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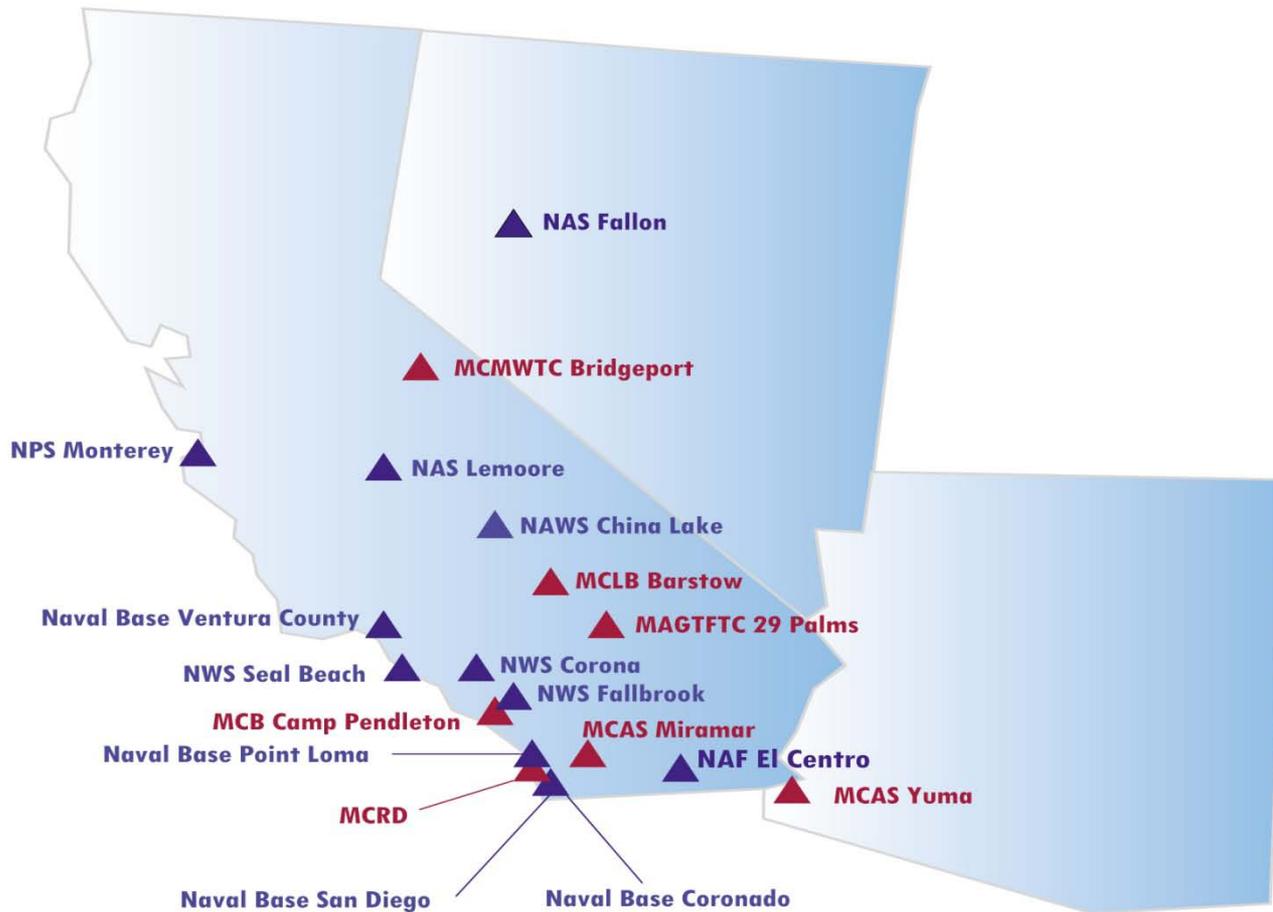
The Premier Energy Training Workshop  
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**A River of Energy Solutions**

# Business Case for PV PPA's

Program Development at NAVFAC SW RPO

# NAVFAC SW Area of Operations



# NAVFAC SW Renewable Program Office

- Established Oct 08
- Pre-RPO
  - No “regional” perspective
  - Very little guidance on meeting mandates/goals
  - Some Installations with plans, others none
  - Vendors engaging with Installations – high expectations
  - No uniformity in integrating renewable technologies

