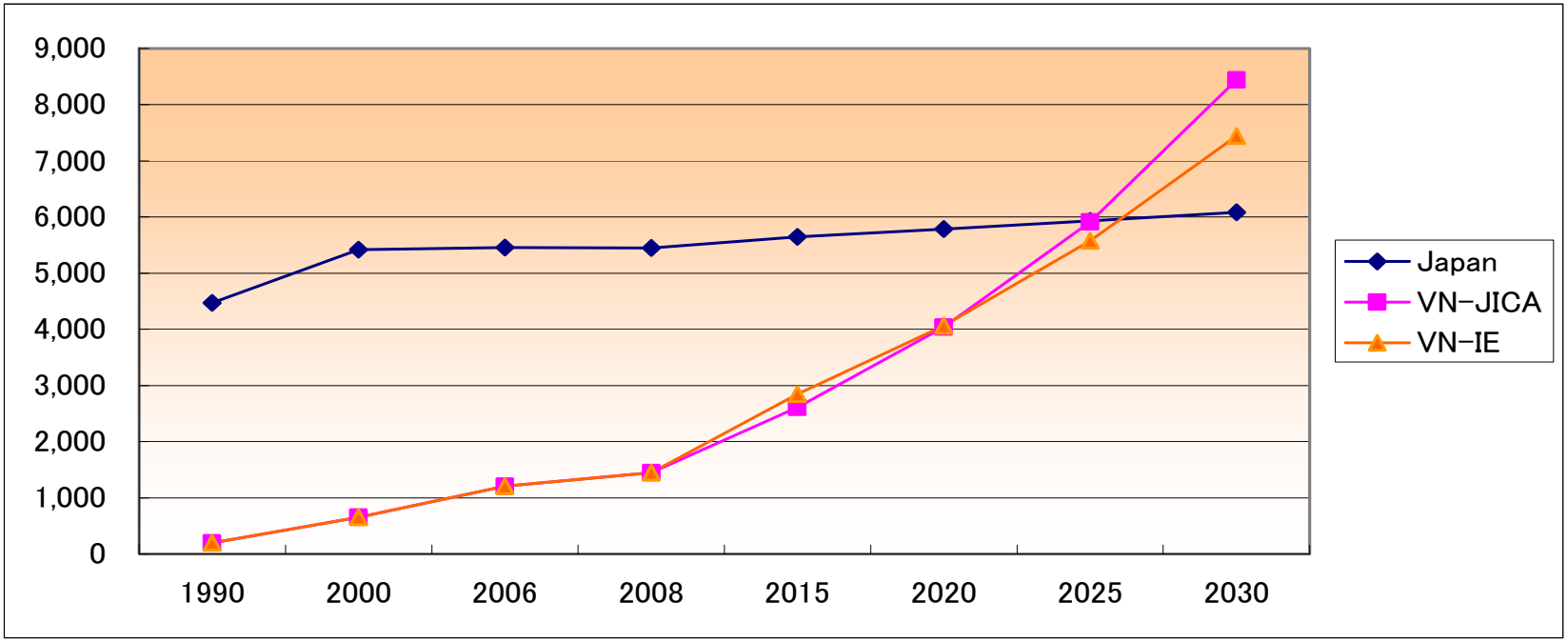
	2000	2005	2008	2015	2020	2025	2030
Japan	110	127	127	127	127	127	127
Vietnam	79	115	136	185	208	215	223
Vietnam	79	115	136	241	242	217	199



Low: Residential Use Power Intensity

Power intensity to Household (kWh/HH)

	1990	2000	2006	2008	2015	2020	2025	2030
Japan	4,470	5,420	5,456	5,450	5,644	5,786	5,932	6,082
VN-JICA	194	653	1,208	1,449	2,608	4,041	5,914	8,443
VN-IE	194	653	1,208	1,449	2,844	4,066	5,578	7,447

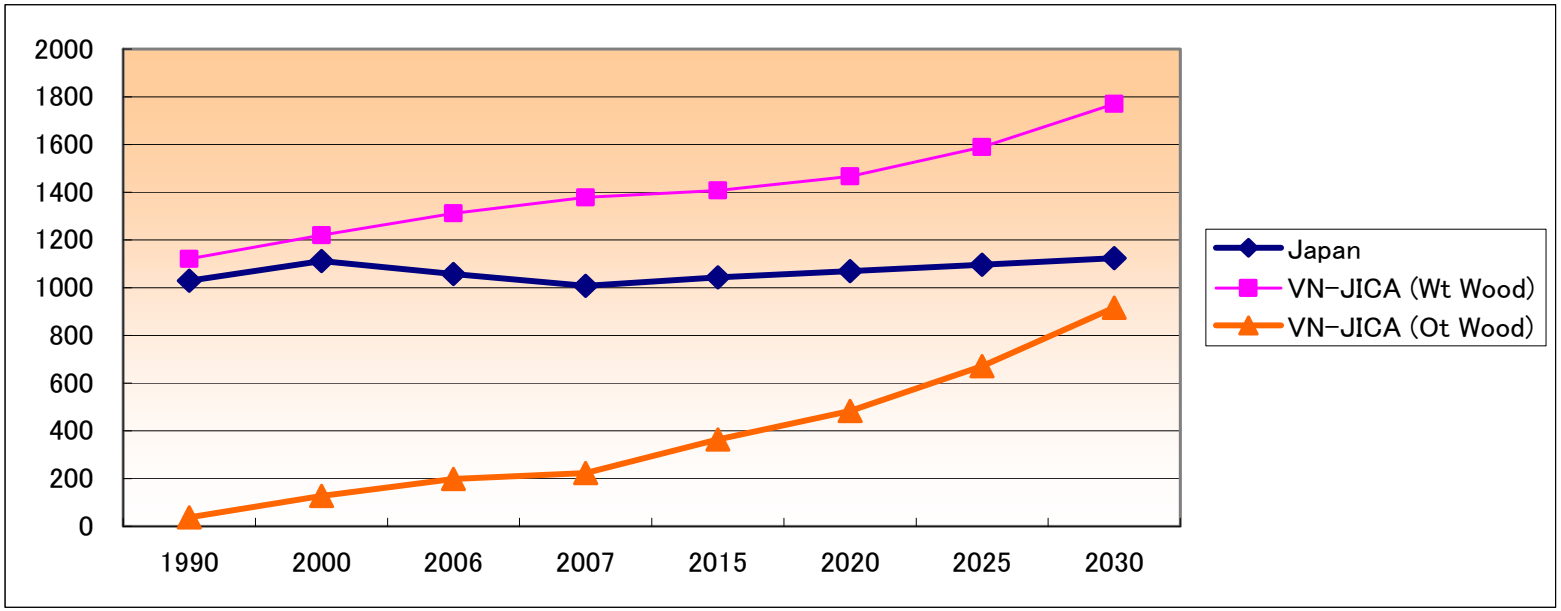


Low: Residential Use Energy Intensity

Residential sector comparison between JP and VN

Energy intensity to Household (TOE/1000HH)

	1990	2000	2006	2007	2015	2020	2025	2030
Japan	1029	1111	1058	1007	1043	1069	1096	1124
VN-JICA (Wt Wood)	1122	1219	1312	1378	1407	1467	1589	1771
VN-JICA (Ot Wood)	37	127	199	223	364	483	672	916



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添付資料 2.F

ステークホルダーミーティング
資料(専門家チーム)

Technical Assistance for Power Development Plan 7 in Vietnam
Stakeholders Meeting
August 3, 2010 in Hanoi, Vietnam

Power Demand Forecasting

JICA TA team / T.Inoue

Contents

1. Methodologies
2. Preconditions
3. Forecasting
4. Recommendations

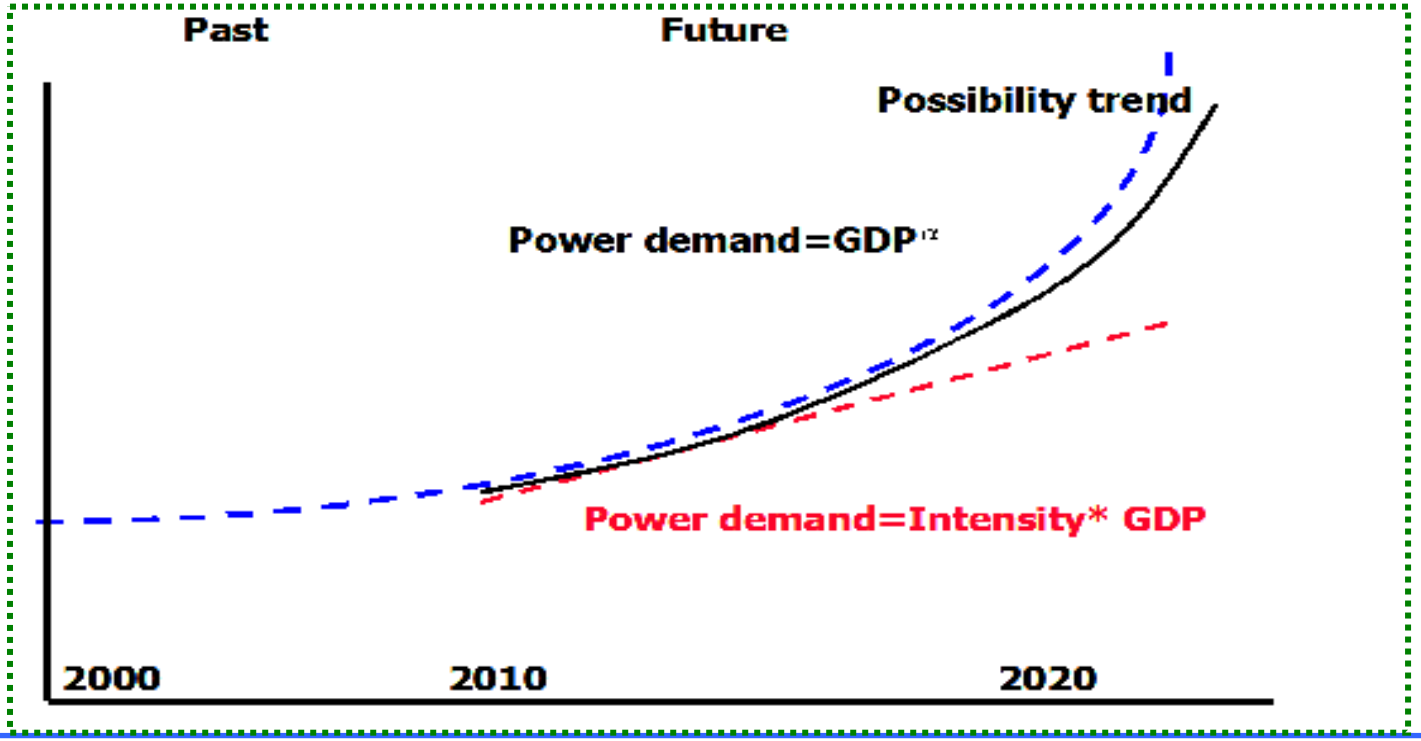
1. Methodology

1.1 Sectoral Intensity Approach

◆Forecasting by Power demand Elasticity to GDP and Price

Power demand = $GDP^{\alpha} * Price^{-\beta}$

Power demand = Intensity(t) * GDP+ γ



1.2 Demand equations for PDP7

Power demand forecasting equation is expressed by the followings

$$\text{Power demand} = (E/GDP) \times (1-T/100) \times (P/E) \times GDP + \gamma$$

◆E/GDP　:Energy intensity to GDP

◆1-T/100：Variable changed by energy price and EE&C to intensity

◆P/E　　:Power ratio

◆GDP　　:Real GDP

◆ γ　　:Constants for adjusting forecasting error

1.3 Adjusting forecasting error

◆High growth GDP is caused by high capital investment.

◆ The investment has been used for factories.

◆Factories are consumed huge power.

◆Capital investment growth equals to power demand growth.

◆“ γ ” is shown by Capital growth rate - GDP growth rate

◆New large scale facilities are surveyed, and the power demand of the facilities is estimated.

1.4 Future large scale facilities

Area	Sector	Unit	2010	2015	2020	2025	2030
Northern	Industrial park	GWh	6,045	19,045	41,635	52,929	64,224
	Commercial	GWh	53	97	128	156	184
	Transportation	GWh	9	108	212	273	344
	Total	GWh	5,642	17,784	38,772	49,287	59,812
	Sector	GWh	2010	2015	2020	2025	2030
Central	Industrial park	GWh	404	3,572	8,400	10,814	13,228
	Commercial	GWh	2	9	20	48	76
	Transportation	GWh	4	128	253	344	435
	Total	GWh	379	3,434	8,026	10,373	12,721
	Sector	GWh	2010	2015	2020	2025	2030
Southern	Industrial park	GWh	11,522	24,160	41,805	50,628	59,451
	Commercial	GWh	8	62	101	133	164
	Transportation	GWh	37	154	896	942	988
	Total	GWh	10,680	22,518	39,587	47,808	56,030
	Sector	GWh	2010	2015	2020	2025	2030
Total	Industrial park	GWh	17,970	46,776	91,840	114,371	136,903
	Commercial	GWh	63	169	249	336	423
	Transportation	GWh	51	390	1,360	1,559	1,768
	Total	GWh	18,084	47,335	93,449	116,266	139,094

$$\text{Power demand} = (E/GDP) \times (1-T/100) \times (P/E) \times GDP + \gamma$$

2. Preconditions

2.1 Economic Prediction

◆ Economic scenarios by Case from SED2020

Prediction Items	Base	High	Low
World economy	Gets out from crisis	Gets out from crisis	Not get out from crisis
Economic structure	Change Moderately	Change Firstly	Change Slowly
Regulatory Reform	Implemented up to 2020	Implemented up to 2020	Not implemented
Oil market	Stable	Stable	High price
Infrastructure Development	Developed on schedule	Developed on schedule	Delayed

Source: Scenarios of Economic Development for The Period up to 2020”

◆ GDP growth rate by case

		Unit	2010	2015	2020	2030
Base	GDP (Current)	Bil USD	103	197	340	1,039
	GDP/capita (at 2008)	USD	1,285	2,140	3,500	10,146
	Japan ($48000/capita)	S%	2.7%	4.5%	7.3%	21%
	Total GDP	G%		7.5	8.1	8.0
High	GDP (Current)	Bil USD	103	214	396	1,437
	GDP/capita (at 2008)	USD	1,234	1,950	3,035	8,150
	Japan ($48000/capita)	S%	3.6 %	5.7 %	8.9 %	24.0 %
	Total GDP	G%		9.1%	9.6%	9.8%
Low	GDP (Current)	Bil USD	103	193	326	953
	GDP/capita (at 2008)	USD	1,216	1,762	2,495	5,408
	Japan ($48000/capita)	S%	3.6 %	5.2 %	7.3 %	15.9 %
	Total GDP	G%		7.1%	7.7%	7.6%

2.2 Population

- Average population growth rate is 1.3%/year in period of 2001-2008.
- Population growth rate will be declined moderately in future. It increases with 1.0% to 0.5% per year in the country,
- Urban population is increased rapidly, increase 2.1% per year in urban area from 2015 to 2030.

