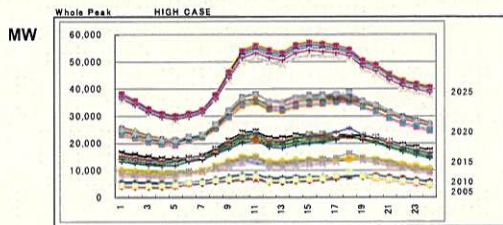




### 3. Daily load curve forecast

14:00-16:00 will increase(Peak days)



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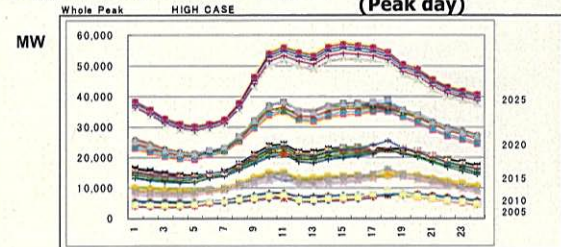


### 3. Daily load curve forecast

• Same load shapes by type

The load curves by type will keep mostly the same proportion as now of daily load curve shapes in peak day, weekday and holiday types.

(Peak day)

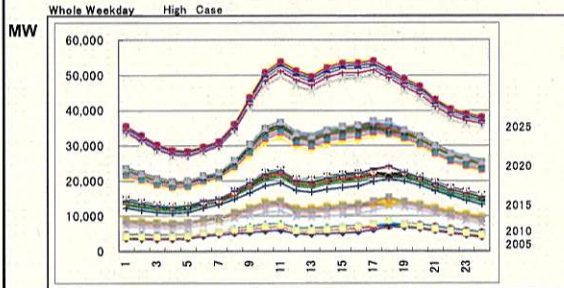


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### 3. Daily load curve forecast

Same load shapes by type (Weekday)

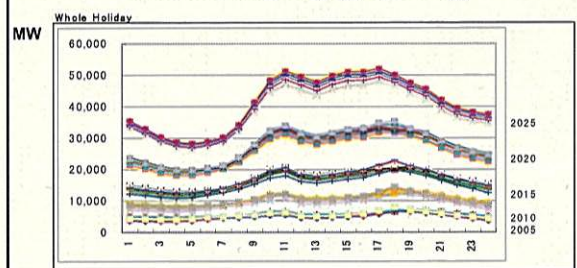


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### 3. Daily load curve forecast

Same load shapes by type(Holiday)



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### 3. Daily load curve forecast

(6) The Results of the Peak Demand Forecast

The following table shows annual peak demand in the whole country.

<High case> The comparison of Peak demand

		Unit	2005	2010	2015	2020	2025
Peak demand	JICA	MW	9,454	16,849	26,467	40,735	59,863
	IE	MW	9,512	17,700	29,069	44,844	66,225
	PDP5th	MW	7,838	12,982	20,703	32,376	
	R-PDP5th	MW	9,199	16,241	26,184	39,139	
Growth rate	JICA	%	16.8	12.3	9.5	9.0	8.0
	IE	%	17.5	13.2	10.4	9.1	8.1
	PDP5th	%	6.6	10.6	9.8	9.4	
	R-PDP5th	%	12.0	12.0	10.0	8.4	
Difference IE / JICA			0.6%	5.1%	9.8%	10.1%	10.6%

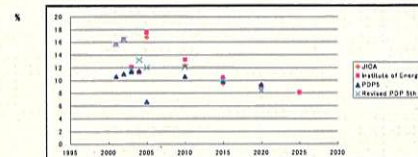
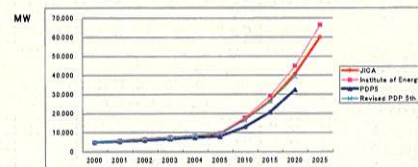
JICA growth rate is 9.7% from 2005 to 2025.