# "Big Picture" Goals for Program Development

- Opportunities/Barriers
- Partnerships
  - Industry Outreach and Dialogue
- The "Business Case"
  - Consider: Technologies, Mission, Feasibility, Procurement/Acquisition tools, Regulatory/Legislative

# Big Picture Goals - Opportunities

- Determine:
  - Technologies and Energy Resource
  - Mission and Operations
  - Financial Feasibility
  - Procurement/Acquisition tools
  - Regulatory/Legislative barriers and opportunities
  - Federal/State incentives
  - Land Use



# Big Picture Goals - Partnerships

- Engage in continuous dialogue with Industry and Outreach efforts.
  - Industry Forum Aug 06, San Diego, CA
  - Industry forum NAWS China Lake Dec 07
  - RFI Oct 08 (Specific Solicitation)
  - Vendor Presentations Quarterly



# Conclusions and Course of Action

- Industry Feedback
  - Opportunities for success:
    - Short term incentives (Federal Taxes, Depreciation, State \$)
    - Market for Renewable Generation Financing (08-09)
    - Land Use
  - Barriers
    - Transmission constraints
    - Regulatory environment
    - Government contracting

# Conclusions and Course of Action

- Mission Impacts
  - Air Ops crucial
  - Wind Turbine challenges
  - Encroachment
- 3 Tier Program
- Existing acquisition tools limited for renewable technologies



# Conclusions and Course of Action

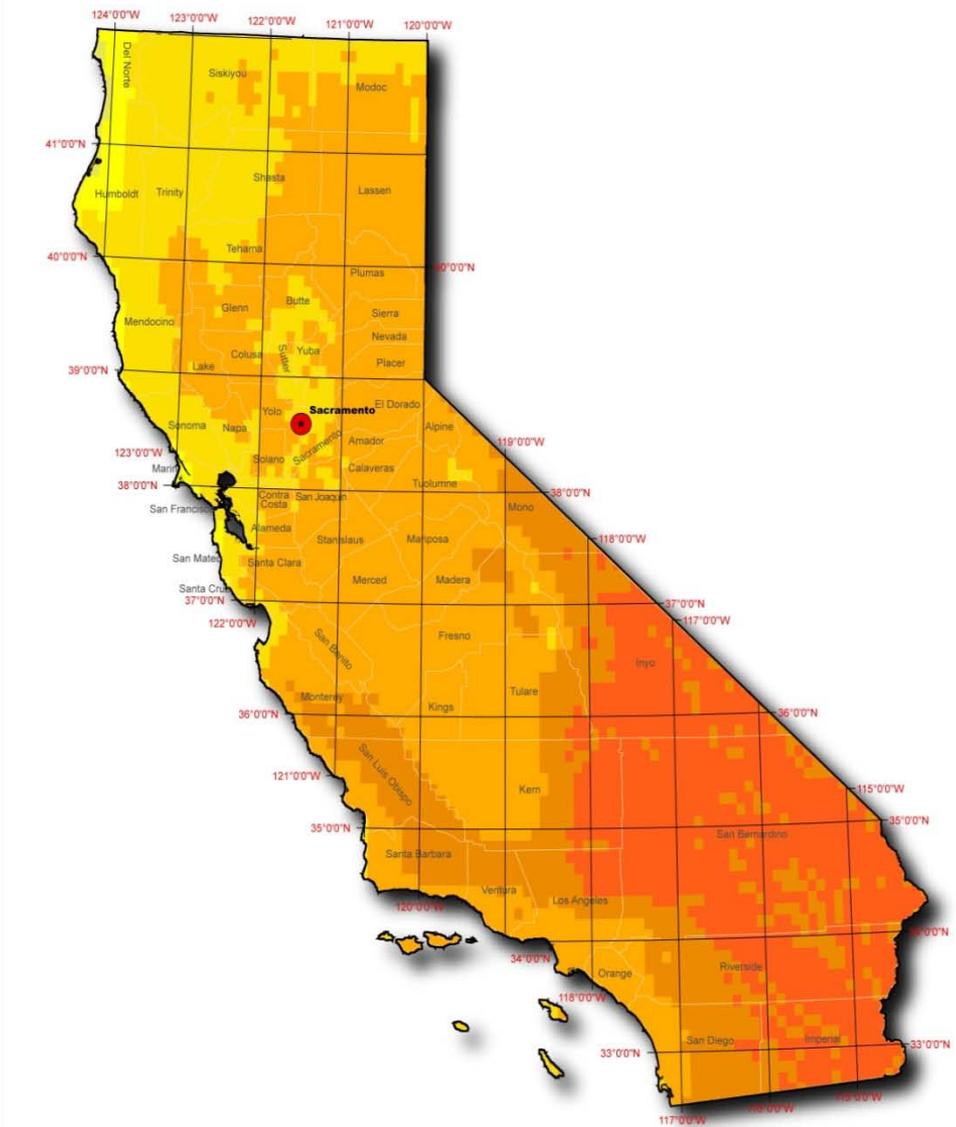
- The “Business Case” analysis leads us to PV PPA’s as the primary focus for Tiers 1 and 2.
- “Small” systems eligible for California Solar Initiative incentives (up to 5 MW)
- Larger systems to meet demand requirements on base, no excess power to grid.

