2. Comments on daily load curve forecasting

- In the expression, Industry-GDP, Service-GDP and Total-GDP have high correlation. Then the regression analysis may have "Multicollinearity" among the variables.
- When multicollinearity is happened in the regression equation, some variable have small t-values (insignificant level) and the equation does not have significance.
- You got a regression equation with multicollinearity, you have to cut the variables with small t-values.

2. Comments on daily load curve forecasting

<Adjustment to EVN authorized values>

- The future power demand calculated from the diary load curve has to be adjusted to the EVN authorized values, as it does not meet EVN's future plan in terms of generation.
- But the formula of the daily load curve can not be changed, then the following adjusted factor is prepared.

Adj-factor(i)=Generation forecasted(i)/EVN generation(i)

Hourly demand (i, j)=Hourly demand(i, j)/ Adj-factor(i)

2. Comments on daily load curve forecasting

(4) Recommends

<Aggregation method>

- There is a premise in the aggregation model that power consumption patterns of factories and commercial building are not changed.
- But application of the present daily load curve to the future purposes needs some change in the developing countries as structural changes to occur more frequently.

2. Comments on daily load curve forecasting

< Multi-regression analysis method>

- In the multi-regression analysis, multicollinearity is supposed to happen, which disturbs the reliability of the equation. The report states that the actual data are not enough for the regression analysis. In the opinion of the Team, the problems of instability of multicollinearity and coefficients may remain with this regression equation even if more data are added.
- For resolving the problems, you need set other explanation variables to the regression analysis.
- As the results, Vietnam selected future daily load curve from "Aggregation method".

3. Conclusion

(1) Power demand forecasting

Development of new models for power demand forecasting is required in the report. It has to be linked with economic activities, energy price, power tariffs, energy conservation and life styles of citizens. The JICA team will support these studies by development and transfer of technology.

(2) Daily load curve forecasting

Dynamic modeling method is preferred theologically to static load profiling method. The JICA team desires to improve the accuracy of the dynamic model in a new concept, by experiencing for itself the model that has been developed this time by the Vietnamese staffs.

End of Session

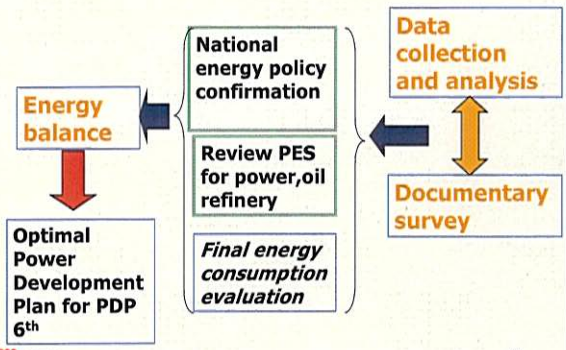
Thank you

Primary Energy for Power development

1. *Study Flow*
2. *Approach & Methodology*
3. *Primary Energy*
   (1) Coal
   (2) Oil and Gas
   (3) Hydropower
4. *Energy Balance*

Japan International Cooperation Agency (JICA)

Study Flow



44

Approach & Methodology

Task Items

1. Data collection/understanding Energy situation
2. Study on Energy supply/demand for power sector for preparation of PDP 6th.
3. Study on energy balance and prices for power sector
4. Assistance in preparation of PDP 6th.

45

Approach & Methodology

Methodology

1. Collection/Reviewing the data of energy supply/demand and policy of energy import
2. Review of 5th. Electricity Master Plan
3. Work out a fuel supply program based on the study for power development
4. Study on energy supply and demand scenario
5. Review of fuel supply program and energy supply scenario
6. Study of integration with national energy policy concerning power development
7. Feedback study results to Power generation and Network Plan and assistance in preparation of PDP 6th.

