

3. FEASIBILITY OF PEAKING POWER SOURCES

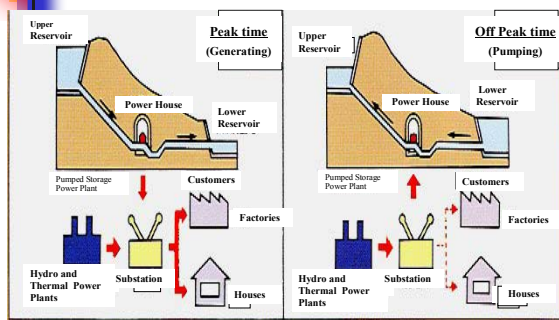
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Contents

- **1) Pumped Storage Power Plant (PSPP)**
- 2) Conventional hydropower
- 3) Works for the next stage

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What is PSPP?



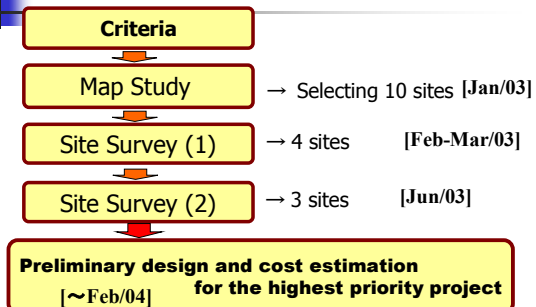
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Target of PSPP project finding

- To Clarify Possibility of PSPP in Vietnam
 - Potential sites
 - Most Promising Project
- To Provide data to Optimization Study
 - Estimated Project cost

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Flow of PSPP project finding



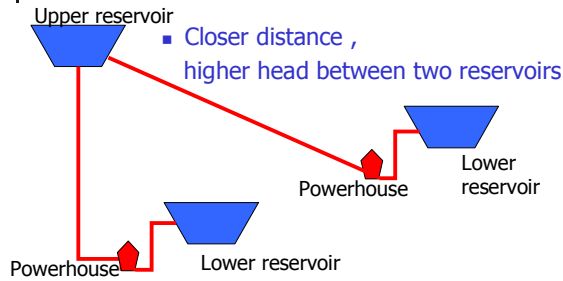
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Criteria setting

- Screening the candidates
- Comparing under the same conditions

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Economical PSPP properties(1)



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Economical PSPP properties(2)

- Smaller dam/pound with necessary storage capacity
- Good geological conditions

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Criteria (technique)

■ Peak duration time	7hrs	} Precondition
■ Installed capacity	1000MW	
■ Depth of reservoir	< 30m	} Technical Constraint
■ Design head	< 720m	
■ Overburden of Power House	< 500m	} Economical Constraint
■ Catchment Area	> 30km ²	
■ Dam crest length	< 500m	
■ Dam height(fill type)	< 180m	
■ Length of water way	< 10km	
■ Length/Head (L/H)	< 10	

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Criteria (Environment)

Natural Environment

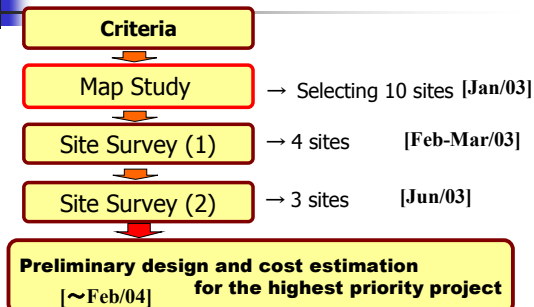
- Beyond the confines of Protected Area
- Avoid the critical habitats

Social Environment

- Avoid mining concession
- Avoid submerging historical and culture heritage
- Fewer submerged houses

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Flow of PSPP project finding



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Site identification

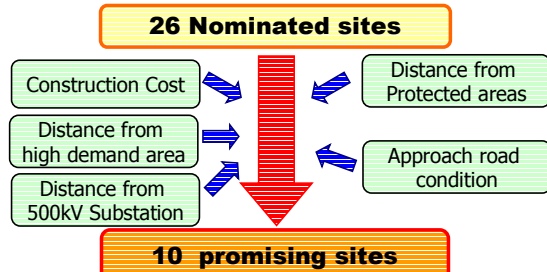
- Project Finding using 1:50,000 topo. map
- Screening by the criteria
➔ Potential PSPPs in Vietnam

