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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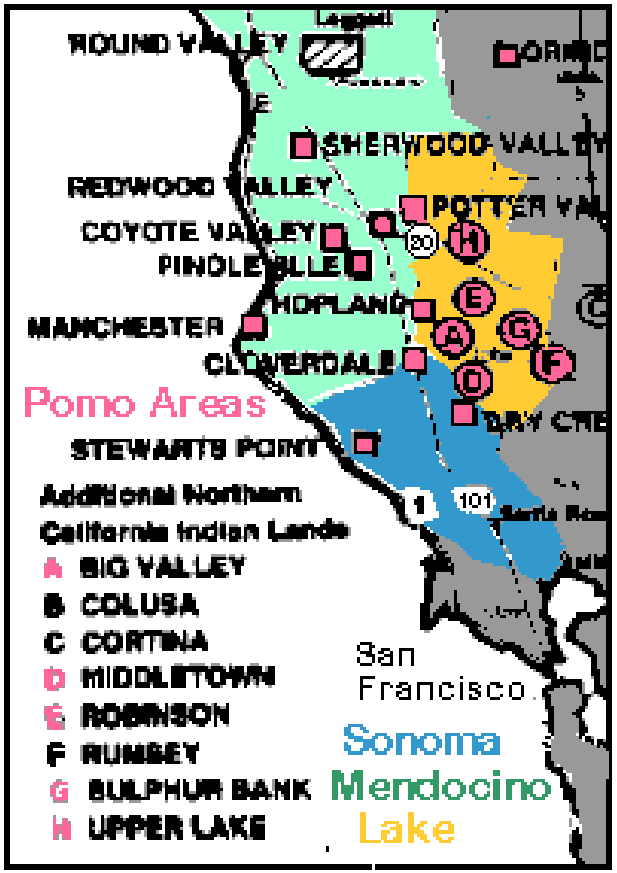
Pinoleville Pomo Nation

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



Mission Statement of the Pinoleville Pomo Nation

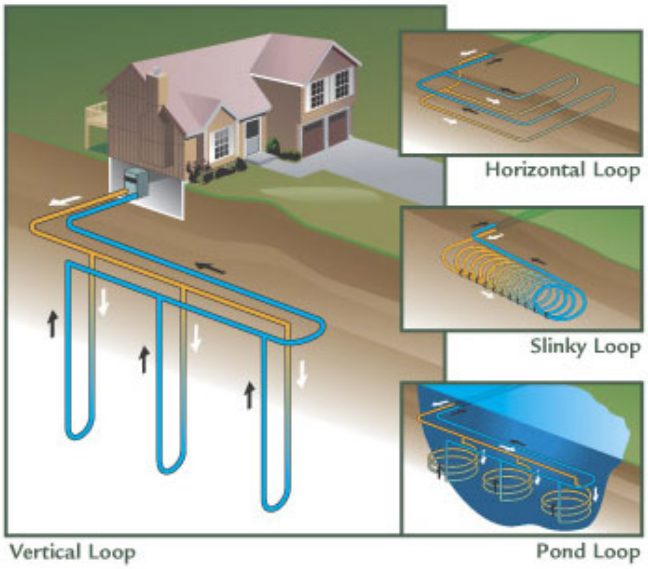
- Secures tribal government, affirms and protects tribal sovereignty
- Maintains government-to-government relationships
- Dedication to developing and maintaining co-operative alliances that benefit the tribe
- Committed to the preservation of its history, culture, and traditions
- Provides for health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

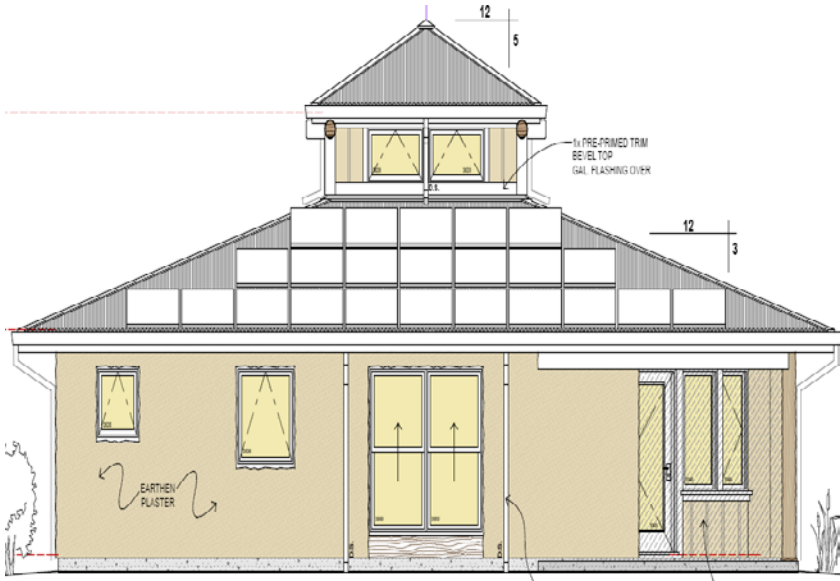
- Goal: maintain cultural and tradition over the generations
- Focus:
  - Create project that utilize renewable energy
  - Incorporate cultural and traditional values
  - Self sufficiency
- Using renewables wherever possible
  - Geothermal pumps
  - Microhydro
  - Wind
  - Solar



