[6] Optimization study on conventional Hydropower Plants

Japan International Cooperation Agency (JICA)

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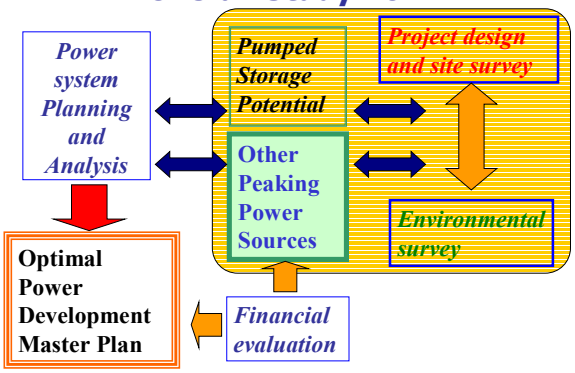
Overall Study flow



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Peaking Power Supply development

Target of this Study

- **Extension of Existing HPP**
  [Thac Mo Extension : F/S finished]
  - Extension of Tri An HPP
    < Dong Nai River system>
- **Development of HPP**
  - Optimization of Huoi Quang and Ban Chat HPP
    <Da River system>

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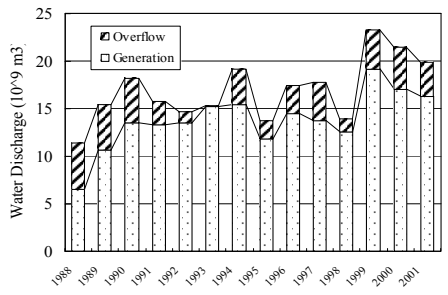
Ineffective discharges at Tri An HPP



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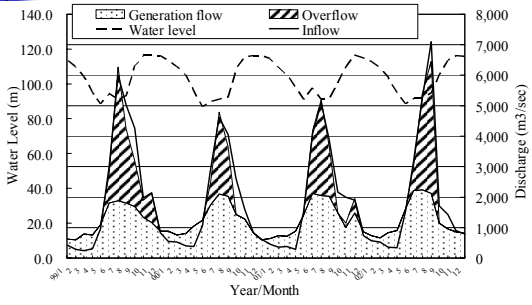
Ineffective discharges at Hoa Binh HPP



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Utilization of ineffective discharge

- HPP for peaking supply
  - Renewable energy
  - Reduce consumption of fossil fuel
  - Prevention of global warming

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Concerning issues

- the use of river flow

Flood control	**Generation**	Water supply
Irrigation	Transportation	Others

Integrated Water Resources Management

Such as consecutive river system operation

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Contents

Conventional HPP for peaking supply

- 1) Introduction
- **2) Extension of Existing HPP**
- 3) Development of HPP
- 4) Conclusion

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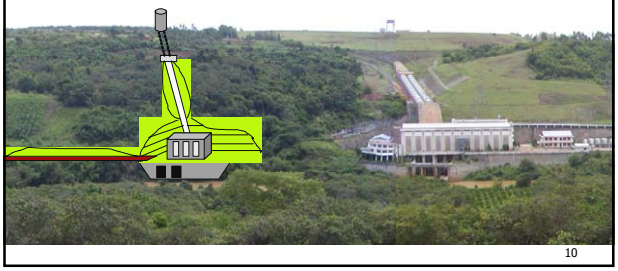
Thac Mo Extension Project



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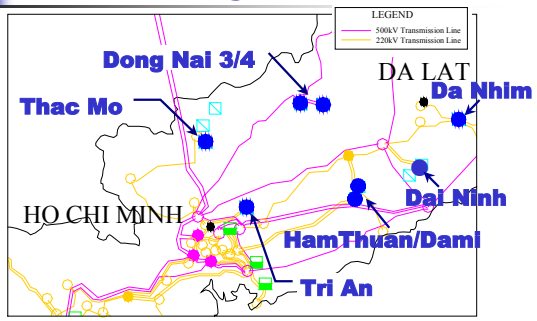
HPPs in Dong Nai/Be River