(million persons)

	2010	2011	2012	2013	2014	2015	2020	2025	2030
Country Population	88.8	89.7	90.6	91.5	92.4	93.3	97.6	100.2	102.8
Urban rate	29%	29%	30%	30%	31%	31%	34%	36%	39%

2.3 Crude oil Price

- World Export Crude Oil Price (WEP) defined by IEA is used as Indicator.
- WTI is 8-10% higher than WEP.
- $5/bbl/year up from 2010 to 2013, the price move from $70/bbl to $85/bbl.
- After 2014, the price increase with 2.0% as much as USA inflation (=dollar devaluation)

	2010	2011	2012	2013	2014	2015	2020	2025	2030
WEP Base	70	75	80	85	87	88	98	108	119
WTI Base	77	83	88	94	95	97	107	119	131
WTI High	77	83	88	94	96	98	111	126	142
WTI Low	77	83	88	94	94	95	100	105	111

2.4 Power tariff

- International coal price will increase in company with crude oil price.
- Coal price for power sector in VN reaches international coal market price by 2015.
- Power tariffs are increased with coal price growth rate multiplied by elasticity (0.8) after 2016.

Base case

	Unit	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030
Agriculture use	VDN/kWh	636	643	675	707	738	768	813	910	1,049	1,199
Residential use	VDN/kWh	908	918	964	1,009	1,053	1,096	1,161	1,299	1,498	1,712
Industry use	VDN/kWh	935	945	996	1,046	1,095	1,144	1,217	1,373	1,600	1,847
ommercial use	VDN/kWh	1,786	1,805	1,902	1,998	2,092	2,185	2,324	2,622	3,055	3,528
Other use	VDN/kWh	955	965	1,013	1,061	1,107	1,153	1,221	1,366	1,574	1,800
Agriculture	%	7.6	1.1	5.0	4.7	4.4	4.1	5.9	2.2	2.8	2.7
Residential	%	15.8	1.1	5.0	4.7	4.4	4.1	5.9	2.2	2.8	2.7
Industry	%	9.0	1.1	5.4	5.0	4.7	4.4	6.4	2.4	3.0	2.9
Commercial	%	9.7	1.1	5.4	5.0	4.7	4.4	6.4	2.4	3.0	2.9
Others	%	3.5	1.0	5.0	4.7	4.4	4.1	5.9	2.2	2.8	2.7

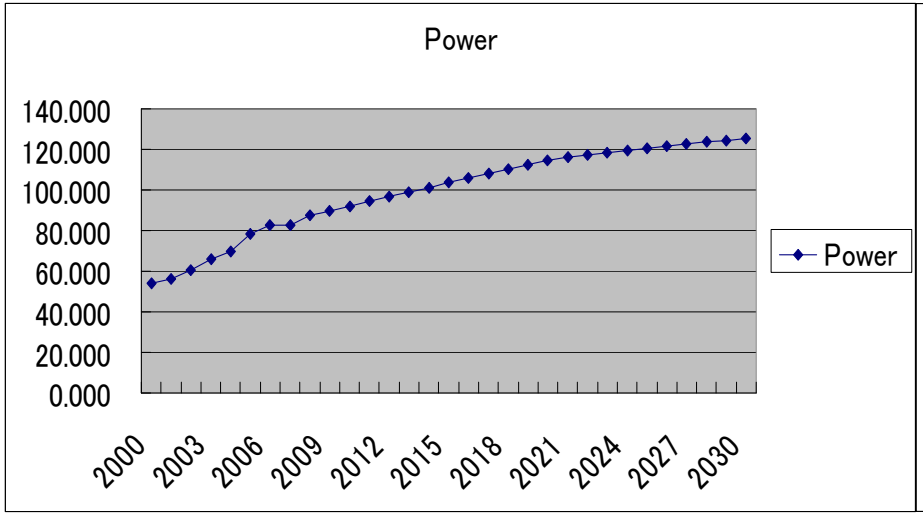
2.5 Power Intensity

(1) Industry

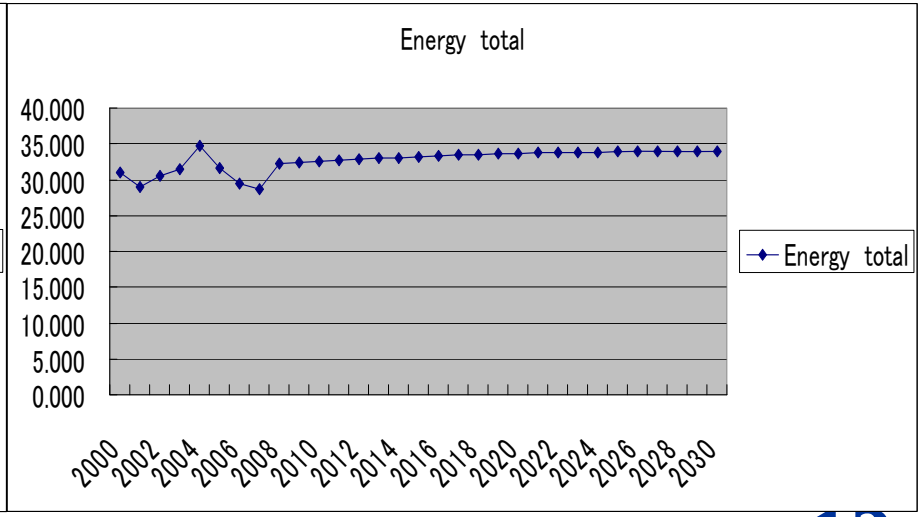
Industry

	2006	2007	2008	2009	2010	2015	2020	2025	2030
Energy total	29.523	28.649	32.222	32.39	32.55	33.21	33.67	33.90	33.92
toe/ Bil VND 2005price	-6.9	-3.0	0.5	0.52	0.49	0.35	0.22	0.08	0.00
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power Ratio	21.9	24.1	23.3	23.8	24.3	26.8	29.3	30.6	31.8
%				0.5	0.5	0.5	0.5	0.3	0.3
	2006	2007	2008	2009	2010	2015	2020	2025	2030
Power	82.721	82.786	87.392	89.73	92.06	103.60	114.80	120.51	125.54
MWh/ Bil VND 2005pric	5.5	0.1	5.6	2.67	2.60	2.26	1.96	0.91	0.79

MWh/ Bil VND of Industry DGP

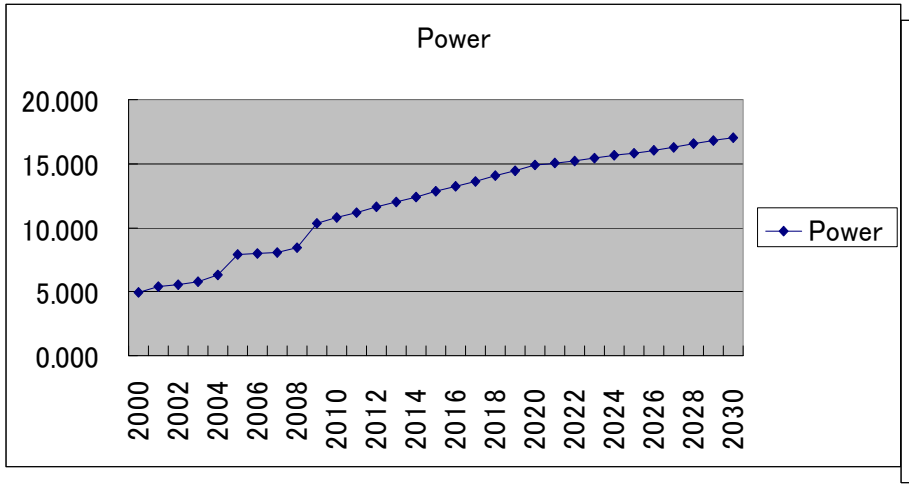


Toe / Bil VND of Industry GDP

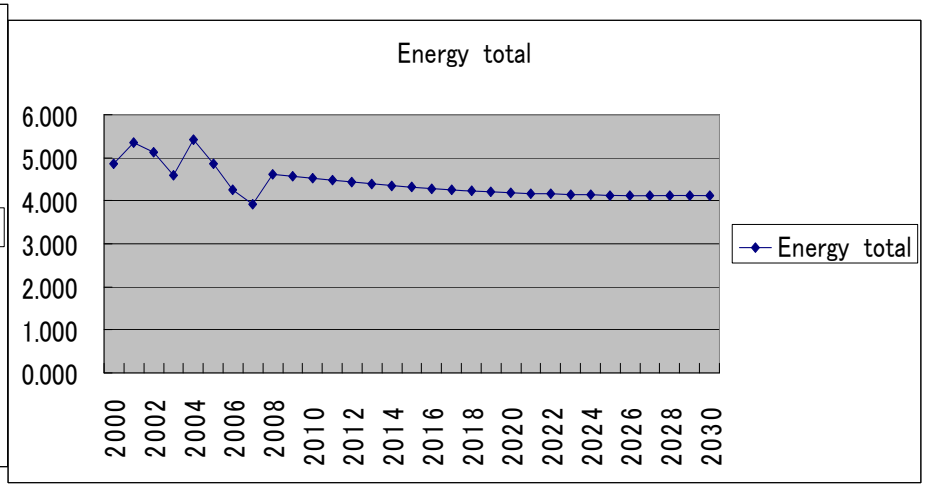


(2) Commercial & Residential

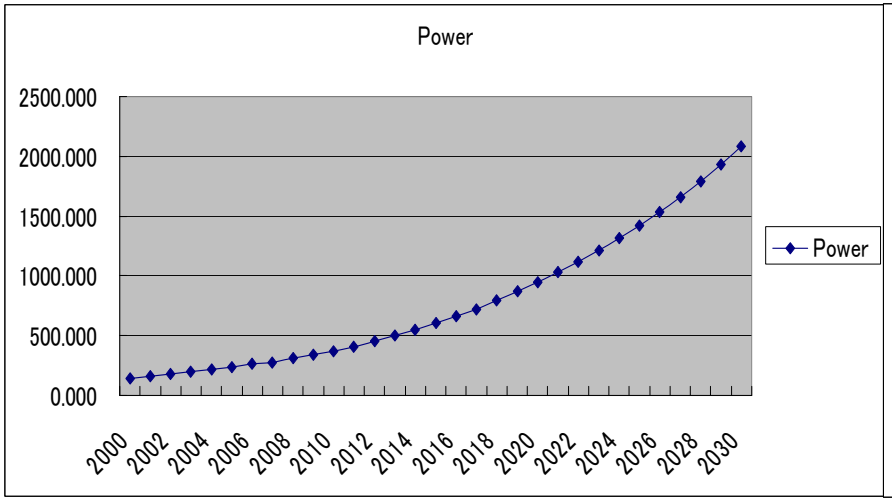
MWh / Bil VND of Commercial GDP



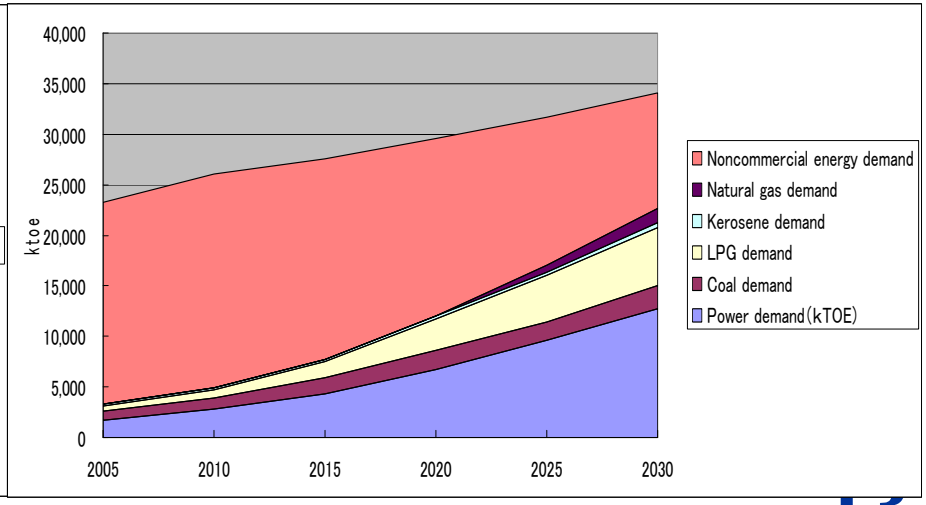
toe / Bil VND of Commercial GDP



Residential MWh/ 1000 p



ktoe



2.6 EE&C & Tariff elasticity

(1) Industry

- Technical Improvement are set with –2.0% per year from 2015.
- As the elasticity Btw demand & tariff, -0.15 are set from 2010 to 2030.
- Power conservation rates are improved from 100.0 in 2009 to 65 in 2030.

