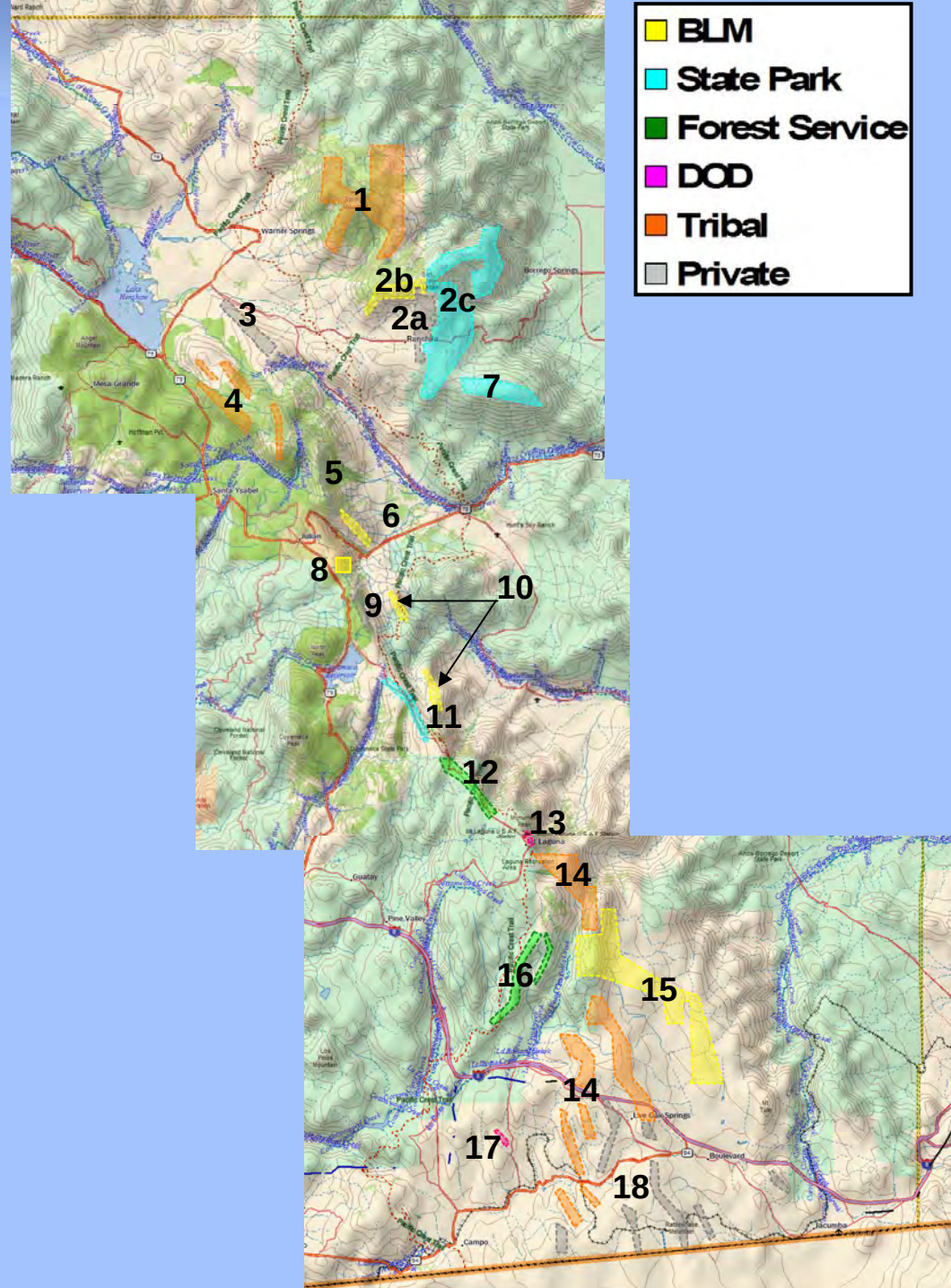
Debenham Energy, LLC

Sustainability Alliance - April 14th, 2009

AGENDA

1. **Overview of San Diego Wind Potential**
2. **Importance of Storage**
3. **Q&A**

1. Tribal - Los Coyotes
2a Private - Ranchita
2b BLM - Ranchita
2c State Park - Ranchita
3. County - Vista Irrig District
4. Tribal Santa Ysabel
5. Private/County Vulcan Mtn
6. BLM - Banner Grade
7. State Park - Pinon Ridge
8. BLM - Inspiration Point
9. Private - Colo River Advent
10 BLM (E of Lake Cuyamaca)
11 State Park (Rancho Cuyam)
12 Forest Service (Laguna)
13 DOD - USAF (Laguna Mtn)
14 Tribes in East County (I-8)
15 BLM PPM Claim-McCain Vl
16 Forest Service East Cty (I-8)
17 DOD (Navy Station)
18 East County (I-8)



Wind Energy Weekly

Vol. 26, #1232
16 March 2007

XCEL ENERGY SEEKING COMMUNITY-BASED PROPOSALS IN MINNESOTA

Xcel Energy said March 15 it is looking for new sources of Minnesota wind energy and is inviting potential wind project owners and developers to submit their proposals.

The effort is part of Xcel Energy's Community-Based Energy Development (C-BED) program. In 2005, the Minnesota legislature directed that each utility establish a tariff for the purchase of C-BED wind energy. The purpose of the tariff is to encourage and promote broader local participation in wind energy development.

Beginning March 20, Xcel Energy will be accepting proposals for new Minnesota wind generation resources to be in commercial operation by Dec. 31, 2008. Xcel Energy will seek approvals for any resulting power purchase agreements from the Minnesota Public Utilities Commission. The submission deadline is April 20. For details and instructions, bidders should go to www.xcelenergy.com/rfp .

The NIMBY Equation: "What's in it for me"

$$\frac{\text{Perceived Project Benefits}}{\text{Perceived Project Detriment}} \geq 1$$

Perceived Detriments:

- Visual Impacts
- Noise
- Health and Public Safety
- Environmental
- Neighborhood Character

Perceived Benefits:

- Reduced Electric Bills
- Jobs
- Community Pride (Sustainability)
- Environmental
- Educational Curriculum Benefit

Courtesy of Lorax Energy Systems (http://www.lorax-energy.com/)

FOUR PERSPECTIVES – WHAT EACH VALUES

Developers

- Wind Resource
- Transmission capacity
- Constructability / Road Access
- Size (Miles Ridgeline)
- Average Wind Speed
- Wind Power Density
- Size (Megawatts)
- Megawatt Hours/Yr
- Cost of Environmental Mitigation
- Cost of Energy (COE) at Grid

Cost vs. Benefit?!

Who pays? (ratepayer!)

Conservationists

- Viewshed
  - ✓ People affected 1-3 Miles
  - ✓ People affected ~25 Miles
- Plants
- Animals
  - ✓ Big Horn Sheep
- Insects
  - ✓ Check Spotted Butterfly
- Cultural/Heritage
  - ✓ Tribal
- Avian
  - ✓ Raptors
  - ✓ Songbirds

Utilities – CAISO

- Keep lights on (peak)
- RPS
- Energy (kWh)
- Capacity (kW)
- Ancillary Services
  - ✓ Frequency support (regulation)
  - ✓ Voltage support (VAR)
  - ✓ Spinning Reserve
  - ✓ Black Start
  - ✓ Avoided Utility Upgrades
- Location conducive to storage
  - ✓ Pumped Storage
  - ✓ CAES
  - ✓ Flow Batteries

Society

- Tons CO_2 Avoided
- Barrels Oil avoided (Note 1)
- NOx, SOx Avoided (Note 2)
- Local Support/Opposition
- Federal/State/Local Land Use Prohibitions

How to Evaluate Potential Sites - Ranking Methodology

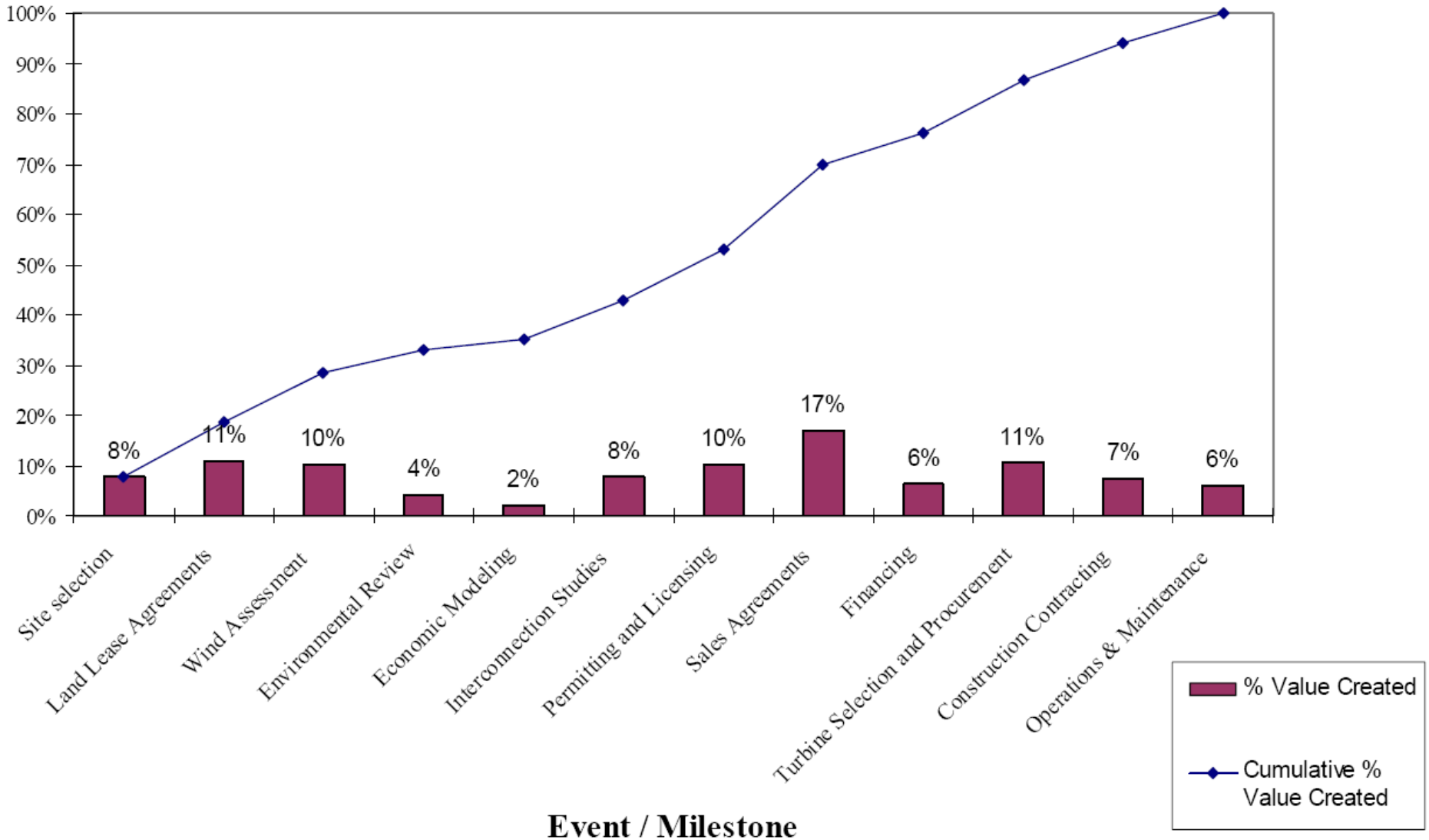
- Wind Resource
- Areas excluded (ACEC/WA/WSA)
- Who Owns the Land (Tribal/Private/DOD/BLM/USFS/State Park)
- Constructability/Close to Transmission
- Cultural/Biological/Aesthetics

