

**Pinoleville Pomo Nation**  
**Renewable Energy Feasibility Study Final Status**

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2014 U.S. Department of Energy Tribal Energy Program Review

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## Pinoleville Pomo Nation

- The Pinoleville Pomo Nation is a Native American tribe located in Mendocino County



## Mission Statement of the Pinoleville Pomo Nation

- Secures tribal government, affirms and protects tribal sovereignty
- Maintains government-to-government relationships
- Dedication to developing and maintaining co-operative alliances that benefit the tribe
- Committed to the preservation of its history, culture, and traditions
- Provides for health , safety, and general welfare of its citizens



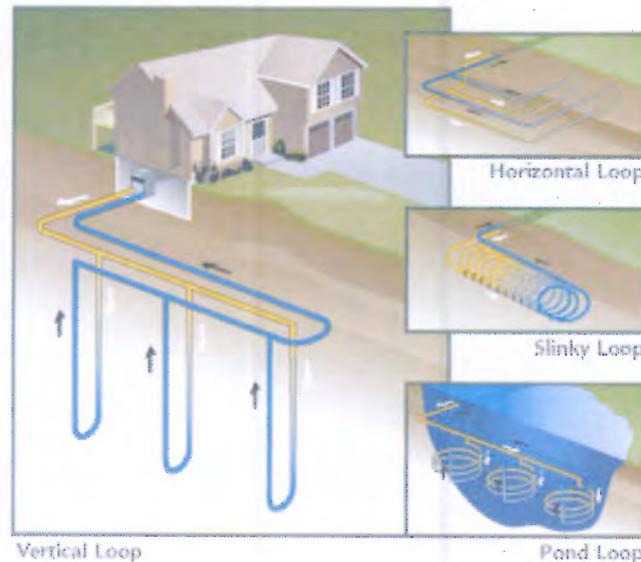
## Vision Statement of the Pinoleville Pomo Nation

- Being healthy spiritually, physically, emotionally, mentally
- Being independent and self-sufficient
- Self governance with a focus on cultural and traditional values
- Being able to pass knowledge and wisdom of ancestors to future generations



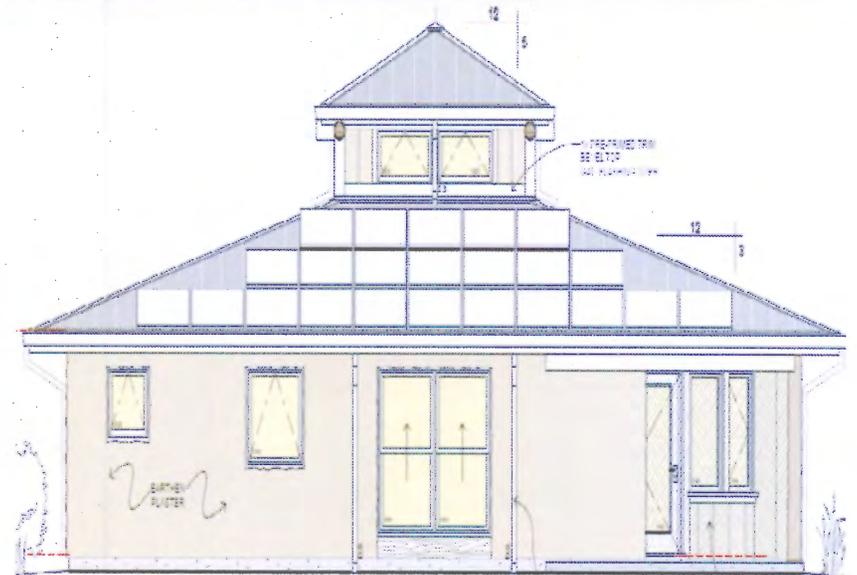
# Pinoleville Pomo Nation Approach to Sustainability, Pt. 1

- Goal: maintain cultural and tradition over the generations
- Focus:
  - Create project that utilize renewable energy
  - Incorporate cultural and traditional values
  - Self sufficiency
- Using renewables wherever possible
  - Geothermal pumps
  - Microhydro
  - Wind
  - Solar