I	J	2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.00	100.00	99.84	94.09	83.51	73.74	65.21
Technical Improvement	%	0.00	0.00	0.00	-2.00	-2.00	-2.00	-2.00
Elasticity to Power price		-2.63	0.00	-0.15	-0.15	-0.15	-0.15	-0.15
Power intensity to GDP	MWh/Bil Don 2005 p	87.4	89.7	92.1	103.6	114.8	120.5	125.5

(2) Commercial & Residential

Commercial

I	J	2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	99.8	96.0	94.3	87.6	81.5
Technical Improvement	%	0.00	0.00	0.00	0.00	0.00	-1.00	-1.00
Elasticity to Power price		-2.93	0.00	-0.15	-0.15	-0.15	-0.15	-0.15
Power intensity to GDP	MWh/Bil Don 2005pr	8.5	10.4	10.8	12.8	14.9	15.9	17.0

Residential

I	J	2008	2009	2010	2015	2020	2025	2030
Power conservation rate	S%	100.0	100.0	100.0	97.6	96.5	95.1	93.8
Technical Improvement	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Elasticity to Power price		-1.7	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Power intensity to GDP	MWh/1000 person	314	339	372	602	951	1,423	2,079

3. Forecasting

(1) Power demand Forecasts

		2010	2015	2020	2025	2030
Demand (TWh)	Base IE	88	170	290	430	615
	JICA	88	156	263	395	581
	High IE	88	184	318	494	738
	JICA	88	169	305	490	778
	Low IE	88	161	248	354	492
	JICA	87	147	240	350	501
P-max (GW)	Base IE	16	31	52	77	110
	JICA	18	29	47	71	104
	High IE	16	33	57	88	132
	JICA	18	31	55	89	141
	Low IE	16	29	45	63	88
	JICA	18	27	43	63	90

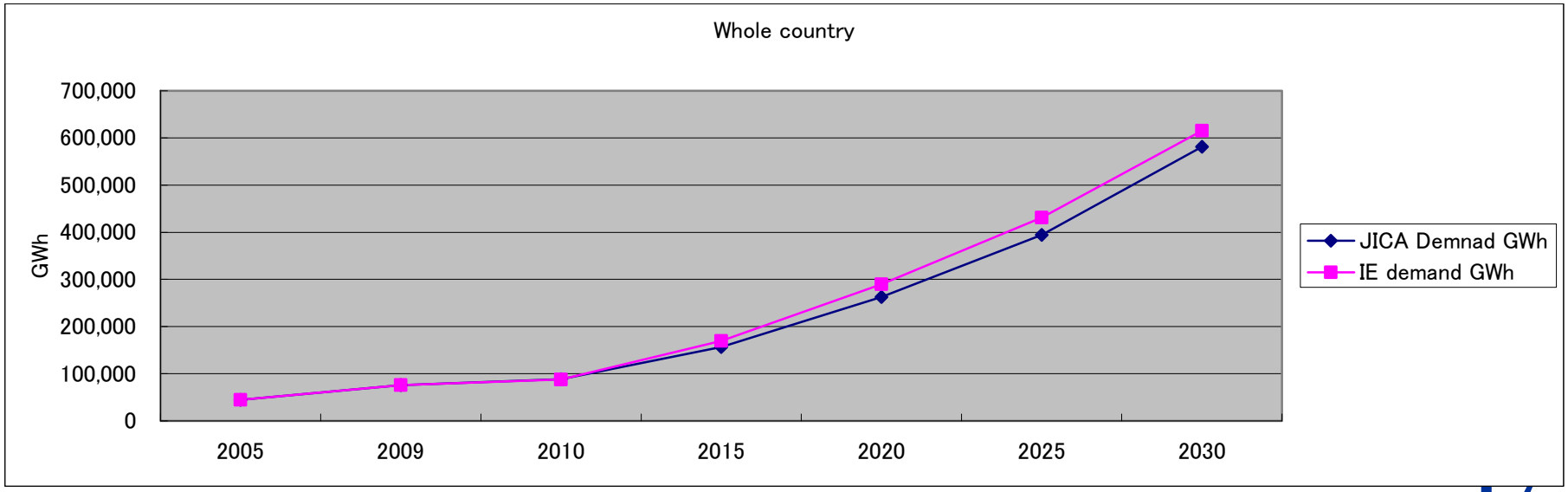
(2) Comparison of Power demand in Base case

Whole country

		2005	2009	2010	2015	2020	2025	2030	20/10
JICA Demnad	GWh	44,832	76,046	88,017	156,341	262,545	394,678	580,795	11.5
IE demand	GWh	44,832	76,046	87,665	169,821	289,882	430,867	615,205	12.7

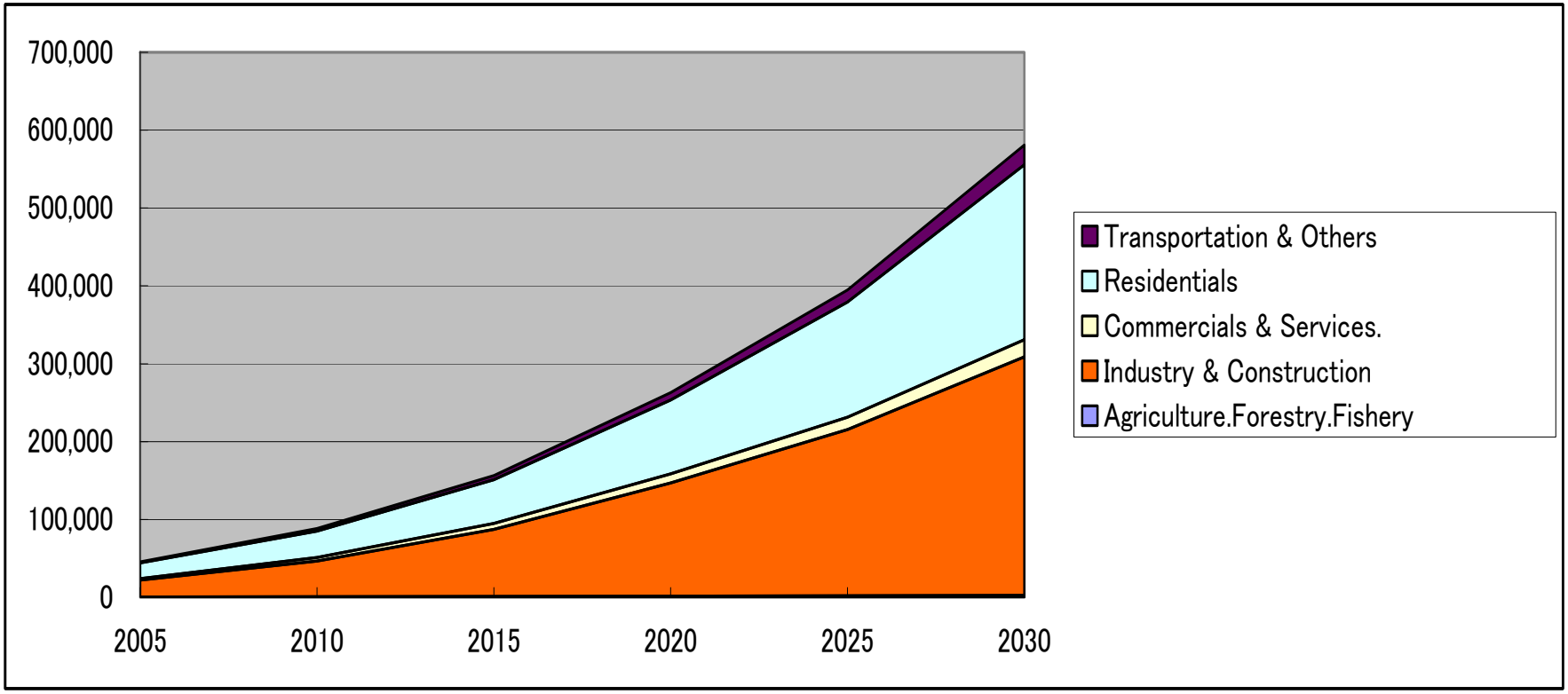
		2005	2009	2010	2015	2020	2025	2030
JICA Demnad	%		14.1	14.4	12.2	10.9	8.5	8.0
IE demand	%		14.1	14.4	14.1	11.3	8.2	7.4

JICA Demnad	GWh	44,832	76,046	88,017	156,341	262,545	394,678	580,795	11.5
Model Forecasts	GWh	44,832	76,046	84,406	142,219	233,281	359,954	539,244	10.7
Additional demand	GWh			3,612	14,122	29,264	34,724	41,551	23.3
Additioanl rate	%			**4.1**	**9.0**	**11.1**	**8.8**	**7.2**	**2.0**



(3) Power demand by Sector

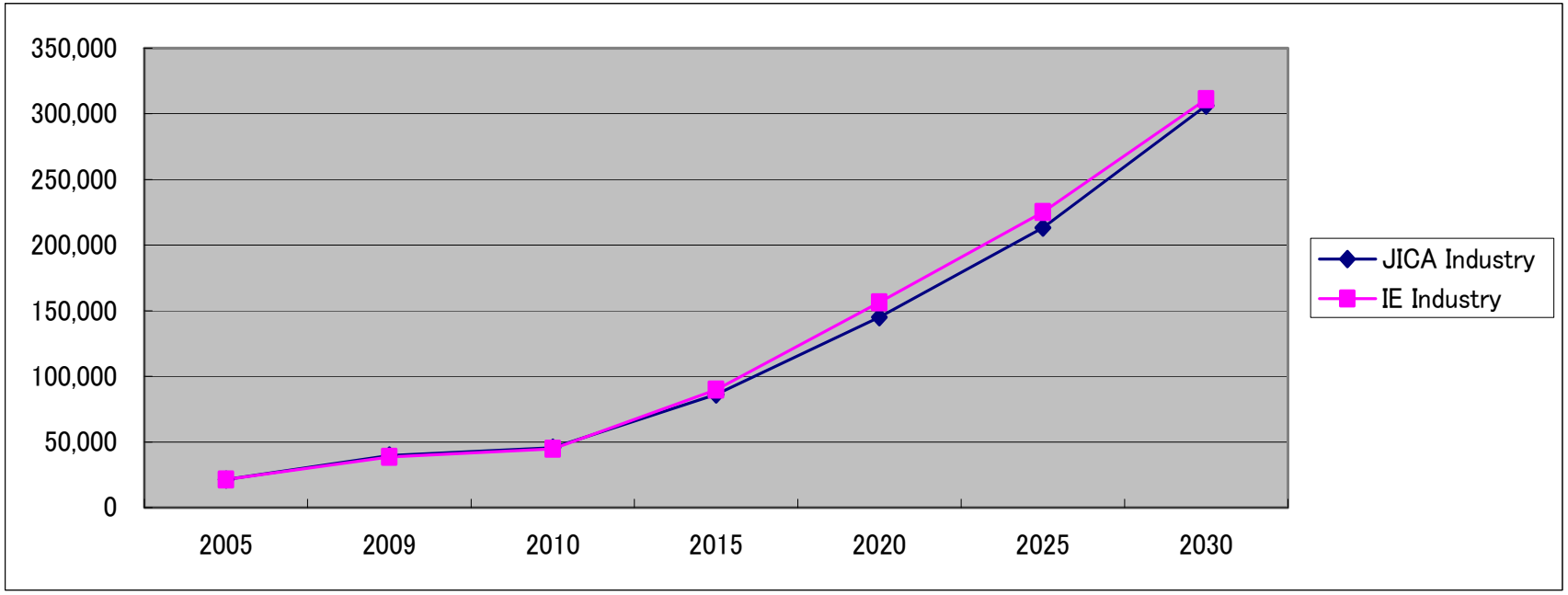
		2005	2010	2015	2020	2025	2030	2020/10	2030/20
Whole	Agriculture.Forestry.Fishery	574	764	1,108	1,534	1,845	2,200	7.2	3.7
	Industry & Construction	21,302	45,551	86,273	145,140	213,342	306,293	12.3	7.8
	Commercials & Services.	2,162	4,621	7,370	11,718	16,165	22,323	9.8	6.7
	Residentials	19,831	33,944	56,288	94,971	147,807	224,588	10.8	9.0
	Transportation & Others	1,734	3,137	5,303	9,183	15,520	25,391	11.3	10.7



◆ Comparison of Power demand by Industrial Sector

Industry & Construction in Whole

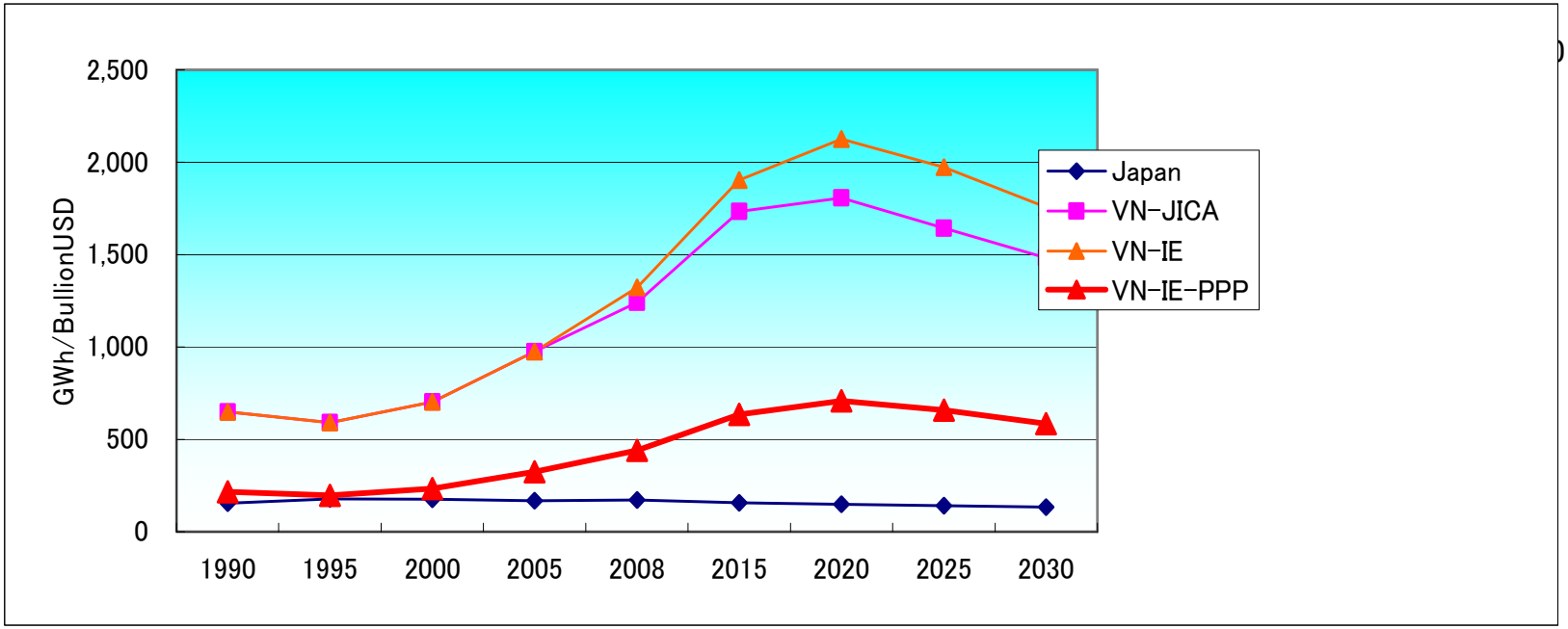
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Industry	21,302	39,822	45,551	86,273	145,140	213,342	306,293	12.3
IE	Industry	21,302	38,501	44,708	89,805	156,458	225,264	311,052	13.3