					Developers Perspective							CAISO/IOU			Conservationist Perspective					Society			
					Wind Power Density Range (CEC)		Average Wind Speed Range (meteorologist)		Local Support or Opposition			Storage Opportunity and Benefit	Peak Load Reduction?	Local (Distributed) Load?		Biological - Cultural				Capacity	Energy	Land Utilization Efficiency	Cost Benefit Ranking (1-10)
		Group #1	Group #1	Group #1	Miles of Potential Development	Max	Min	Max	Min	(1-10)	Constructability (1-10)	Transmission Access and Required Network Upgrades (1-10)	(Frequency, Voltage, Defer T&D etc)	Transmission Capacity?	MWH/Yr	Aesthetics (1-10)	Animal (1-10)	Plant (1-10)	Avian (1-10)	Cultural (1-10)	MW	MWh/Yr	MWh/Yr-Mile	
1	Tribal - Los Coyotes																						
2a	Private - Ranchita	*																					
2b	BLM - Ranchita	*																					
2c	State Park - Ranchita	*																					
3	County - Vista Irrig District																						
4	Tribal Santa Ysabel																						
5	Private/County Vulcan Mtn																						
6	BLM - Banner Grade																						
7	State Park - Pinon Ridge																						
8	BLM - Inspiration Point			*																			
9	Private - Colo River Advent			*	1.6																		
10	BLM (E of Lake Cuyamaca)			*																			
11	State Park (Rancho Cuyam)			*																			
12	Forest Service (Laguna)																						
13	DOD - USAF (Laguna Mtn)																						
14	Tribes in East County (I-8)		*																				
15	BLM PPM Claim-McCain Vly		*																				
16	Forest Service East Cty (I-8)		*																				
17	DOD (Navy Station)																						
18	East County Private (I-8)																						

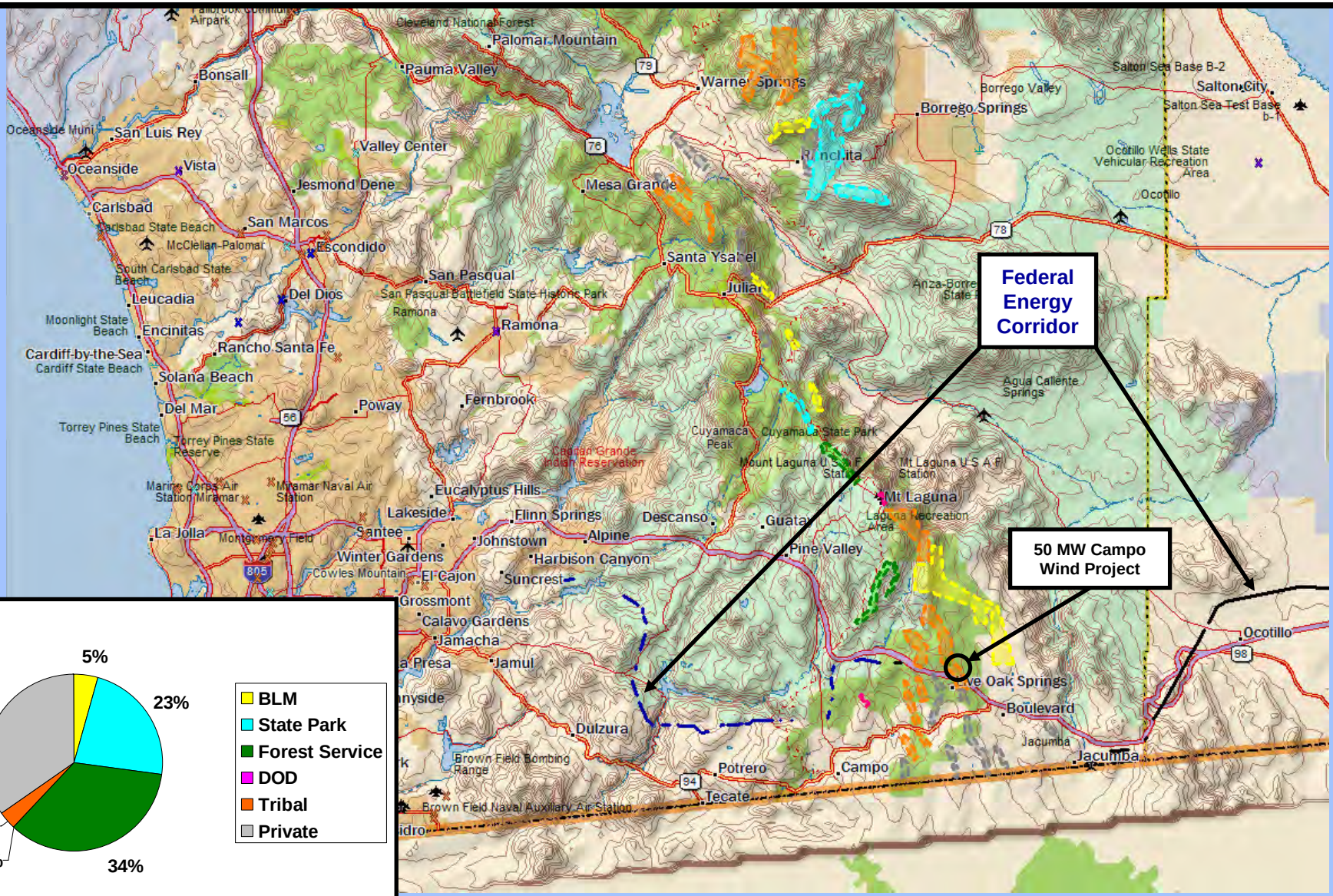
Who Decides?

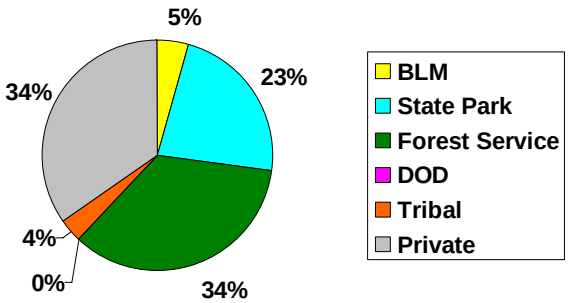
5 Near County Preserve. Local opposition historically to dual land use.
6 Seawest withdrew BLM Application due to local opposition. Modification to RMP is possible
14 Campo, La Posta, Mazanita and Cuyapaipe. La Posta recently decided not to develop wind (~50-100 MW potential)
15 201 MW CAISO Queue position (#32, 5/24/04). Reduced in size by RMP approximaely 50%.

Value Created in Project Development

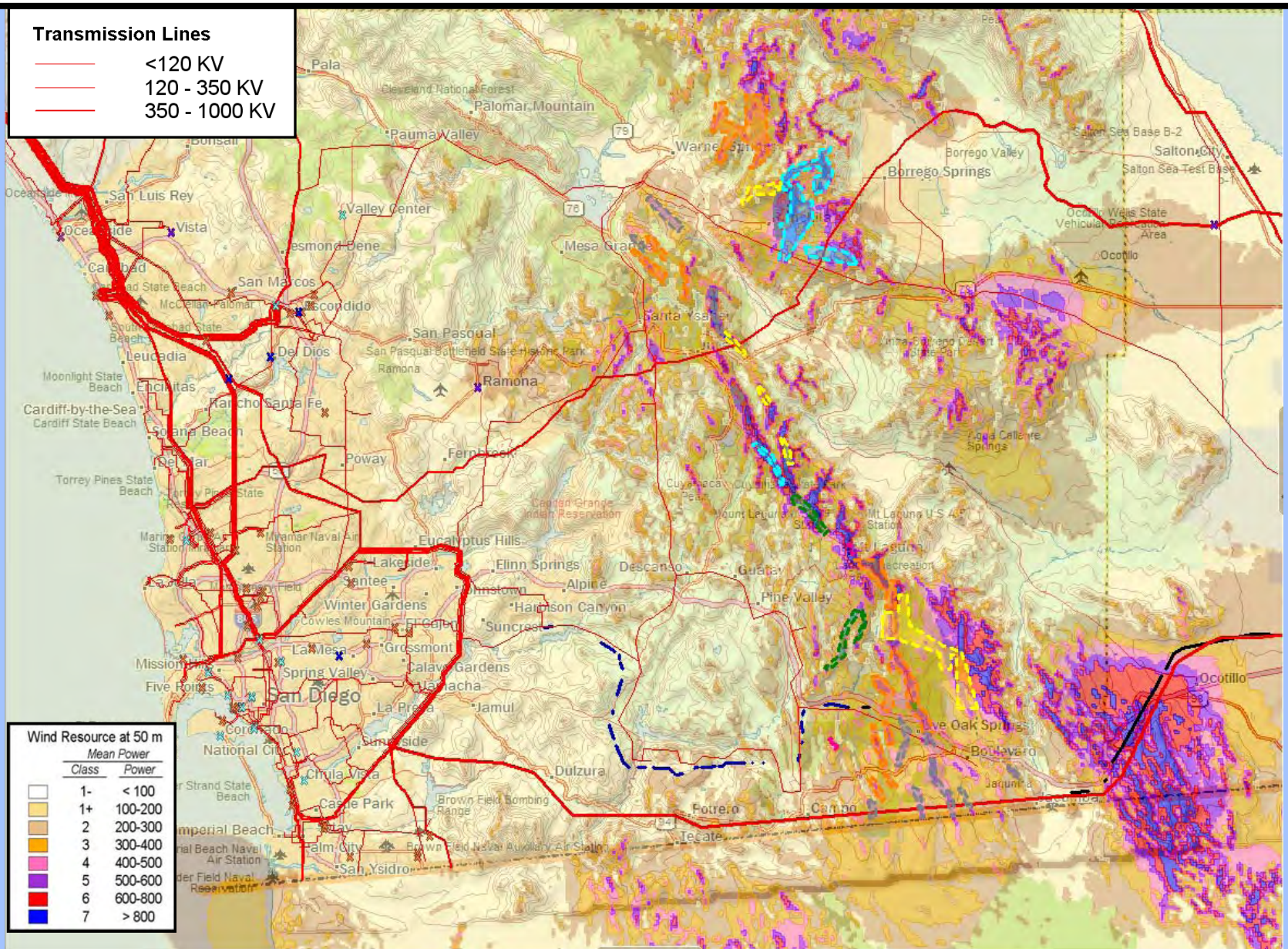


Potential Wind Development Areas – Federal Energy Corridor / Existing Power Plants

