# 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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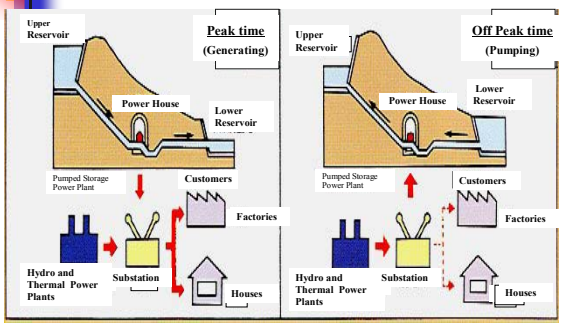
## What is PSPP?

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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

**Criteria**

Map Study → Selecting 10 sites **[Jan/03]**

Site Survey (1) → 4 sites **[Feb-Mar/03]**

Site Survey (2) → 3 sites **[Jun/03]**

**Preliminary design and cost estimation for the highest priority project [~Feb/04]**

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## Criteria setting

- Screening the candidates
- Comparing under the same conditions

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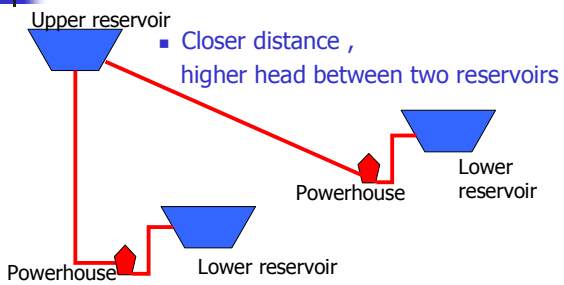
## Economical PSPP properties(1)

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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 | |
| Catchment Area | > 30km² | Economical Constraint |
| 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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**Preliminary design and cost estimation for the highest priority project** [~Feb/04]

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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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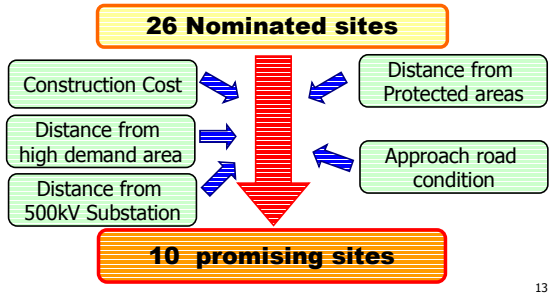
## Selection of promising projects

- Considerations for Narrowing down

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## First Site Survey

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

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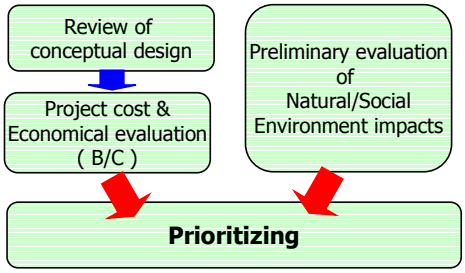
## First site survey outcomes

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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 caluculated 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 | and /or | Natural/Social Environmental |
| A A | 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 eveluation scores of Environmental Assesment | 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**

**10 Promising sites**

- Prioritized AA / A

**6 sites**

- Avoid competition
- Similar to P5 but lesser economic viability

**4 sites**

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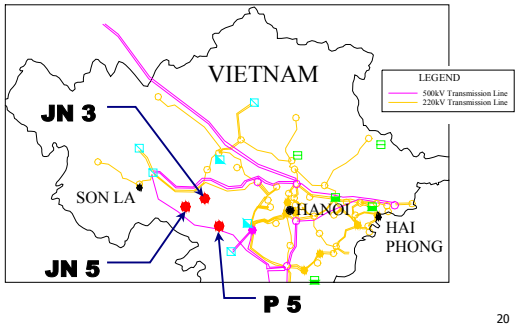
## Location of the sites (north area)

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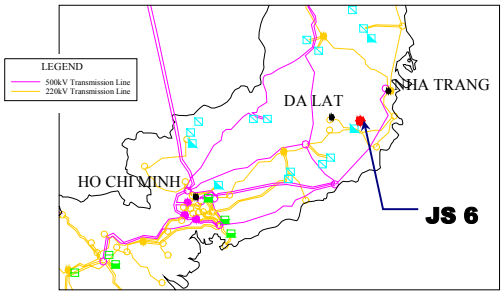
## Location of the sites (South area)

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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

**Drop out**

- **JN3, JN5, JS6** : No significant problems

**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 Specifica-tion | Installed Capacity P (MW) | 1000 | 1000 | 1000 |
| | 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) | 880 | 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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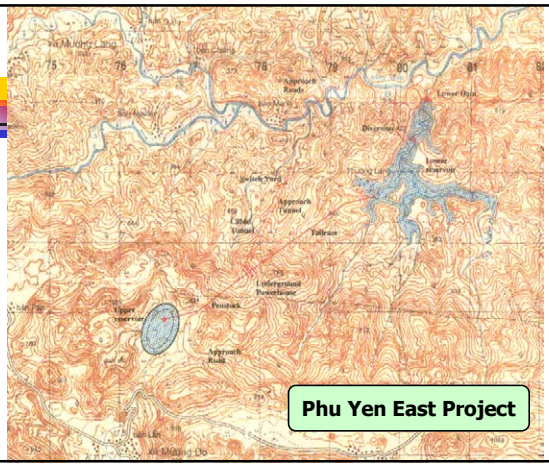