Area	Potential Sites	Nominated Sites
North	21	13
Central	8	5
South	9	8
Total	38	26

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Selection of promising projects

- Considerations for Narrowing down



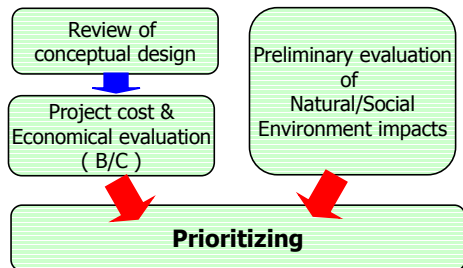
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First Site Survey

- Check points
 - Topography / Geography
 - Geology
 - Hydrology
 - Natural / Social environment

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First site survey outcomes



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Preliminary evaluation of Natural/Social environmental impacts

Site name	Natural Environment		Social Environment		Multiplication of all scores	Evaluation score (* see note)
	Direct	Indirect	Direct	Indirect		
P 5	1	1	1	1	1	1.0
11 B	1	1	1	1	1	1.0
JN 1	2	2	2	2	16	2.0
JN 3	1	1	2	1	2	1.2
JS 6	2	2	2	2	16	2.0
JN 5	1	1	2	1	2	1.2
JN 6	2	2	1	1	4	1.4
JN 9	1	2	2	2	8	1.7
JN 18	2	2	3	1	12	1.9
JS 11	2	2	1	1	4	1.4

3 = significant impact
2 = can be mitigated or unknown
1 = no significant impact

Note: Evaluation score is calculated in the following method in order to compare each evaluation score: 4th route of multiplication of all four scores of each site.

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Criteria for Priority Ranking

Priority Rank	Criterion			
	Economically	and /or	Expected problems / impacts	
			Technical	Natural/Social Environmental
AA	superior	and	no significant problems	and no significant impacts
A	superior	and	some technical problems	or some environmental impacts
B	feasible	and	ditto	or ditto
C	uneconomical	or	significant problems	or significant impacts

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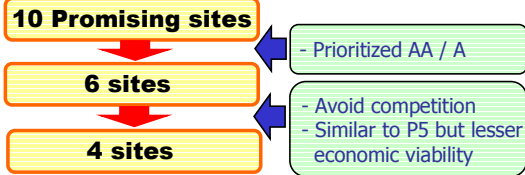
Prioritization of the projects

Project Site Name	(P5)	(P11B)	(JN1)	(JN3)	(JN18)	(JN5)	(JN9)	(JN6)	(JS6)	JS11
Economic Value (US\$/kW)	750	770	910	760	790	680	820	760	730	820
B / C	1.10	1.08	0.93	1.09	1.05	1.20	1.02	1.09	1.13	1.02
Tentative evaluation scores of Environmental Assessment	1.0	1.0	2.0	1.2	1.9	1.2	1.7	1.4	2.0	1.4
Priority Rank	AA	A	C	AA	B	AA	B	A	A	B

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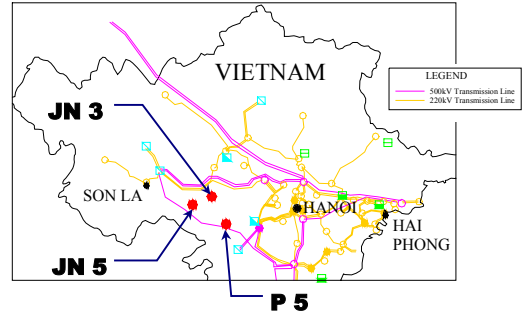
Selection of Projects for Second Site Survey

Consideration for narrowing down



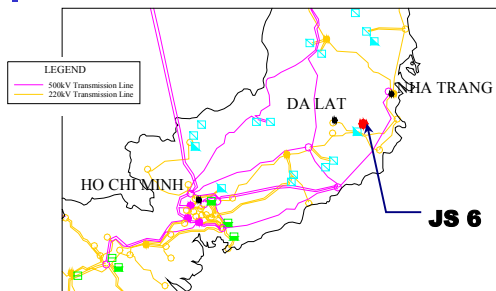
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Location of the sites (north area)



