Vandenberg SFB Energy Resiliency Activities

UNITED STATES SPACE FORCE

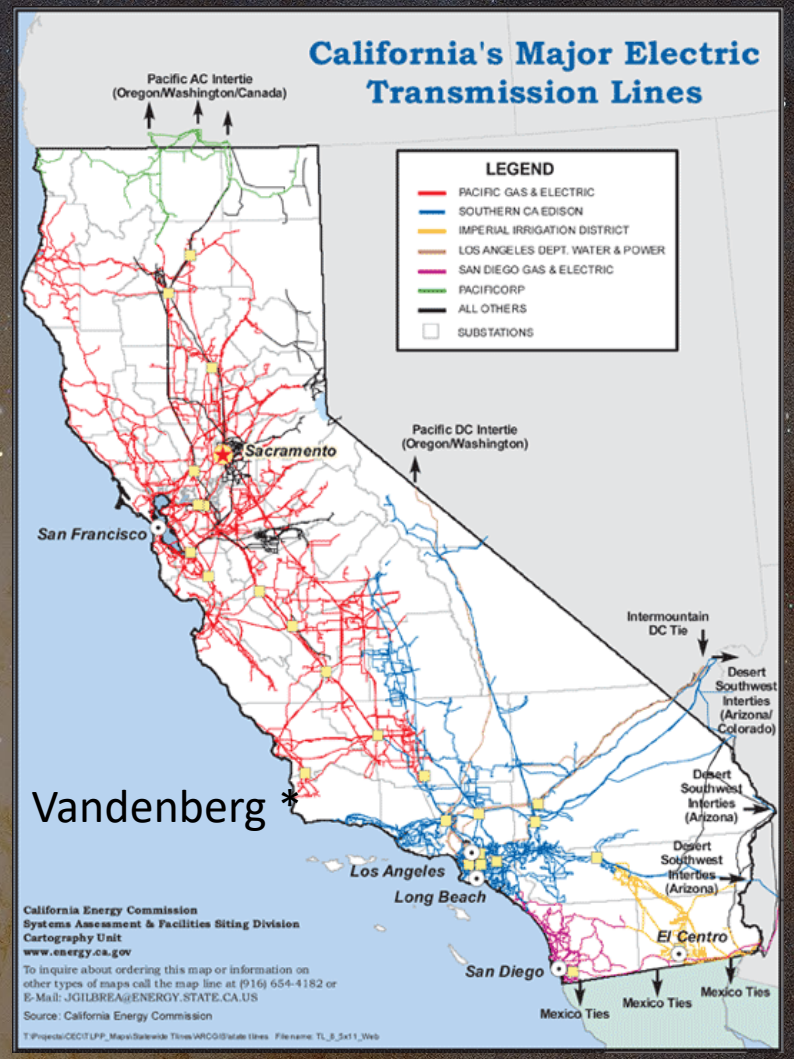
Semper Supra

Vandenberg SFB is positioned to be DoD's springboard for emerging clean energy solutions

Vandenberg Space Force Base Energy Resiliency Presentation for:

Society of American Military Engineers (SAME), Orange County
Naval Weapons Station Seal Beach
April 18, 2024