## Pinoleville Pomo Nation Approach to Sustainability, Pt 2

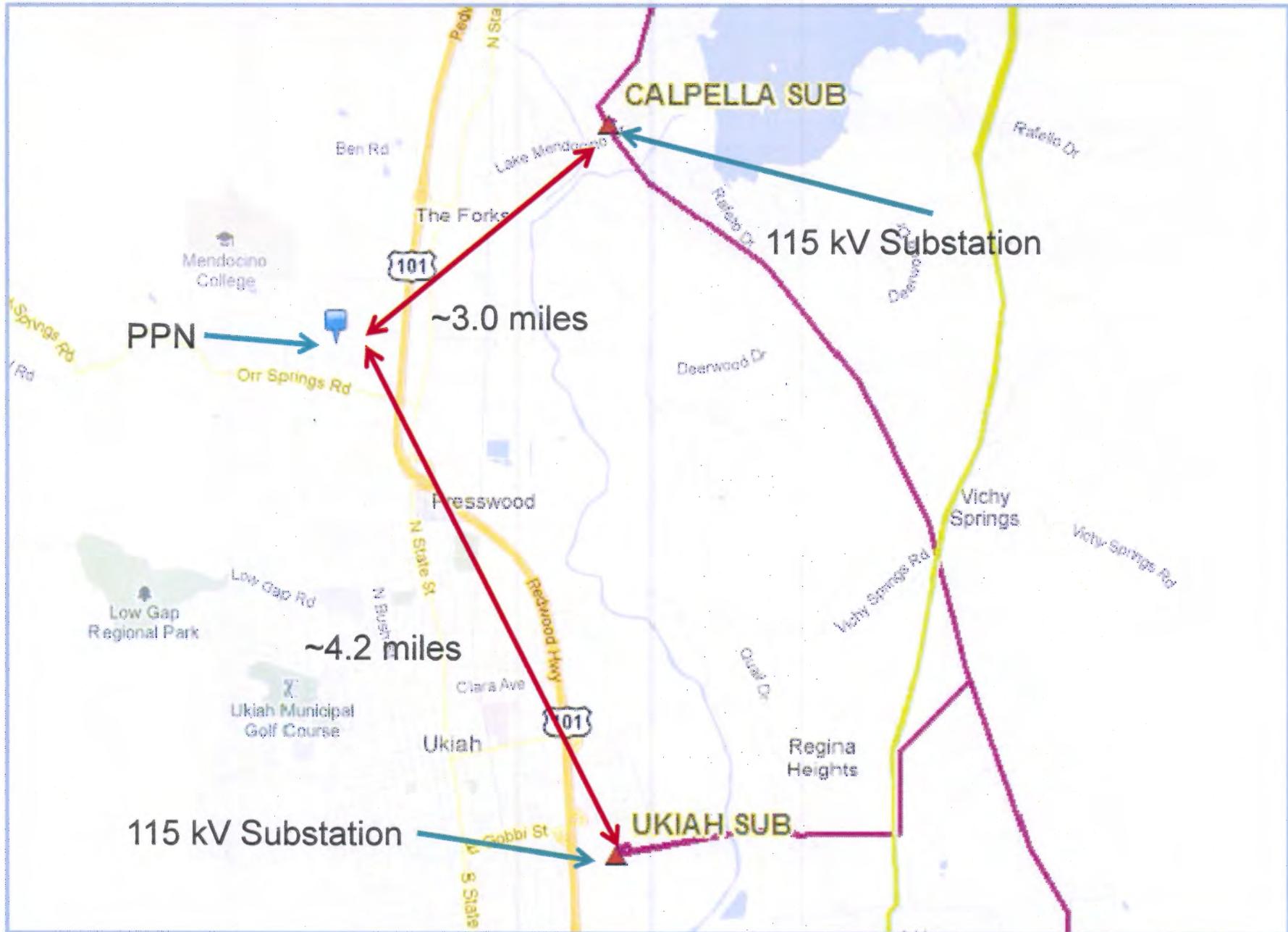
- Co-designing & weaving together the various energy technologies in building designs
- Goals:
  - Low cost,
  - Energy efficiency
  - Natural materials (strawbale)
  - Net zero or positive energy buildings