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Location of the sites (South area)



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Second Site Survey

- Purpose
 - To identify obstructions of the project
 - To collect data for preliminary design

Pick-up specific points

Preparing checklists

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Selection of priority sites

- P5 : Significant geological problem
- JN3, JN5, JS6 : No significant problems

Drop out

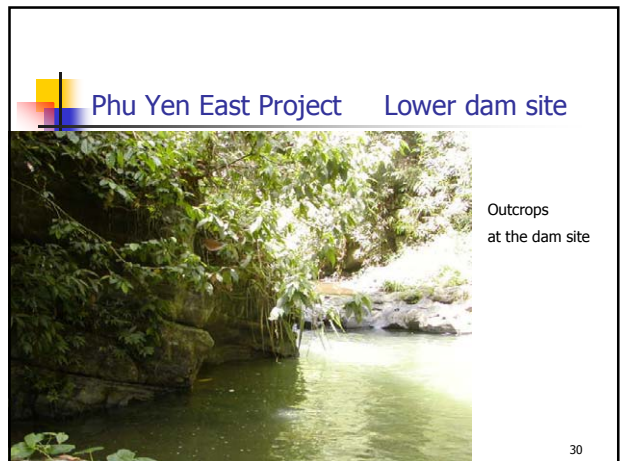
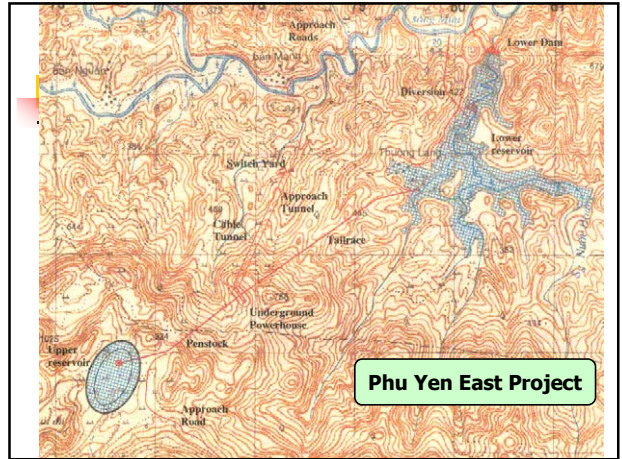
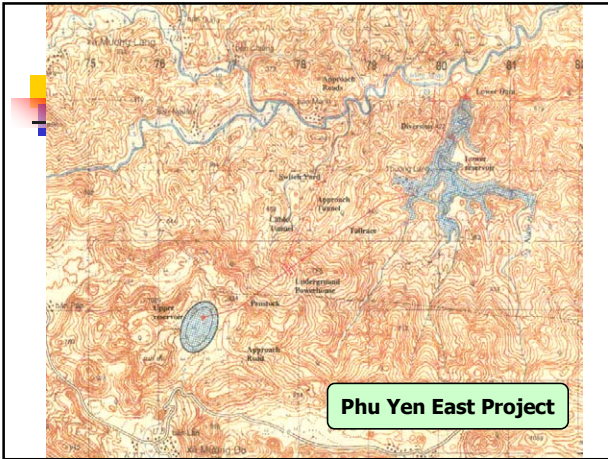
Priority sites

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Outline of priority PSPPs

Project Site Name		Phu Yen East (JN3)	Phu Yen West (JN5)	Bac Ai (JS6)
Project	Installed Capacity P (MW)	1000	1000	1000
Specification	Designed Discharge Qd (m ³ /s)	230	240	350
	Effective Head Hd (m)	560	520	360
Upper Reservoir	Type	Full Faced Pond (Asphalt)	Concrete Gravity	Rockfill
	H.W.L (m)	860	720	600
	L.W.L (m)	850	705	580
Lower Reservoir	Type	Concrete Gravity	Concrete Gravity	Concrete Gravity
	H.W.L (m)	280	160	210
	L.W.L (m)	270	157	206
Total Length of Waterway Lt (m)		3800	2800	2400
Power House overburden (m)		400	400	250
Lt / Hd		6.8	5.4	7.3

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Phu Yen East Project Lower reservoir