46

Primary Energy : Coal Development

(Unit: 10^6 ton)

	2000	2005	2010	2015	2020
Coal Production	10.5-11.0	12-13	14-15	-	15-20
	10.5-11.0	16	24	27	30

Source: Upper : 5th Master Plan of Electric Power Development
Lower : Vinacoal M/P, 2003

47

Primary Energy : Oil and Gas Development

(Unit: million m^3 OE)

	2000	2005	2010	2020
Oil Production	16.5	17.6-18	20.6-21.6	11-18
Gas Production	1.5	6.7	11.5-13.5	14-18

Source: Institute of Energy, 2003

48

Primary Energy: Feasible Hydropower Potential

River Basin	Capacity (MW)	Energy (TWh)
Lo River	1,068	4.8
Da River	6,258	31.6
Ma River	320	1.3
Ca River	560	2.6
Vu Gia - Thu Bon	1,194	4.6
Tra Khu River	360	1.7
Ba River	402	2.1
Xe Xan River	1,485	8.0
Srepok River	496	2.6
Dong Nai River	3,000	11.6
Sub Total	15,143	70.7
Total	17,700	82.0

Source: Son La PMB, 2003

TEPSCO 49

Energy Balance

1. Balanced capacity of fossil energy exploitation with national demand
2. Well preparation for future nuclear development
3. Develop of hydro and increasing share of non-fossil energy utilization including NRE
4. Develop of oil refinery to reduce import dependency and meet domestic demand
5. Strength of international cooperation in energy sector

50

End of Session

Thank you

51

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

Outline of Power Generation Development Plan

Japan International Cooperation Agency (JICA)

Approach & Methodology for Power Planning and Analysis

Study Items

1. Power Planning & analysis
   - 1) Review on 5th MP
   - 2) Checking and verifying data
   - 3) 4) Establishment of power development scenario & vision
   - 5) Considering of interconnection with neighboring countries
   - 6) Evaluation of power plant candidates
   - 7) Simulation least cost operation and Review of scenario & vision
   - 8) Prioritizing power plant candidates
   - 9) Establishment of long term least cost power development plan

Methodology

1) Review on 5th MP
- ✓ Proceeding power development, Demand&supply balance, etc.
- ✓ Feature of the Vietnamese system

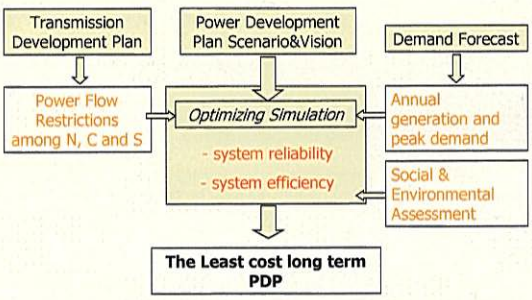
3) Establishment PDP scenario&Vision
- ✓ Energy policy
- ✓ System reliability
- ✓ Demand fluctuation, fuel cost rising, International power exchange etc.

6)8) Evaluation of power plant candidates
- ✓ Economy
- ✓ Environment, Social impact, etc.

7)9) Establishment of least cost long term PDP
- ✓ Simulation by PDPAT-II
- ✓ Comparison of system efficiency and reliability

TEPSCO

Study Flow on PDP



54

Review on 5th MP

- Proceeding power development, Demand&supply balance, etc.
- Feature of the Vietnamese system

55

Feature of Vietnamese Power System

- Slender geography
- Historical changes in demand profile
- Seasonal fluctuation of supply capability
- International electricity trade

56

Power system in Vietnam

57

Establishment of Scenarios

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

58

Establishment of Scenarios

- Setting up Situations & Conditions
  - Daily load Curve, Limitation of transmission
- System reliability analysis
  - Necessary Reserve margin
- Screening Analysis
  - Selection of Economical Arrangement

To establish Scenarios for
Quantification of annual costs
by PDPAT II Simulation for divided systems

59

Demand-and-supply simulation

Requirements

- Capable to understand the effect of the system interconnection between N,C and S.
- Easy simulation focused on the daily operation
- Easy to make power development strategy

