

Week 6 Meeting



10/8/18

Team Leader: Katayi

Other Team Members: Nur, Chufu, Tam, Ahmed, YJ

Advisor: Dr. Ajarapu

Safety Moment: Driving in Challenging Road Conditions

- Rule of thumb: Adjust speed to match the current road conditions, increase following distance, and don't use cruise control
- Use headlights
- Roads become very slippery as rain mixes with oil and dirt → decreases braking ability, you go farther before stopping than on dry roads
- Hydroplaning occurs when you drive too fast on roads covered with water
 - Take your foot off the pedal and slow down so that your tires can make contact with road again
- Bridges freeze before roads, slow down
- Beware of “black ice”, ice that appears as the same color as dark-colored roads
 - Take foot off pedal, do not brake, continue driving straight until the patch ends

Topics

- Why Estancia, New Mexico?
- NREL SAM
- Fixed Rack Design

Why Estancia?

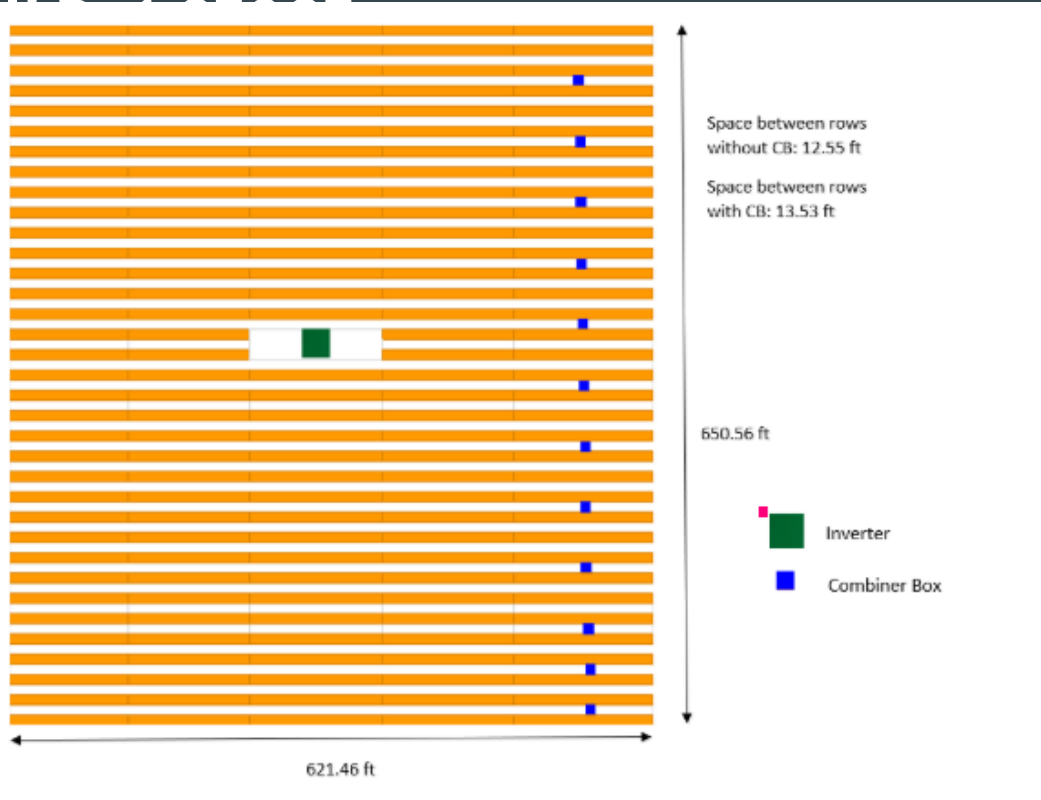
- Originally had 6 locations (2 in Texas, 2 in California, 2 in New Mexico)
- Choose the best one based on:
 - Solar radiation
 - Land size and price
 - Sunny days per year
 - Elevation
 - State financial incentives ranking
 - Total cost of solar power plant
 - Extra land for substation and expansion
 - More cost-effective than the rest of the Nation
 - Distance to the nearest city/town

Comparison Table

Categories	Description	Millville, CA	Alpine, TX	Estancia, NM	Who Wins?
Solar Radiation (kWh/m ² /day)	How much solar radiation a location gets per <u>day</u> . Higher solar radiation is better.	5.67	6.49	6.41	Alpine, TX
Land Size and Price	The size and price of each location. More land for a cheap price is what we want.	440 acres for \$375,000	280 acres for \$147,000	560 acres for \$195,000	Estancia, NM
Sunny Days/Year (Days)	An average of how many sunny days each location gets per year. More sunny days is better.	249	247	280	Estancia, NM
Higher Than Average Sunshine Compared to the Rest of the Nation	How much higher than average sunshine each location gets. Higher percentage is better.	19.1%	33.1%	33.8%	Estancia, NM
Elevation (ft)	How high the location is from sea <u>level</u> . UV increases at higher altitudes as the atmosphere has less chance to absorb the incoming UV. Higher elevation is better.	600	4514	6103	Estancia, NM