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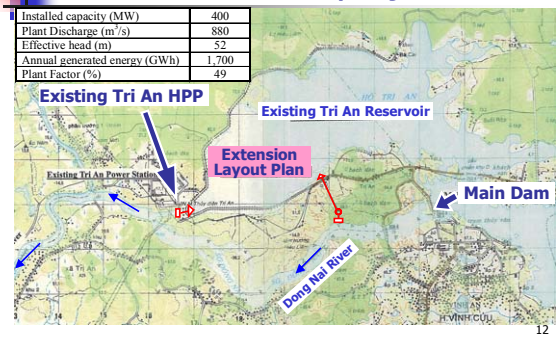
Tri An extension project

Installed capacity (MW)	400
Plant Discharge (m^3/s)	880
Effective head (m)	52
Annual generated energy (GWh)	1,700
Plant Factor (%)	49



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Methodology

Influences of reservoirs in the same river basin :
Ham Thuan DaMi
Dai Ninh
Dong Nai No.3&4

1. Regulation

Method: Mass curve

Conditions
-River discharge considering other dams
-Dam/Reservoir features
-Evaporation

Output
Firm discharge

2. Reservoir operation

Method: Simulation

Conditions
above and
-Firm discharge
-Installed capacity

Output
Generation
Firm Capacity

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Extension project plan

- Conditions
  - Dam/Reservoir : Existing (No change)
  - Extension capacity : +100MW
    (Existing HPP : 400 MW)
  - Main structures for extension project
    <intake, headrace, surge tank, penstock, powerhouse, outlet >

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Results of reservoir operation

	Without Extension	With Extension	Extension Project
Installed capacity (MW)	400	500	100
90% firm peak power (MW)	354	441	87
Generated energy (GWh/year)	1,863	1,952	89
Capacity factor (%)	53	45	45
Rate of spillway discharge (%)	9.4	3.4	3.4

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Economic Evaluation

Installed capacity (MW)	100
B/C	1.42
FIRR at consumer's end (%)	9.1

- >> High Economical efficiency

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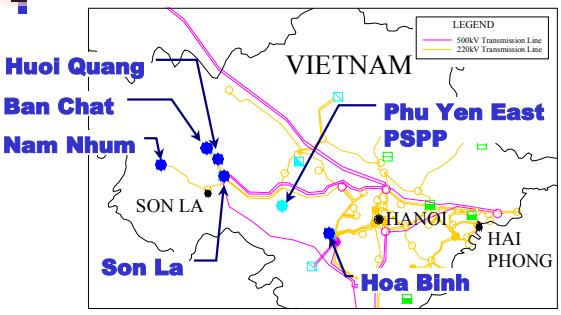
HPP plan for Da River Basin



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Current project plan

	Unit	Ban Chat	Huoi Quang
Installed Capacity	MW	200 (100MW x2)	540 (180MW x3)
Catchment Area	km^2	2,017	2,930
Dam type	-	Concrete gravity	Concrete gravity
Dam height	m	127	151
Total water head	m	82	149
Effective Storage	$10^6 m^3$	1,380	173

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Methodology

- Simulation method :
  - Same as Tri An extension
- Considering
  - Regulation of Ban Chat in case of cascade development

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Case of simulation

Ban Chat \ Huoi Quang	No develop-ment	1 unit, 180MW	2 units, 360MW	3 units, 540MW	4 units, 720MW
No development	–	–	–	○	–
1 unit, 100MW	–	–	–	○	–
2 units, 200MW	○	○	○	◎	○
3 units, 300MW	–	–	–	○	–
4 units, 400MW	–	–	–	○	–

Legend ○ : simulation case, ◎ : current plan

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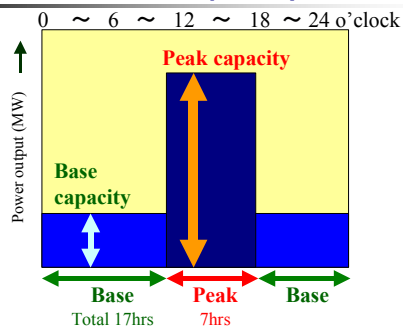
Peak / Base capacity