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### 3. Daily load curve forecast

The comparison of Peak demand in High Case



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### 3. Daily load curve forecast

#### <Base Case> The comparison of Peak demand

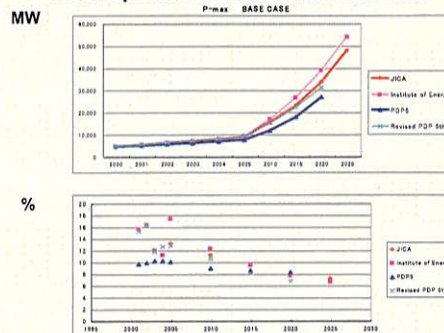
		Unit	2005	2010	2015	2020	2025
Peak demand	JICA	MW	9,454	16,233	24,289	35,463	50,011
	IE	MW	9,512	17,036	26,851	39,188	54,268
	PDP5th	MW	7,797	12,003	18,197	27,204	
	R-PDP5th	MW	9,199	15,256	22,575	31,432	
Growth rate	JICA	%	13.3	11.3	8.3	7.8	7.3
	IE	%	17.5	12.4	9.5	7.9	6.7
	PDP5th	%	10.1	9.0	8.7	8.4	
	R-PDP5th	%	12.9	10.6	8.2	6.8	
Difference IE / JICA			0.6%	4.9%	10.5%	10.5%	8.5%

JICA growth rate is 8.6% from 2005 to 2025.

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### 3. Daily load curve forecast

#### The comparison of Peak demand in Base Case



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### 3. Daily load curve forecast

#### (7) The Results of Load Factors

High case

		Unit	2005	2010	2015	2020	2025
Load Factor	JICA		0.62	0.65	0.67	0.69	0.69
	IE		0.64	0.66	0.67	0.69	0.69
Growth rate	JICA	%					
	IE	%					

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### 4. Recommends

#### 4. Recommends

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### 4. Recommends

#### (1) Consistency of power and primary energy demand

- It is important to make consistency between power and primary energy demand. For making it, the power demand forecasting model should include final energy demand as well as power demand.
- At the first step, the total final energy demand in sectors should be forecasted in the model. And at the next step, the power demand in the sectors are forecasted by using the total final energy demand.
- Especially it supports you to make long term forecasting model.

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### 4. Recommends

#### (2) Energy demand effected by Government policies

- The state energy policies change the power demand. If the electrification of rural and isolated area is promoted, the power demand in the rural increase. And the power demand growth of the rural area bring to decrease oil product demand.
- The above energy demand can not be forecasted by statistical methods. But it is possible to be forecasted by the energy ratio among the energies consumed in the rural area. In JICA model, the methods are applied.
- Natural gas demand in residential sector depends on construction of gas transmission and distribution pipelines. Then it is said that the natural gas demand in residential sector is political matter, not forecasting matter.

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## 4. Recommends

### (3) Energy prices and energy conservation

- The increase of crude oil price brings the hike of other energy prices such as oil product, coal and natural gas prices, and also power tariff. At the time, **energy consumption are suppressed, in other words, energies are conserved.**
- In the energy demand forecasting model, it is better for us to **analyze the impact of the energy price fluctuation.** The JICA model have the function to analyze the impact.
- Energy conservation in the model are controlled by the **technical improvement and energy price hike.**

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## End of Session

### Thank you for your attention!

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*The Study on National Power Development Plan for the period of 2006-2015, perspective up to 2025 in Vietnam*



## Primary Energy Resource

Jul. 2005

Japan International Cooperation Agency (JICA)

Tokyo Electric Power Co., Inc. (TEPCO)  
Tokyo Electric Power Service Co., Ltd. (TEPSCO)



## Primary Energy : Resources Distribution



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## Primary Energy: Energy Policy Key Point

- ❖ Ensure national energy security
- ❖ Efficient use of energy and energy conservation, NRE development etc
- ❖ Environmental protection
- ❖ Energy sector reform and energy market
- ❖ Investment for energy development