- Solar Insolation  $\text{kWh/m}^2/\text{day}$
- Ranging 4-12 annually
- Barstow, CA : 7-12, average 9.5
- Approximately 2.3 M  $\text{kWh/year}$  for 1 MW

Location (1 MW system)	Ave Solar* (single)	kWh/year* (mil)
Barstow, CA	8.8	2.3
New Jersey	5.6	1.5
El Paso, TX	8.7	2.2
Atlanta, GA	6.4	1.7
Colorado Springs	7	1.9
Jax, FL	6.2	1.6
Las Vegas, NV	8.7	2.2

## Global Solar Radiation at Latitude Tilt - Annual

California



Model estimates of monthly average daily total radiation, averaged from hourly estimates of direct normal irradiance over 8 years (1998-2005). The model inputs are hourly visible irradiance from the GOES geostationary satellites, and monthly average aerosol optical depth, precipitable water vapor, and ozone sampled at a 10km resolution.

$\text{kWh/m}^2/\text{Day}$

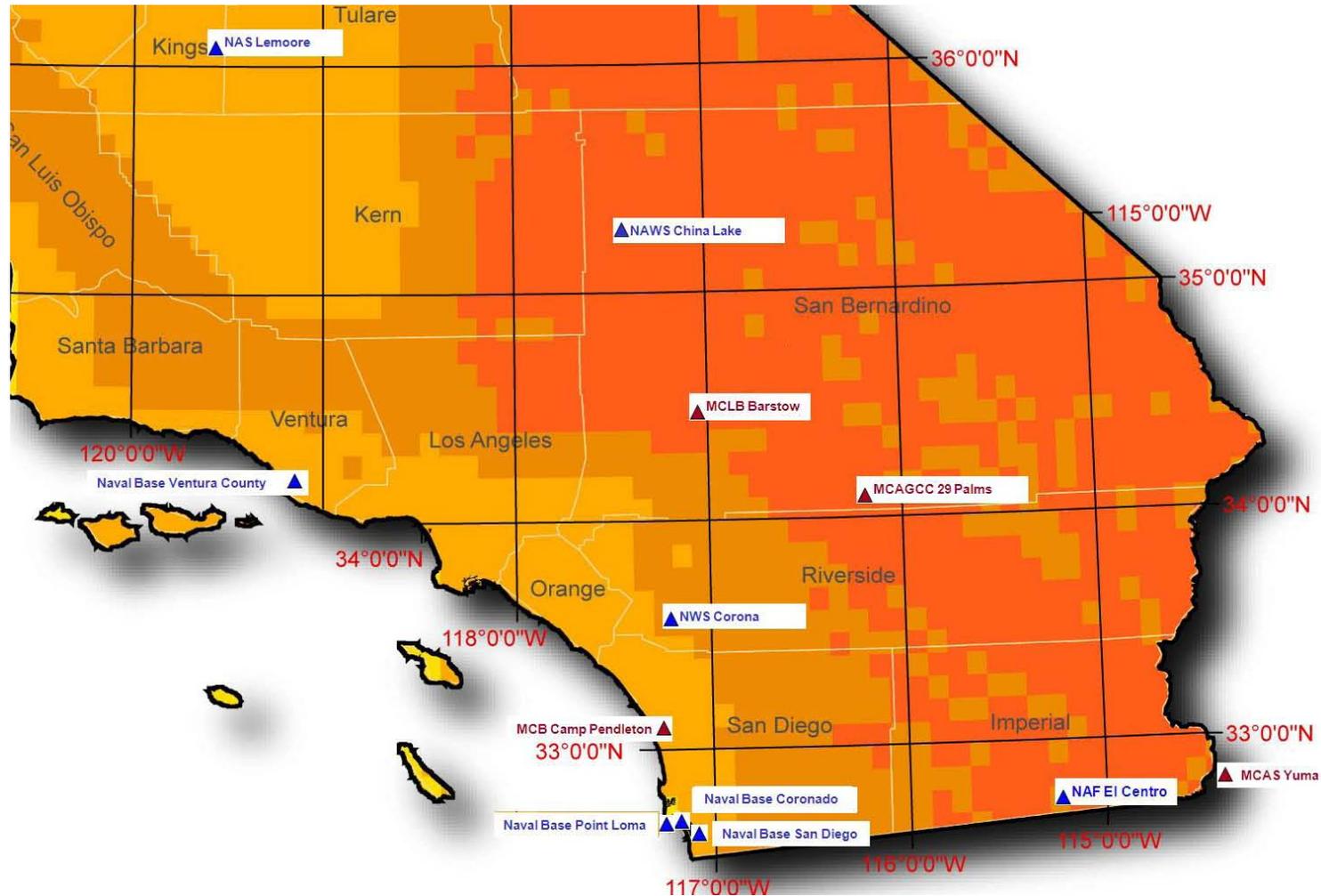


0 50 100 200 Miles

This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy, September 25, 2007



# Solar Insolation and DoN Locations



# Why Does PV PPA Work Economically?

- For the Installation, cheaper PV power replaces power that would have been purchased anyway
- Cheaper because:
  - Federal ITC for Investor (30%)
  - Accelerated Depreciation (1-7 years)
  - State incentives (CSI at \$0.05 to \$0.15 per kwh)
  - Higher rate of escalation for Brown Power (4% in CA)
  - If current rate for Brown Power is equal to or more (or close)