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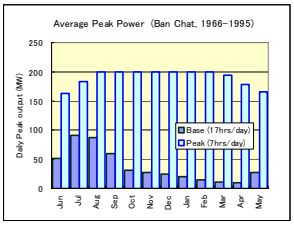
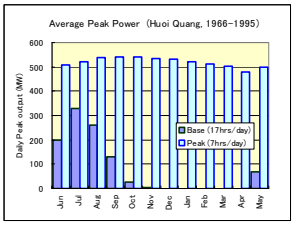
Average Peak / Base





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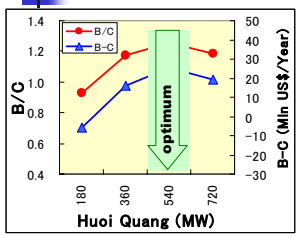
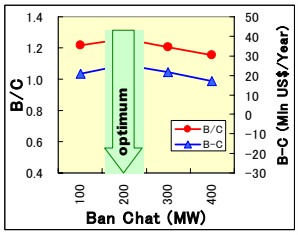
Optimum installed capacity





< Peak duration : 7hrs >

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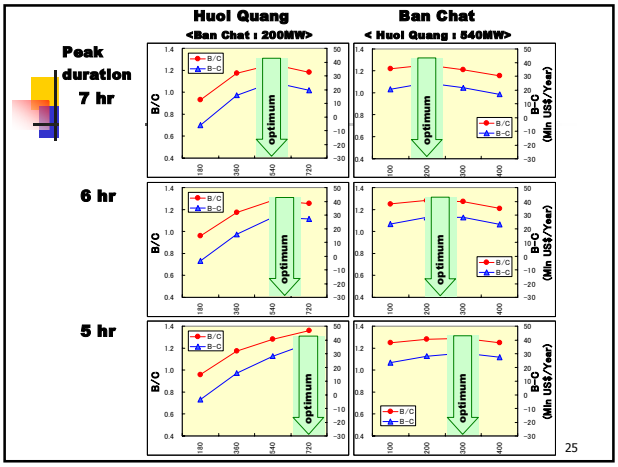

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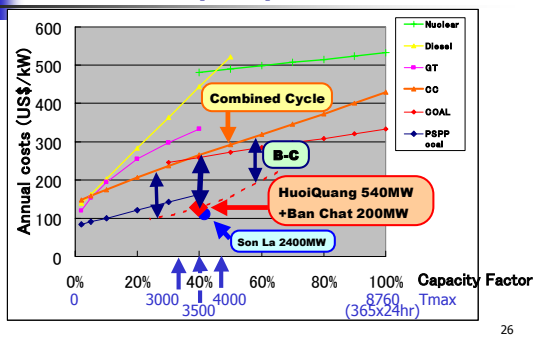
The B/C (B-C) method



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Optimum installed capacity

- Current plan
  - Ban Chat : 200 MW, Huoi Quang : 540 MW
- Optimum
  - The Current plan : Best Choice considering future profile of power demand
  - Capacity Factor 40% : Tmax=3500 hr

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Conclusion

- Extension of Existing HPP
  - Tri An Extension : High economic efficiency
- Development of HPP in the North
  - Installed capacity planned currently : optimal
    <Ban Chat 200MW, Huoi Quang 540MW>
  - Cascade development : Requisite

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END of session

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[7] Possibility of Installation of Coal Thermal Power Plant in the South

Japan International Cooperation Agency (JICA)

1

Contents

- Geographical Study
- Coal Price Transported from the North
- Economical Evaluation