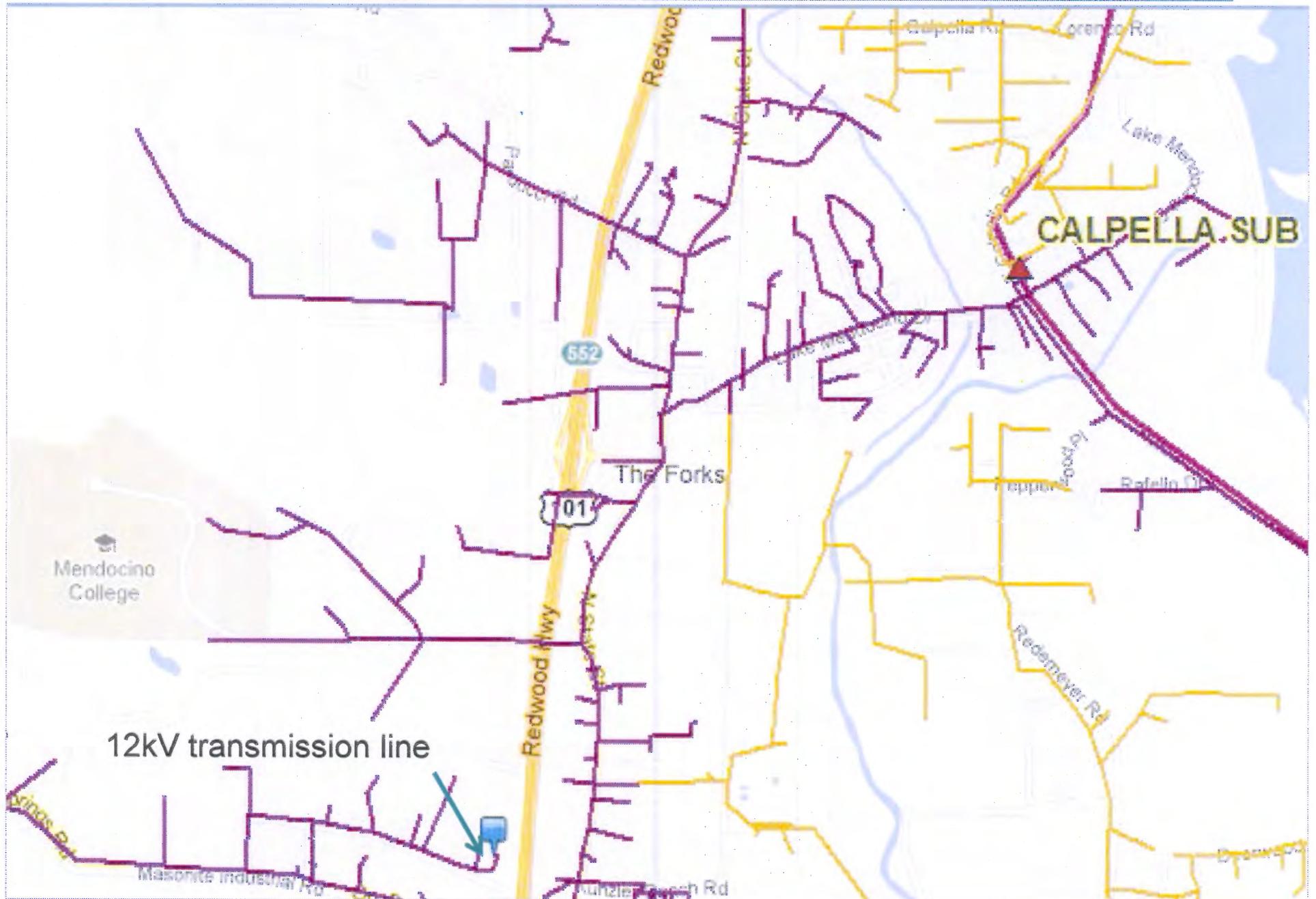
# Solar Sites Under Consideration for 1 or 3 MW Utility



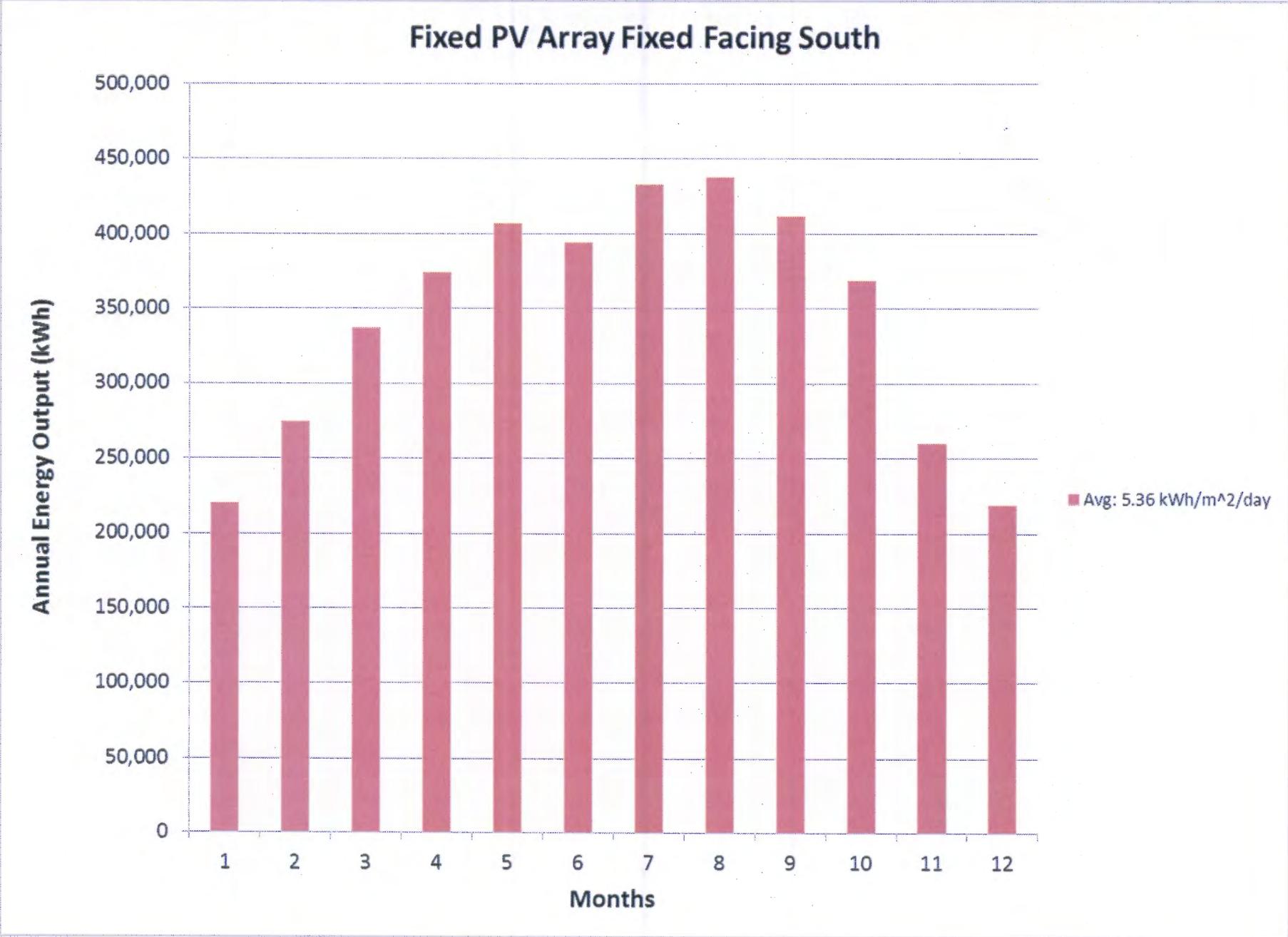
# Transmission Line and Substation Location, Pt 1