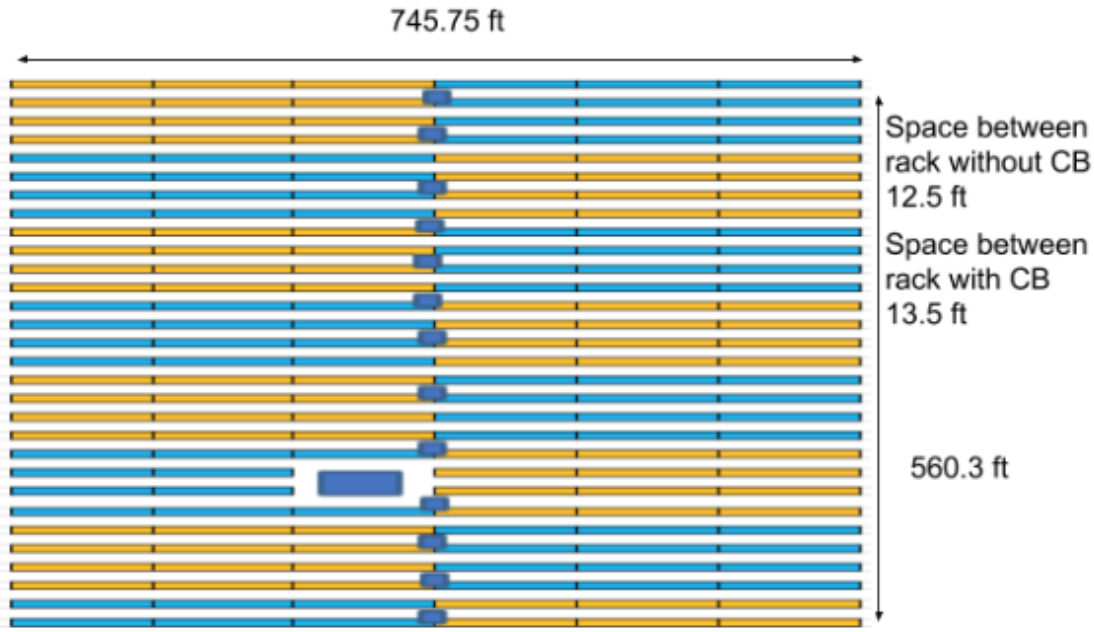
State Financial Incentives Ranking (Out of 50)	The ranking of states giving loans or grants. #1 is the best and #50 is the worst.	#28	#27	#8	Estancia, NM
Total Cost of Solar Plant (Million \$)	How much the solar plant would cost in each location. Less cost is better.	64.72	65.02	64.58 (5x35 version)	Estancia, NM
How Much Land Left <u>For</u> Substation/Expansion(acres)	How much land is left for the substation and future expansions. More land is better.	252.7	30.8	211.7 (5x35 version)	Millville, CA
More Cost-Effective Than the Rest of the Nation	How much more cost-effective each location is compared to the rest of the nation. Higher percentage is better.	38.1%	21.6%	22.0%	Millville, CA
<u>Distance To</u> Nearest City/Town (m)	How far the nearest town is to the location. The further the better, considering the dangers of having a <u>large scale</u> plant close to people.	Palo Cedro (6,343)	Alpine (50,291)	Estancia (7,893)	Alpine, TX

5x35 Racks with 2 Removed, 12 CBs, 1 Inverter,



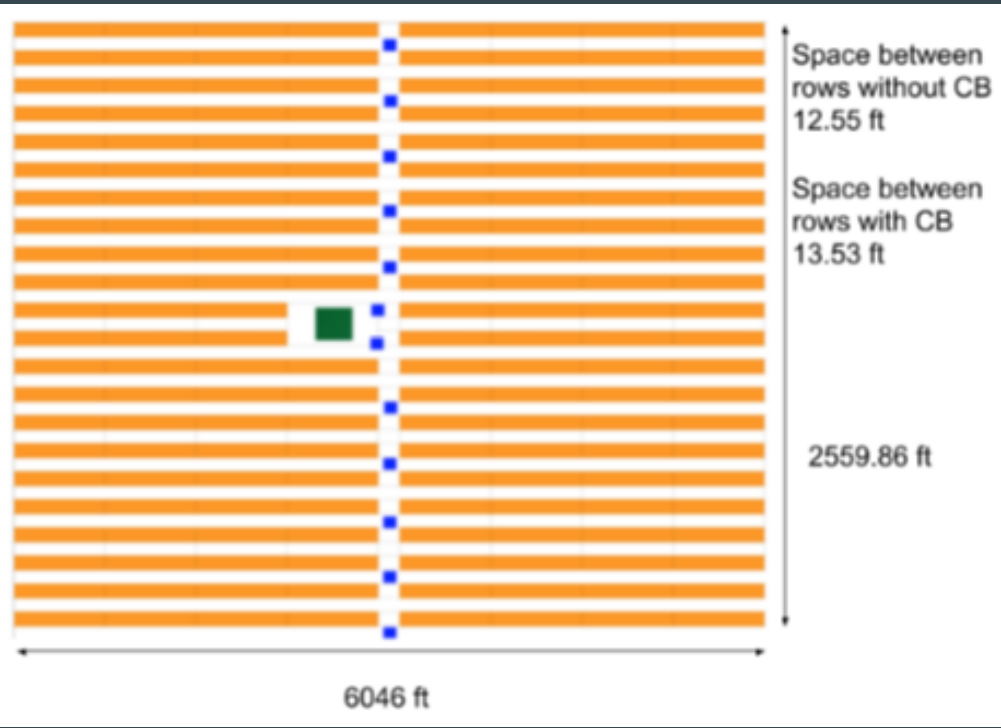
Solar Plant Cost				
Panels	236664	48.279456	million \$	
CBs	432	0.55320192	million \$	
Inverters	36	15.556275	million \$	
Land	348.2920827	0.195	million \$	560 acres
Total Cost		64.58393292	million \$	