2

Geographical Study

Assumptions

- Kinds of Coal
  Anthracite (Quang Ninh), Subbituminous (Red River Delta)
- Installed Capacity
  1,200MW for one plant (with premise for an additional plant)
  - ✓ 4 units of 300MW for Anthracite
  - ✓ 2 units of 600MW for Subbituminous coal
- Specifications of the private harbor
  Navigation Channel, Turning Basin and Berth length were intended for 45,000DWT tanker

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Geographical Study

Evaluation and selection of candidate sites

- Selection Area :
  - ✓ Seacoast from lat. 13°N to the South
- Selection Points :
  - ✓ To secure the sufficient water depth without dredging
  - ✓ Unnecessary to build Seabreak by leveraging peninsula or island
  - ✓ To be equipped with access road

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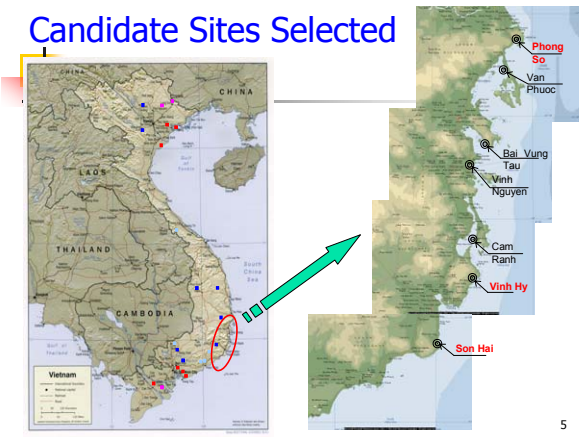
Candidate Sites Selected



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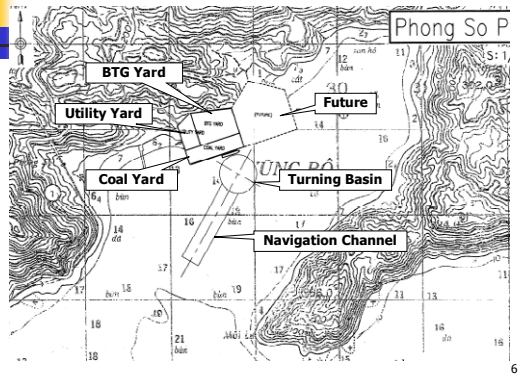
Outline Design of Phong So



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Construction Cost

Items / project site name		Phong So	Vinh Hy	Son Hai
Anthracite	Plant	850 US$/kW		
	Civil & Arch.	153 mil.US$		
Subbituminous	Plant	722 US$/kW		
	Civil & Arch.	130 mil.US$		
Harbor (mil.US$)	Total	90.6	201.3	156.6
	Break Water	31.1	181.1	135.6
	Reclamation	36.6	11.6	12.4
	Ash disposal	22.9	8.6	8.6
Construction Cost (USD/kW)	Anthracite	1,053	1,145	1,108
	Subbituminous	906	998	961

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Contents

- Geographical Study
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- Economical Evaluation

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Coal Price Transported from the North

- Coal Price (FOB)

Coal		Heat value kcal/kg	Coal price FOB(VND/t)
Anchracite	Hon Gai #3	7,100	431,000
	Hon Gai #4	6,050	332,000
	Hon Gai #5	5,500	305,000
Subbituminous	Red River V3	5,100	305,000*

*:assumed price (same as Hon Gai #5)

- Transportation Fee from Haiphong to the site
  - ✓ Based on that from Haiphong to HCMC of 7 US$/ton

as stated by Vinacoal

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Economic Evaluation (as of 2003)

Unit Generation Cost (UScents/kWh)

Coal		Phong So	Vinh Hy	Son Hai
Anchracite	Hon Gai #3	3.54	3.74	3.67
	Hon Gai #4	3.49	3.69	3.62
	Hon Gai #5	3.53	3.72	3.65
Subbituminous	Red River V3	3.28	3.47	3.40

1) Capacity factor = 75%
2) Including station service (7%)
3) Coal transportation fee = 7 US$/ton

Every unit generation cost is cheaper than GTCC's 3.75 UScents/kWh.

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The End of Session

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