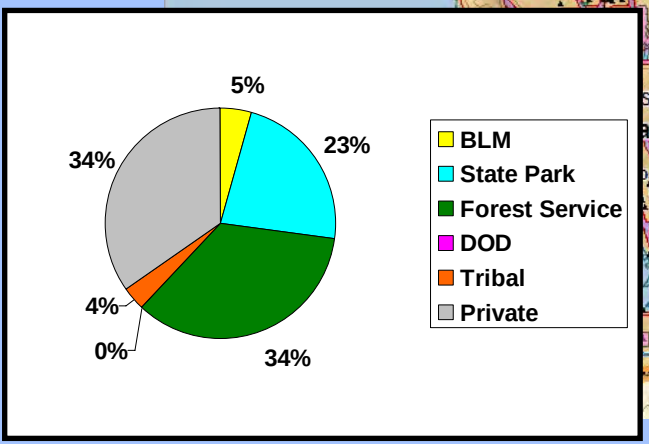




Potential Wind Development Areas – Transmission / Wind Resource



Land Ownership in San Diego County



IMPORTANCE OF STORAGE

On the evening of Tuesday, Oct. 23, Dave Geier, SDG&E's vice president of electricity distribution, learned from fire officials that the Horno fire was moving across Camp Pendleton and threatening Path 44.

Electric grid managers are supposed to plan for what could happen next.

Confronted with the possibility of a key transmission line failing, for example, grid operators often choose to shut down a line while it is still functioning, rather than waiting and risk the scramble of compensating for the sudden loss of a key power supply.

Geier understood that with the Southwest line out of service and Path 44 threatened, the region could become an electrical "island" — a last resort option.

San Diego did have an additional resource — a connection with the grid in Baja California, which was providing badly needed electricity to San Diego during the wildfires.

But in the event San Diego lost its connections to the U.S. grid, Geier said he feared the connection with Mexico would be severed by systems designed to prevent instability on one grid from cascading onto other systems and causing them to crash.

The veteran utility executive also knew that the problems involved with "islanding" San Diego went beyond having enough electricity within the county to satisfy local demand.

The grid can be thought of as a complex organism, involving a host of generating sources, thousands of miles of power lines, and — in SDG&E's case — 1.4 million customers.

Among the most delicate tasks in maintaining a stable grid is frequency management, or ensuring that power generation and consumer demand remain on a standard frequency. Diverging from that standard heightens the risk of the grid becoming unstable, with power plants automatically disconnecting from the system.

Frequency management is usually handled by the California Independent System Operator, which manages the state grid. But if San Diego lost its connections with the statewide grid, a major power plant within the county would have to take over the job, or "lead the dance," as Geier put it.

A pump storage system of 250-400 MW would 'lead the dance'

There was no experienced dance leader, however.

"In my almost 30 years with the utility, we have never run as an island," Geier said.

There are only three large power plants operating within the county: the Encina Power Plant in Carlsbad, owned by NRG Energy; the South Bay Power Plant in Chula Vista, operated by Dynegy; and the Palomar Energy Center in Escondido, owned by SDG&E.

"We made calls that night to see if someone knew how to regulate the frequency in San Diego County," Geier said. "Since no one had done that in anyone's history, we had no certainty anyone could do it.

"Palomar was the most certain about being able to do it, but they were not certain," he said. "It was probably the most stressful time in my 30-year career — and the ISO made a similar statement."

The utility executive said he did not know if anyone had ever practiced or simulated managing the local grid frequency.

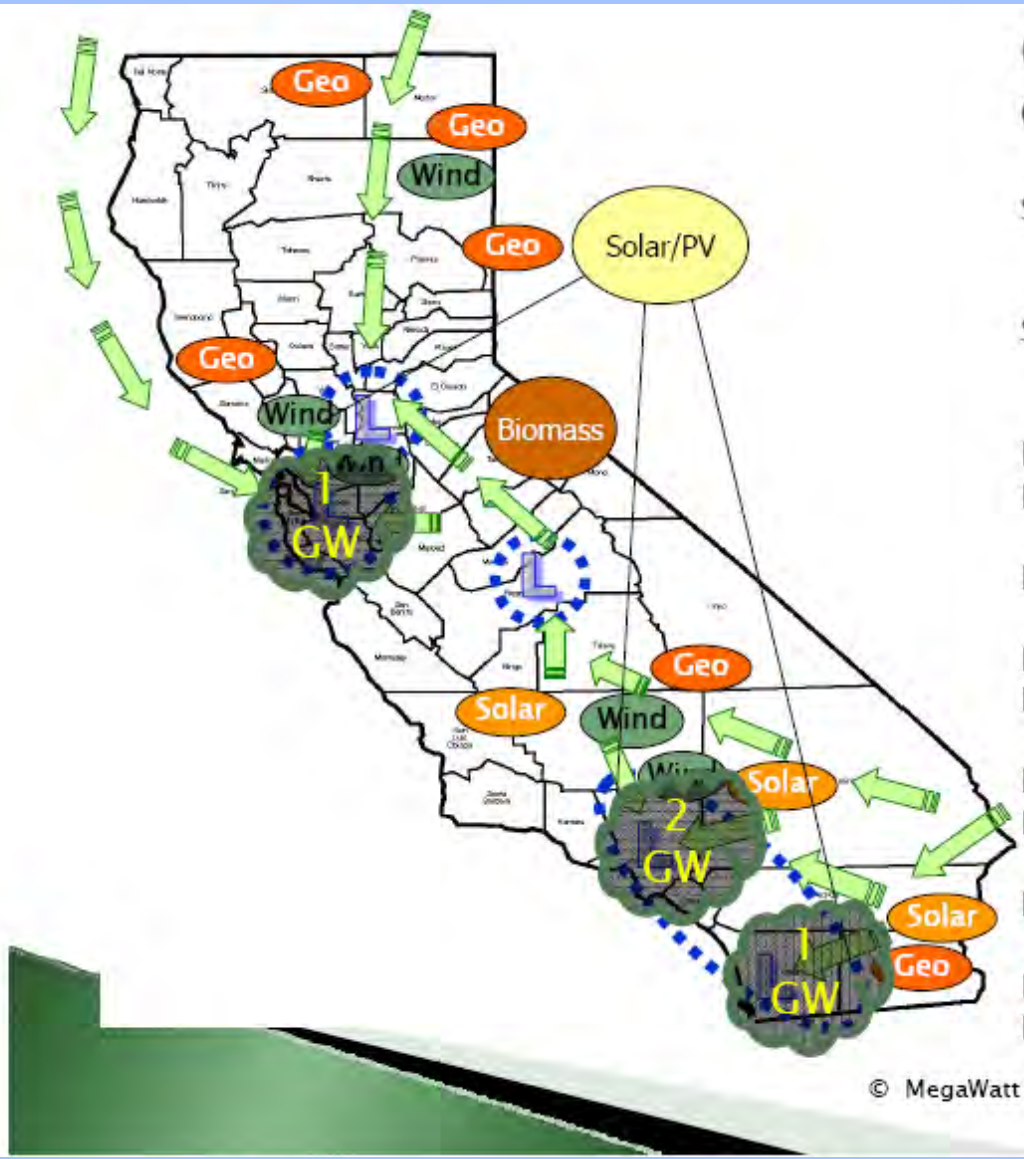
In a subsequent interview, however, Geier said he had learned that the utility had participated in three disaster drills in the past two years. Management of the local grid was included in those drills, he said.

Asked whether that included frequency management, Geier said it was part of the disaster training.

In a written statement later, SDG&E said it "strongly disputed" any implication that it was unprepared or ineffective in dealing with the emergencies caused by the wildfires.

"We have plans in place for 'islanding' our system and we were clearly ready and able to island if that became necessary to do," SDG&E said in the statement. "However, islanding is a measure of absolute last resort."

But the owners of the two power plants not owned by SDG&E say they weren't involved in this training.



California 2020 Vision

(33% Renewables)

Storage Target (conservative):
5% Peak = 4 GW

Storage Attributes:
No Emissions, Water, Noise

Displaces 4 GW Transmission & Distribution

Provides 4 GW RA Capacity

Provides 8 GW Dispatchable Ramping, Load Following, and Regulation

Provides 4 GW Over Generation Protection

Provides 4 GW Voltage Support

Need to refocus CA Transmission, Distribution and Generation Planning.