# Why Does PV PPA Work Economically?

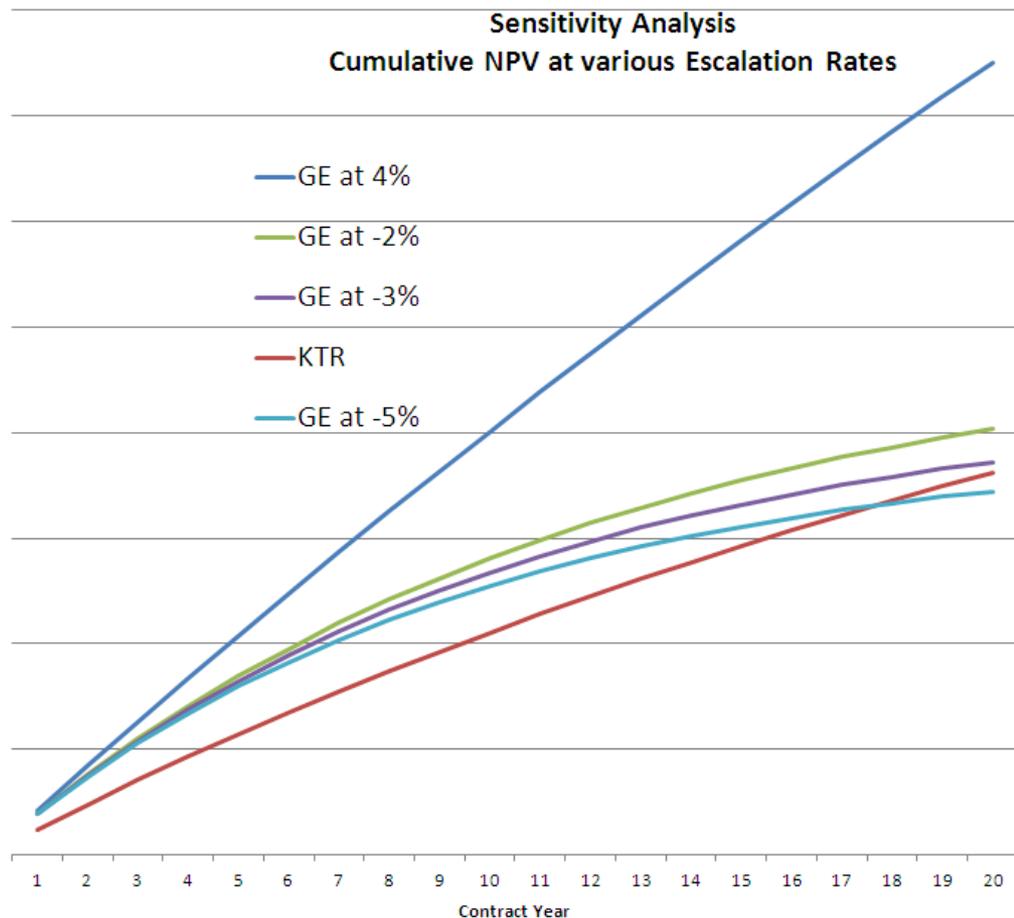
- Sample numbers: 1 MW PV System PPA

(1 MW)	Gov't (brown)	KTR
Year 1 rate	\$0.12	\$0.08
Annual esc	4%	2%
kwh/yr	2.5 mil	2.5 mil
Annual cost	\$300 k	\$200 k