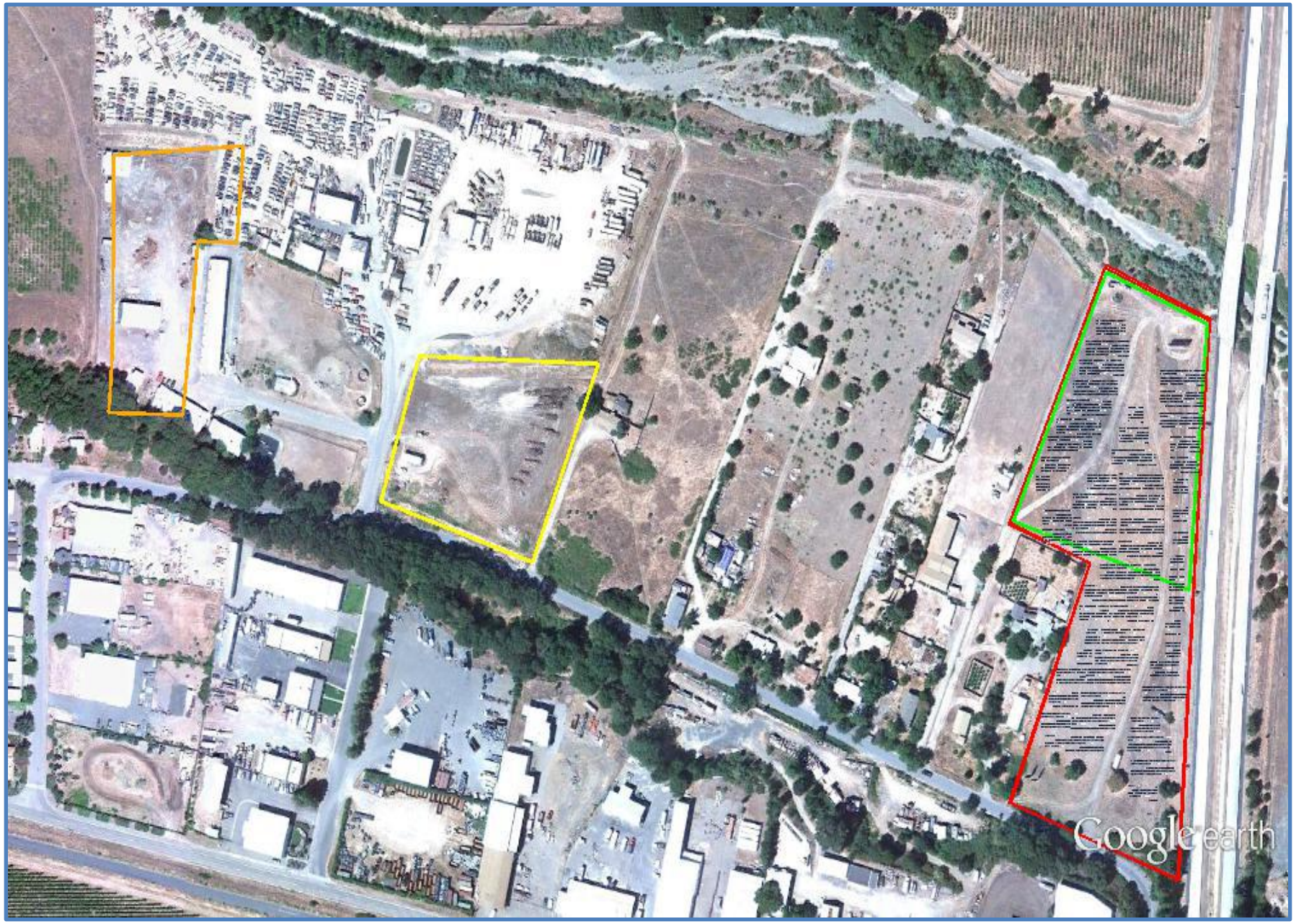
Pinoleville Pomo Nation Approach to Sustainability, Pt 2

- Co-designing & weaving together the various energy technologies in building designs

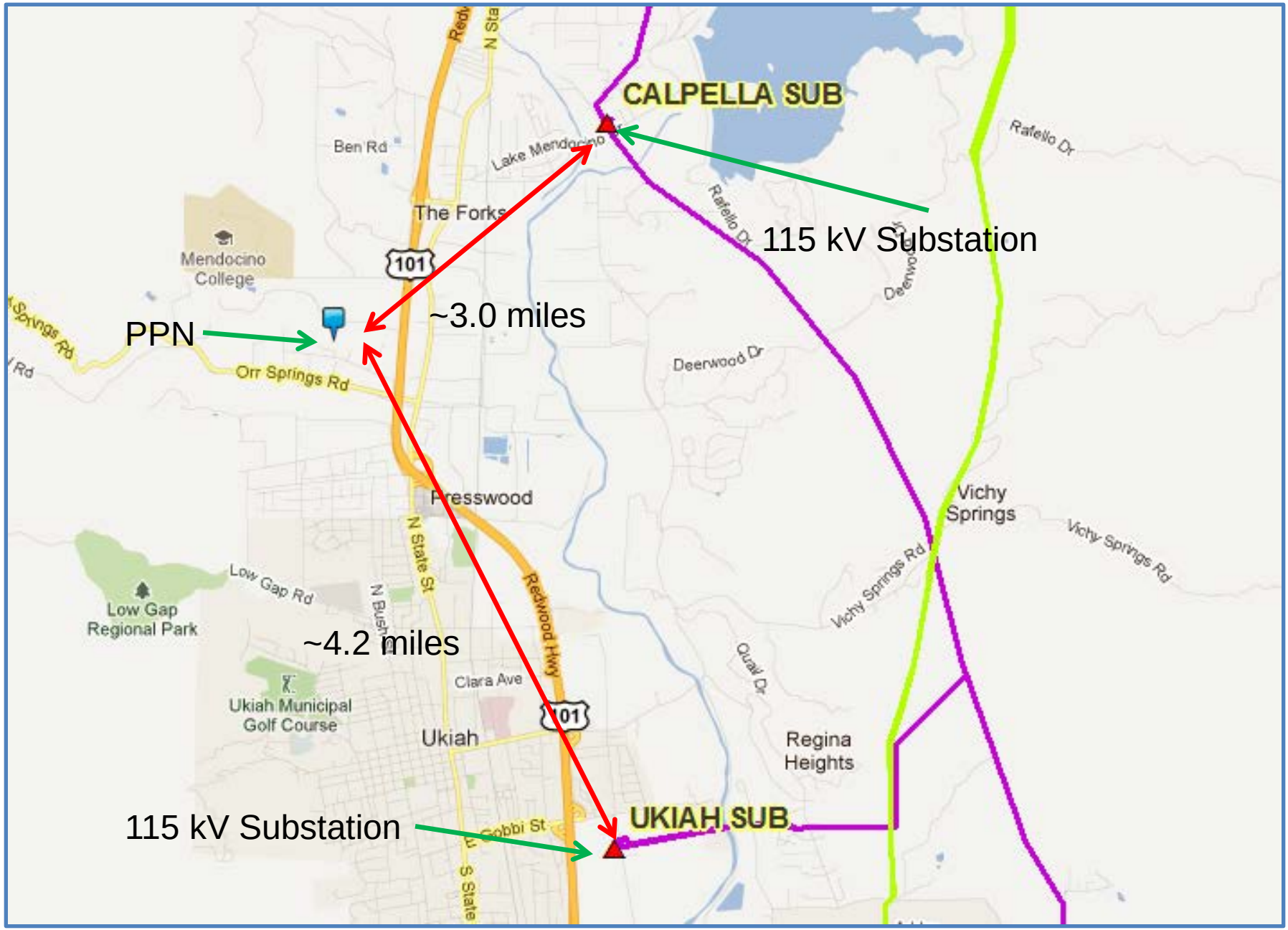
- Goals:
  - Low cost,
  - Energy efficiency
  - Natural materials (strawbale)
  - Net zero or positive energy buildings