◆ Comparison of Power intensity by Industrial Sector

Power intensity to Industrial GDP (GWh/Billion US$)

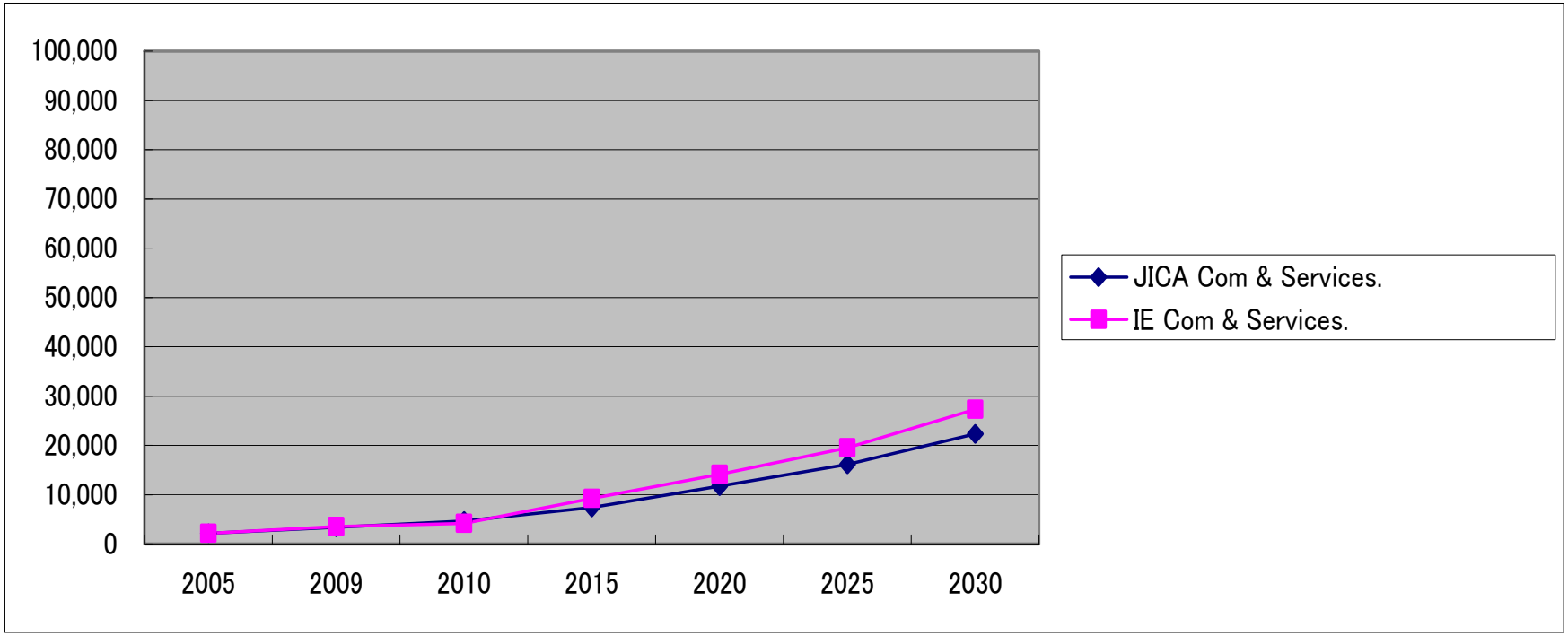
	1990	1995	2000	2005	2008	2015	2020	2025	2030
Japan	154	177	175	167	172	156	148	141	134
VN-JICA	649	591	703	976	1,242	1,734	1,807	1,644	1,482
VN-IE	649	591	703	976	1,322	1,904	2,126	1,973	1,756
VN-IE-PPP	216	197	234	325	441	635	709	658	585



◆ Comparison of Power demand by Commercial Sector

Commercial & Services

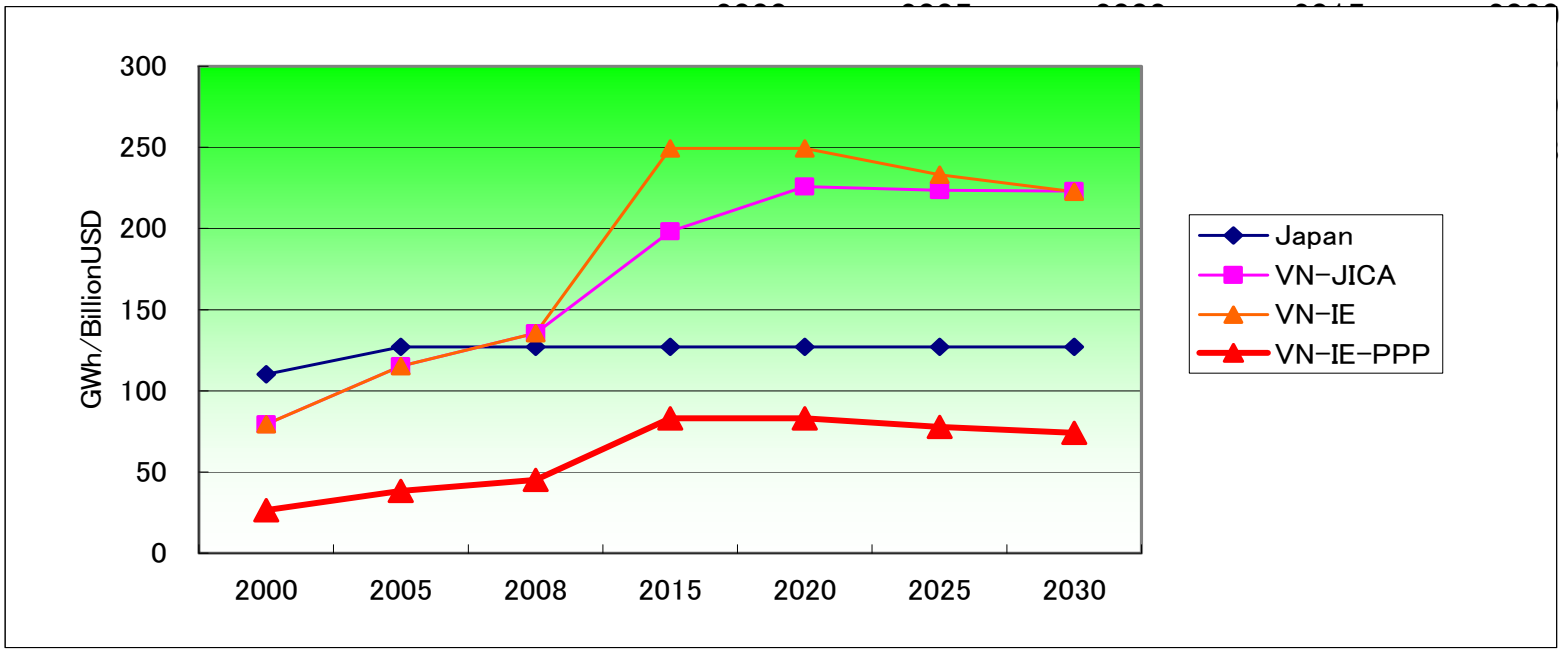
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Com & Services	2,162	3,412	4,621	7,370	11,718	16,165	22,323	9.8
IE	Com & Services	2,162	3,512	4,181	9,268	14,146	19,516	27,344	13.0



◆ Comparison of Power intensity by Commercial Sector

Power intensity to Commsercail & Service GDP (GWh/BillionUS$)

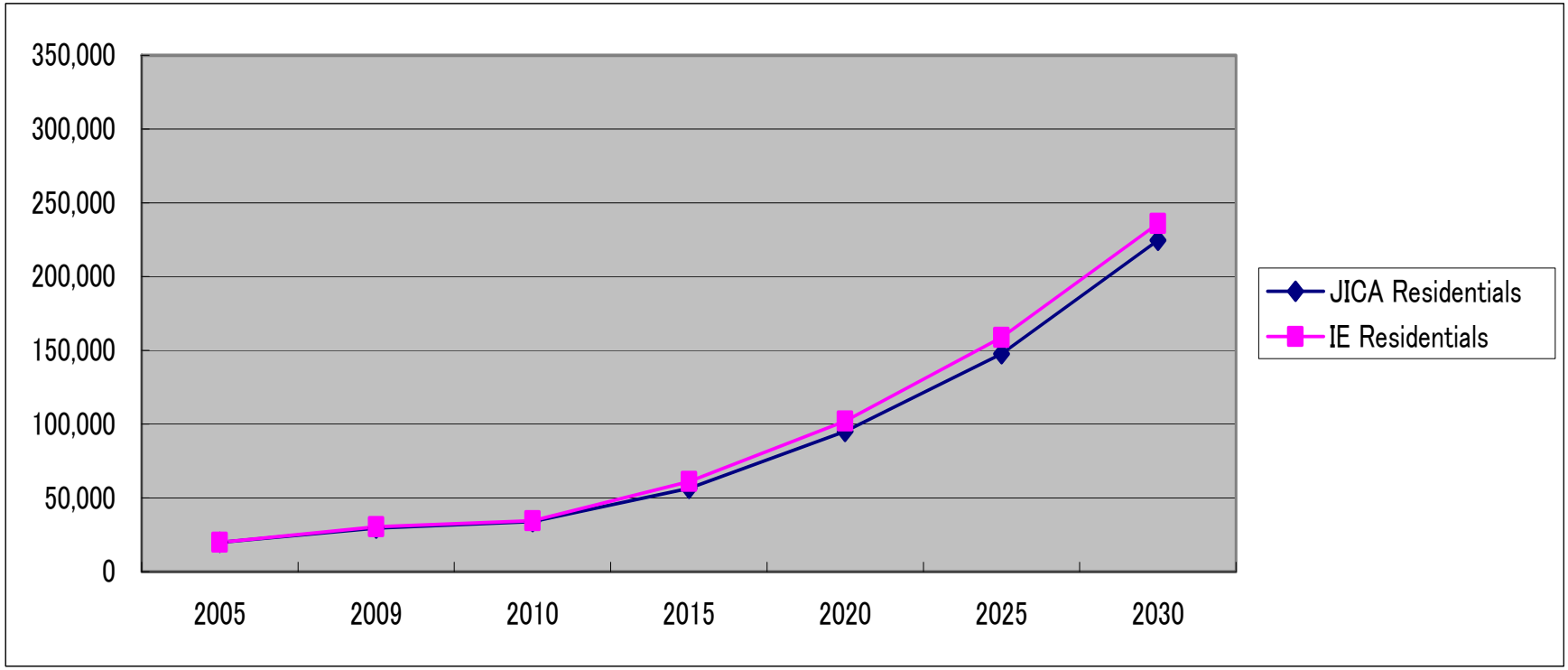
	2000	2005	2008	2015	2020	2025	2030
Japan	110	127	127	127	127	127	127
VN-JICA	79	115	136	198	226	224	223
VN-IE	79	115	136	249	249	233	223
VN-IE-PPP	26	38	45	83	83	78	74



◆ Comparison of Power demand by Residential Sector

Residential in Whole

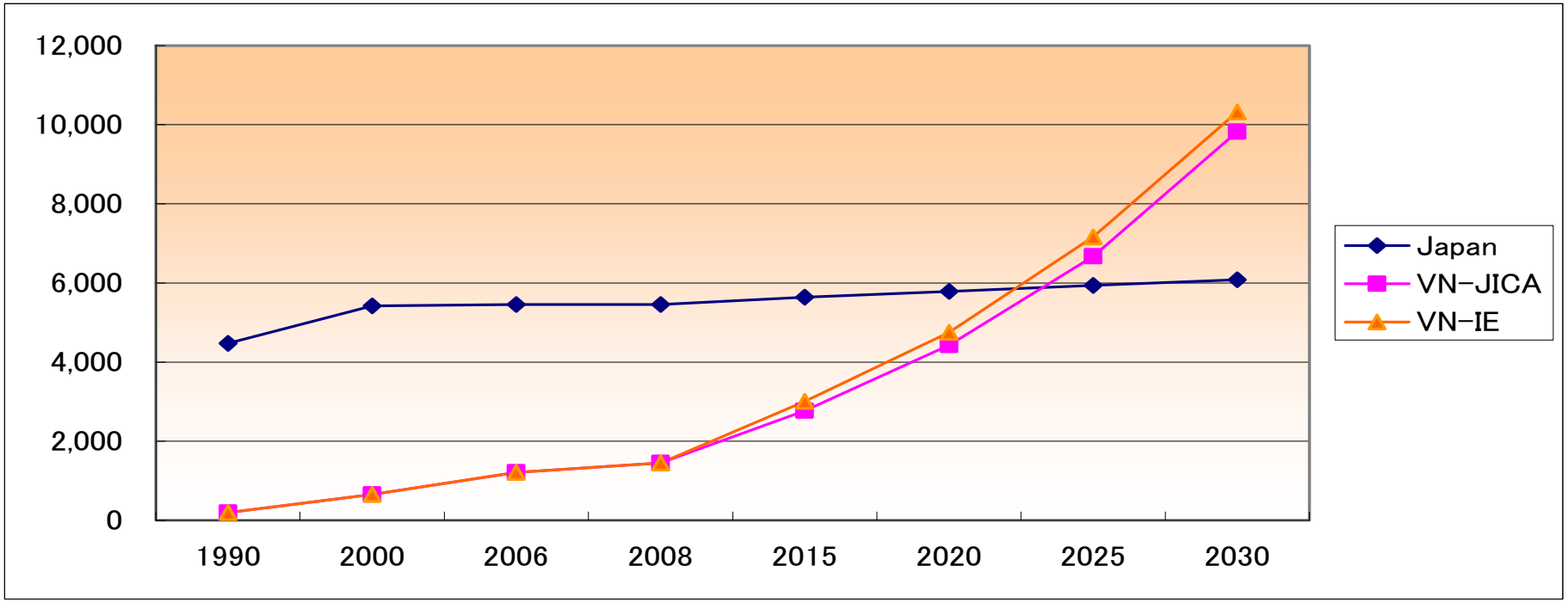
		2005	2009	2010	2015	2020	2025	2030	20/10
JICA	Residentials	19,831	29,534	33,944	56,288	94,971	147,807	224,588	10.8
IE	Residentials	19,831	30,534	34,585	61,114	101,924	158,687	235,897	11.4