20 yr NPV	\$4.6 mil	\$2.6 mil

- Sensitivity Analysis shows this is still economical when Gov't Yr 1 Rate is \$0.06 OR Gov't escalation is -3%.

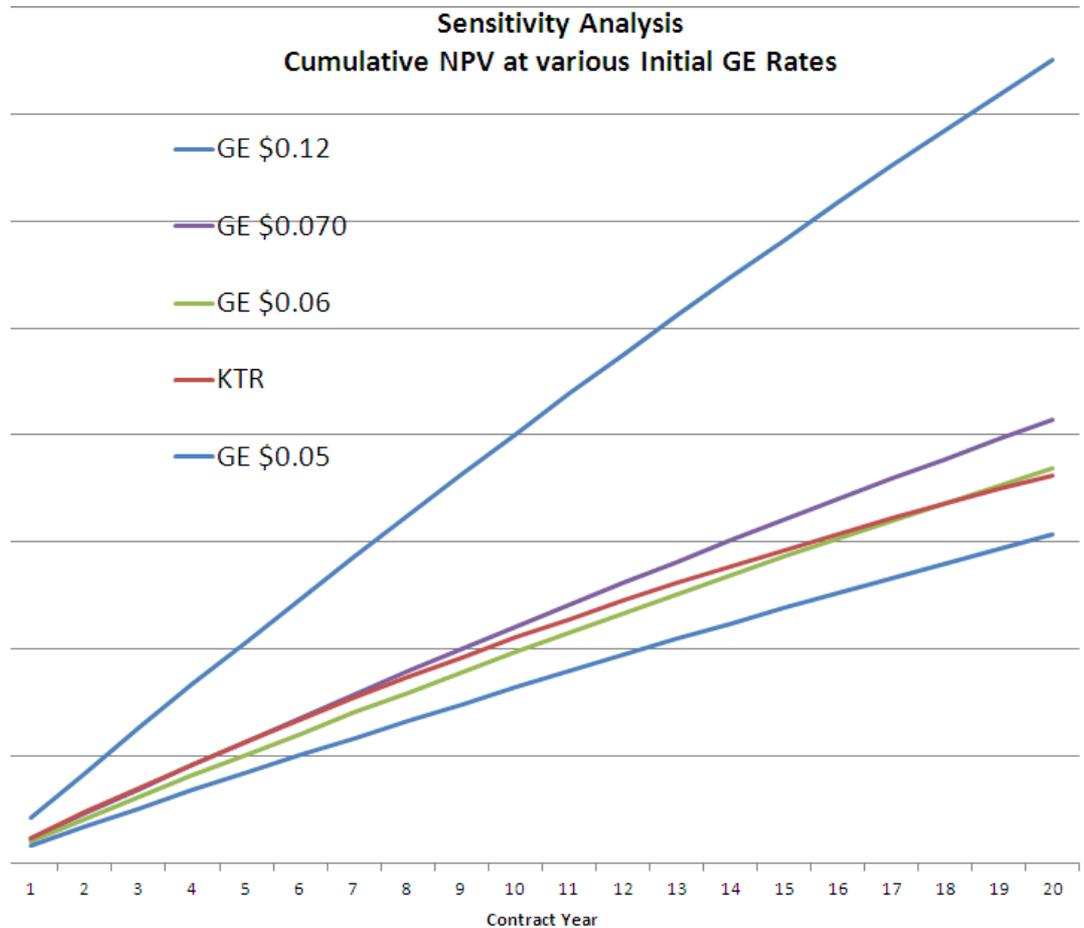
# Why Does PV PPA Work Economically?