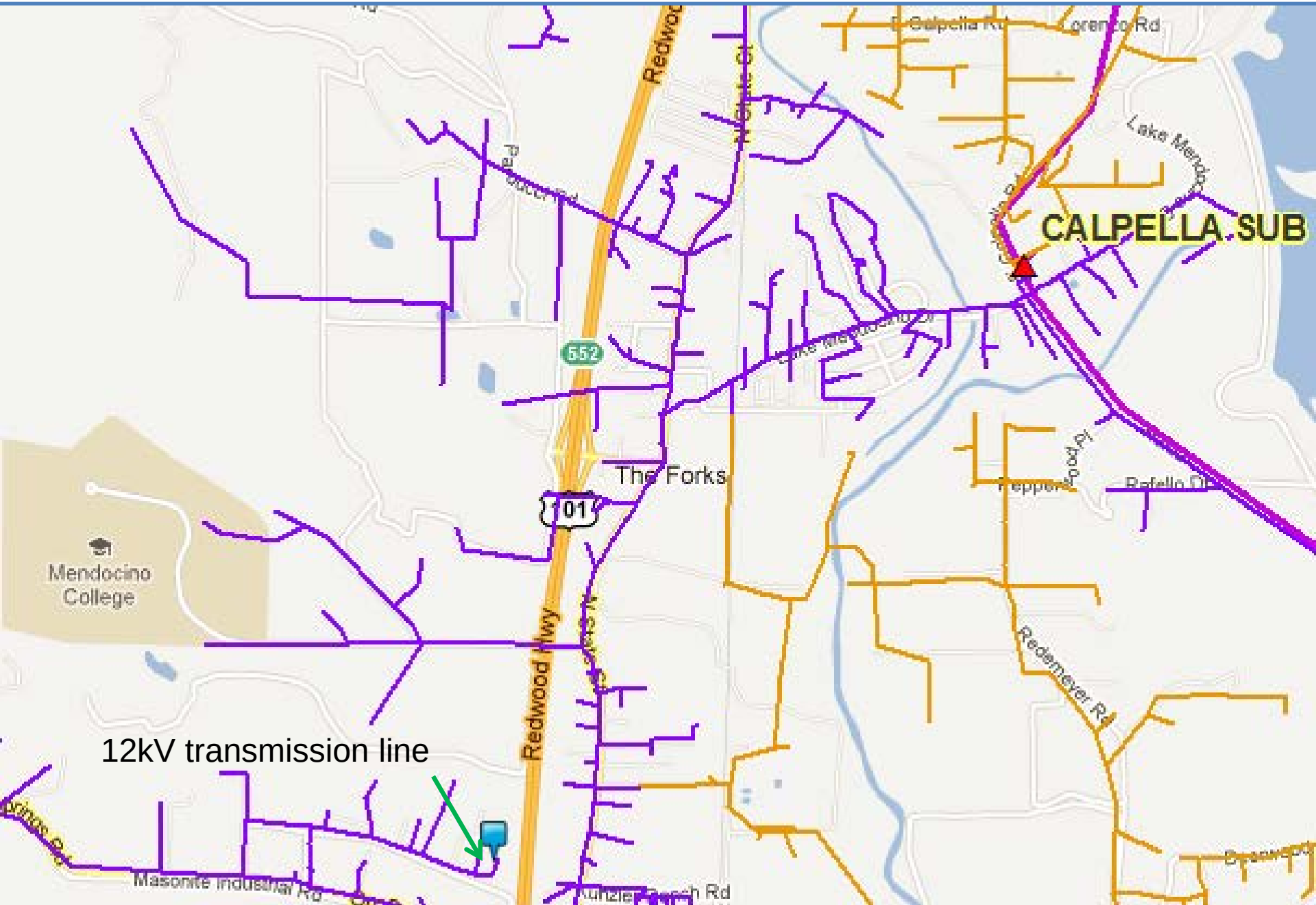
Solar Sites Under Consideration for 1 or 3 MW Utility



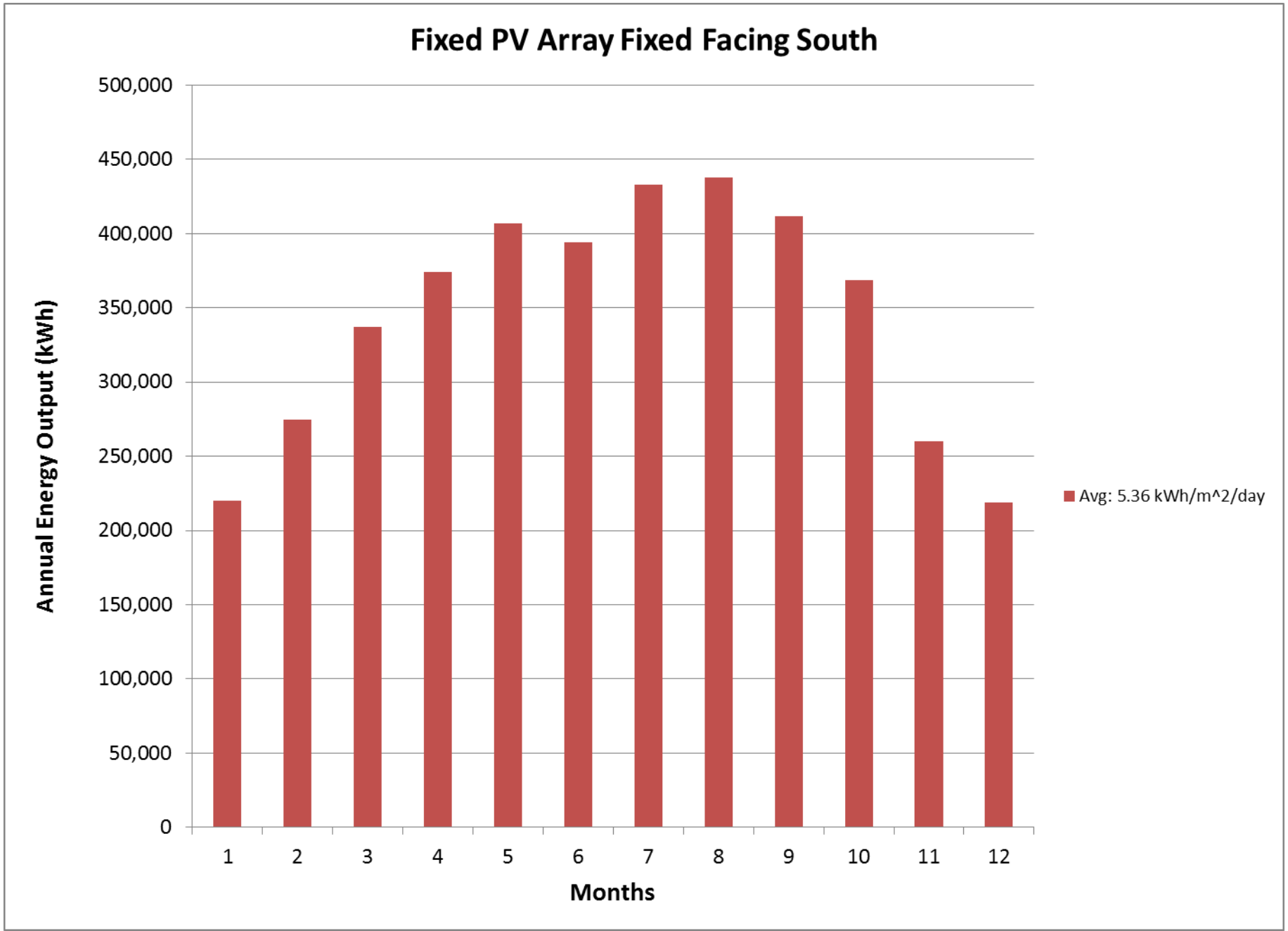
Transmission Line and Substation Location, Pt 1



