SAN VICENTE ENERGY STORAGE FACILITY PROJECT

An Environmentally Friendly Solution to Energy Storage

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PROJECT SUMMARY

Description: Watt Water Solutions, Inc. is collaborating with Black and Veatch to design an "upper" reservoir located above the existing San Vicente Reservoir in San Diego, California. This includes designing water conduits, tunnel systems for electricity, and a powerhouse in between the two reservoirs. The powerhouse will contain reversible pump-turbines capable of lifting water to the upper reservoir from the lower reservoir and generate power as the water flows downstream.

Objective: Provide a feasibility design for a pumped-storage facility that will supplement peak energy demands for 8 hours with 500 MW of power.

DESIGN APPROACH

- Conceptually reviewed project components
- Developed screening analysis for potential reservoir sites
- Examined all sites potentially capable of natural reservoir within the vicinity
- Determined flow and head required at each site to produce 500 MW for an 8 hour duration
- Evaluated each potential reservoir site's natural volume capacity at head required
- Pump-turbine characteristics per U.S Bureau of Reclamation Engineering Monograph
- Hydraulic references per Hydraulic Design Handbook

DESIGN CONSTRAINTS & PARAMETERS

- Physical constraints
- Environmental constraints
- Cultural and societal constraints
- Generate 4,000 MW-Hr over 24 hr cycle
- Closed-loop system

SITE ALTERNATIVES

FIGURE 1: *PROPOSED UPPER RESERVOIR SITES*

PRELIMINARY DESIGN RESULTS

- Identified nine potential upper reservoir sites
- Evaluated sites and determined four candidate sites
- Determined preliminary pump-turbine characteristics
- Cost estimated the four sites for further evaluation
- Calculated required embankment volume

Proposed Upper Reservoir requirements and details:

Table 1: *Reservoir site details*

Site	REQUIRED		ESTIMATED	
	Flow (MGD)	Volume (acre-feet)	Natural Reservoir Capacity (acre-ft)	Conduit Diameter (ft)
A	5,684	6,371	8,509	22
B	10,063	7,267	7,879	25
C	12,331	9,579	10,730	26
D	4,212	4,309	5,460	19

Table 2: *Embankment details*

Site	Max Crest Height (ft)	Crest to Crest Elevation Difference (ft)	Estimated Volume (cy)
A	240	840	149,400
B	280	680	107,405
C	320	600	1,299,000
D	200	1,160	108,688

ENVIRONMENTAL DOCUMENTATION

- Study Plans: Geological, Water Resources, Fish and Aquatic Resources, Wildlife and Botanical Resources
- Water Quality Certification
- Ready for Environmental Analysis Review
- CEQA / NEPA
- Environmental Impact Report

PRELIMINARY COST ESTIMATION

Includes 20% contingency and all design components

Site	Costs
A	$ 0.968 billion
B	$ 0.853 billion
C	$ 1.259 billion
D	$ 0.969 billion

FUTURE OBJECTIVES

- Refine tunnel alignment, embankment volumes, reservoir volumes, and pump-turbine characteristics
- Select preferred alternative site

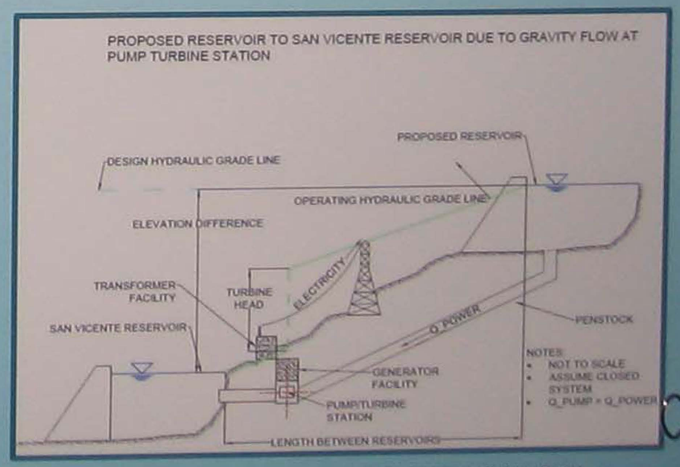

FIGURE 2: *CONCEPTUAL SCHEMATIC OF ENERGY GENERATION DURING PEAK ENERGY DEMAND*