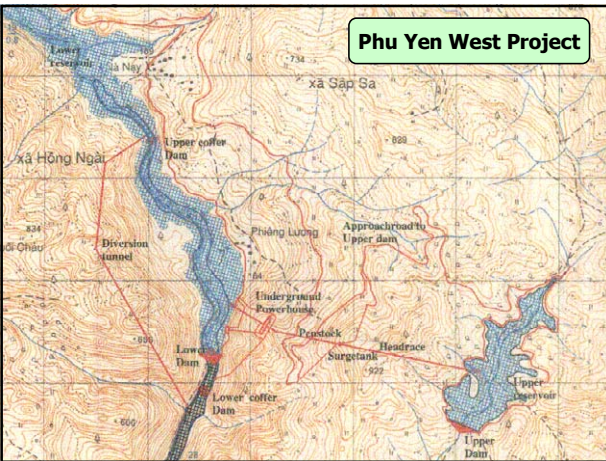


Flat area of the lower reservoir

Phu Yen West Project



Phu Yen West Project



Phu Yen West Project Upper dam site



Dan site view from upstream

Phu Yen West Project Upper dam site

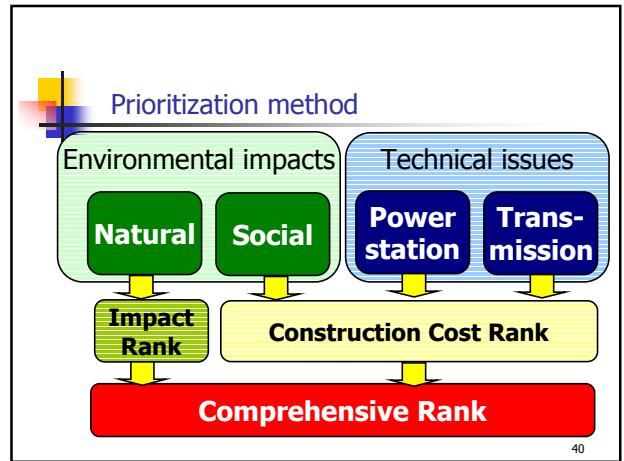
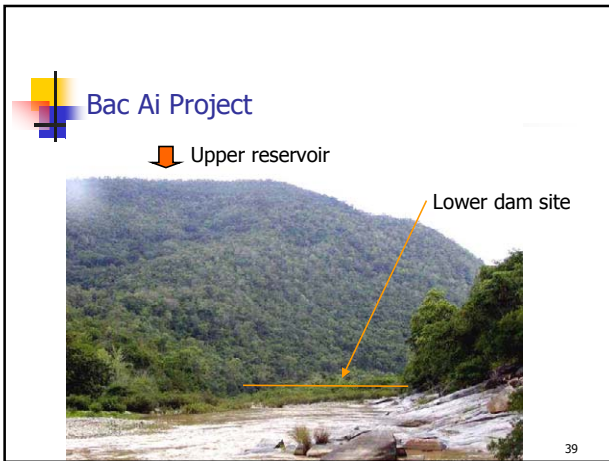
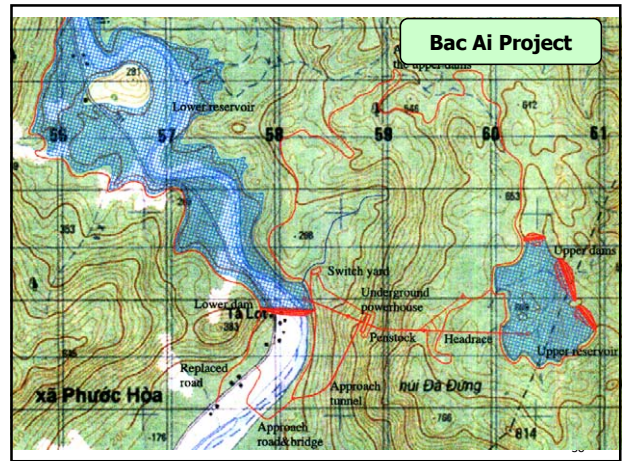
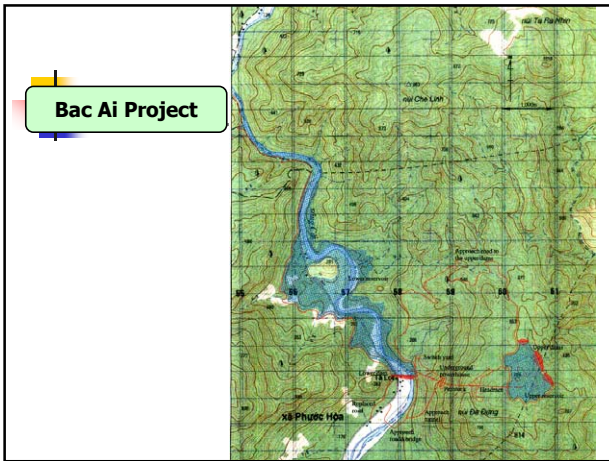