Electric Power Surety
Preview

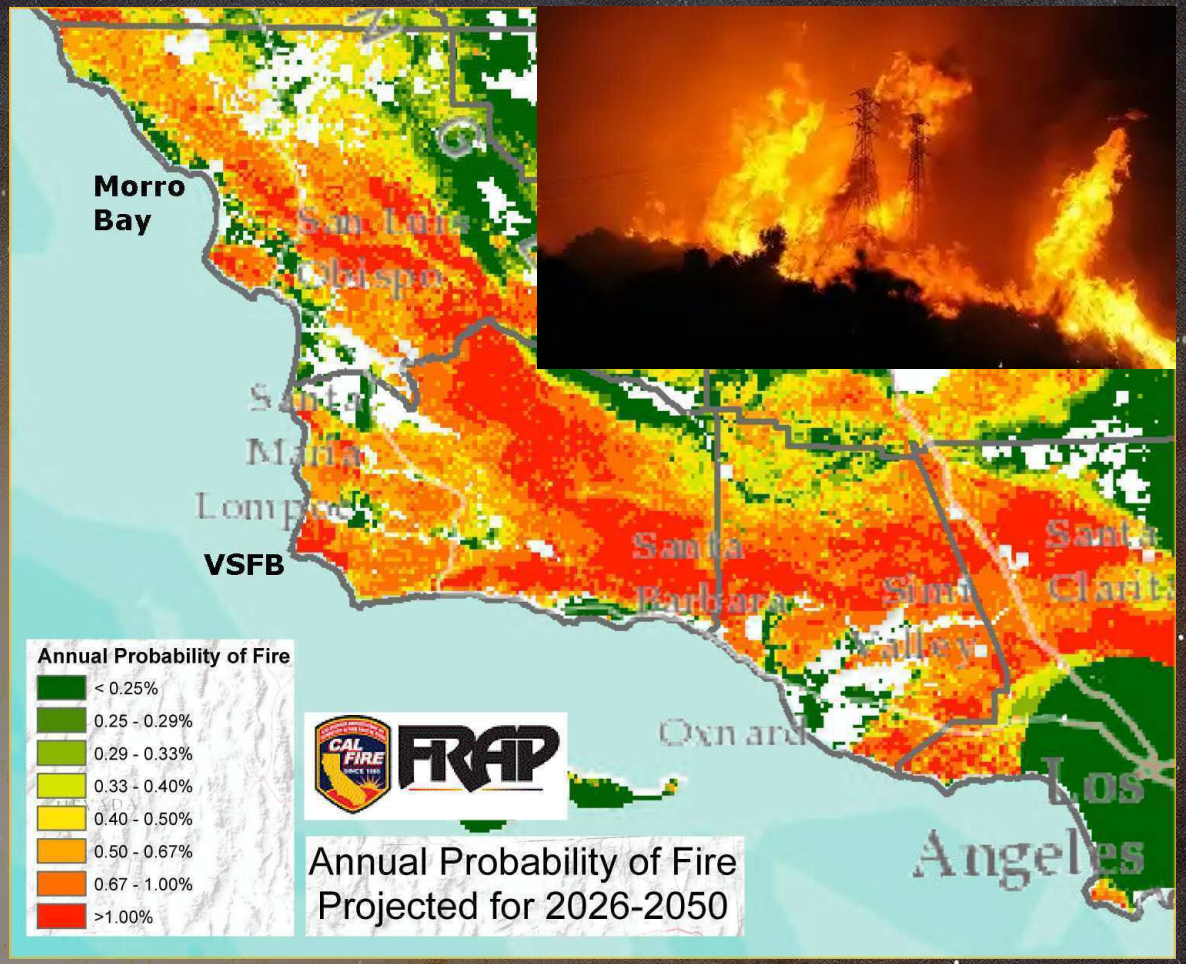


- Vandenberg Space Force Base is on California's Central Coast, 150 miles north of Los Angeles
- It covers 100,000 acres, has 42 miles of coastline and two mountain ranges
- Provides U.S. Government and commercial space launch facilities
- Part of a worldwide satellite tracking network

Electric Power Surety
Current Status

- Vandenberg SFB is 100% solar powered by day, receiving upwards of 22.5 MW from our PV solar facility
- National Renewable Energy Lab (NREL) is assisting Vandenberg / AFCEC in designing microgrid capability to power installation independent of PG&E supply (known as “Islanding”)

Electric Power Surety
Current Status - Risks



- Vandenberg faces direct and indirect wildfire risks
- Climate change exacerbates wildfire frequency, magnitudes and impacts
- Multi-GW of grid power have been interrupted by wildfires in transmission ROWs ➔ increased rolling blackouts
- CPUC authorizes PSPS allowing utilities to de-energize regional grids to preclude wildfire ignition from transmission lines ➔ multi-day grid outages

Power Grid Resilience – Islanding

Short Term Mitigation for Electricity Supply

- Temporary generator / battery from PG&E to mitigate Public Safety Power Shutoffs (PSPS)
- Can serve entire base 24/7/365 in “Island” Mode
- Can black start solar farm reducing daytime fuel burn and emissions
- Caterpillar can supply H2 fueled engines, Vandenberg has hydrogen supply chain. Navy willing to support with CRADA
- Still evaluating economics