◆ Comparison of Power intensity by Residential Sector

Power intensity to Household (kWh/HH)

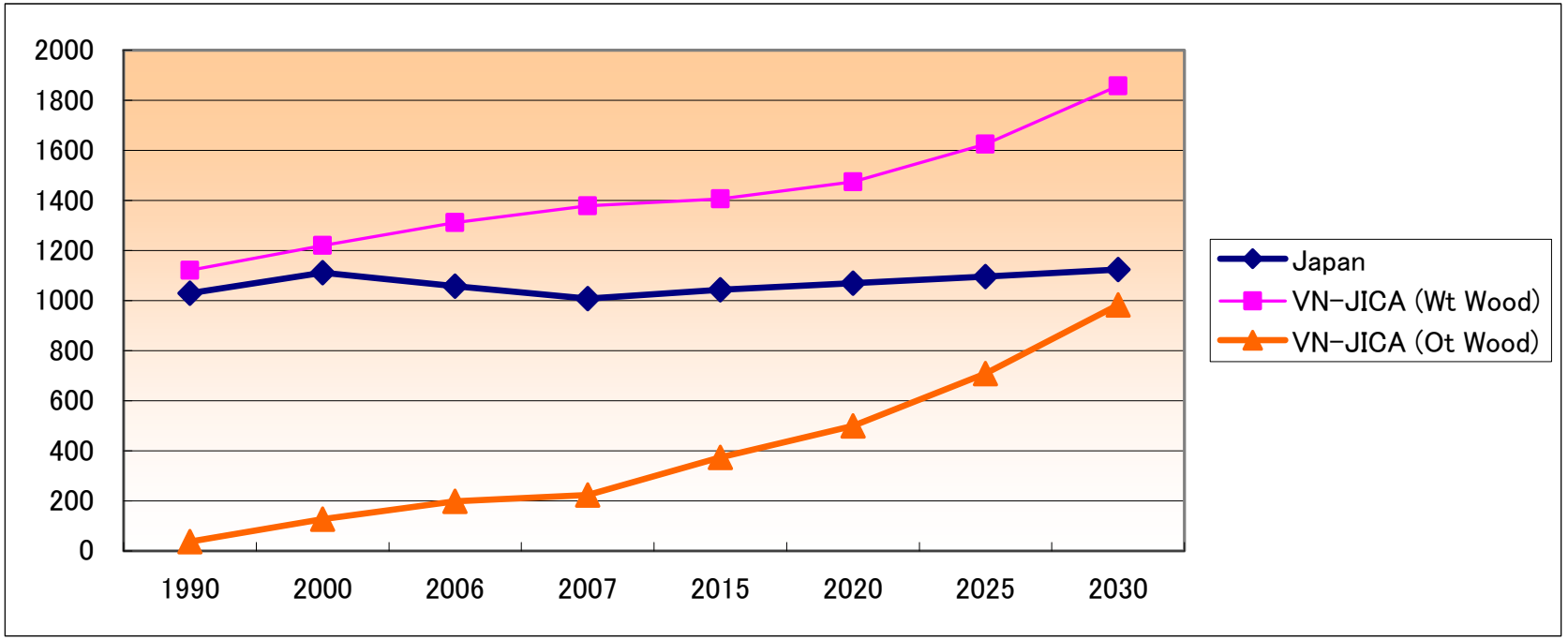
	1990	2000	2006	2008	2015	2020	2025	2030
Japan	4,470	5,420	5,456	5,450	5,644	5,786	5,932	6,082
VN-JICA	194	653	1,208	1,449	2,766	4,425	6,673	9,826
VN-IE	194	653	1,208	1,449	3,004	4,749	7,165	10,321



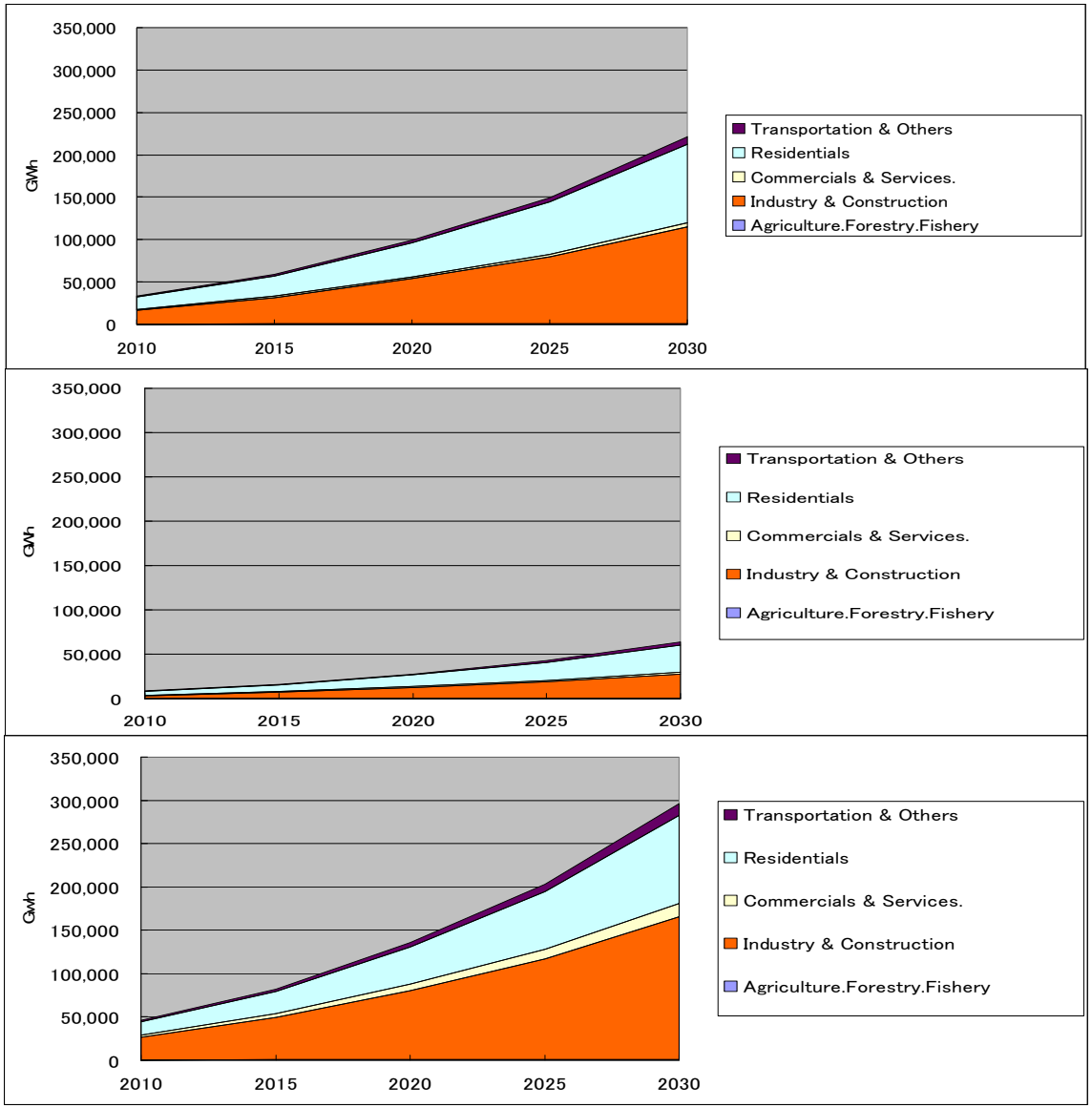
◆ Comparison of Energy intensity by Residential Sector

Energy intensity to Household (TOE/1000HH)

	1990	2000	2006	2007	2015	2020	2025	2030
Japan	1029	1111	1058	1007	1043	1069	1096	1124
VN-JICA (Wt Wood)	1122	1219	1312	1378	1406	1474	1624	1857
VN-JICA (Ot Wood)	37	127	199	223	373	500	708	983