Source:MOI Draft strategy on National Energy Policy. 2004

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## Primary Energy: Energy Policy Development Target(1)

	2004	2010	2020
Hydropower	18 B.kWh	35 B.kWh	55-60 B.kWh
Oil	20.4 M.ton	16-18 M.ton	17-20 M.ton
Accumulation	None	30 days	60 days
Gas	6.3 B.m3	12-14 B.m3	13-15 B.m3
Coal	27.1 M.ton	35-40 M.ton	>50 M.ton

Source:2010-2020 MOI, Draft of over vies on National Energy resources and National Energy Policy.2004. For 2004, Report of PetroVietnam and Vinacoal, 2005

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**Primary Energy: Energy Policy Development Target(2)**

	2004	2010	2020
NRE		2% of Total Commercial PE	3% of Total Commercial PE
Oil refinery		6.5 M.ton x2	30-35 M.ton
Environment		Long-term Target	
Nuclear			No.1 operation
International cooperation		Power Interconnection 500kV	Gas interconnection

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**Primary Energy: Hydropower Potential**

Rev.5th.MP:Total 17,700 MW, 82.0 TWh  
Main 11 Rivers: 15,143 Mw, 70.7 TWh

Further Study:Total 20,560 MW, 83.4 TWh  
Main 11 Rivers: 17,660 MW, 71.67 TWh

Exploitation 2004: 4,195 MW, 18.0 TWh  
Exploitation Rate: 21.6% (2004)

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**Primary Energy: Hydropower Development Plan**

2004: Installed 4,195MW Gen.18 B.kWh  
2010: Plan 8,800MW 35 B.kWh  
2020: Plan 15,000MW 60 B.kWh  
Up to 2020, almost hydropower in main rivers will be developed

Source:MOI, Draft on National Energy Policy,2004

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**Primary Energy: Oil & Gas Reserves**

- 5th.MP Proven:  
Oil 390 million ton, Gas 617 billion m3
- Recent Estimation in 6 Basins:  
Oil & Gas 4- 4.5 billion m3 OE (55%-60% Gas)
- Proven: 1,150 million m3 OE (<200m)  
(Oil 750 million m3, Gas 400 billion m3)

Source:PetroVietnam, Strategy on Oil & Gas Sector Dev. 2005

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**Primary Energy: Oil & Gas Exploitation Plan**

	2005	2010	2015	2020
Oil (M. tons)	18-20	18-20	19-20	19
Gas (B. m3)	6-10	6-10	11-15	15-16

Source:Strategy on Vietnam Oil and Gas Sector Development up to 2015 and Orientation to 2025, Feb.2005, PetroVietnam

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**Primary Energy: Coal Reserves**

5th.MP: (<300m) 3.8 bil.Ton  
Anthracite 85%, Lignite 5.6%, Peat 9.14%  
Recent Study (2005) 12.28 bil.ton  
( Proven 5.4 bil.ton)  
Red River Basin (<1,200m) 1.64 bil.ton

Source: Vinacoal, Report on Coal Evaluation,2005

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### Primary Energy: Coal Exploitation Plan

	2000	2005	2010	2015	2020
2003 plan	10.5-11.0	16	24	27	30
2005 plan	—	31.7	45.2	50.8	59.7

Source: upper, Vinacoal M/P, 2003  
lower, Report on Vietnam Coal Evaluation, 2005

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### Primary Energy: Crude Oil Supply and Demand Forecast

	2005	2010	2015	2020	2025
Production	18.00	20.36	19.34	19.48	18.62
Import	0	0	0	0	(0.88)
Export	18.00	13.86	6.34	6.48	
Total PES	0.00	6.50	13.00	13.00	19.50
Oil refinery		6.5	13	13	19.5
Use for power	0	0	0	0	0
FC for sectors	0	0	0	0	0
Total Demand					
Balance	0	0	0	0	0