Benefits of integrating energy storage with wind

Firm renewable generation for sale on peak

- » Capture spilled generation off peak, sell on peak
- » Capture capacity payments

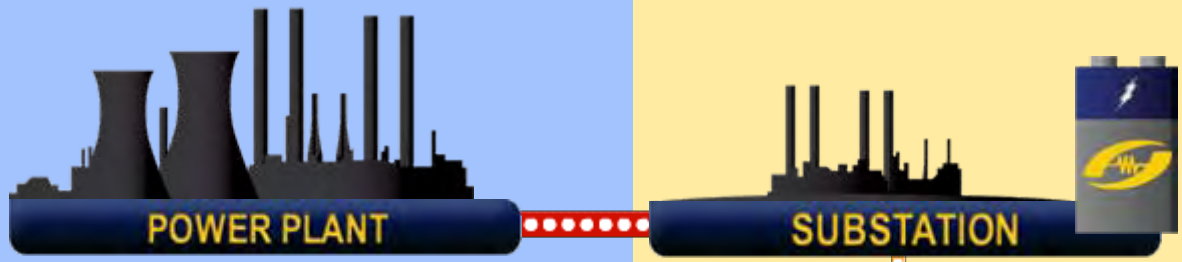
Smooth intermittent generation

- » Mitigate impact of frequency variation
- » Reduce spinning reserve required for grid stabilization

Relieve grid congestion or defer upgrade cost

- » Defer T&D capital cost
- » Improve power quality and customer service

Grid Benefits from Storage



Substation Storage

Location: In substation
Benefits:
- Provides emergency backup power
- SOC remotely monitorable
- Easily relocatable

Primary user: Utility

T&D Asset Optimization

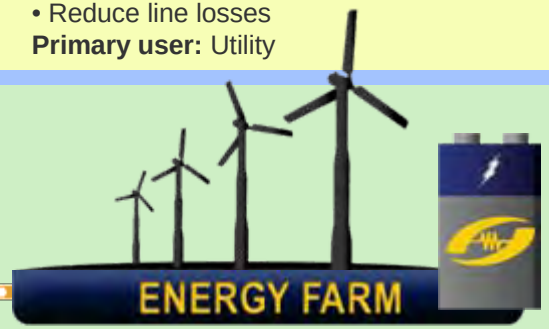
Location: At feeder line/substation
Benefits:
- Defer T&D capital investment
- Dispatch stored energy to shave peak
- Improve power quality & customer service
- Provide voltage and frequency support
- Capture energy arbitrage savings
- Reduce line losses

Primary user: Utility

Distributed Energy Storage

Location: Customer side of the meter
Benefits:
- Offset peak usage with stored energy
- Integrate with distributed renewables, DSM, DR
- Provide UPS/emergency backup power

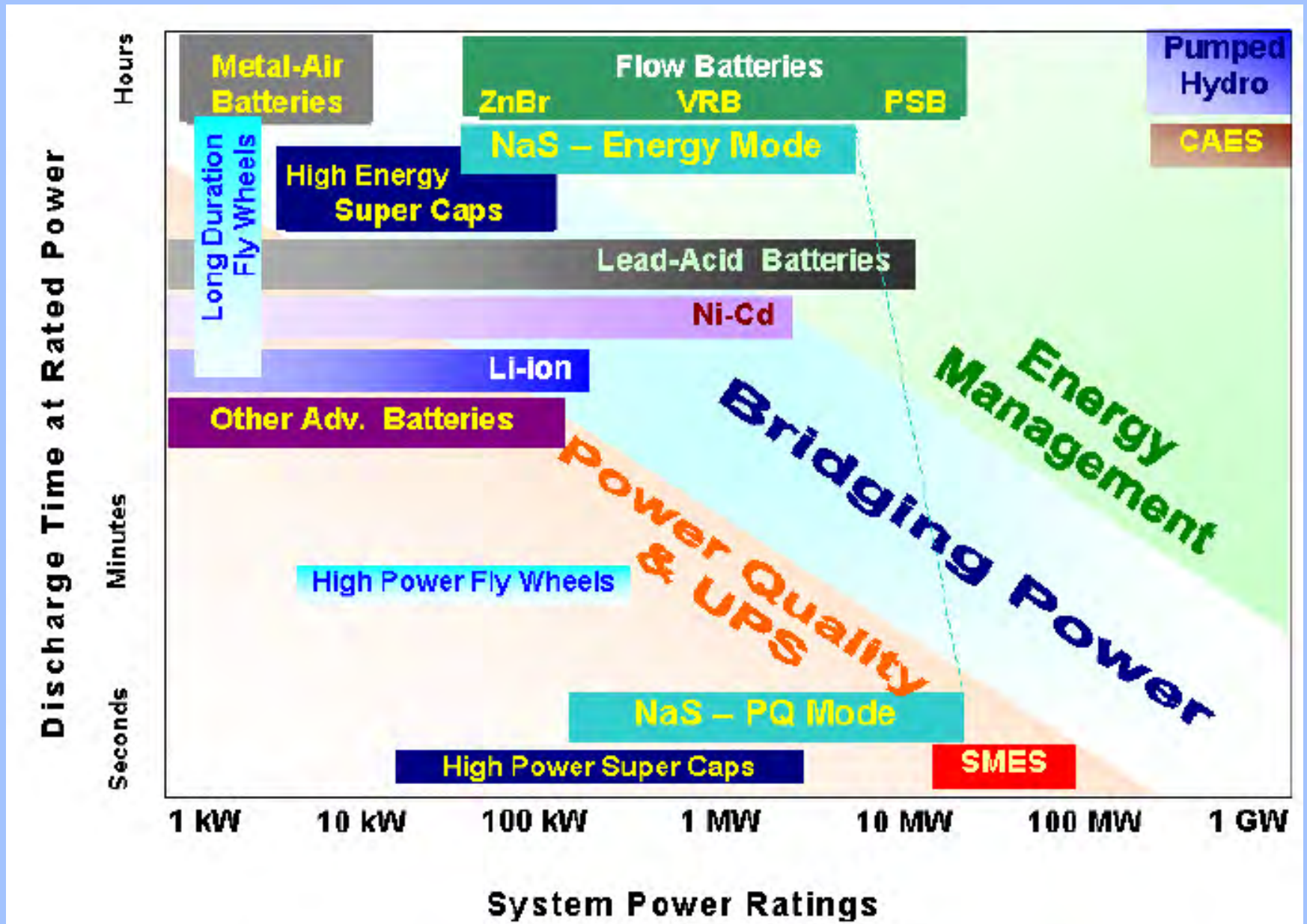
Primary user: Utility Customer/End User



Integration with Renewables

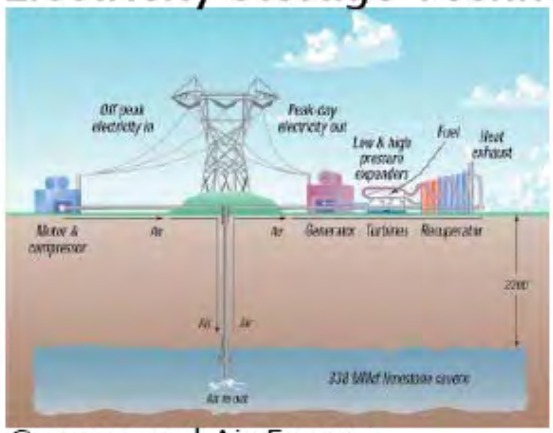
Location: Large scale renewable energy sites
Benefits:
- Smooth intermittent generation
- Firm renewable generation for sale on peak
- Reduce spinning reserve required for grid stabilization

Primary user: Site Developer/Investors


Discharge Time at Rated Power
Hours
Minutes
Seconds
Metal-Air Batteries
Flow Batteries
ZnBr
VRB
PSB
Pumped Hydro
CAES
NaS – Energy Mode
High Energy Super Caps
Long Duration Fly Wheels
Lead-Acid Batteries
Ni-Cd
Li-ion
Other Adv. Batteries
Energy Management
Bridging Power
Power Quality & UPS
High Power Fly Wheels
NaS – PQ Mode
High Power Super Caps
SMES
1 kW
10 kW
100 kW
1 MW
10 MW
100 MW
1 GW
System Power Ratings

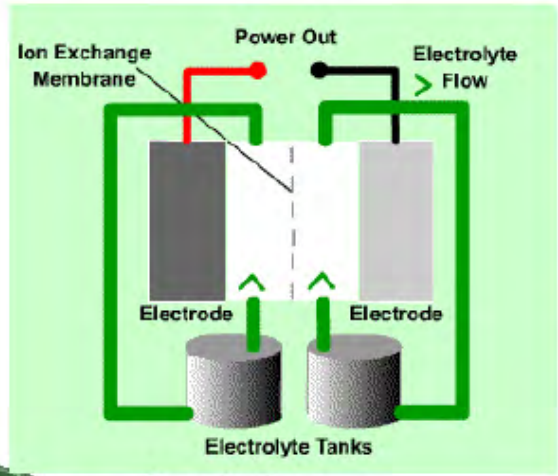
Alternative Electricity Storage Technologies

Pumped Storage



Compressed Air Energy Storage

Sodium Sulfur (NAS) Battery



Flow Battery

Lithium Ion Battery Trailers

Flywheel Storage

MegaWatt is storage technology agnostic.

1. SD County Water Authority FERC Permit

October 31, 2006

Notice of Application Accepted for Filing and Soliciting Motions To Intervene, Protests, and Comments

[Federal Register: December 4, 2006 (Volume 71, Number 232)]
[Notices]
[Page 70377-70379]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr04de06-51]

DEPARTMENT OF ENERGY
Federal Energy Regulatory Commission

Notice of Application Accepted for Filing and Soliciting Motions To Intervene, Protests, and Comments

November 27, 2006.

Take notice that the following hydroelectric application has been filed with the Commission and is available for public inspection:

a. Type of Application: Preliminary Permit.

b. Project No.: 12747-000.

[[Page 70378]]

c. Date filed: October 31, 2006.

d. Applicant: San Diego Water Authority.

e. Name of Project: San Vicente Pumped Storage Project.

f. Location: The project would be located on San Vicente Reservoir and San Vicente River in San Diego County, California.

g. Filed Pursuant to: Federal Power Act, 16 U.S.C. 791(a)-825(r).

h. Applicant Contacts: Mr. Paul Gebert, San Diego Water Authority, 4677 Overland Avenue, San Diego, CA 92123, phone: (858)-522-67551.

i. FERC Contact: Robert Bell, (202) 502-4126.

j. Deadline for filing comments, protests, and motions to intervene: 60 days from the issuance date of this notice.

The Commission's Rules of Practice and Procedure require all intervenors filing documents with the Commission to serve a copy of that document on each person in the official service list for the project. Further, if an intervenor files comments or documents with the Commission relating to the merits of an issue that may affect the responsibilities of a particular resource agency, they must also serve a copy of the document on that resource agency.

k. Description of Project: There are three alternatives for the proposed project: Iron Mountain Alternative, Foster Canyon Alternative, and East Reservoir Alternative. Specific details about each of these alternatives are described below.

Applicable To All Alternatives

All of the alternatives will have the same lower reservoir consisting of: (1) An existing dam to be raised to a dam height of 274 feet, and a length of 1,120 feet with the possibility that the dam could be raised to be 337 feet high with a length of 1,442 feet; and (2) an existing impoundment increased to a surface area of 1,360 acres, having a storage capacity of 142,00 acre-feet with a normal maximum water surface elevation of 704 feet mean sea level (msl), and also the possibility to further increase the surface area to 1,667 acres, having a storage capacity of 247,000 acre-feet with a normal maximum water surface elevation of 767 feet msl.