(4) Power demand by Region



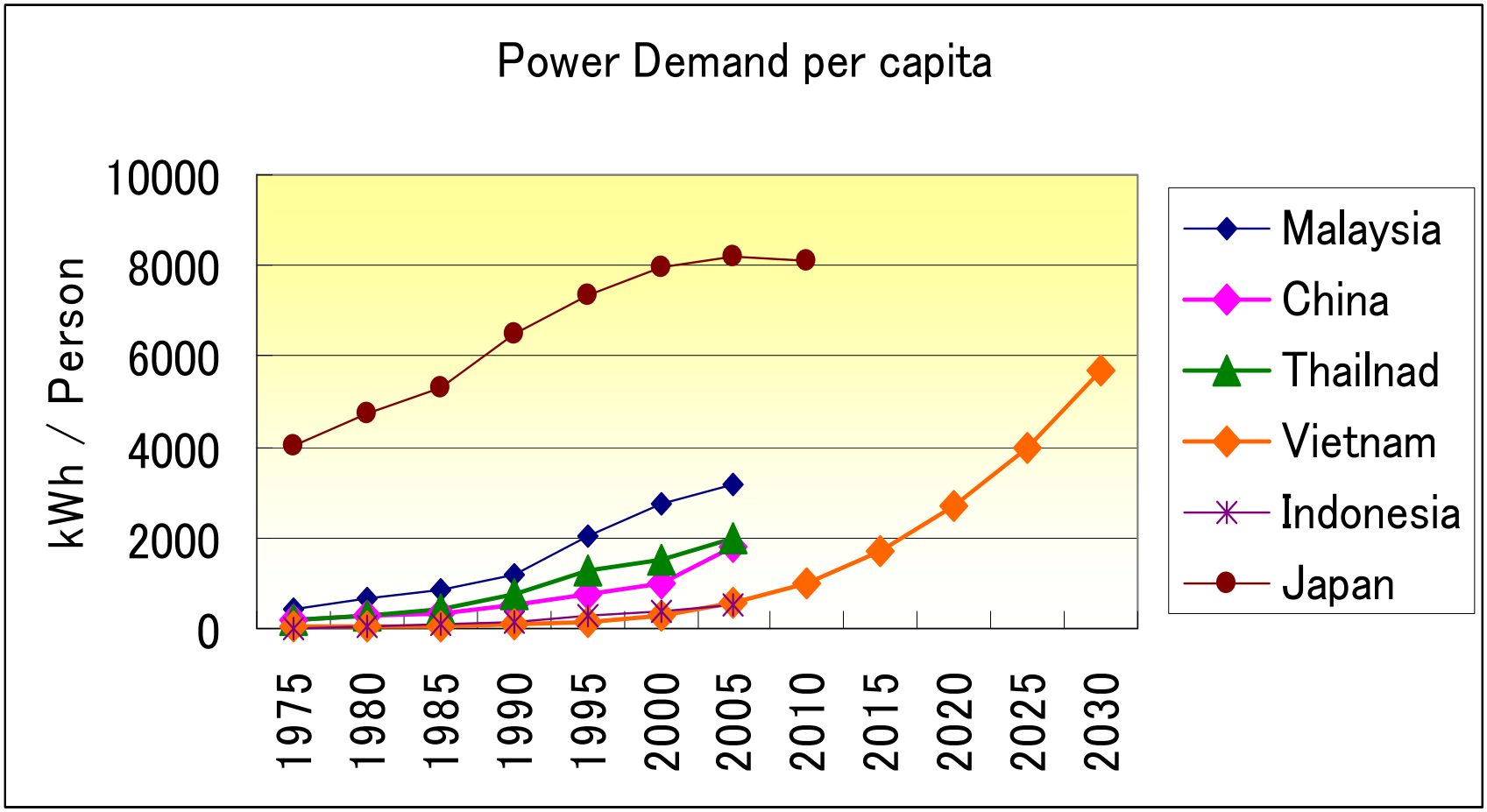
North

Central

South

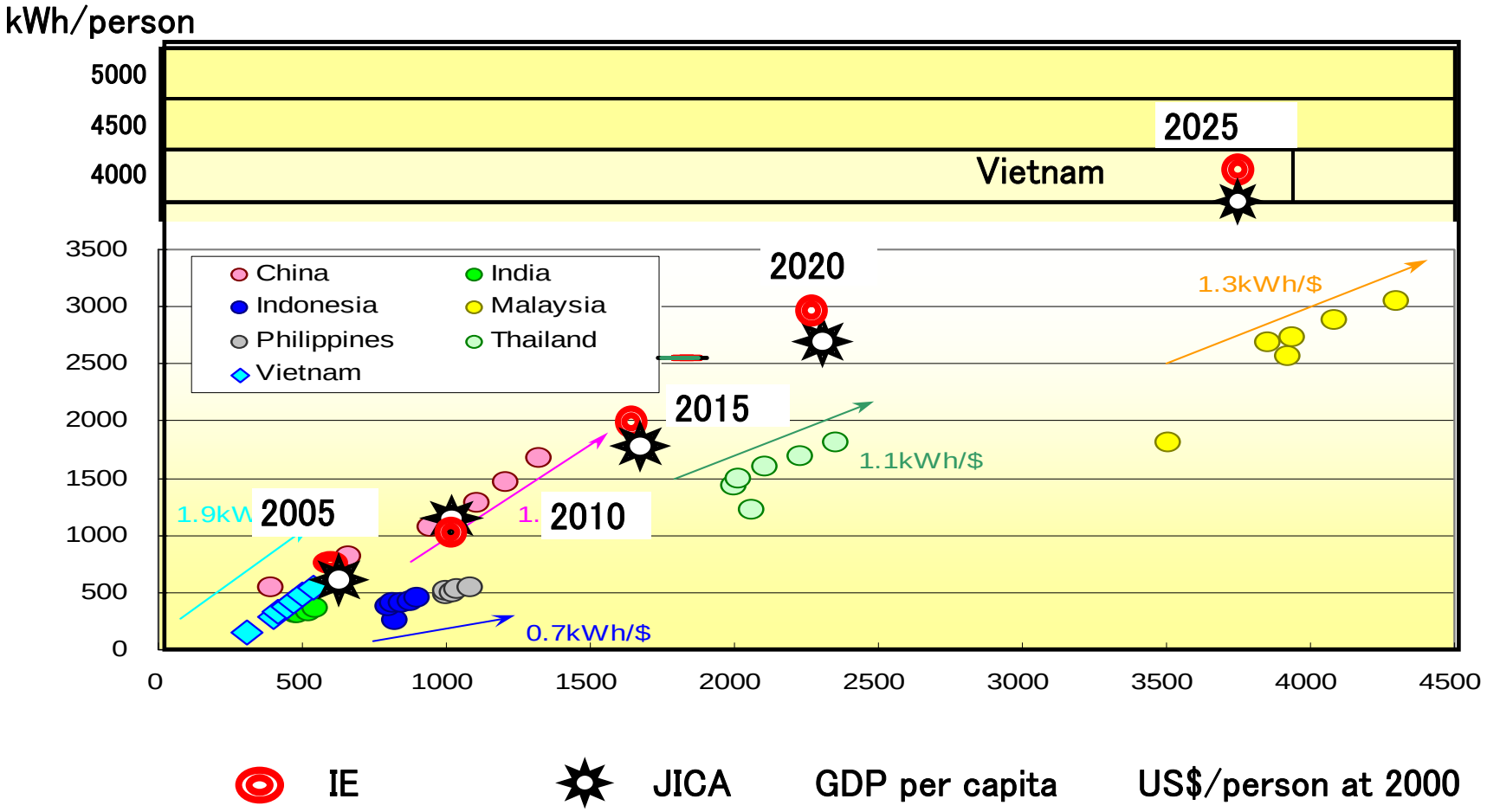
(5) Power demand by Country (kWh/p, GDP/p)

◆Power consumption per capita



Source; IEA 2009

◆Power consumption per capita & GDP per capita



Values in Fugure are Power consumption per GDP based on US$

4. Recommendations

4.1 Regarding economic outlook

◆World economy are worried about Government financial un-stability, especially in EU.

◆The labor cost will be increased continuously in China.

4.2 Regarding energy demand

◆ The difference of energy intensities between Japan and Vietnam is so big. The difference in future will become in narrow.

◆Current total energy demand in Residential sector is 1.3% up from 2010 to 2020. More higher growth rate in the sector can be considered, energy demand in the sector usually is around 2%.

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添付資料 2.G

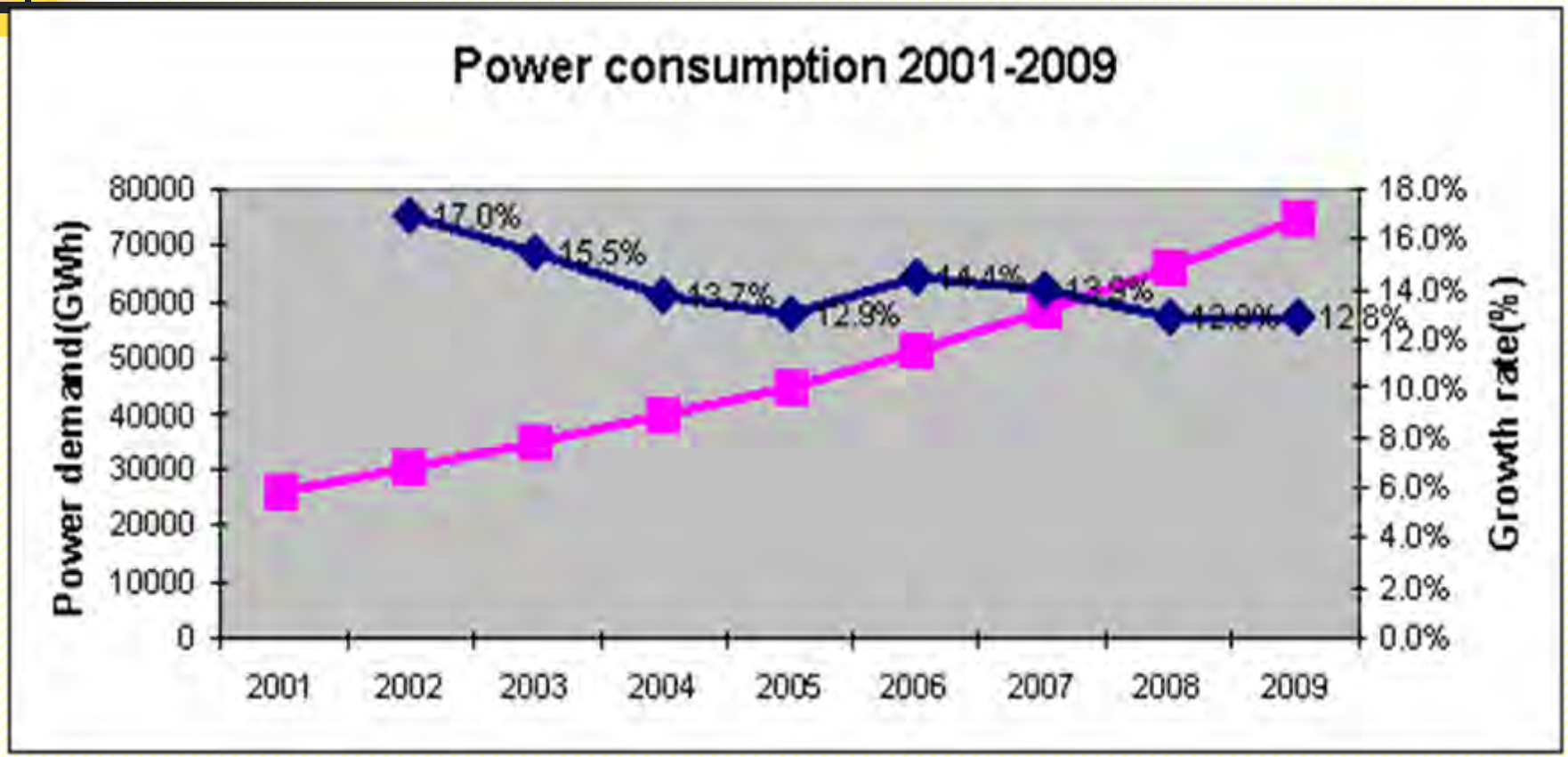
ステークホルダーミーティング

資料(IE)

Power Demand forecasting in PDP-VII

Hanoi, 8 - 2010

I. Power consumption in 2001-2009



YEAR 2009

Power Sales (TWh)	**:**	**76,0**
Power Generation (TWh)	**:**	**87,0**
Pmax (MW)	**:**	**13867**
Growth rate 2001-2009	**:**	**14,5 % / year**
2006-2009	**:**	**13,6 % / year**

Electricity consumption of Power Corporations in 2001 – 2009

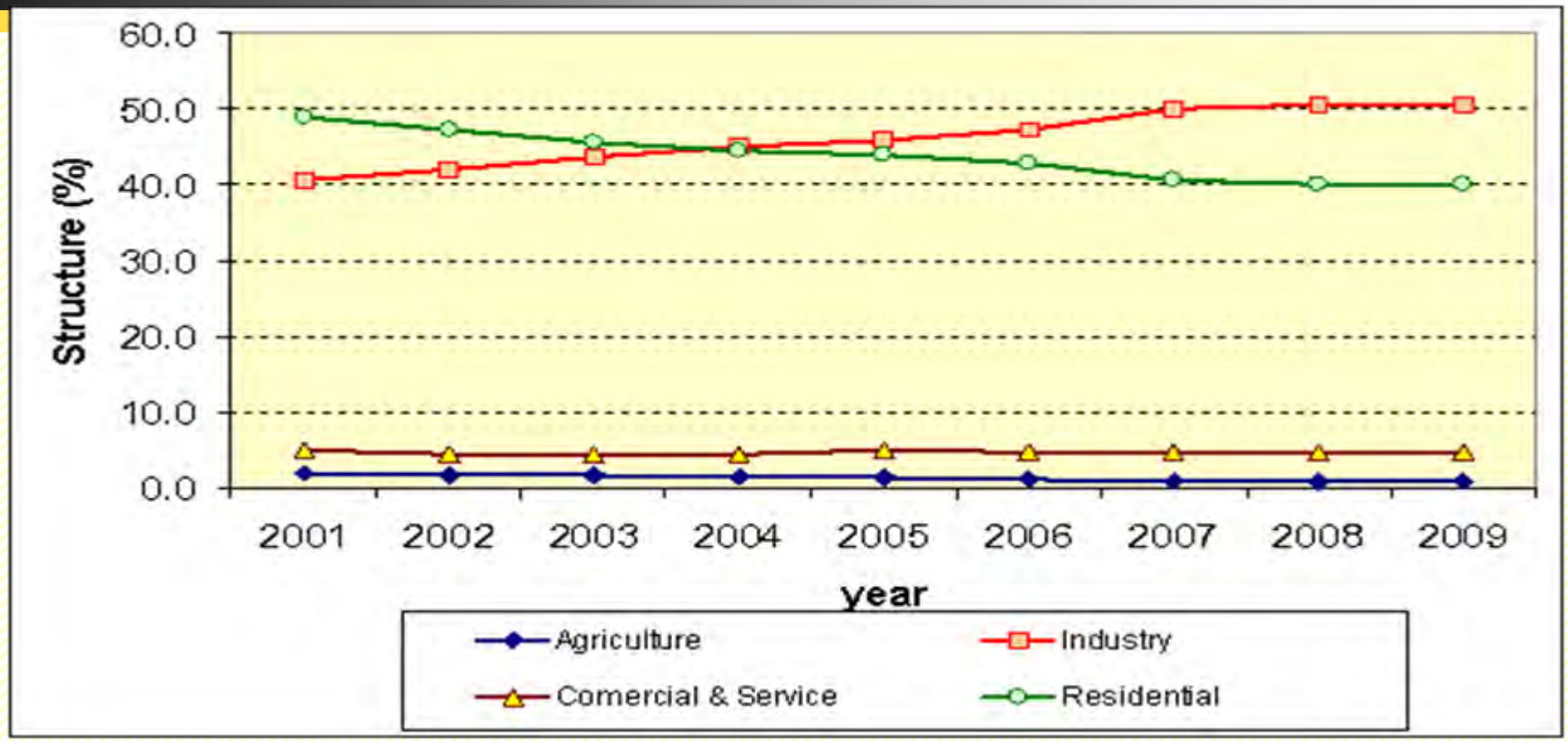
	Power Corporation	Consumption in 2009(GWh)	Average growth rate		
			2001 - 2009	2006 - 2009	2008 - 2009
1	Northern PC	21456	13,7%	14,1%	11,6%
2	Southern PC	25393	18,6%	13,9%	16,8%
3	Central PC	7426	14,1%	12,4%	13,7%
4	Hanoi PC	7889	14,8%	18,6%	15,6%
5	HCM City PC	13782	10%	7,8%	7,0%

Power consumption of regions in 2001 – 2009

Regions	Items	2009	Growth rate 2001-2009	Growth rate 2006-2009	Growth rate 2008-2009
Whole country	Demand(GWh)	76046	14,3%	13,6%	12,8%
	Generation (GWh)	87109	13,7%	12,9%	14,7%
	Peak (MW)	**13867**	**11,9%**	**10,6%**	**9,7%**
North	Demand (GWh)	29445	13,8%	13,4%	14,5%
	Peak (MW)	**6207**	**12,3%**	**12,4%**	**22,5%**
Center	Demand (GWh)	7426	14,1%	12,4%	13,7%
	Peak (MW)	**1482**	**11,7%**	**10,9%**	**17,7%**
South	Demand(GWh)	39175	14,7%	13,8%	11,6%
	Peak (MW)	**7001**	**12,9%**	**11,4%**	**11,9%**

In 2009: ***Whole Country: 12,8%***
North: 14,5%
Centre: 13,7%
South: 11,6%

Structure of electricity consumption in 2001 – 2009



Growth rate in 2001-2009:

	Power sales	***14,5%***
In Which:	**-Industry:**	**17,6%**
	-Management &residential use:	**11,6%**
	-Commercial and service:	**13,9%**

GDP growth rate & Electricity demand 2001-2009

GDP	Power sales	Elasticity
7,3%	14,5%	1,98

II. ASSESMENT OF PDP-VI IMPLEMENTATION

The result of power demand forecast in PDP-VI (base case)