Source: Strategy on Vietnam oil and gas sector development up to 2015 and orientation to 2025, February 2005, PetroVietnam

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### Primary Energy: Oil Products Supply and Demand Forecast

	2005	2010	2015	2020	2050
Refinery	0.00	6.50	13.50	20.50	20.50
Import	11.2	11-12	6.5-11.5	12.2-16	85.5-114.5
Loss & stock					
Total PES	11.20	18-20	20-25	32.7-36.5	106-135
Total Demand	11.2	17.5-18.0	20-25	32.7-36.5	106-135
Balance	0	0	0	0	0

Source: Strategy on Vietnam oil and gas sector development up to 2015 and orientation to 2025, February 2005, PetroVietnam

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### Primary Energy: Gas Supply and Demand Forecast

	2005	2010	2015	2020	2025
Exploitation	6.02	10.26	15.00	15.62	16.49
Import	0	0	0	0	*
Export	0	0	0	0	
Loss & stock	0	0	0	0	
Total PES	6.02	10.26	15.00	15.62	16.49
Use for power	5.05	6.29	12.19	14.77	
FC for sectors	0.5	1.9	1.9	1.9	
Total Demand	5.55	8.19	14.09	16.67	
Balance	0.47	2.07	0.91	-1.05	

Source: Strategy on Vietnam oil and gas sector development up to 2015 and orientation to 2025, February 2005, PetroVietnam

Demand forecast : Power Generation Development Plan up to 2020, IE, 03/2005

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### Primary Energy: Coal Supply and Demand Forecast

	2005	2010	2015	2020	2025
Production	31660	44640	50185	54775	
Import	0	0	0	0	0
Export	12000	11000	8000	8000	
Loss & stock	0	0	0	0	0
Total PES	19660	33640	42185	46775	
Use for power	4200	15000	22000	25000	
FC for sectors	9200	11200	12800	13900	
Total Demand	13400	26200	34800	38900	
Balance	6260	7440	7385	7875	

Source: Report on Vietnam coal evaluation, January 2005. Vietnam coal cooperation

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### Primary Energy: Principle on Pricing

- ❖ Energy production regulated through price and tax system by the State
- ❖ Ensure to cover production cost, import fee and reproduction
- ❖ Aiming market mechanism
- ❖ Not to maintain united price
- ❖ Adjusted by period under inflation rate and exchange rate

Source: MOI, Draft strategy on National Energy Policy.2004

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**Primary Energy: Growth Rate Forecast JICA Team Study**

	2005	2010	2015	2020	2025
	(%)				
GDP Growth	8.0	7.5	7.2	7.2	7.0
Sector Growth					
Agriculture	3.4	3.0	3.0	3.0	2.5
Manufacture	10.5	10.0	9.7	9.7	9.7
Commercial	7.7	7.2	7.0	7.0	7.0
Transportation	7.7	7.2	7.0	7.0	7.0
Services	7.7	7.2	7.0	7.0	7.0
Total	8.0	7.5	7.2	7.2	7.0

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**Primary Energy: Demand Forecast JICA Team Study**

	2005	2010	2015	2020	2025
Power Demand (GWh)	45,682	82,324	129,022	197,079	279,784
Final Consumption (KTOE)					
Coal	5,061	7,150	8,772	10,774	14,114
Petroleum	12,753	15,966	26,872	33,082	40,241
Natural Gas	23	39	1,766	3,913	6,696
Electricity	3,929	7,080	11,096	16,949	24,062
Total	21,766	34,877	48,507	64,718	85,112

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**End of Session**  
**Thank you for your attention!**

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**The Study on National Power Development Plan for the period of 2006-2015, perspective up to 2025 in Vietnam**

**Power Generation Development Plan**

Jul. 2005

Japan International Cooperation Agency (JICA)

Tokyo Electric Power Co., Inc. (TEPCO)  
 Tokyo Electric Power Service Co., Ltd. (TEPSCO)