Waterfall of the Dan site

Phu Yen West Project Lower dam site



Appeared rocks at the dam site

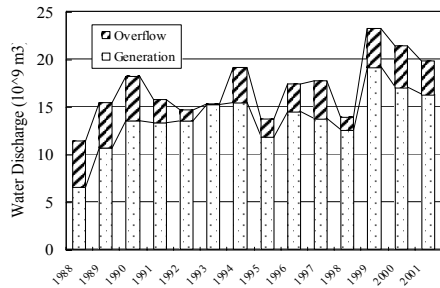


Prioritization of three projects

Items		Phu Yen East (JN3)	Phu Yen West (JN5)	Bac Ai (JS6)
Environmental Impacts	Natural Environment	Direct impacts on the natural environment are limited.	Direct impacts on the aquatic ecosystem may be significant.	Direct impacts on the aquatic ecosystem will be significant.
	Social Environment	direct impacts: 74 households (385 persons).	direct impacts: About 300 households (1,700 persons).	direct impacts: 63 households (330 persons).
Project Cost	P/S Cost	US\$ 630 / kW	US\$ 700 / kW	US\$ 660 / kW
	T/L Cost Distance to S/S	US \$ 40 min. 70 km	US\$ 45 min. 80 km	US\$ 50 min. 90 km
Environment impact rank		①	②	③
Construction cost rank		①	③	②
Comprehensive rank		①	②	②

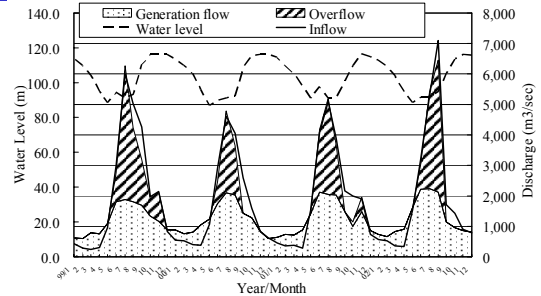
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Ineffective discharges at Tri An HPP



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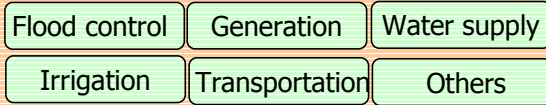
Ineffective discharges at Hoa Binh HPP



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Difficulties

- the use of river flow



Integrated Water Resources Management

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Further issues

- Target
 - river system with large reservoir
 - Don Nai < Tri An etc.>
 - Da < Huoi Quang, Ban Chat etc.>
 - Others
- To be Compared with other peaking sources in the optimization study

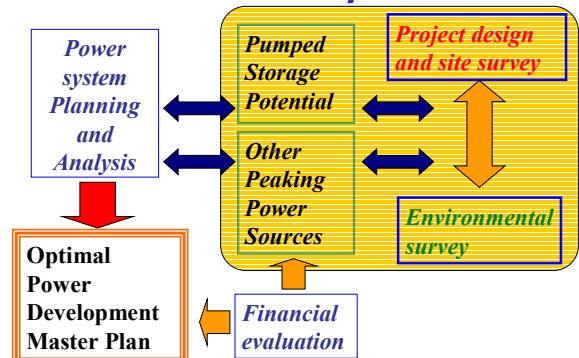
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- 3) **Works for the next stage**

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Overall Study flow





Works for the next stage

- Preliminary study of conventional hydro for peaking power
- Power system planning using property of peaking power sources
 - PSPP
 - conventional hydro
- Preliminary design and cost estimation for the highest priority PSPP
- Optimal installed capacity, peak duration time

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END

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