Iron Mountain Alternative

(1) A proposed 235-foot-high, 1,250-foot-long upper dam, (2) a proposed upper reservoir with a surface area of 93 acres having a storage capacity of 8,070 acre-feet and a normal maximum water surface elevation of 2,110 feet msl, (3) a proposed 12,300-foot-long, 20-foot-long concrete power tunnel, (4) two proposed 300-foot-long steel lined penstocks, (5) a proposed powerhouse containing two generating units having a total installed capacity of 550 megawatts, (6) a proposed 3,300-foot-long, 24-foot-diameter concrete tailrace, (7) a proposed 2,600-foot-long, 230 kilovolt transmission line, and (8) appurtenant facilities.

Foster Canyon Alternative

(1) A proposed 215-foot-high, 4,500-foot-long upper dam, (2) a proposed upper reservoir with a surface area of 100 acres having a storage capacity of 12,200 acre-feet and a normal maximum water surface elevation of 1,490 feet msl, (3) a proposed 3,000-foot-long, 20-foot-long concrete power tunnel, (4) two proposed 300-foot-long steel lined penstocks, (5) a proposed powerhouse containing two generating units having a total installed capacity of 480 megawatts, (6) a proposed 2,700-foot-long, 24-foot-diameter concrete tailrace, (7) a proposed 2,600-foot-long, 230 kilovolt transmission line, and (8) appurtenant facilities.

East Reservoir Alternative

(1) A proposed 200-foot-high, 2,200-foot-long upper dam, (2) a proposed upper reservoir with a surface area of 60 acres having a storage capacity of 6,800 acre-feet and a normal maximum water surface elevation of 1,600 feet msl, (3) a proposed 6,000-foot-long, 20-foot-long concrete power tunnel, (4) two proposed 300-foot-long steel lined penstocks, (5) a proposed powerhouse containing two generating units having a total installed capacity of 570 megawatts, (6) a proposed 2,600-foot-long, 24-foot-diameter concrete tailrace, (7) a proposed 2,600-foot-long, 230 kilovolt transmission line, and (8) appurtenant facilities.

The proposed project would have a maximum estimated annual generation of up to 1,000 gigawatt-hours, which would be sold to a local utility.

1. SDCWA's Proposed Three Alternatives

Iron Mountain Alternative

550 MW

City of Poway

Surface Area: 100 acres
Dam Length: 1,300 feet
Dam Height: 130 feet
Piping Distance: 16,000 feet
Height Difference: 1,300 feet

East Reservoir Alternative

570 MW

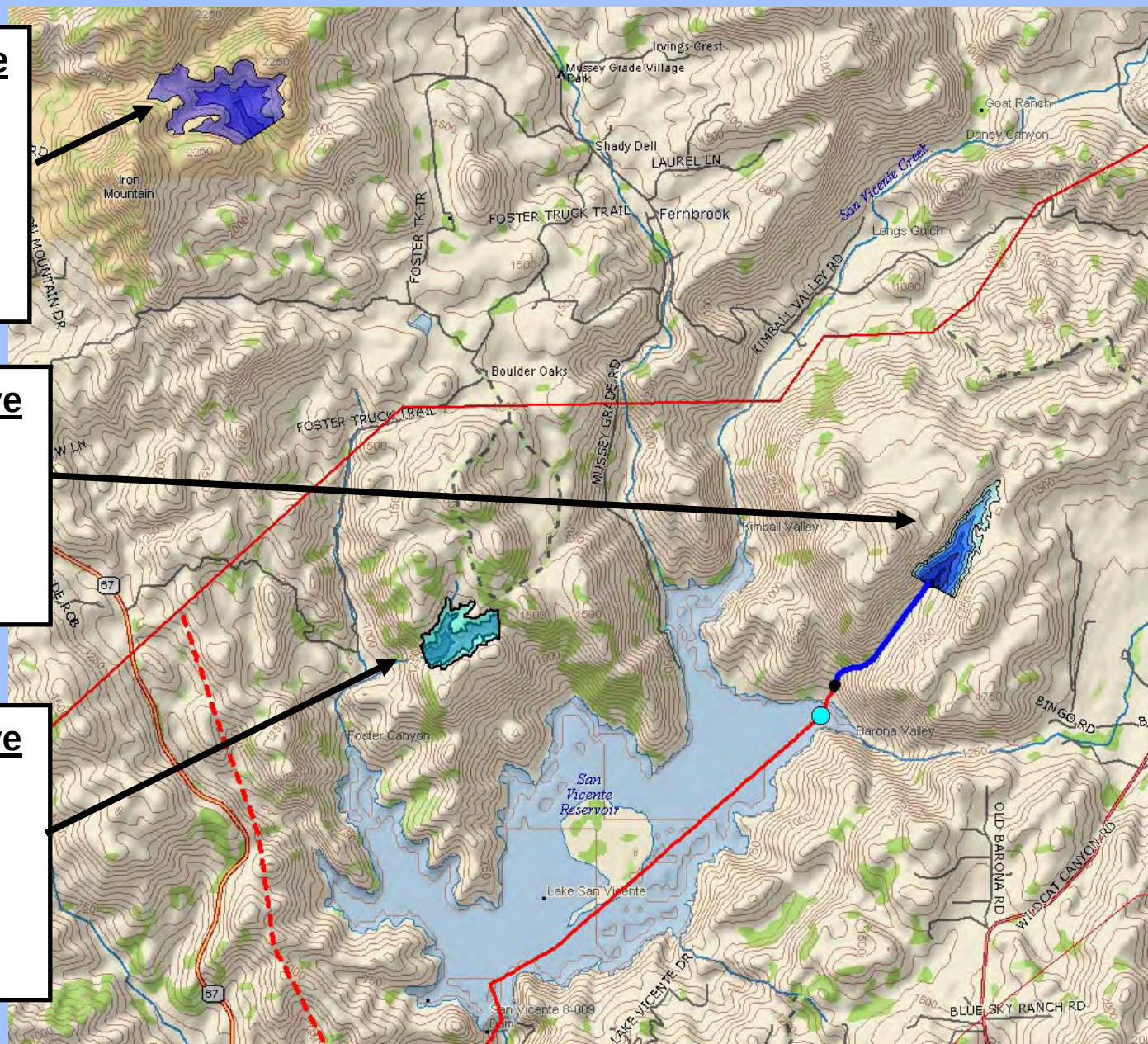
Surface Area: 75 acres
Dam Length: 1,100 feet
Dam Height: 200 feet
Piping Distance: 3,000 feet
Height Difference: 800 feet

Foster Canyon Alternative

480 MW

State of California 100 acres

Surface Area: 75 acres
Dam Length(2): 700/600 feet
Dam Height: 140/100 feet
Piping Distance: 3,500 feet
Height Difference: 600 feet



Required Market Conditions for Pumped Storage

- ## Day vs. Night Power Price Differential ("Arbitrage")

  Demand for electricity in the summer afternoon hours is much higher than at night. This is because the peak energy demand in the area is determined by the air conditioning load which occurs between 1:00 and 7:00 pm. However, in the San Diego/Baja region the summer winds are predominately at night. Transmission alone does not solve this problem; only storage does. Storage "time shifts" the less valuable wind energy generated at night to the afternoon when it is much more valuable. There comes a point where the cost of a storage facility spread over its 50+ year life is less than the difference in electricity price between night and day. We anticipate that this point will occur in 3-4 years as additional wind capacity comes on line. We want to be ready for when that occurs. This concept it shown on the following page.

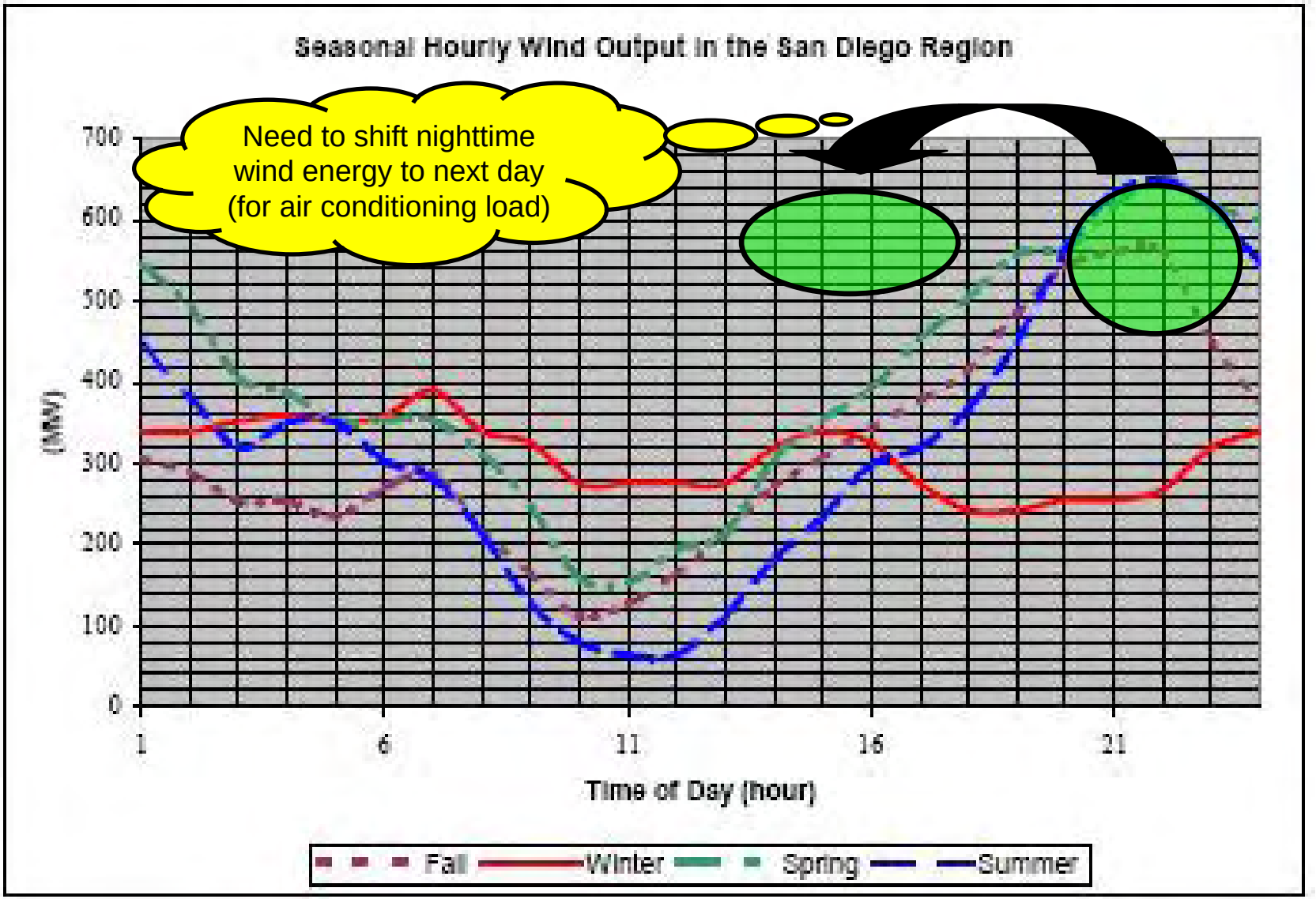
- ## Reliability and Grid Stability

  A pumped storage facility is unique in its ability to 'control' or 'regulate' the grid electrical frequency. This capability has a value which is not yet reflected in the regulated market. This becomes even more important with increased percentages of intermittent renewable generation such as wind and solar. When a grid reaches about 20% renewable energy 'frequency regulation' becomes critical. California is seriously discussing a requirement for 33% renewables. It is inevitable that regulation of grid electrical frequency will be required. The Los Coches substation in Lakeside would be an ideal location to 'inject' frequency regulation because there are two 230,000 volt transmission lines with a combined electrical capacity of 700 MW. Additionally, the recently approved Sunrise Powerlink provides an additional opportunity. The regulatory environment does not currently provide proper financial value for frequency regulation and reliability. However, that is changing with the California Independent System Operator (CAISO) Market Redesign and Technology Upgrade (MRTU). The program will launch March 31, 2009 as described on the link below