Power Grid Resilience – Microgrids

Mid-Term Mitigation for Electricity Supply

- Li-Ion Batteries (14 MW / 56 MWh)
- Microgrids (control, battery / generation host)
- Leverages existing Vandenberg solar array curtailed capacity
- DoD funding through Energy Resilience and Conservation Investment Program (ERCIP) and Utilities Energy Support Contract (UESC)

Floating Offshore Wind Energy Turbines
4 x 15 MW Demonstration

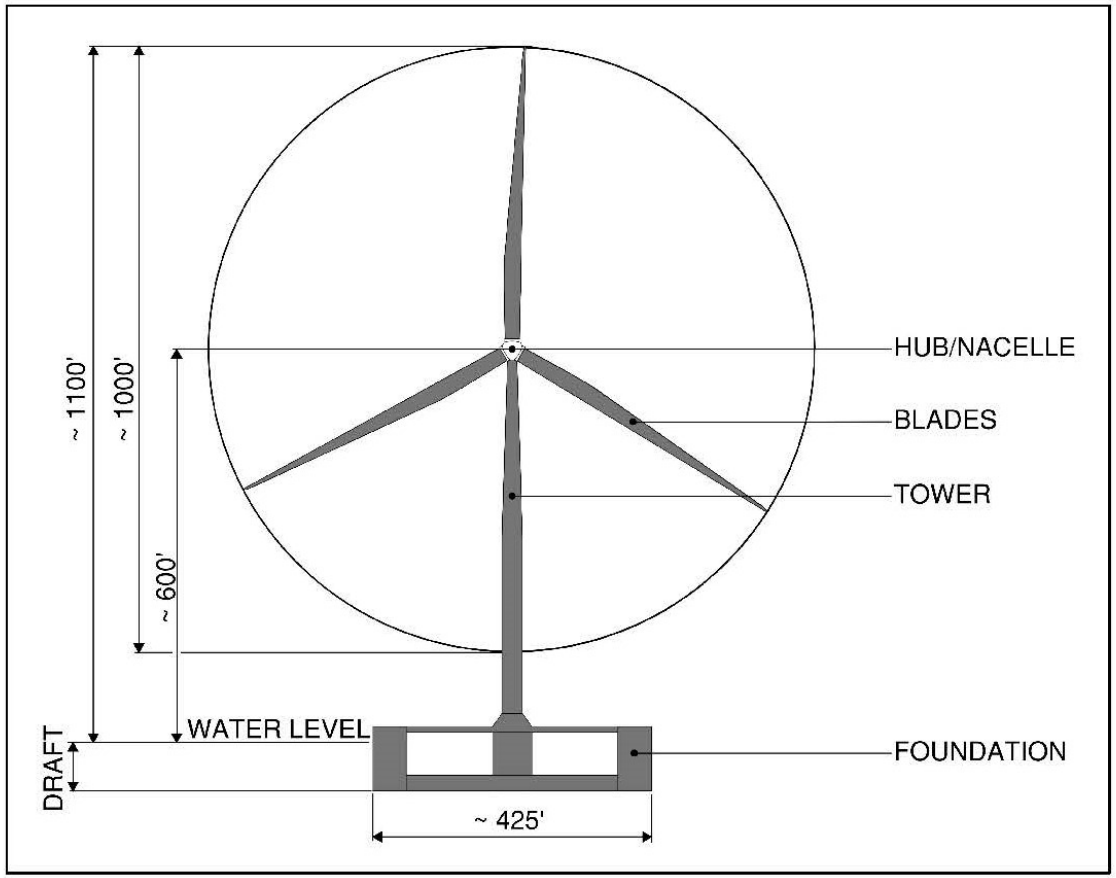


Figure 3.1. Anticipated Floating Offshore Wind Turbine Dimensions

Figure 3.2. Illustration of floating foundation types (left to right: spar, semi-submersible, TLP) (NREL 2022)