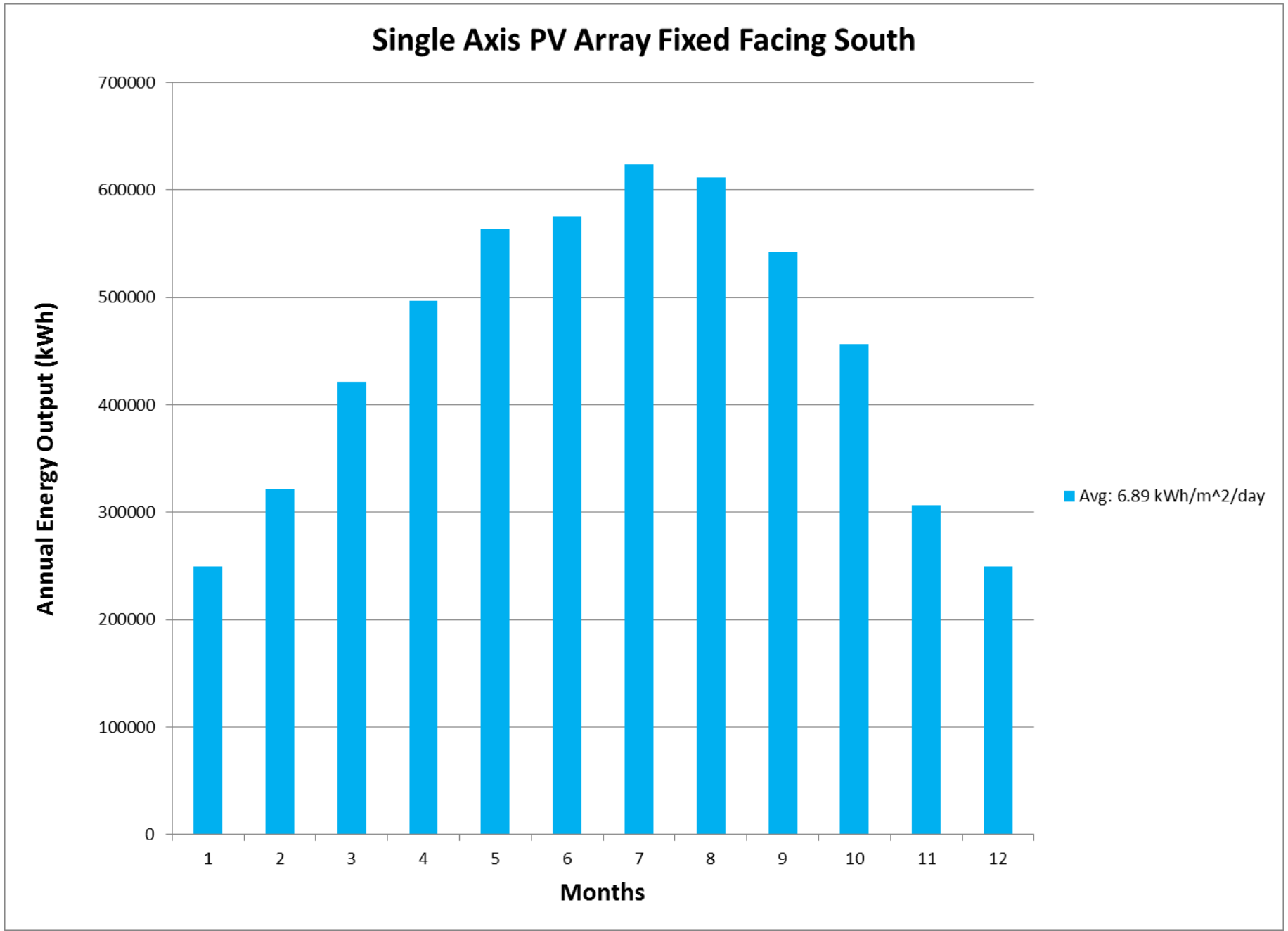
Transmission Line and Substation Location, Pt 2