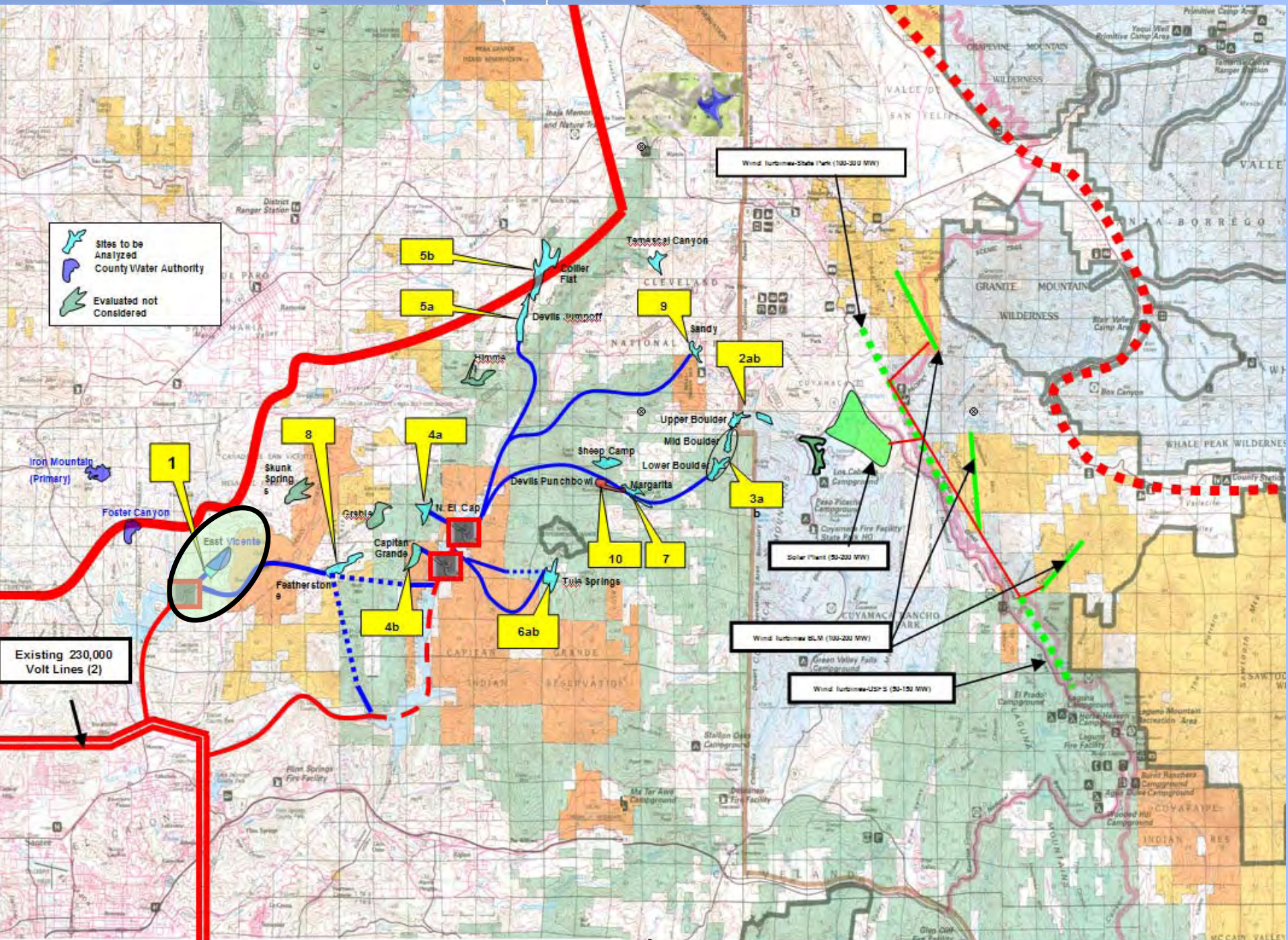
  http://www.caiso.com/docs/2001/12/21/2001122108490719681.html