**Reviewing the revised 5 MP**

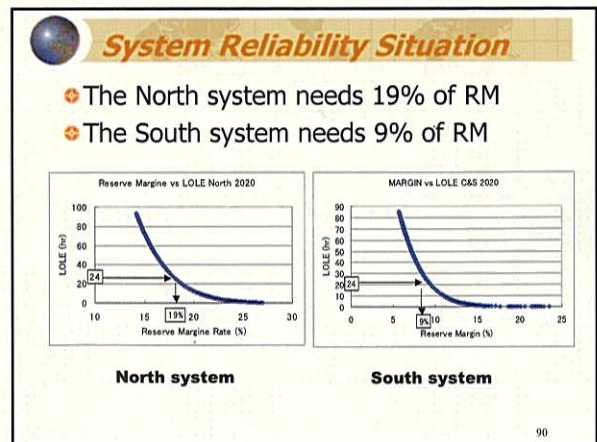
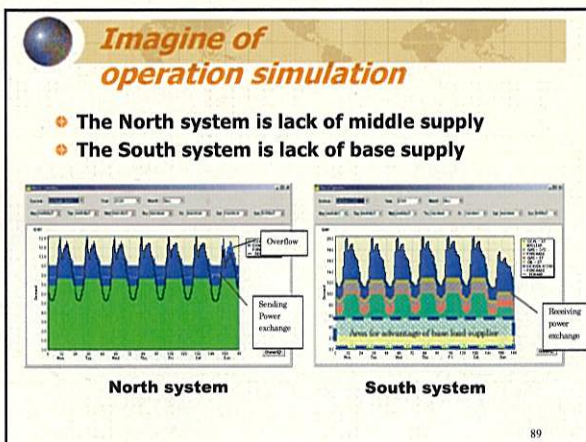
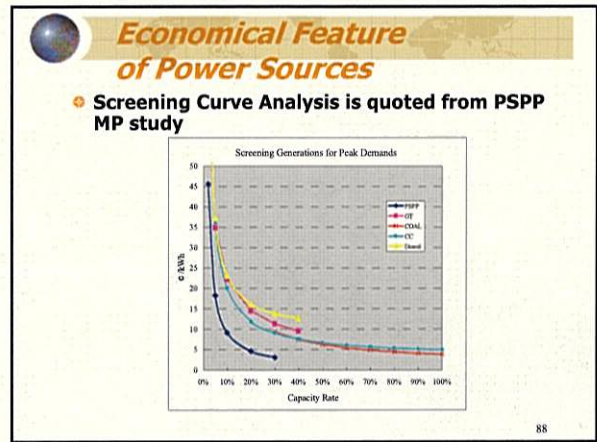
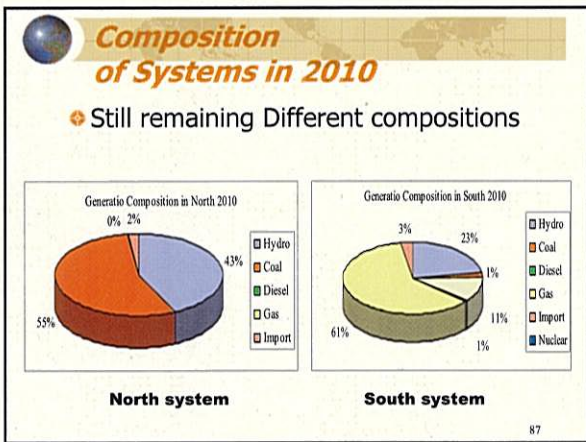
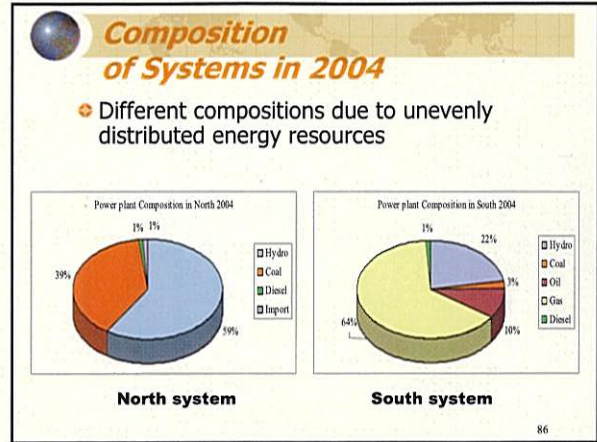
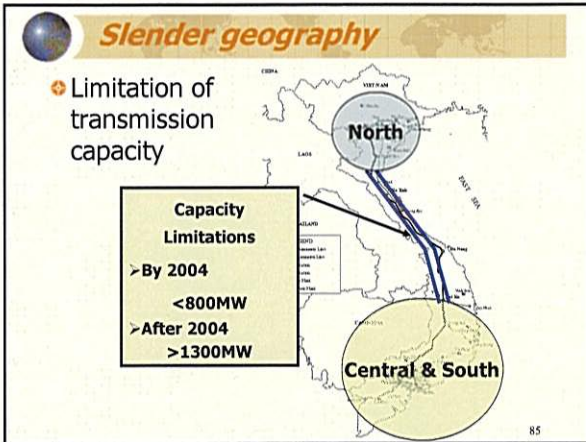
- ◆ Feature of the Vietnamese system
- ◆ Composition of generation sources
- ◆ System Reliability Situations in the North system and the C&S system
- ◆ Proceeding Power Development: Balance between Supply and Demand