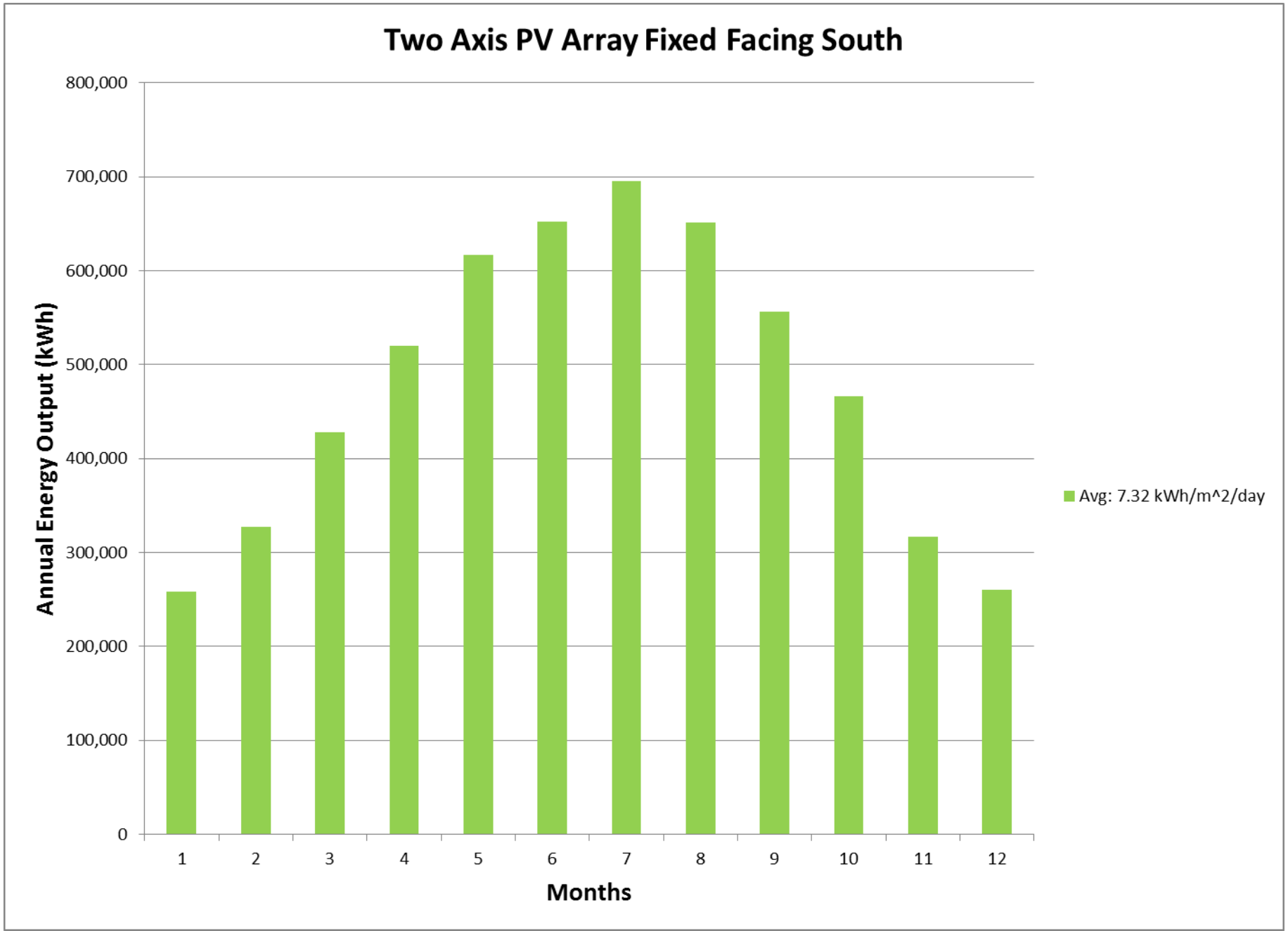
Monthly & Yearly Avg. Solar Radiation for Fixed PV Array Fixed