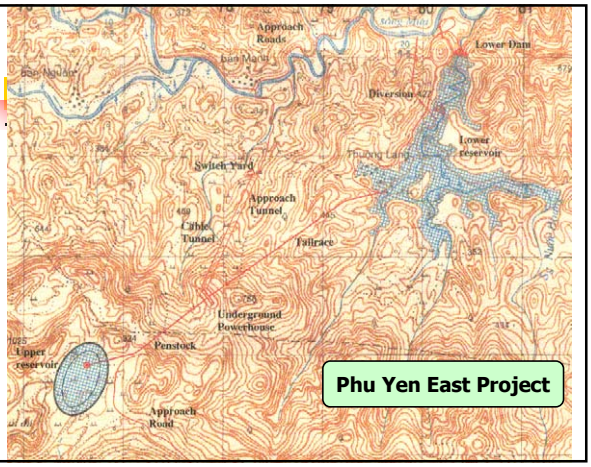


## Phu Yen East Project Upper reservoir site

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## Phu Yen East Project Upper reservoir site

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## Phu Yen East Project Lower dam site

Downstream of the lower dam

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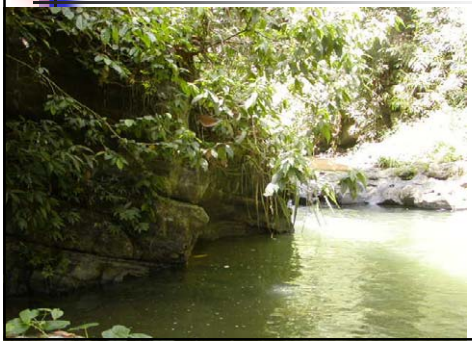
## Phu Yen East Project Lower dam site



Outcrops at the dam site

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## Phu Yen East Project Lower reservoir

Flat area of the lower reservoir

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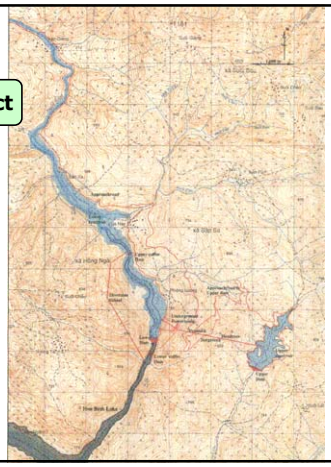
## Phu Yen West Project



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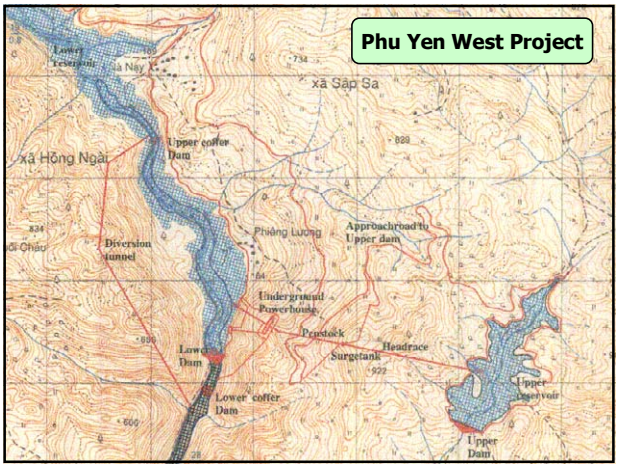


## Phu Yen West Project Upper dam site

Dan site view from upstream

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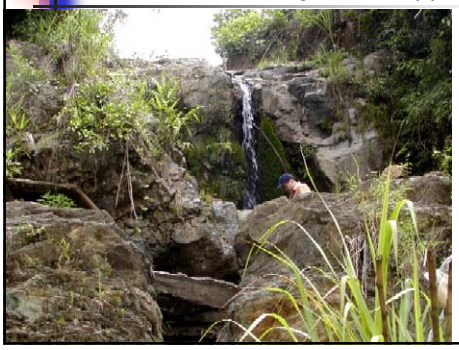
## Phu Yen West Project Upper dam site



Waterfall of the Dan site

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## Phu Yen West Project Lower dam site