60

Tools for analysis

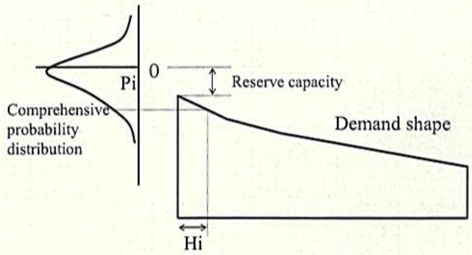
- System Reliability — RETICS
- Annual Costs
- Balance between Demand and Supply

(Annual Costs; Balance between Demand and Supply) } PDPAT II

61

Checking System Reliability

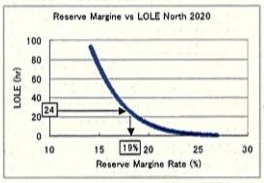
- Reliability; LOLE Loss of Load Expectation
- LOLE= Σ (Pi × Hi)

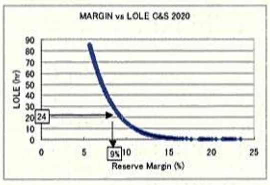


62

Reliability analysis by RETICS (1)

- Divided systems

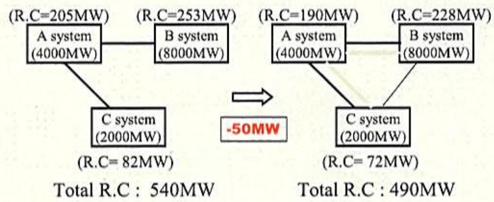




63

System Reliability Analysis by RETICS

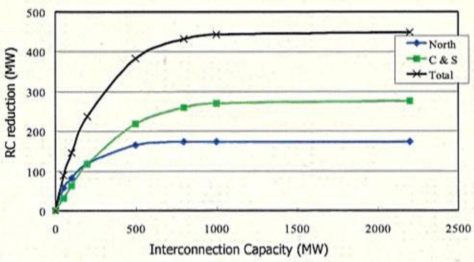
- To simulate how Reserve Capacity Required changes along with Interconnection Capacity on the Same Reliability



64

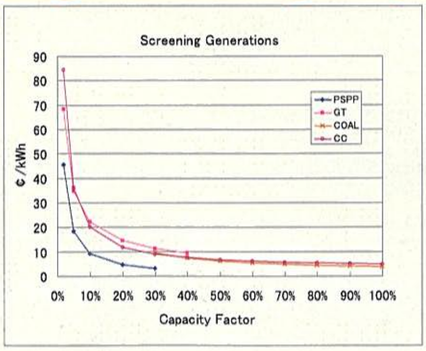
Reliability analysis by RETICS (2)

- Reduction of Reserve Capacity



65

Image of Screening Analysis



66

Evaluation of Power Plant Candidates

- Economy
- Environment, Social impact, etc.

67

Establishment of the Least cost Long-term PDP up to 2025

- Simulation by PDPAT-II
- Comparison of system efficiency and reliability

68

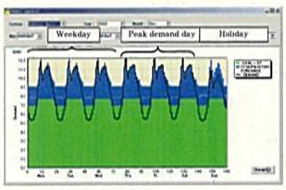
Simulation of Supply & Demand Balance by PDPAT II

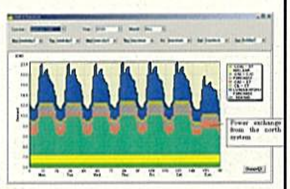
- Computation of Balance between Demand and Supply (Economic Dispatch)
  - Most Economical Energy Balance (Fuel Balance)
  - Optimal Power Balance
  - Reserve Margin
  - Fuel Consumption
- Computation of Power Exchange
  - Quantity & Frequency of Exchange
  - Economical Power Exchange

69

Least cost Operation Simulation

- Simulating Multi-system Model

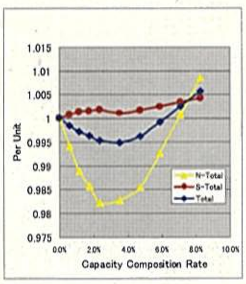




70

Analysis Appropriate Composition

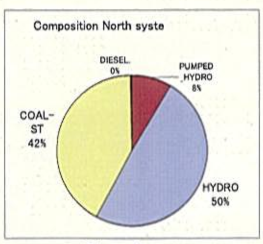
- Find out the most beneficial composition