Power Grid Resilience – Offshore Wind

Mid/Long Term Mitigation for Electricity Supply

- 60 MW offshore wind demonstration project is being privately developed in State Waters near Vandenberg
- Vandenberg is interested in purchasing renewable energy from project to compliment its solar energy and battery storage
- California State Lands Commission is conducting an EIR analysis of these demonstration projects. Vandenberg is responding to State Lands inquiries

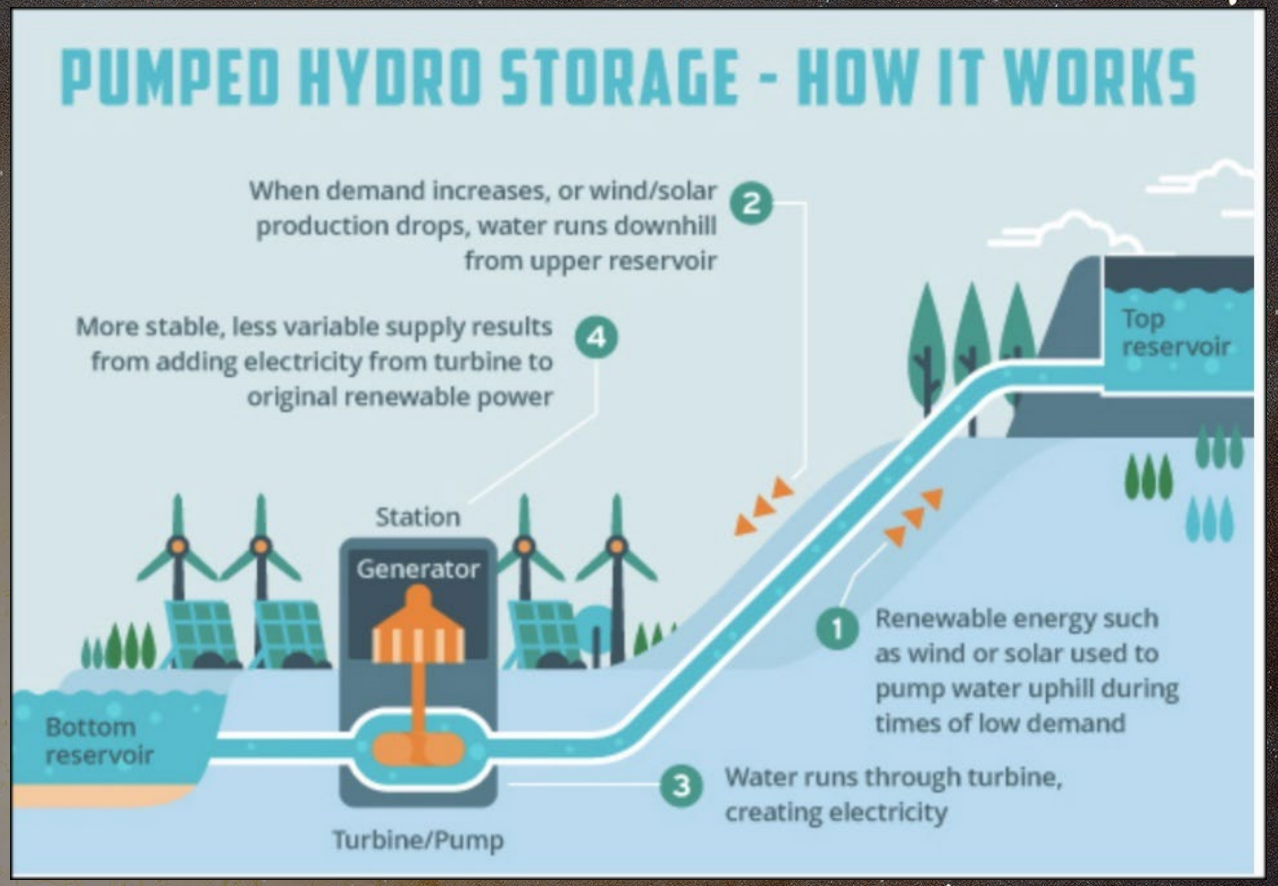
Power Grid Resilience – Offshore Wind

Mid/Long Term Mitigation for Electricity Supply

- Demonstration project, first floating wind turbines in U.S.
- Potential to repurpose retiring Platform Irene to serve as R&D venue for offshore wind, ocean wave, desalinated water and clean fuel (green H2, algae bio-diesel) demonstrations
- DAF's Office of Energy Assurance (OEA) is investigating acquiring Platform Irene
- New substation connecting the offshore wind project to Vandenberg SFB's electric system can provide an additional connection to PG&E grid