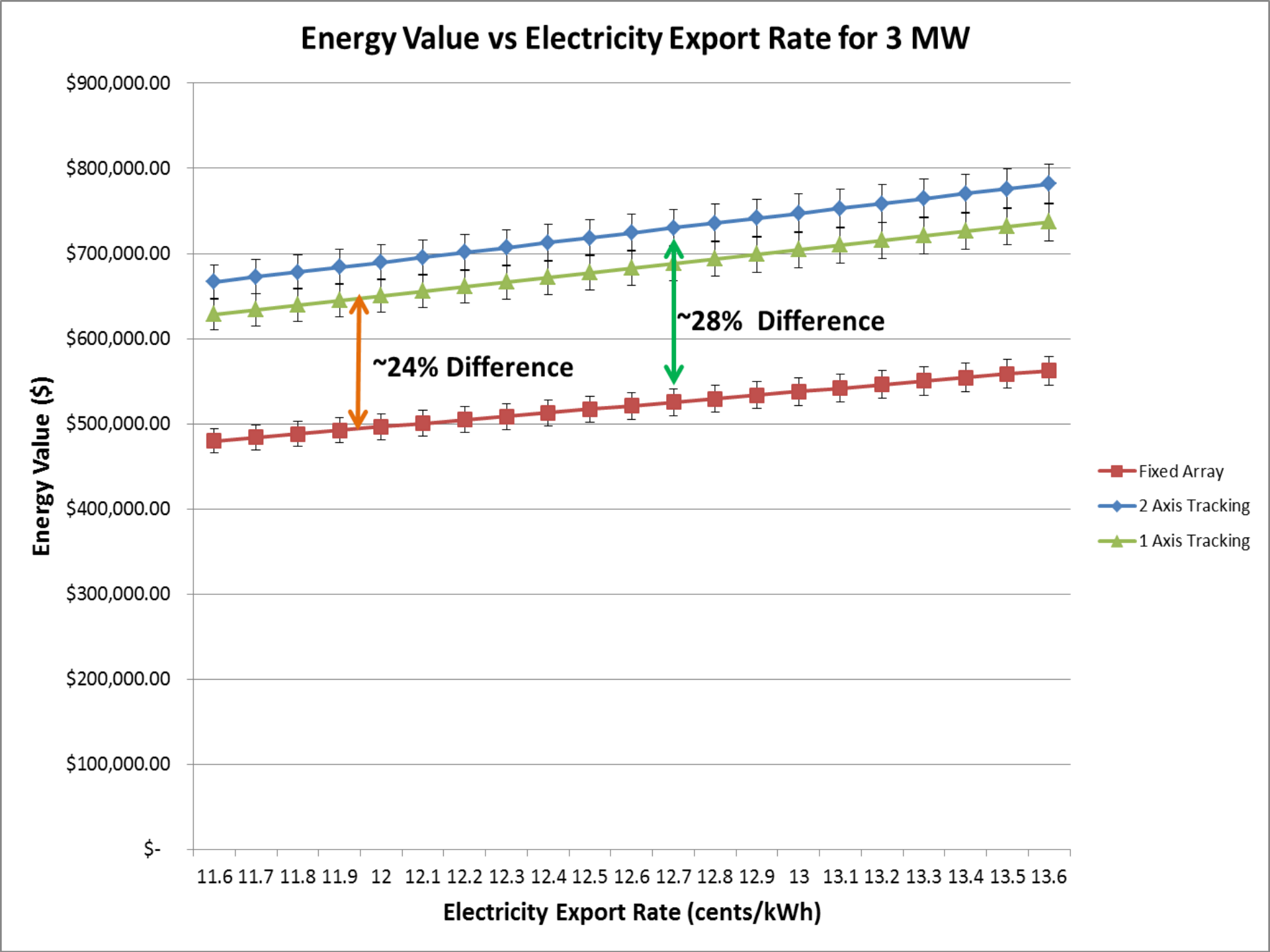


Monthly & Yearly Avg. Solar Radiation for Single Axis PV Array



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




Energy Value vs Electricity Export Rate for 3 MW
$900,000.00
$800,000.00
$700,000.00
$600,000.00
$500,000.00
$400,000.00
$300,000.00
$200,000.00
$100,000.00
$-
Energy Value ($)
~24% Difference
~28% Difference
11.6 11.7 11.8 11.9 12 12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 13 13.1 13.2 13.3 13.4 13.5 13.6
Electricity Export Rate (cents/kWh)
Fixed Array
2 Axis Tracking
1 Axis Tracking

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

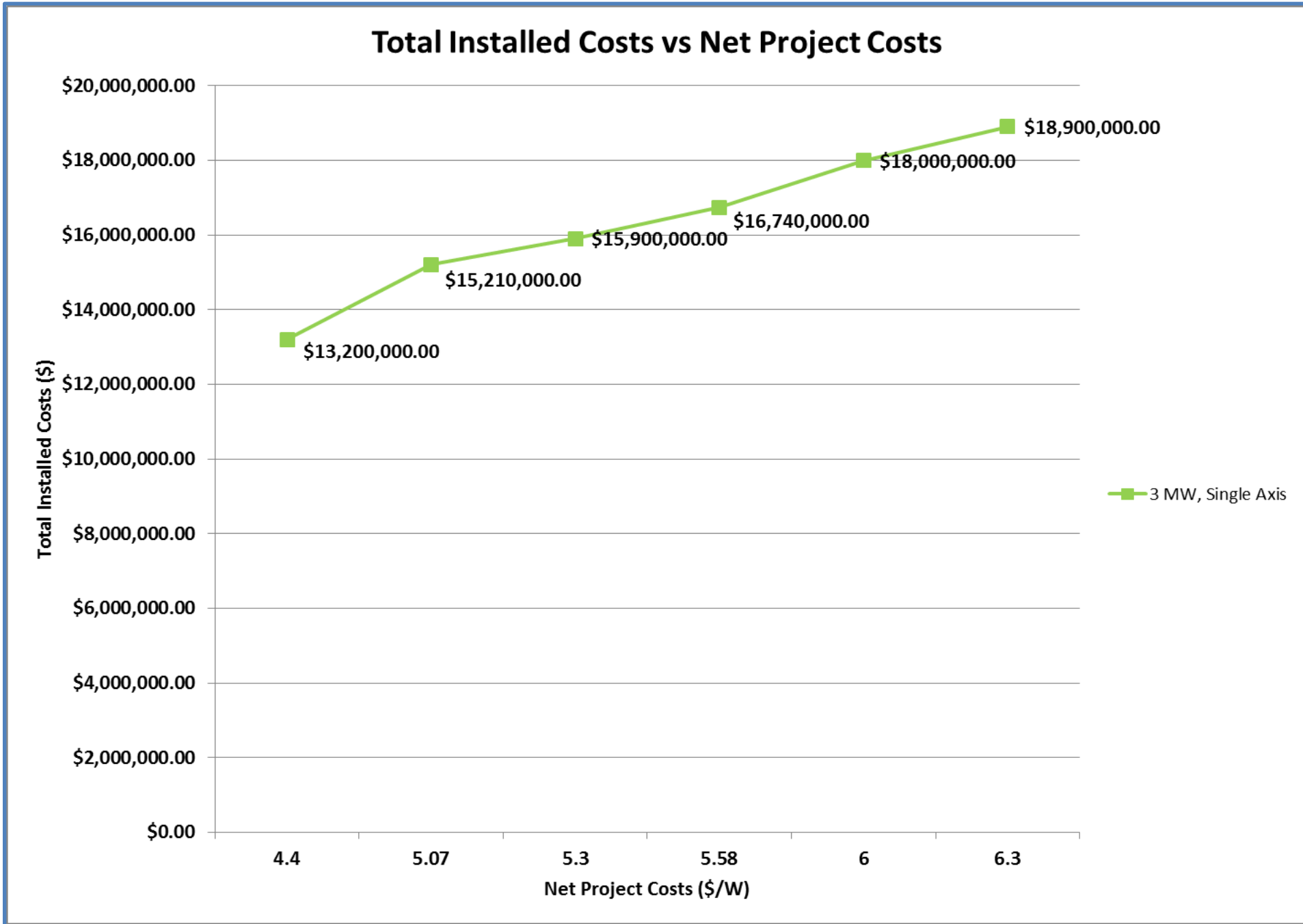
- Fixed solar array and its components: $.18 per watt installed
- Single axis tracking system and its components: $.22 per watt installed
- Two axis tracking system and its components: $.27 per watt installed.
- ~ 18% difference between the fixed and single axis system option.
- **A single axis tracking 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