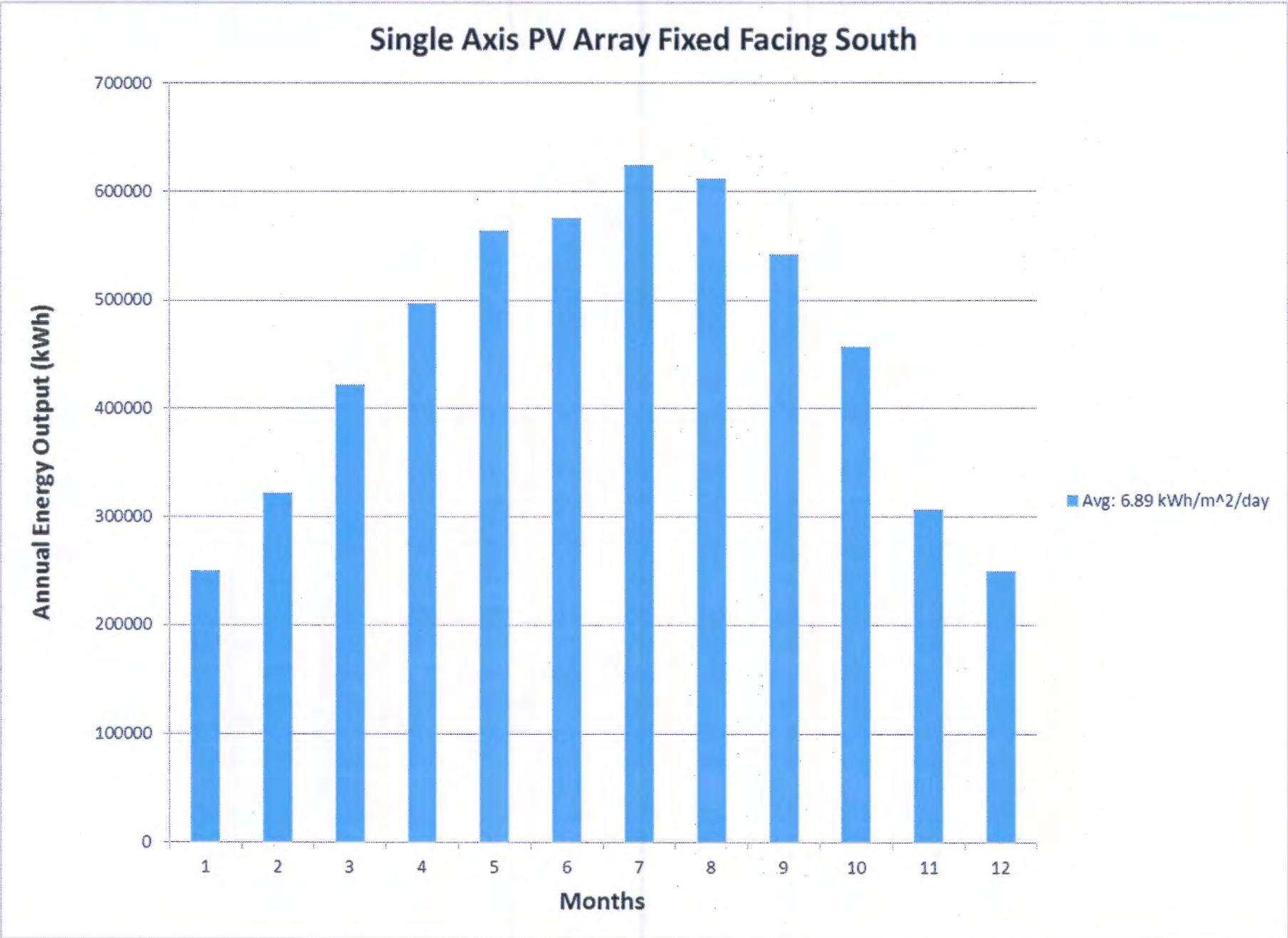
## Transmission Line and Substation Location, Pt 2