- Sensitivity Analysis: Various GE (brown power) Escalation Rates
- NPV Approximately equal when GE rates are at -3%
- Everything else left constant



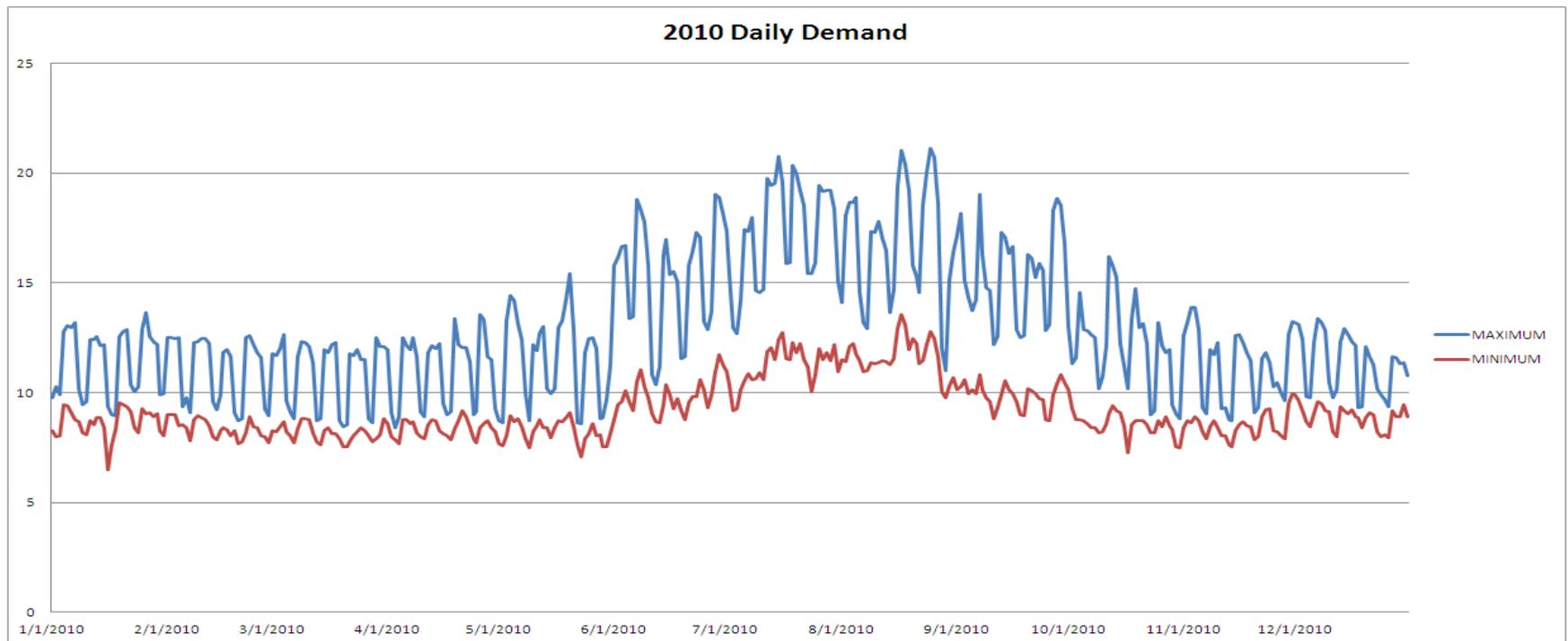
# Why Does PV PPA Work Economically?