Long-Duration Discharge Electricity Storage

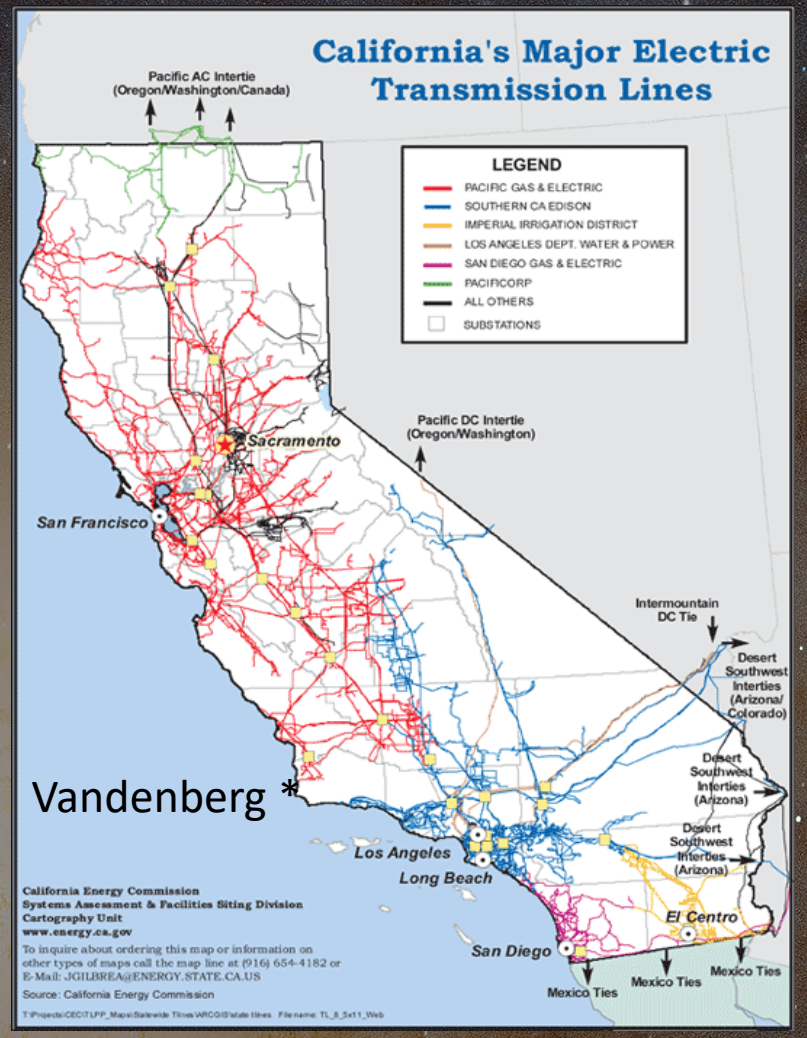
Pumped Storage Hydropower (PSH)



- 2 weeks of base wide energy use storage
- Fresh water, closed circuit system (i.e. no river blockage)
- 96% of U.S. grid-scale energy storage is PSH (U.S. DOE)
- Base and regional grid black start capability
- Potable water / firewater storage
- Vandenberg is good PSH candidate (NREL)

Regional Grid Enhancements

Potential PG&E / SCE Grid Intertie



- Santa Barbara County grids of both PG&E and SCE are thin in the Vandenberg and Santa Barbara regions
- PG&E / SCE grid intertie could significantly improve resiliency of both grids
- Allows Santa Barbara / Navy Base Ventura County areas access to Central Coast renewable energy
- Federal / State lead is necessary

Discussion
Q&A

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