2. Required Market Conditions for Pumped Storage

Figure 4.1: Seasonal Hourly Wind Potential in the San Diego Region

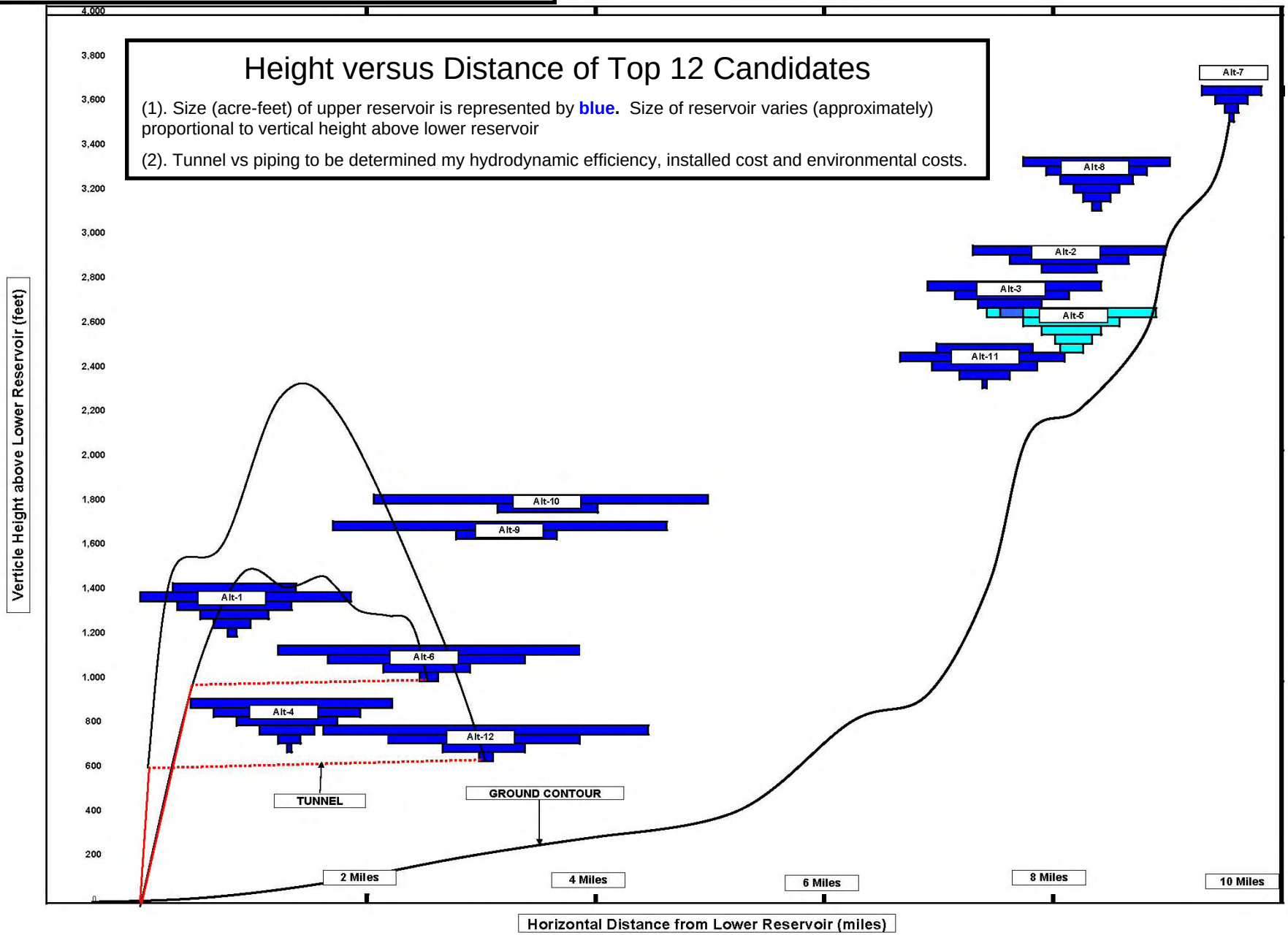


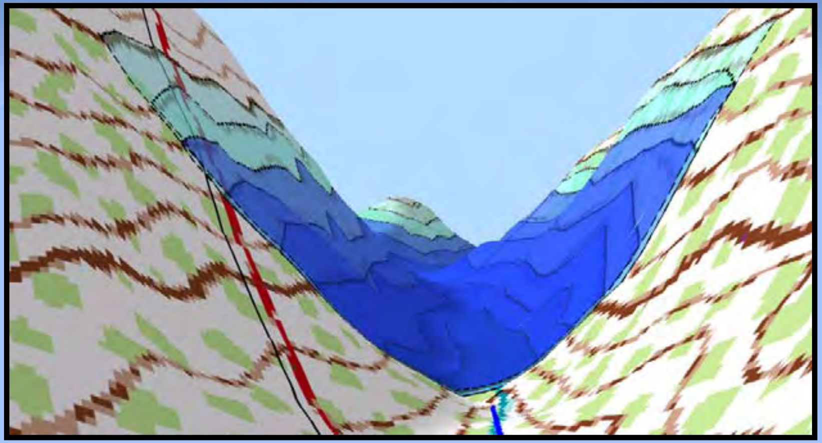
San Diego Pump Storage Study

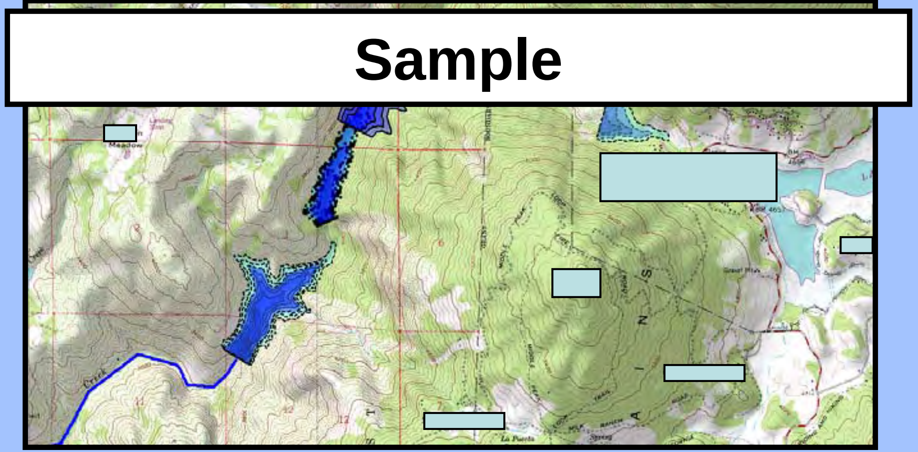

Sites to be Analyzed
County Water Authority
Evaluated not Considered
Existing 230,000 Volt Lines (2)
Iron Mountain (Primary)
Foster Canyon
East Vicente
1
Skunk Springs
8
Grotto
Capitan Grande
Featherstone
4a
N. El Cap
4b
6ab
Tule Springs
5b
Collier Flat
5a
Devils Punchbowl
Tamarisco Canyon
9
Sandy
2ab
Upper Boulder
Mid Boulder
Lower Boulder
Sheep Camp
Margarita
3ab
10
7
Wind Turbines-State Park (100-300 MW)
Solar Plant (50-200 MW)
Wind Turbines BLM (100-200 MW)
Wind Turbines-USFS (50-150 MW)
CLEVELAND NATIONAL FOREST
CAPITAN GRANDE INDIAN RESERVATION
CUYAMACA RANCHO STATE PARK
ANZA-BORREGO
GRANITE MOUNTAIN WILDERNESS
WHALE PEAK WILDERNESS
LAGUNA MOUNTAIN WILDERNESS

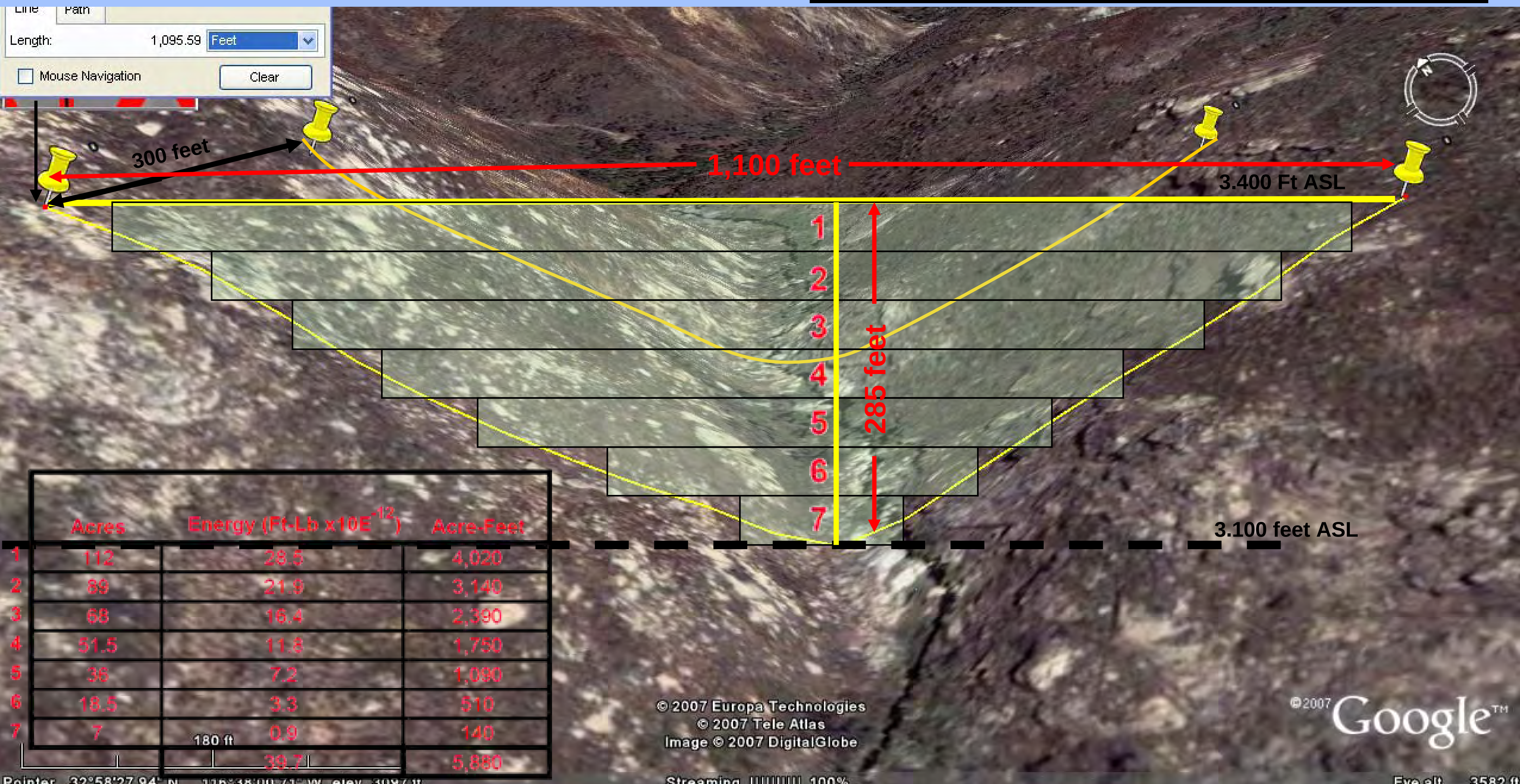
Number	MW	Hours	Height Difference	Acre-Feet	Distance	"Steepness"	Surface Area (Acres)	Reservoir Length	Reservoir Height
1	905	12	793	18,246	1,600	0.496	120	1,750	360
2a	770	12	3,425	3,136	42,080	0.081	41.8	1,375	260
2b	1,033	12	3,345	4,340	40,765	0.082	46	1,050	280
3a	811	12	2,825	3,990	38,135	0.074	54	650	170
3b	2,412	12	2,625	13,040	36,820	0.071	112	650	170
4a	715	12	1,425	8,862	4,250	0.335	78.7	1,050	240
4b	681	12	905	10,940	6,575	0.138	120	1,350	250
5a	677	12	1,825	5,200	13,150	0.139	114	1,550	140
5b	1,538	12	1,865	11,600	13,150	0.142	206	2,050	180
6a	818	12	1,705	6,706	31,560	0.054	147	950	80
6b	1,334	12	1,785	10,420	36,820	0.048	300	800	125
7	1,021	12	2,065	6,960	24,722	0.084	109	590	220
8a	749	12	833	13,140	15,254	0.055	207	1,250	190
8b	749	12	833	13,140	13,000	0.064	207	1,250	190
9	851	12	2,625	4,120	40,765	0.064	53	950	270
10	1,088	12	1,825	TBD	20,000	0.091	76	TBD	TBD

13a. Describe other reasonable alternative routes and modes considered.

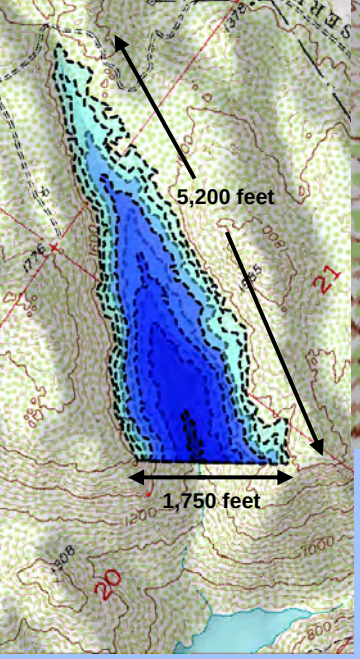


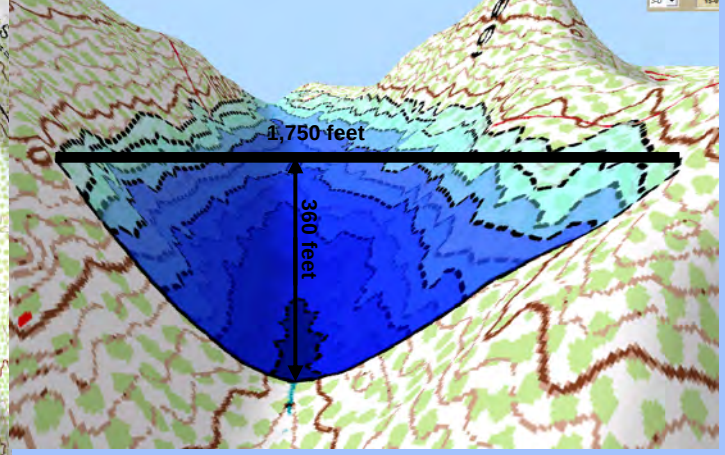




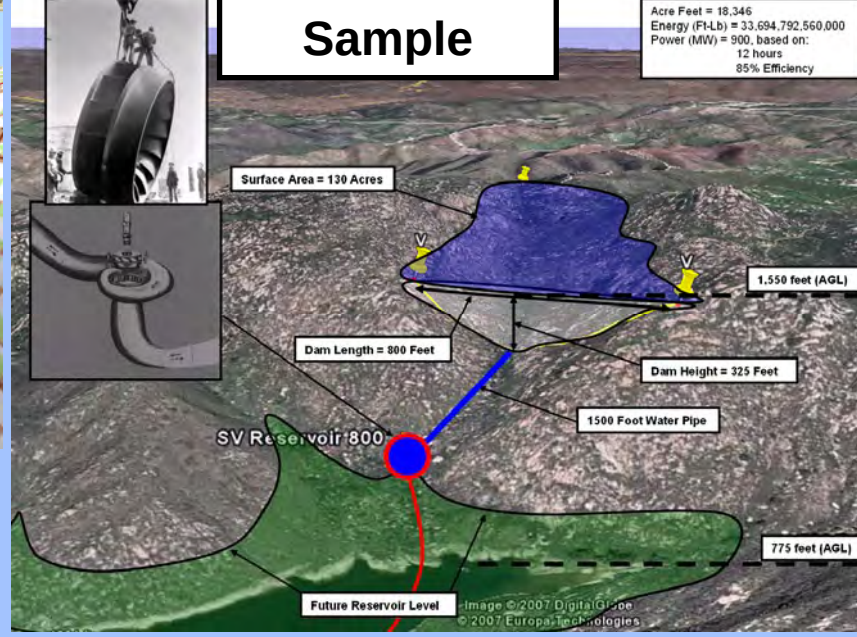


	Acres	Energy (Ft-Lb x10E^{-12})	Acre-Feet
1	112	28.5	4,020
2	89	21.9	3,140
3	68	16.4	2,390
4	51.5	11.8	1,750
5	36	7.2	1,090
6	18.5	3.3	510
7	7	0.9	140
		39.7	5,880