Appeared rocks at the dam site

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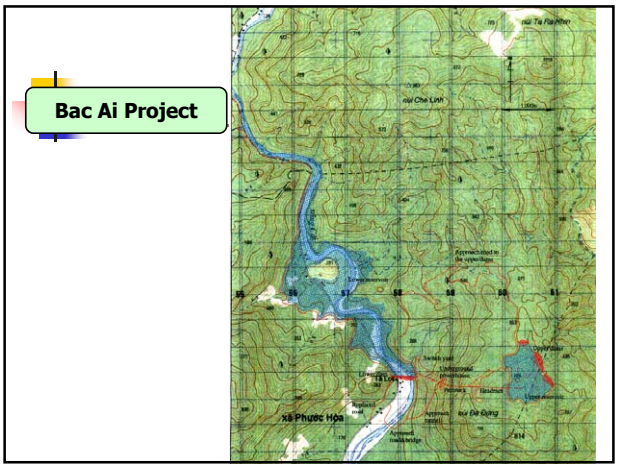


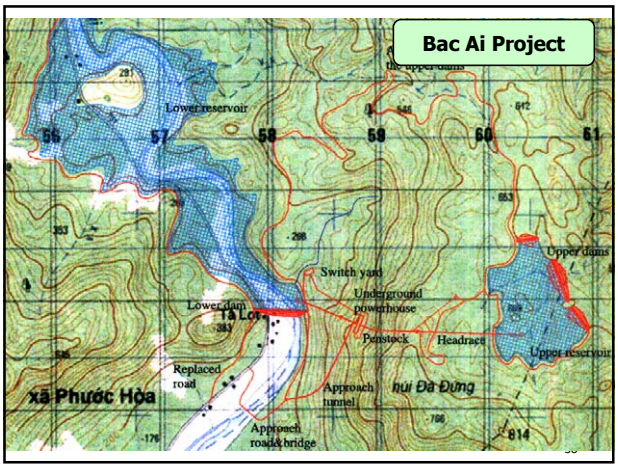


## Bac Ai Project

Upper reservoir

Lower dam site

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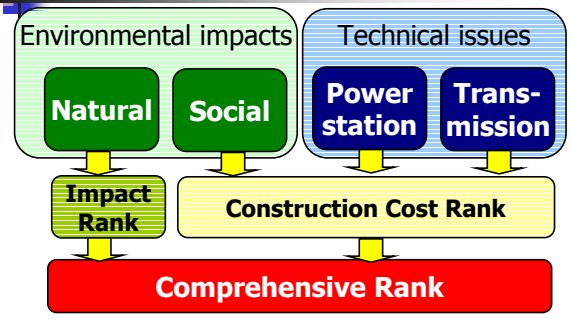
## Prioritization method

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## 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 mln. 70 km | US$ 45 mln. 80 km | US$ 50 mln. 90 km |
| Environment impact rank | | ① | ② | ③ |
| Construction cost rank | | ① | ③ | ② |
| Comprehensive rank | | ① | ② | ② |

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## Contents

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

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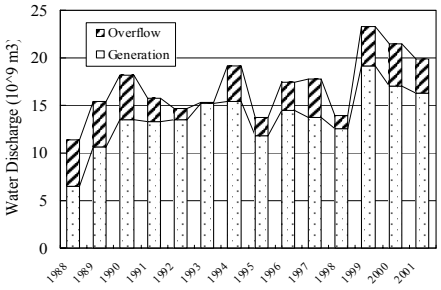
## Ineffective discharges at Tri An HPP

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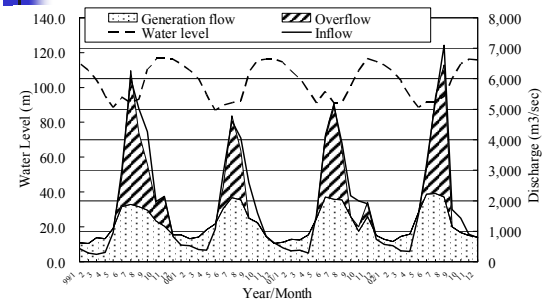
## Ineffective discharges at Hoa Binh HPP

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## Difficulties

- the use of river flow

| | | |
|---|---|---|
| Flood control | Generation | Water supply |
| Irrigation | Transportation | Others |

**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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## Contents

- 1) Pumped Storage Power Plant (PSPP)
- 2) Conventional hydropower
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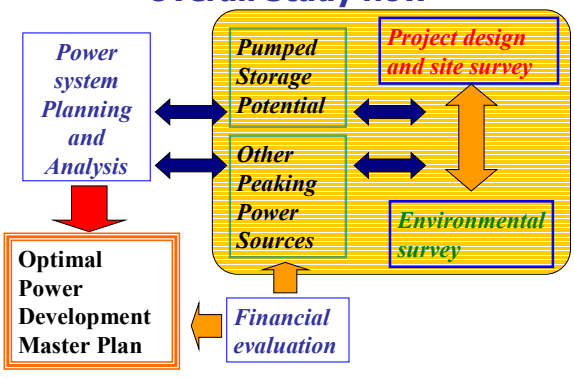
## Overall Study flow



## 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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