# Monthly & Yearly Avg. Solar Radiation for Fixed PV Array Fixed

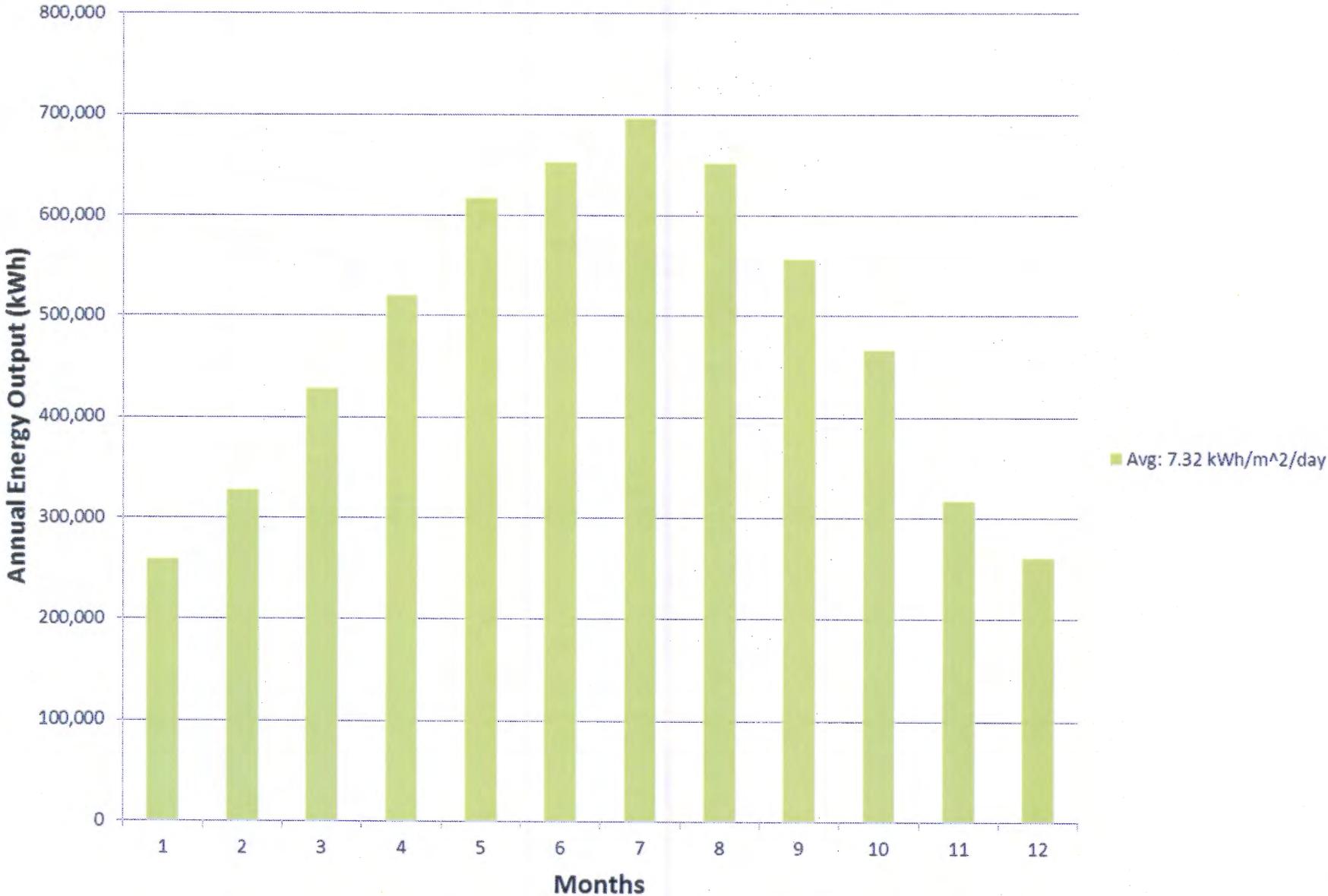


# Monthly & Yearly Avg. Solar Radiation for Single Axis PV Array

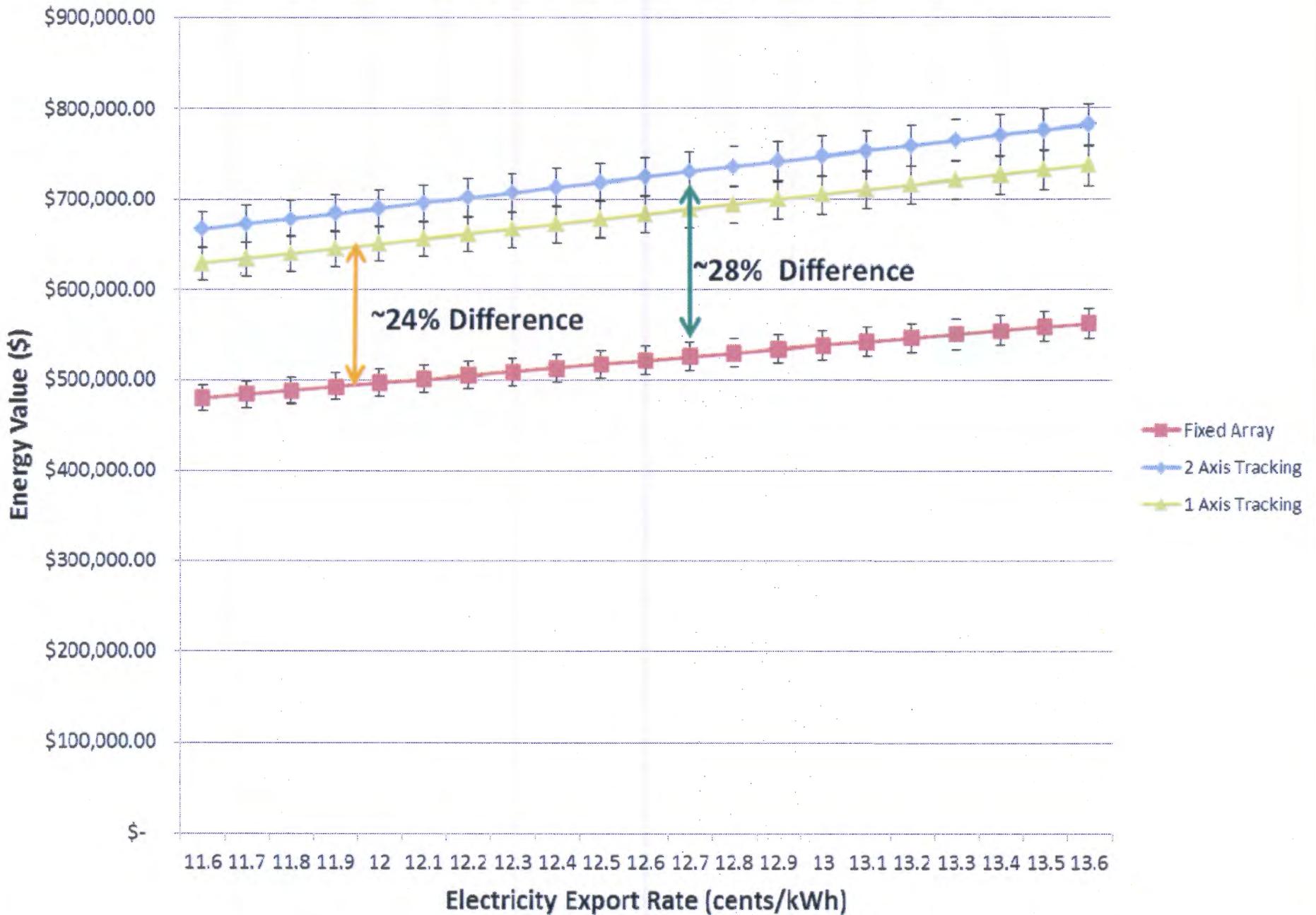


# Monthly & Yearly Avg. Solar Radiation for Two Axis PV Array

## Two Axis PV Array Fixed Facing South



# Energy Value vs Electricity Export Rate for 3 MW



## Monthly & Yearly Avg. Solar Radiation for Single Axis PV Array

- Fixed solar array and its components: \$.18 per watt installed
- Single axis tracking system and its components: \$.22 per watt installed
- Two axis tracking system and its components: \$.27 per watt installed.
- ~ 18% difference between the fixed and single axis system option.
- A single axis tracking system results in ~24% increase in energy value of electricity generated compared to a fixed array system. This is recommended.
- This is a net energy value increase of 6%

## Total levelized cost of energy for solar utility near Ukiah, CA

Capacity Factor (%)	Levelized Capital Cost (\$/MW)	Fixed O&M (\$/MW)	Variable O&M (including fuel) (\$/MW)	Transmission Connection (\$/MW)	CRF	Interest rate	n	Total System Levelized Cost (\$/MWh)
25	5,165,592	11,380	0	91,871	0.08	0.06	25	233.07