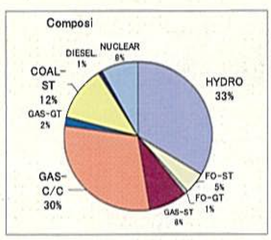
71

Optimal Composition

- The image of appropriate composition



N system



C&S system

72

Image of power development pattern

73

End of Session

Thank you for your attention!

74

Power network development planning

M. Yogo JICA Study Team
20th May 2005

Japan International Cooperation Agency (JICA)

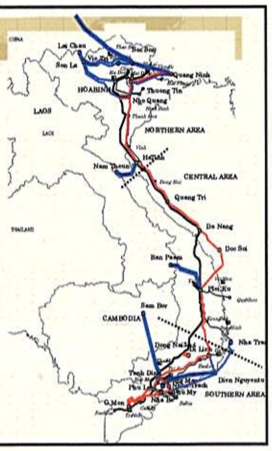
Optimum power network planning

- To realize reliable and economical network systems
- To meet special local conditions of Vietnam

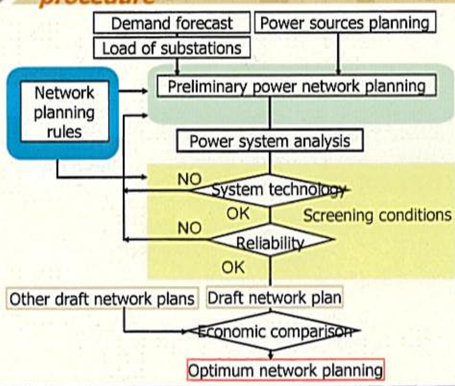
76

Issues of Vietnam system

- Stabilization of the transmission systems spread from north to south of Vietnam
- Power trades from neighboring countries through inter-regional connections
- Large power trade brought by economic operation of domestic power stations



Flow of power network planning procedure



78

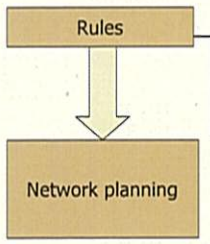
Study procedure

- Review of the 5th M/P
- Preliminary power network planning
  - Setting out network planning rules
  - System modeling and data checking
  - System analysis
- Optimal power network planning
  - Reflecting opinions
  - Economic comparison

79

Setting out network planning rules

Determine power network reliability.

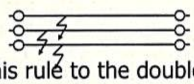


- •Criteria for reinforcement
- •Frequency
- •Voltage
- •General system configuration
- •Permissible fault current
- •Bus connection
- •Relay
- •Transmission line route
- •Location of substations
- •N-1, N-2
- •Thermal limit capacity
- •Technical criteria for stability
- •Etc.

80

Examples of rules (1)

- Technical criteria for stability
  - 3LG-O (3 phase fault CB Opened) -> stable
  - Fault clearing time (TEPCO 70 ms)

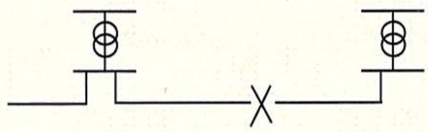


Applying this rule to the double circuits of 500 KV Vietnamese system, power transmission ability from north to south might not reach 1,500 MW.

81

Example of rules (2)

- General system configuration
  - 500 kV -> connecting network
  - Radial form for supplying system (e.g. 110 kV) ->Avoiding over fault current and securing easy and reliable operation



82

Example of rules (3)

- N-1
  - A fault of a unit of facilities should not interrupt power supply without any special countermeasures.

83

System modeling

- Existing 5 years after 10 years after 20 years after
- In accordance with demand forecast and power sources development
- Generator operation
- Interregional connections

84