	2005	2010	2015	2020	2025
GDP growth rate (% /year)		7,5%	7,2%	7,2%	7%
Demand growth rate (% /year)		16,3%	11,2%	9,3%	8,2%
Power Demand (GWh)	45603	97111	164961	257260	381160
Peak (MW)	*9255*	*19117*	*31495*	*47607*	*68440*

assessment of PDP-VI IMPLEMENTATION

Comparison between actual value and forecasted electricity demand in PDP VI

Scenarios	Base	High
Period	2006-2010	2006-2010
Actual	7.3%*	
PDP-Vi	7.5%	8.5%

Elasticity coefficient

Scenario	2006-2009	2001-2010
Actual	1.9	1.9**
PDP-Vi	1.9	1.9

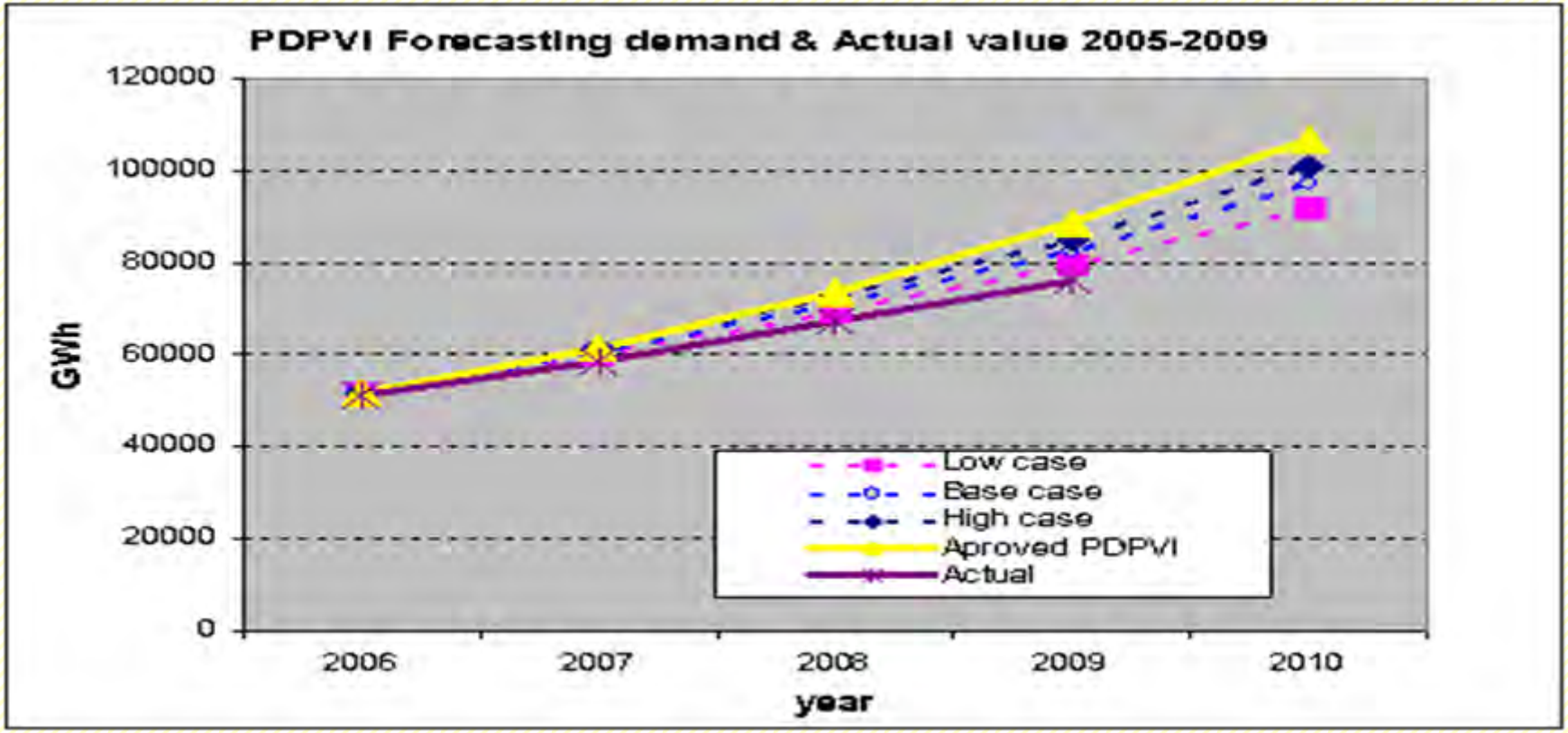
* Up to *2009*

assessment of PDPVI IMPLEMENTATION

Comparison between actual and forecasted electricity demand in PDP VI

Years	Power Consumption (GWh)					Peak(MW)				
	PDP VI (IE)			PDPVI (approved)	Actual value	PDP (IE)			PDPVII (approved)	Actual
	15%	16%	17%			15%	16%	17%		
2006	51720	51720	51720	51514	51295	10466	10466	10466	10187	10187
2007	59892	60668	61236	61301	58438	12039	12195	12309	12322	11286
2008	69235	71042	72443	73623	67417	13820	14180	14460	14696	12636
2009	79689	82622	84975	88937	76046	15824	16476	16973	17629	13867
2010(*)	91948	97111	101148	106724	87665	18100	19117	19911	21009	16048

assessment of PDPVI IMPLEMENTATION



Actual electricity consumption in 2006-2009 is lower than forecast in alternative. Growth rate of electricity sales in 2006-2009: 13,6%/year

assessment of PDPVI IMPLEMENTATION

Forecasted power demand growth rate in PDP VI is approximately double to the GDP growth rate. But actually the average power consumption for 4 years from 2005 to 2009 is 13.6% per year (less than three scenarios in PDP VI):

+ The average economic growth in 2005-2009 is lower than the expectation (actual GDP growth rate was only 7.3% per year);

+ PDP VI was created in the context that Vietnam's economy is in the fast growth. It is expected that industry and service sectors supported by direct investment from abroad (FDI) grow strongly and many large industrial zones will be established.

+Within four recent years of PDP VI, economic growth remained to be over 8% only in 2005-2007, reduced 6,3% in 2007-2008 and 5,3% in 2008 - 2009 affected by world monetary crisis, Vietnam's industrial production and power consumption are also decreased.

assessment of PDPVI IMPLEMENTATION

To assess PDP VI implement, IE surveys in provinces for three regions: North, South and Center.

Southern Region:

+ By the impact of the global financial crisis, economic recession, so many projects are stopped or delayed. HCM City and Dong Nai province have the share accounted for nearly 50% of the total power consumption, and are affected drastically by the crisis, therefore electricity growth is lower than the expectation in PDP VI in 2006-2009. The average growth of HCM City is 7.8% per year and Dong Nai province is 14.9% per year (compared with 15%, 17% respectively corresponded in PDPVI).

+ Power company 2: the whole company growth in the period from 2006 to 2009 has no differences from the expectation in PDP VI; some provincial electricity consumptions continue to grow the same as expectation: Binh Duong, Ba Ria - Vung Tau, Long An, other provinces have higher growth than the expectation such as Binh Phuoc and Kien Giang province, other remain provinces are lower than as expected in the PDP VI.

assessment of PDPVI IMPLEMENTATION

Northern Region:

As well as other areas in the whole country, affected by the financial crisis, the provinces which have large power consumptions have achieved only 80-95% over the forecasted demand in PDP VI. Consumption in industrial sector is lower than the expectation . However, some provinces such as Hai Phong, Hai Duong have reached the forecast. Ninh Binh province grows faster than what was forecasted.

- **Central region**:

- The trend is the same as in the whole country, it was expected to be relatively high development, especially provinces contain economic zones, the industrial parks and commercial centers, hotels, and resorts along central provinces such as Chan May Economic Zone (Thua Thien Hue), Chu Lai (Quang Nam), Dung Quat (Quang Ngai), Nhon Hoi (Binh Dinh), Van Phong (Khanh Hoa). However, only a few of them are put into operation, the rest are only registered but not yet implemented so that electricity demand growth is not so high.

assessment of PDPVI IMPLEMENTATION

Electricity consumption growth rate in some provinces in 2001-2009

	2001-2005	2006-2009	2008-2009
TP HCM	12,2%/n¨m	7,8%	6,95%
§ång Nai	19,3%/n¨m	14,9%	9,4%
B×nh D-¬ng	37%/n¨m	17,2%	11,3%
Vòng Tµu	21,6%/n¨m	20,4%	15,5%
Long An	20,6%/n¨m	17,3%	19,9%
Hµ Néi	12,0%/n¨m	18,6%*	15,6%
H¶i Phßng	10,4%/n¨m	20,1%	15,0%
H¶i D-¬ng	12,4%/n¨m	14,0%	8,3%
Ninh B×nh	24,6%/n¨m	21,0%	17,4%
Qu¶ng Ninh	17,3%/n¨m	18,9%	26,8%
Đà Nẵng	14,8%/năm	12,5%	15,7%
Thừa thiªn HuÕ	13,4%/n¨m	15%	18,1%
Qu¶ng Nam	17,5%/n¨m	16,9%	13,6%
Qu¶ng Ng·i	15,3%/n¨m	16%	11,7%
Kh¸nh Hßa	10,5%/n¨m	7,9%	9,1%

III. Energy AND Power demand forecasting method

Forecasting method: Multi-Regression analysis

Energy and electricity demand forecast: Energy and electricity of each sector (industry, agriculture, transportation, commercial and services, residences) were forecasted base on building a regression function of power (energy) consumption with dependent variables: GDP, population, crude oil price, electricity price, energy and electricity consumption data in the past.

History data (19 years): 1990-2009

Energy and electricity demand is calculated with the following assumptions:

+ **National economic development scenarios of GDP (3 scenarios);**
+ **Forecasted population in 2010-2030;**
+ **Energy savings: 1-3 % /year varied by sectors and periods;**
+ **Crude oil and electricity price.**

Electricity demand forecast of Regions:

Electricity demand by each sector of each Region would be predicted on the basis of the density of power consumption per region over that of the whole country and the proportion of GDP contribution per region over GDP of the whole country for each sector.

Power generation demand forecast:

+ **Rate of transmission loss: (2010: 10 %; 2015: 9 %; 2020: 8 %; 2030: 7 %);**
+ **% own use: based on electricity source structure.**

Forecast of load factor:

Based on building of a regression function of load factors in the past and power consumption in industry and residence sector.

Power demand forecasting methodS

Power forecasting methods: *Similar to methods applied in PDP VI*

+Direct method: Demand forecast for the whole country , each Region, Power corporations, Power companies and provinces in the period to 2015 and 2020.

+Indirect method:

- ***Main method: Multi-regression analysis(Simple-E)***
- ***Other methods (for checking forecast results):***
  - ***+ Electricity intensity/GDP;***
  - ***+ Elasticity;***
  - ***+ Comparison to international practices.***

IV. National economic development scenarios

GDP growth rate in 2011 – 2030 (%)

Scenarios	2011 - 2015	2016 - 2020	2021 - 2030
Low	6,96	7,0	7,22
Base	7,5	8,0	7,83
High	7,96	8,44	8,64

Population increase in 2009 – 2030

Years	2009	2010	2015	2020	2030
Population (1000. persons)	87093	88038	92499	97187	102421

(Scenarios prepared by Institute of Strategy of MPI)

V.The results of power demand forecast in scenarios

Năm	2010	2015	2020	2025	2030
Base case					
Generation (GWh)	100880	194304	329412	489621	695147
Peak(MW)	16048	30803	52040	77084	110215
Demand (GWh)	87665	169821	289882	430867	615205
High case					
Generation (GWh)	100880	210852	361945	561506	833817
Peak (MW)	16048	33426	57180	88401	132201
Demand(GWh)	87665	184284	318511	494126	737928

The results of power demand forecast in scenarios

Growth rate of power sales in whole country in scenarios

	2006-2010	2011-2015	2016-2020	2026-2030
High case	14%	16%	11.6%	8.8%
Base	14%	14.1%	11.3%	7.8%

Elasticity

	2006-2010	2011-2015	2016-2020	2021-2030
Base case	2.0	1.9	1.4	1.0

VI. Suggestions on electricity scenario

Results on electrical demand forecast the whole country to 2030

	Unit	2010	2015	2020	2025	2030
Demand	GWh	87665	169821	289882	430867	615205
Generation	GWh	100880	194304	329412	489621	695147
Pmax	MW	16048	30803	52040	77084	110215

Power consumption /person

	2010	**2015**	**2020**	**2025**	**2030**
kWh/person	**1010**	**1860**	**3020**	**4345**	**6000**

Source and network development Program will be established in order to adopt the base scenario and to provide provisions in the high scenario.