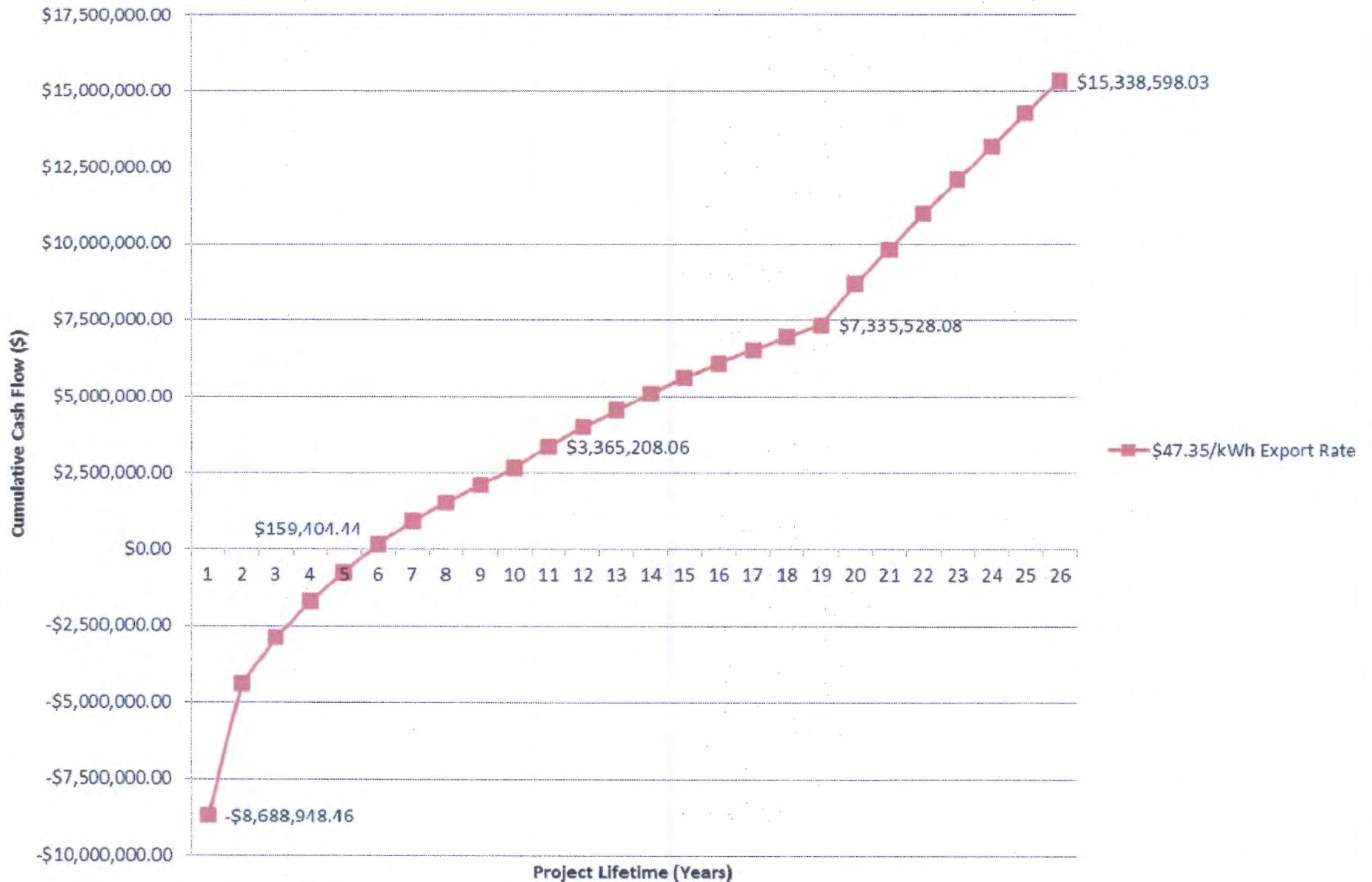
- Wind energy tLCOE: \$268.14/MWh
  - Lack of sustained wind speeds
- Biomass/biogas energy tLCOE: \$133.43/MWh
  - Lack of access to stable feedstock (slide 20)