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**Feature of Vietnamese Power System**

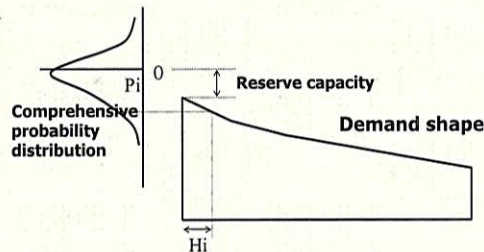
- ◆ Slender geography
- ◆ Seasonal fluctuation of supply capability: Hydro power outputs fluctuations

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## Definition of System Reliability

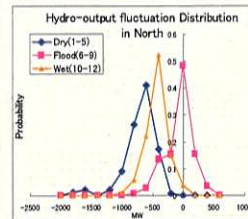
- Reliability; LOLE Loss of Load Expectation
- $LOLE = \sum (P_i \times H_i)$



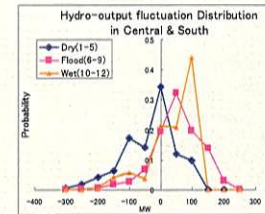
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## Water Flow Fluctuation

- Difference between actual record and plan of Hydropower plant outputs at peak demand in 1996 - 2001



North system



South system

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## Proceeding Power Development Projects

- Total 430MW will be delayed by 2005
- The North system -300MW
- The Central & South system -130MW

Unit: MW

	2005		
	Plan	Actual	Diff.
North	500	200	-300
C&S	1140	1010	-130
Total	1640	1210	-430

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## Balance between Supply and Demand

- Balance in the North and C&S systems

	2003		2004		2005	
	North	C&S	North	C&S	North	C&S
Demand (MW)	3111	4165	3453	4759	3830	5398
Firm Capacity (MW)	3169	4933	3288	6321	3392	7341
Reserve Margin (MW)	58	768	-165	1562	-438	1943
Reserve Margin Rate (%)	1.9	18.4	-4.8	32.8	-11.4	36.0
LOLE (hour)	72	61	62	4	115	2

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## Issues of the revised 5<sup>th</sup> MP

- Limitation of 500kV interconnection capacity
- Delay of Power development project
- Water Flow Fluctuation
- Reconciling PDP with Energy resource development plan

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## Establishment of Scenarios

- Energy policy
- System reliability
- Demand fluctuation, fuel cost rising, International power exchange etc.

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