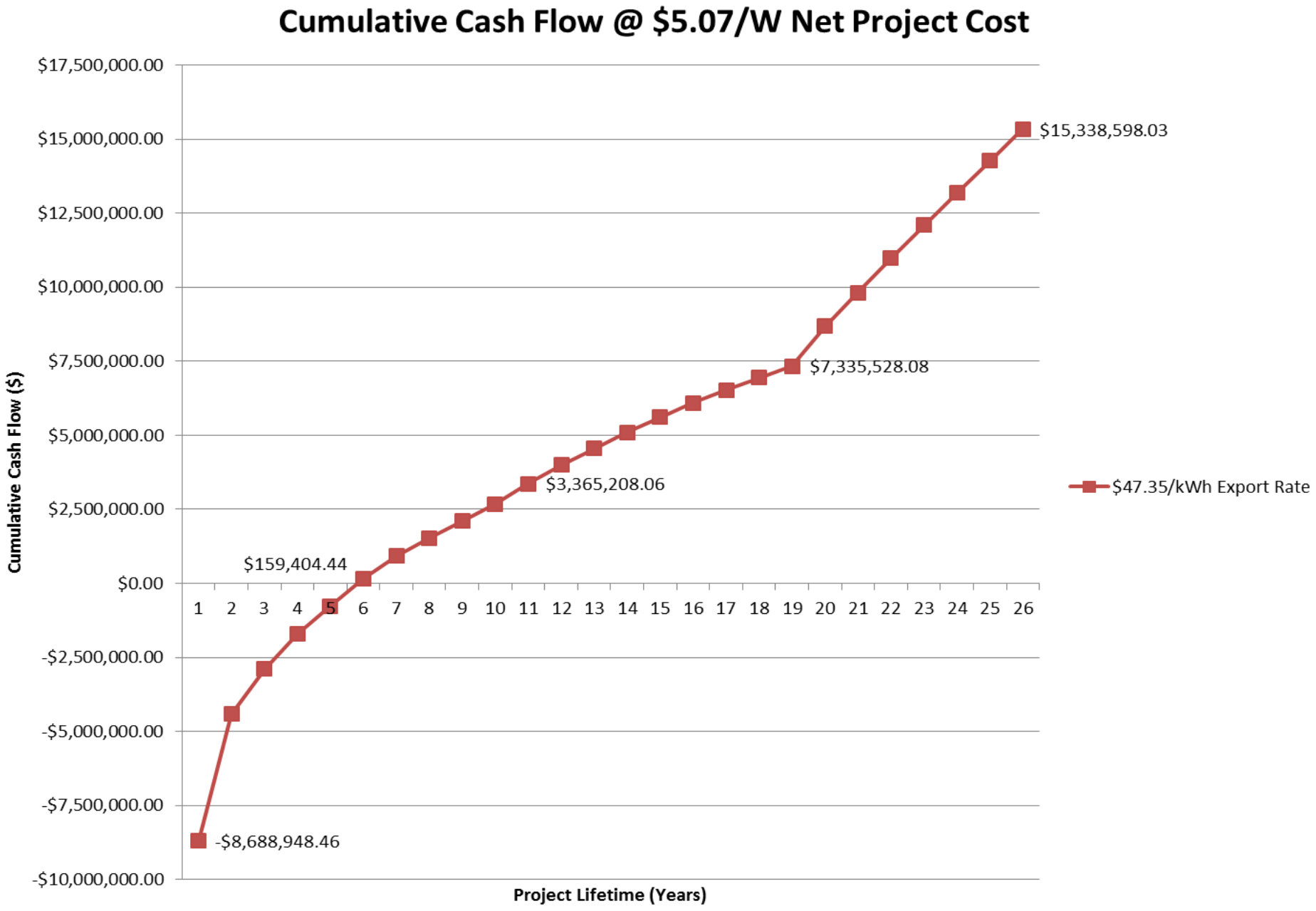
Capacity Factor (%)	Levelized Capital Cost ($/MW)	Fixed O&M ($/MW)	Variable O&M (including fuel) ($/MW)	Transmission Connection ($/MW)	CRF	Interest rate	n	Total System Levelized Cost ($/MWh)
25	5,165,592	11,380	0	91,871	0.08	0.06	25	233.07

- 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



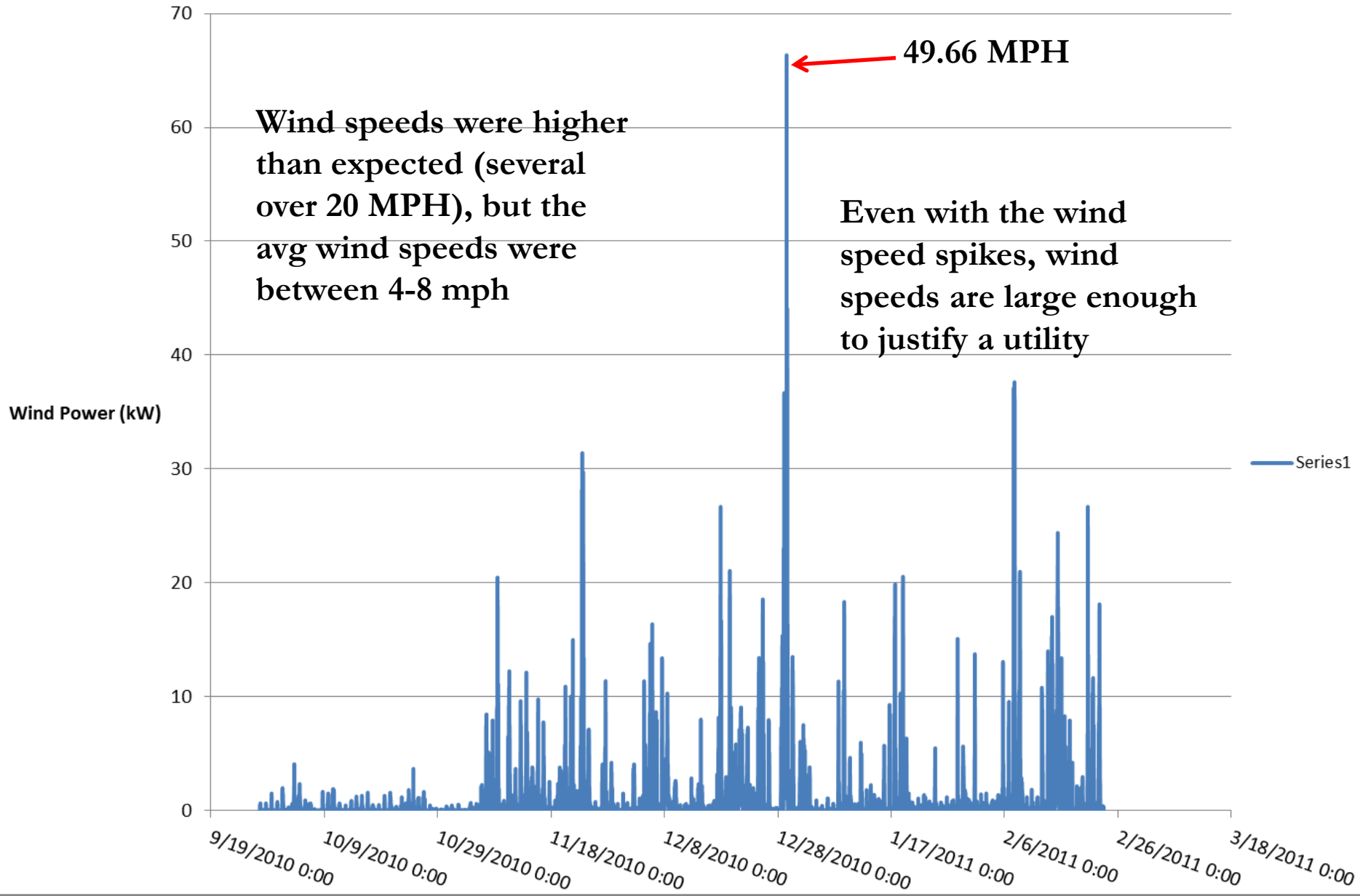
Cumulative Cash Flow at Net Project Cost of $5.07/W, 15% IRR