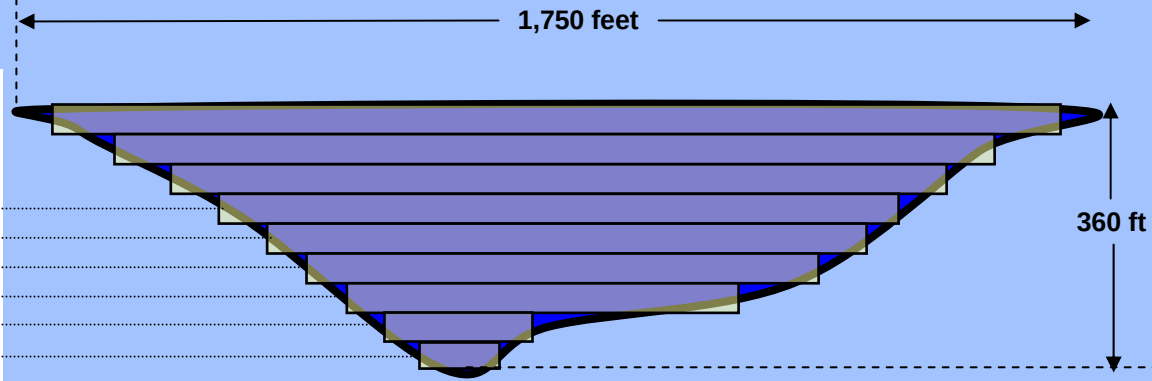


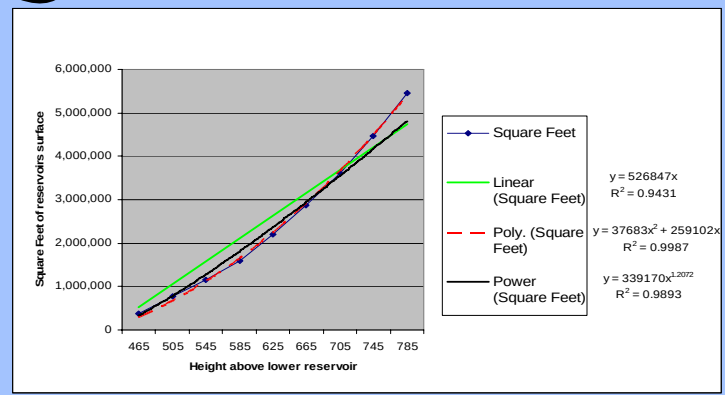


830 Megawatts
18,214 Acre-Feet
.046 MW/Acre-Foot



	Elevation	Acres	Volume (Ft^3)	Weight (Lb)	Acre-Feet	Energy (Ft-Lb)
9	1,560	123	5,445,000	339,768,000	4,556	9,473,656,008,960
8	1,520	103	4,477,968	279,425,203	3,712	7,315,069,132,800
7	1,480	83	3,606,768	225,062,323	2,976	5,541,099,632,640
6	1,440	66	2,874,960	179,397,504	2,331	4,087,066,553,856
5	1,400	51	2,202,394	137,429,361	1,747	2,873,230,424,064
4	1,360	37	1,603,008	100,027,699	1,268	1,947,332,724,480
3	1,320	27	1,158,696	72,302,630	886	1,264,344,681,600
2	1,280	18	771,012	48,111,149	530	698,698,915,200
1	1,240	9	383,328	23,919,667	208	251,349,493,824
			22,523,134	1,405,443,537	18,214	33,451,847,567,424





Take Aways

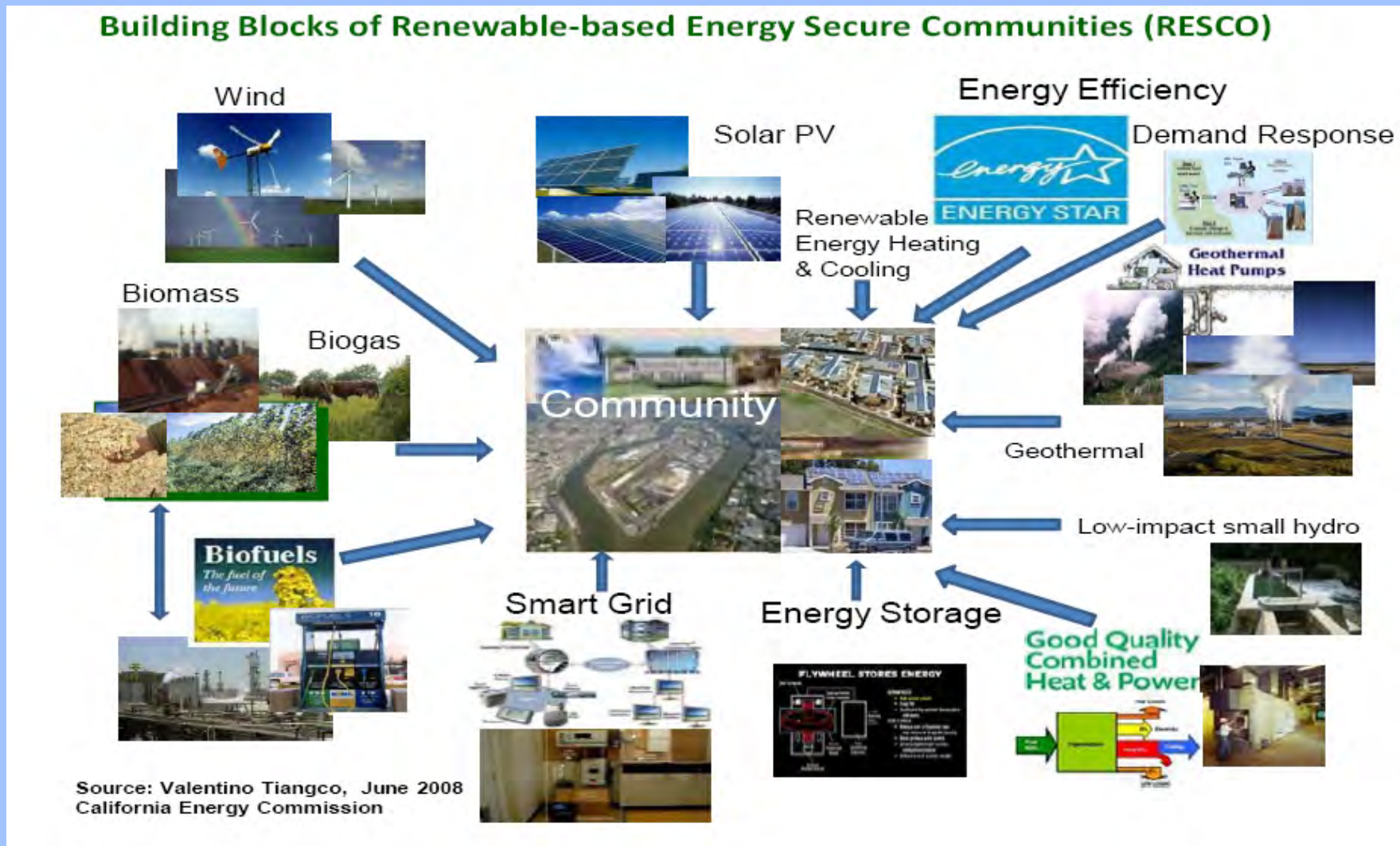
- **Is the current outlook acceptable?**
- **Who determines the consensus on which specific locations are acceptable?**
- **How can community/regulatory support be obtained?**
- **ACTION.**
  - **Evaluate/Prioritize 20 potential locations based on load/energy and reliability improvements (storage). Sustainability Alliance to take the lead on tradeoffs between GHG/Energy Security and habitat/aesthetic. Local Sierra Club is not willing to do this. Julian or Boulevard as Pilot.**
  - **Letter to Governor that State Parks should be evaluated for wind in San Diego**

Debenham Energy, LLC

RESCO

The maximum levels of funding for RESCO Technical Integration projects are:

1. Exploratory: **$200,000**
2. Pilot: **$1,000,000**
3. Implementation: **$2,000,0000**



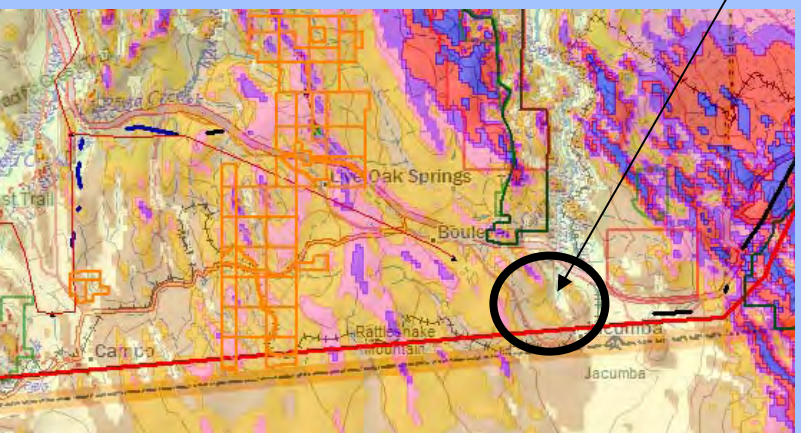
Debenham Energy, LLC

Are negative impacts of wind turbines on Bighorn Sheep more substantial than benefits of wind?

Lawsuit against BLM by CBD and Sierra Club. Vast areas of land.

How do we compare the negative impact on butterflies to the beneficial impact of wind energy?

Quino checkersport butterfly



BLM Resource Management Plan (RMP)