# Solar Total Installed Costs vs Net Project Costs via CREST Model



# Cumulative Cash Flow at Net Project Cost of \$5.07/W, 15% IRR

## Cumulative Cash Flow @ \$5.07/W Net Project Cost



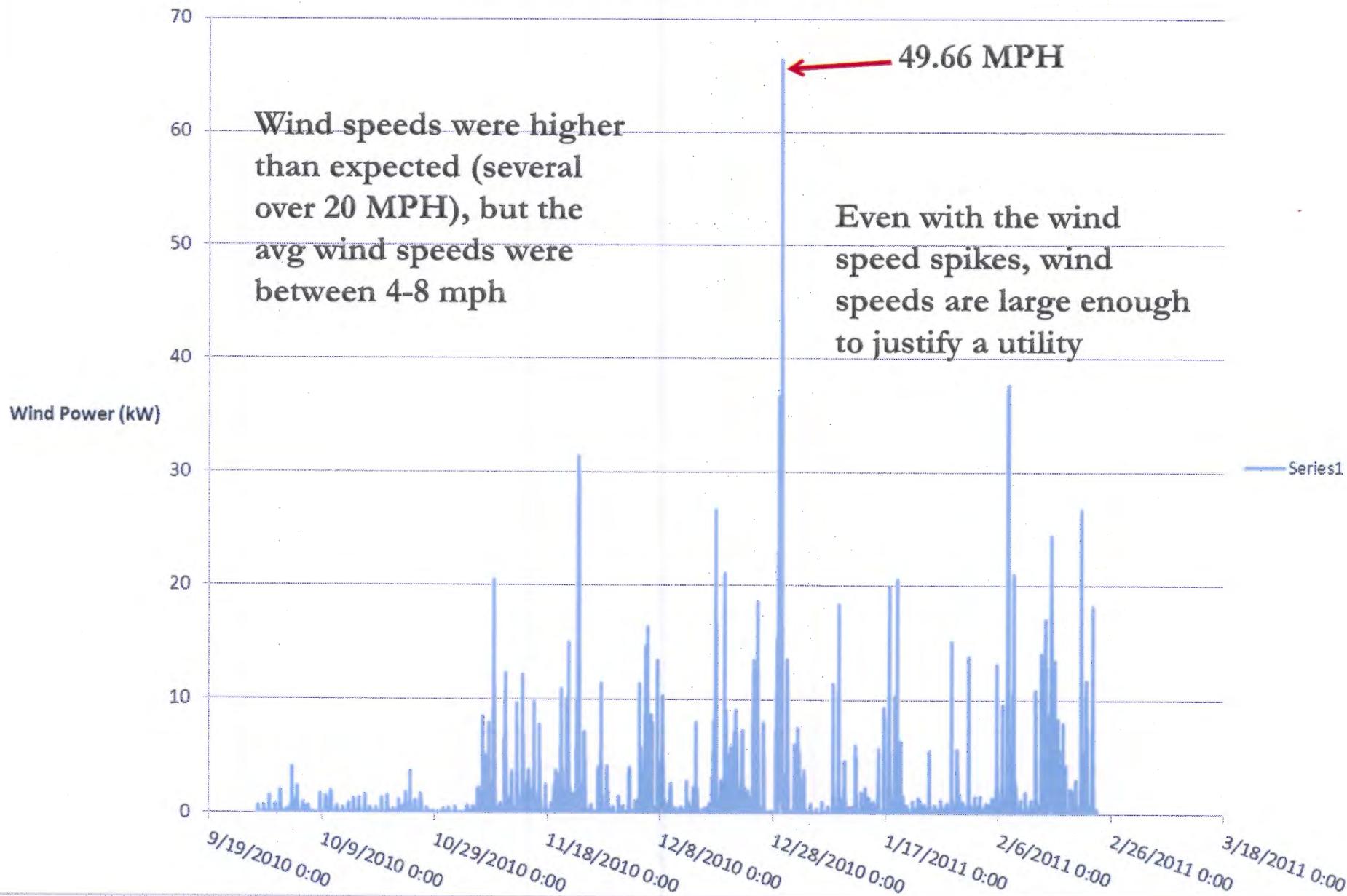
## Renewable Energy Feasibility Study: Anemometer Details



More images here:

<http://www.ryanlshelby.com/2010-pinoleville-pomo-nation-anemometer-installation.html>

# Wind Power Estimate from 09-27-10 to 02-23-11 [20 m (60 ft), 15 ft diameter]



# Biogas Feedstock (Anaerobic Digestion) Results



- EPA Biogas Mapping Tool shows that there are
  - 14 fat/oil/grease haulers,
  - 43 food processing facilities,
  - 9 landfills, and
  - 2 organics collection programs within a 70 mile radius of Ukiah, CA
- Unknown how much feedstock these sites produce or if PPN can access the feedstock

## Future Work and Next Steps

- Biogas utility (\$133.43/MWh) is cheaper than a solar utility (233.07/MWh) for Ukiah, CA
  - Wind is present, but the speeds are not fast enough to recommend
  - Solar, however, is a more reliable feedstock that the PPN can access
  - PPN has started PPA talks with PGE
  - Main concern is that PGE already has signed contracts in the pipeline to meet its CA Renewables Portfolio Standard for 2016 and 2020
  - Focus is now on creating a PPA with the City of Ukiah's local utility
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- Renewable Energy Credits
  - Seeking Auto dismantler site as a Brownfields site
  - Final report to DOE