- Sensitivity Analysis: Various GE (brown power) current rates
- NPV approximately equal at \$0.06/kwh
- Everything else left constant



# Determine How Much Power You Can Take

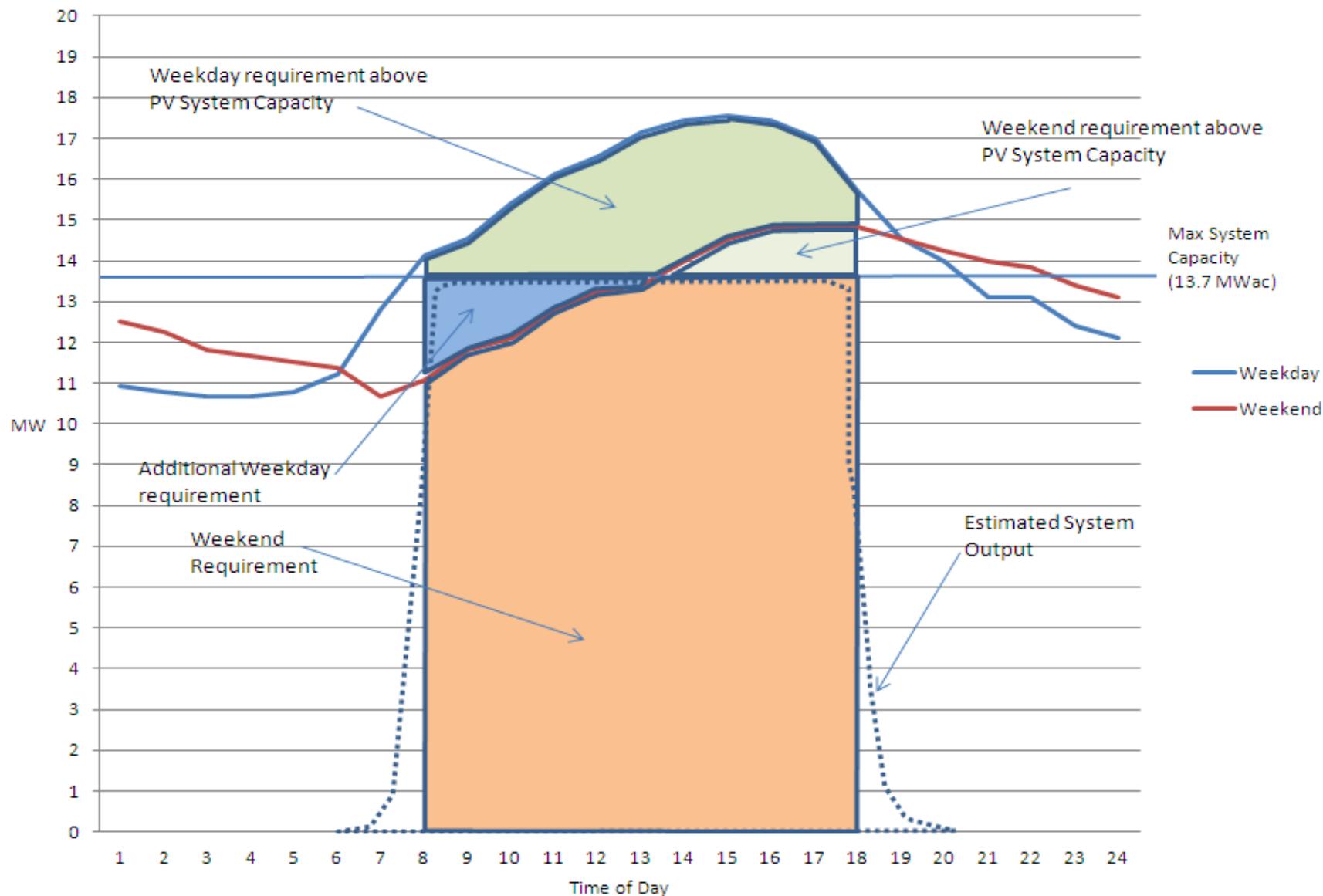
- Current and Historical Data
  - At least 3 years worth