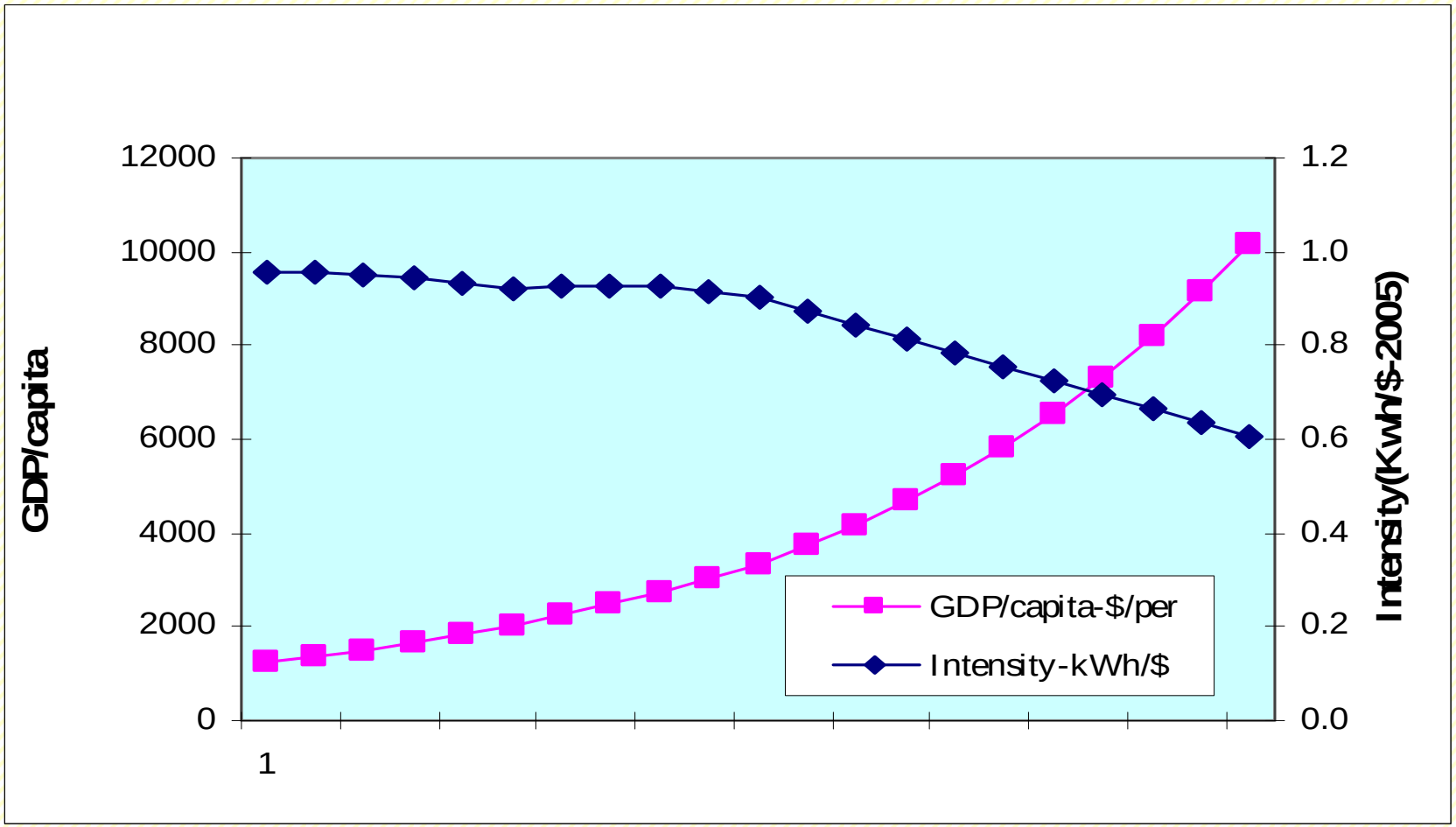
Suggestions on electricity scenario

Results on electrical demand forecast of the Power corporation to 2020

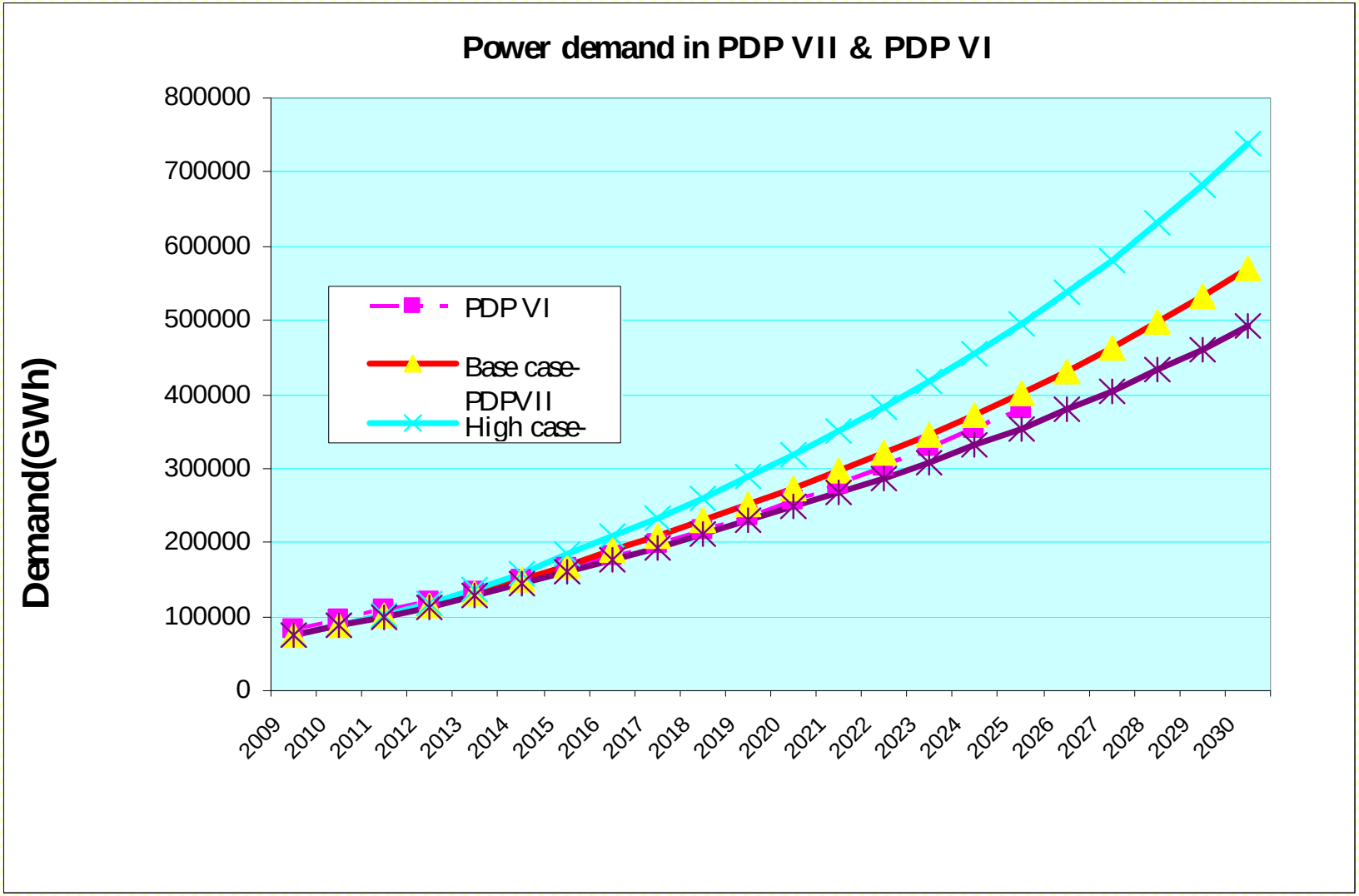
	Unit	2010	2015	2020
Demand for Whole country	**GWh**	**87665**	**169821**	**289882**
TCTy 1	GWh	*24385*	*47397*	*81944*
TCTy 2	GWh	*30425*	*61977*	*107910*
TCTy 3	GWh	*8489*	*16462*	*27525*
TCTy § L Hµ Néi	GWh	*9152*	*16714*	*27866*
TCTy § L TPHCM	GWh	*15409*	*26755*	*42931*
Pmax	**MW**	**16048**	**30803**	**52040**
TCTy 1	MW	*5174*	*9771*	*16510*
TCTy 2	MW	*5569*	*11296*	*19417*
TCTy 3	MW	*1670*	*3060*	*4870*
TCTy § L Hµ Néi	MW	*1850*	*3340*	*5260*
TCTy § L TPHCM	MW	*2600*	*4535*	*7269*

Suggestions on electricity scenario

GDP/person and power intensity



VII. CompareD with the forecast in PDP VI



Compared with the forecast in PDP VI

Power sales:

TWh

G § / PA	2010		2015		2020		2025	
	PDPVI	PDPVII	PDPVI	PDPVII	PDPVI	PDPVII	PDPVI	PDPVII
Low	91,9	87,7	146,9	160,7	216,4	248,2	308,5	354,4
Base	97,1	87,7	164,9	169,8	257,2	289,9	381,1	430,9
High	101,1	87,7	187,3	184,3	292,4	318,5	432,3	494,1

Compared with the forecast in PDP VI

Power generation:

TWh

G § / PA	2010		2015		2020		2025	
	TSDVI	TS § VII	TSDVI	TS § VII	TSDVI	TS § VII	TSDVI	TS § VII
ThÊp	106,7	100,9	169,2	184,0	247,4	282,0	349,4	402,7
C¬ së	112,6	100,9	190,0	194,3	294,0	329,4	431,6	489,6
Cao	117,3	100,9	215,8	210,9	334,1	361,9	489,6	561,5

Up to 2015:

Base Case: Similar PDP VI

After 2020: Higher thanPDP VI

VIII. The result of Energy demand forecast by sector (Base case)

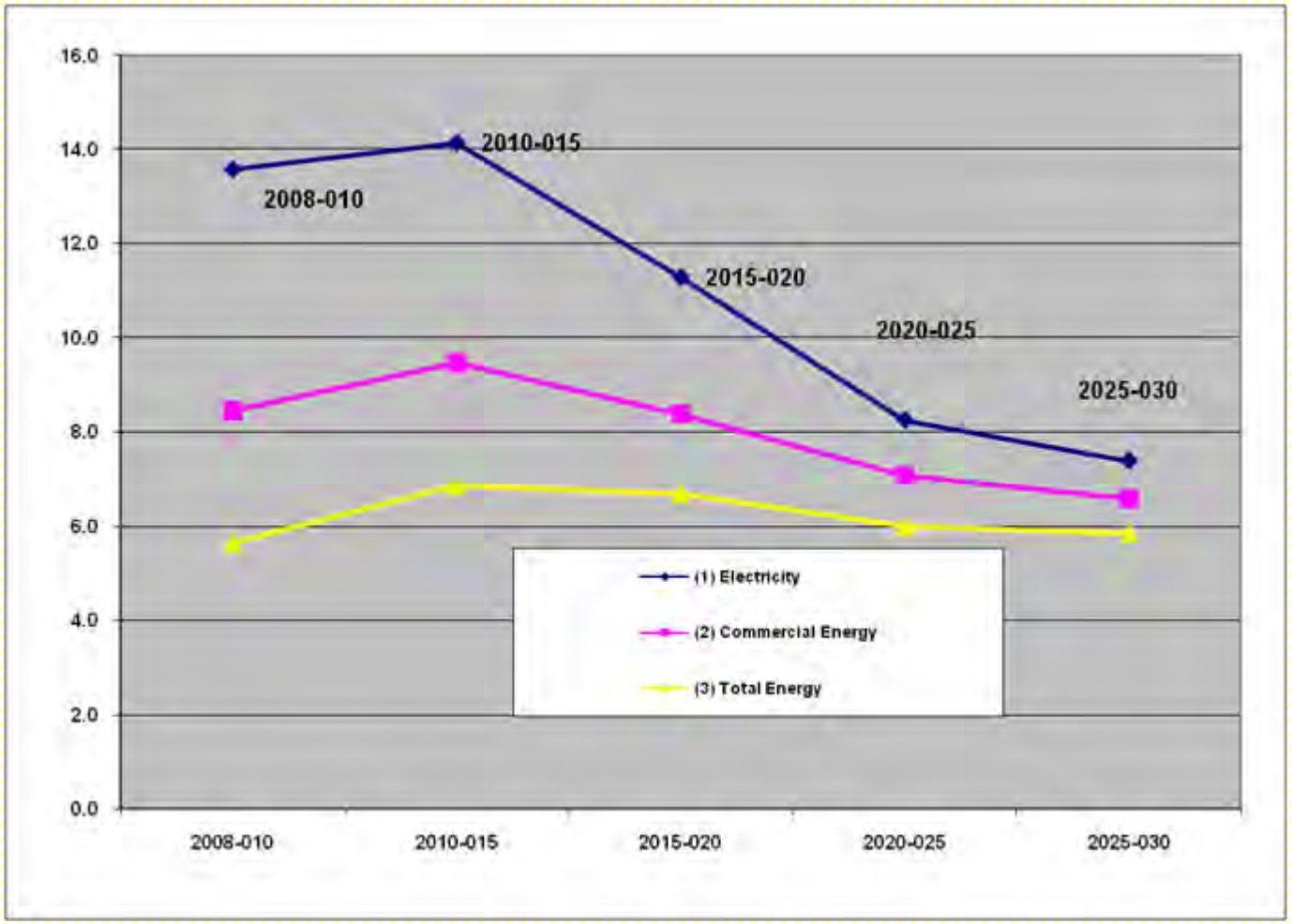
		2010	2015	2020	2025	2030
(1)Agriculture	KTOE	618	769	870	946	986
(2)Industry	KTOE	17,413	25,418	35,406	46,790	59,881
(3)Transportation	KTOE	10,276	16,322	25,142	36,136	51,488
(4)Commercials & Service	KTOE	2,122	4,609	9,492	16,090	24,661
(5)Residential	KTOE	16,566	18,805	20,641	22,868	26,524
(6)Non Energy	KTOE	1,209	1,240	1,271	1,303	1,336
Total	KTOE	48,205	67,163	92,824	124,134	164,877

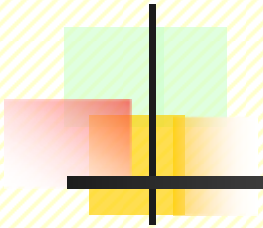
The result of Energy demand forecast by fuel (Base case)

		2010	2015	2020	2025	2030
Coal demand	KTOE	9,547	13,607	17,997	23,608	29,974
LPG demand	KTOE	1,143	1,676	2,476	3,598	5,179
Gasoline demand	KTOE	4,303	6,949	10,690	15,557	22,173
Jet fuel demand	KTOE	668	1,122	1,757	2,577	3,689
Kerosene demand	KTOE	106	105	130	174	240
Diesel demand	KTOE	7,030	10,519	15,540	21,530	29,727
Fuel oil demand	KTOE	1,311	1,861	2,570	3,492	4,615
Natural gas demand	KTOE	654	1,006	1,419	1,968	2,593
Other Petroleum	KTOE	1,209	1,240	1,271	1,303	1,336
Power	KTOE	7,539	14,605	24,930	37,055	52,908
Commercial Total	KTOE	33,510	52,689	78,780	110,862	152,434
Non commercial	KTOE	14,695	14,474	14,044	13,272	12,443
Energy Total	KTOE	48,205	67,163	92,824	124,134	164,877
		2010	**2015**	**2020**	**2025**	**2030**
Coal demand	%	28.5	25.8	22.8	21.3	19.7
LPG demand	%	3.4	3.2	3.1	3.2	3.4
Gasoline demand	%	12.8	13.2	13.6	14.0	14.5
Jet fuel demand	%	2.0	2.1	2.2	2.3	2.4
Kerosene demand	%	0.3	0.2	0.2	0.2	0.2
Diesel demand	%	21.0	20.0	19.7	19.4	19.5
Fuel oil demand	%	3.9	3.5	3.3	3.2	3.0
Natural gas demand	%	2.0	1.9	1.8	1.8	1.7
Other Petroleum	%	3.6	2.4	1.6	1.2	0.9
Power	%	22.5	27.7	31.6	33.4	34.7
Commercial Total	%	100.0	100.0	100.0	100.0	100.0
Non commercial	%	30.5	21.6	15.1	10.7	7.5
Energy Total	%	100.0	100.0	100.0	100.0	100.0

The result of Energy demand forecast (Base case)

The change of Energy Growth rate up to 2030





Thank you