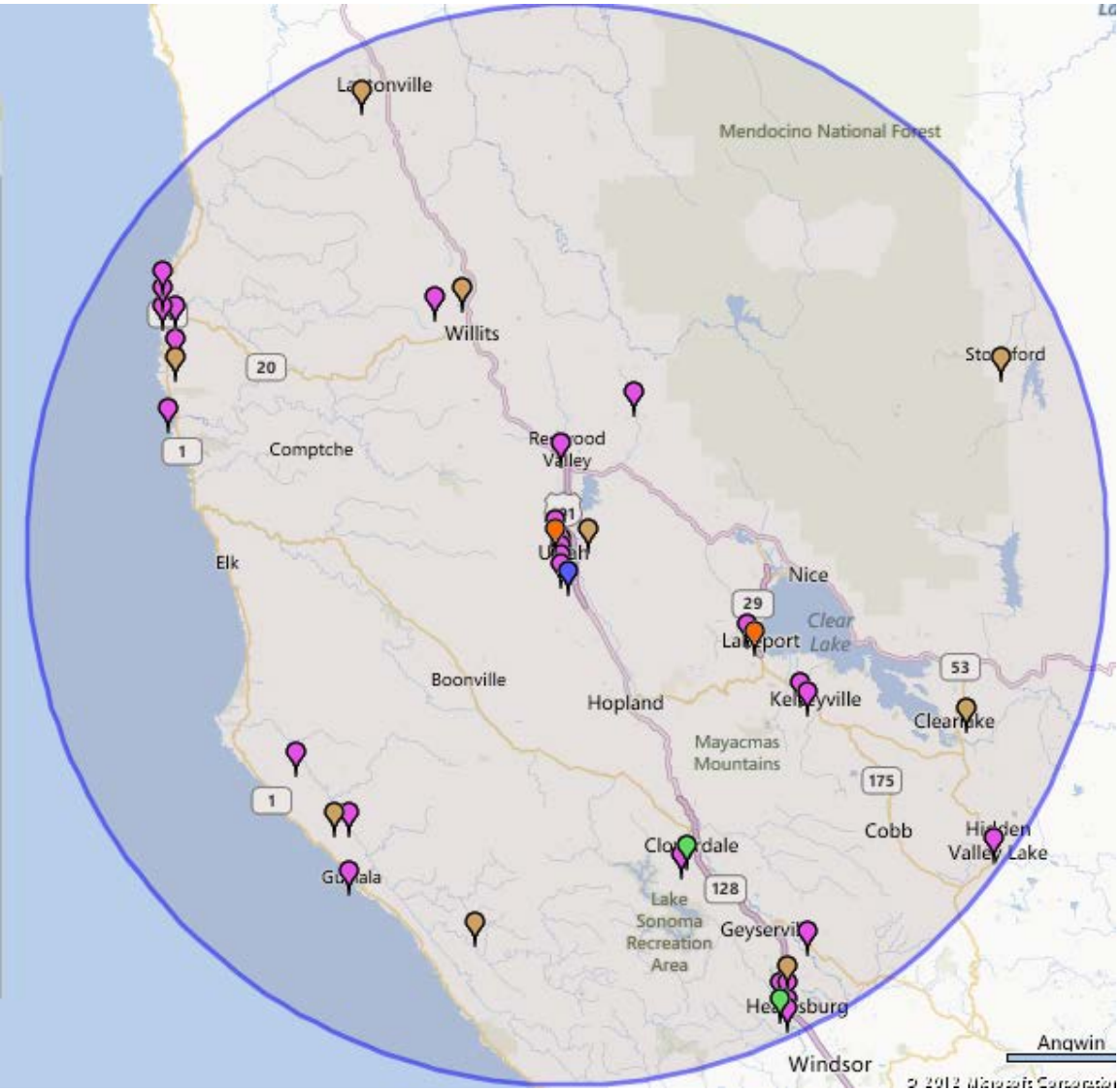
Renewable Energy Feasibility Study: Anemometer Details

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 diamater]



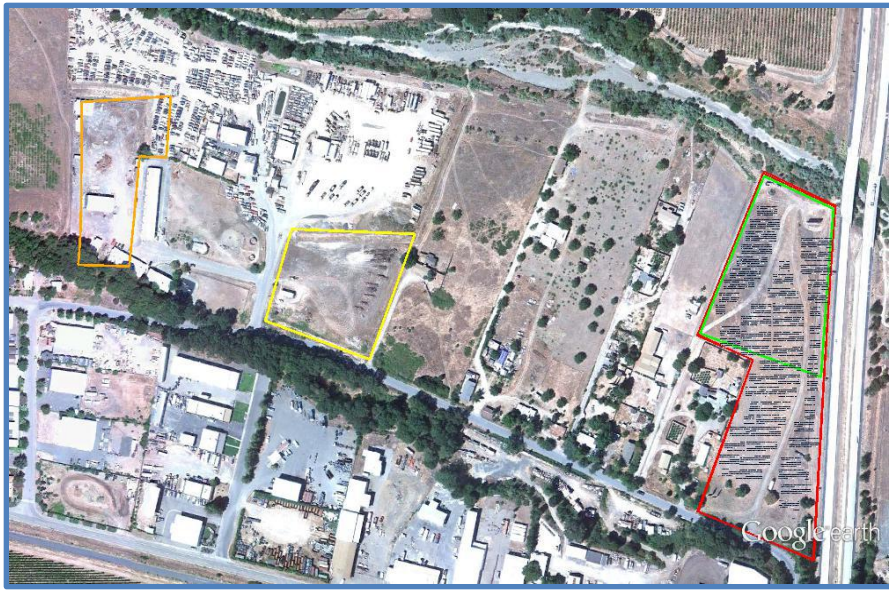
Biogas Feedstock (Anaerobic Digestion) Results



- 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 Workand Next Steps

- Biogas utility ($133.43/MWh) is cheaper than a solar utility (233.07/MW) 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 meets its CA Renewables Portfolio Standard for 2016 and 2020
- Focus is now on creating a PPA with the City of Ukiah's local utility



- Renewable Energy Credits
- Seeking Auto dismantler site as a Brownfields site
- Final report to DOE

Q/A?