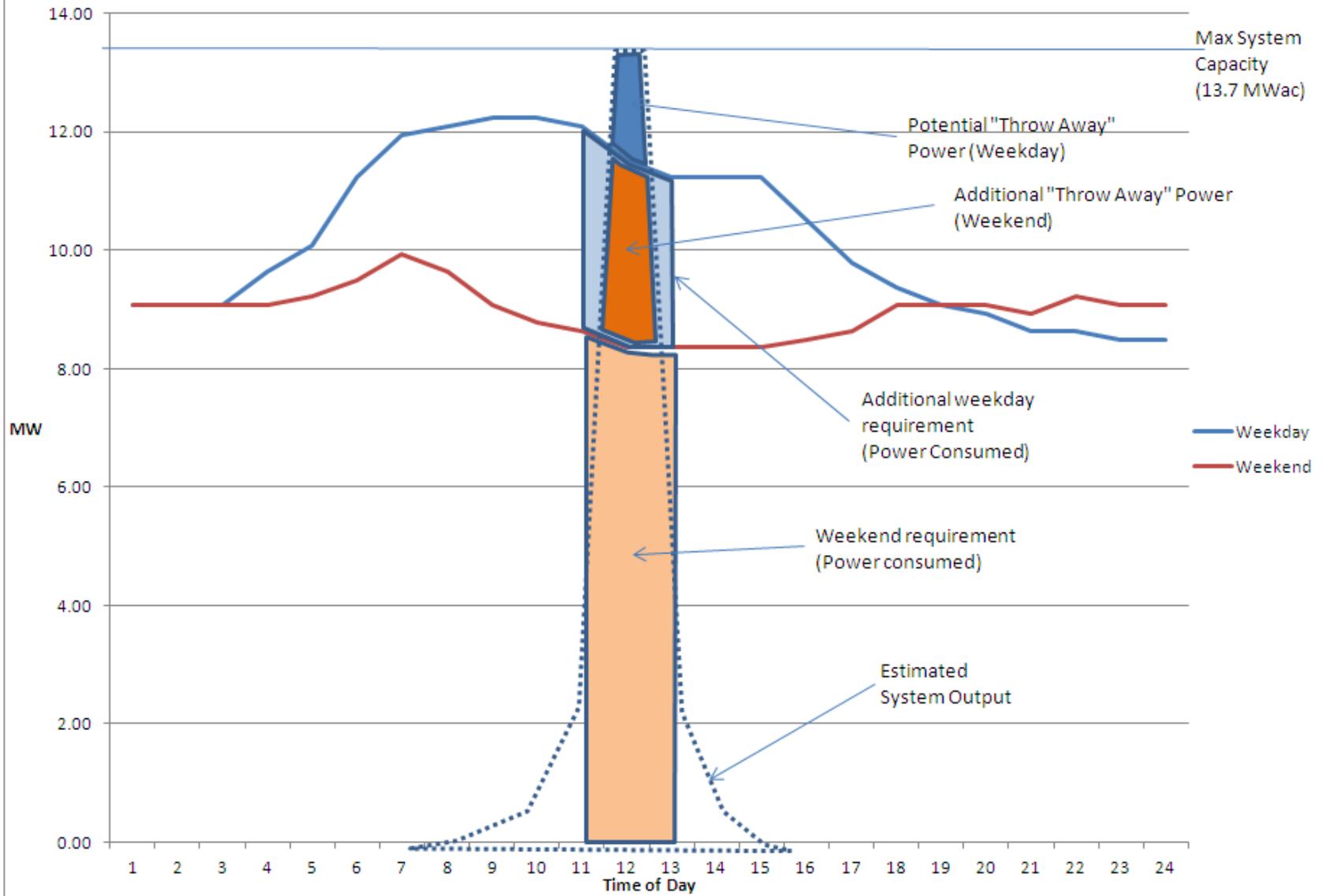
# Determine How Much Power You Can Take

- Compare to Solar Production data
- Assumptions
  - PV system produces as much power as we can take during the production period
  - PV system is on or off (no curve ramp up and down)
  - Median time of production is noon
  - Overall conservative estimate for power requirement
- Month to Month Comparison (Easy)
  - Daily (need model)
- Weekdays vs Weekends
- Low Peak Times are Crucial

### Jul 2010 Hourly Demand



# Jan 2010 Hourly Demand



# Questions?