6x30 Racks with 2 Removed, 13 CBs, 1 Inverter, ILR=1.31635



Solar Plant Cost				
Panels	238032	48.558528	million \$	
CBs	288	0.36880128	million \$	
Inverters	36	15.556275	million \$	
Land	357.3509235	0.195	million \$	560 acres
Total Cost		64.67860428	million \$	

8x22 Racks with 2 Removed, 12 CBs, 1 Inverter, ILR=1.28677



Solar Plant Cost				
Panels	238032	48.558528	million \$	
CBs	432	0.55320192	million \$	
Inverters	36	15.556275	million \$	
Land	355.3009211	0.195	million \$	560 acres
	Total Cost	64.86300492	million \$	

Layout Comparison

Categories	5x35	6x30	8x22	Who Wins?
ILR	1.27937	1.31635	1.28677	8x22 Version
Solar Plant Size (acres)	348.29	357.35	355.30	5x35 Version
Total Cost (million \$)	64.58	64.68	64.86	5x35 Version

NREL SAM Output

- Largest loss is from Xformer
- Total loss: ~ 21.945%

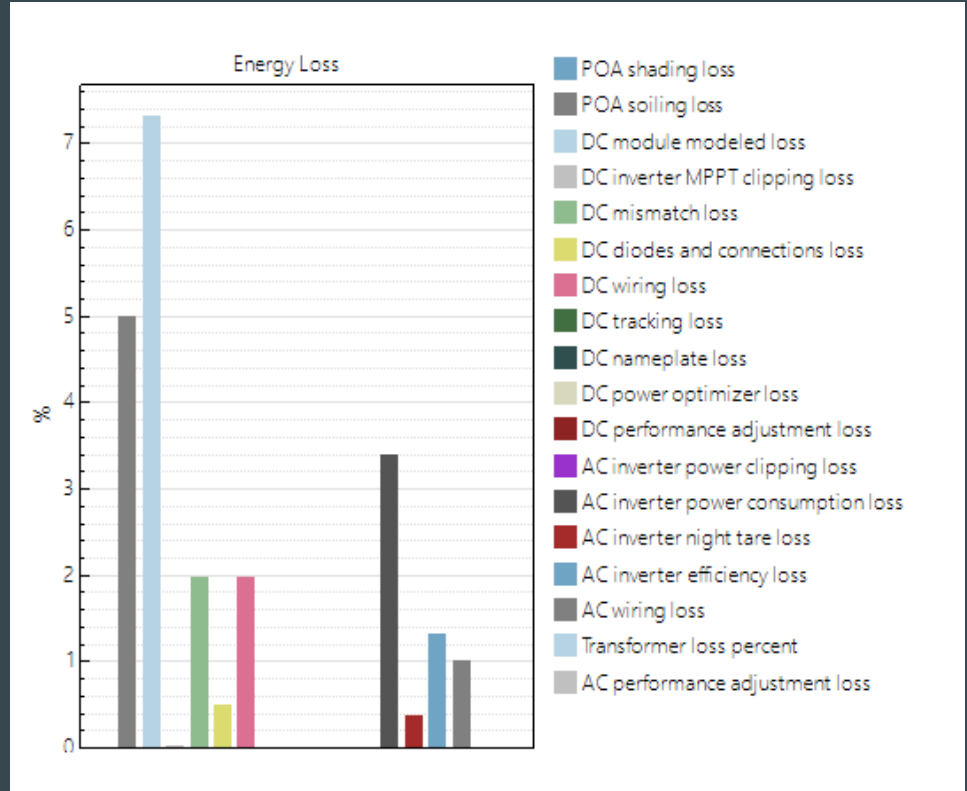
Net DC energy (kWh)
426,821

Inverter power clipping
-0 %

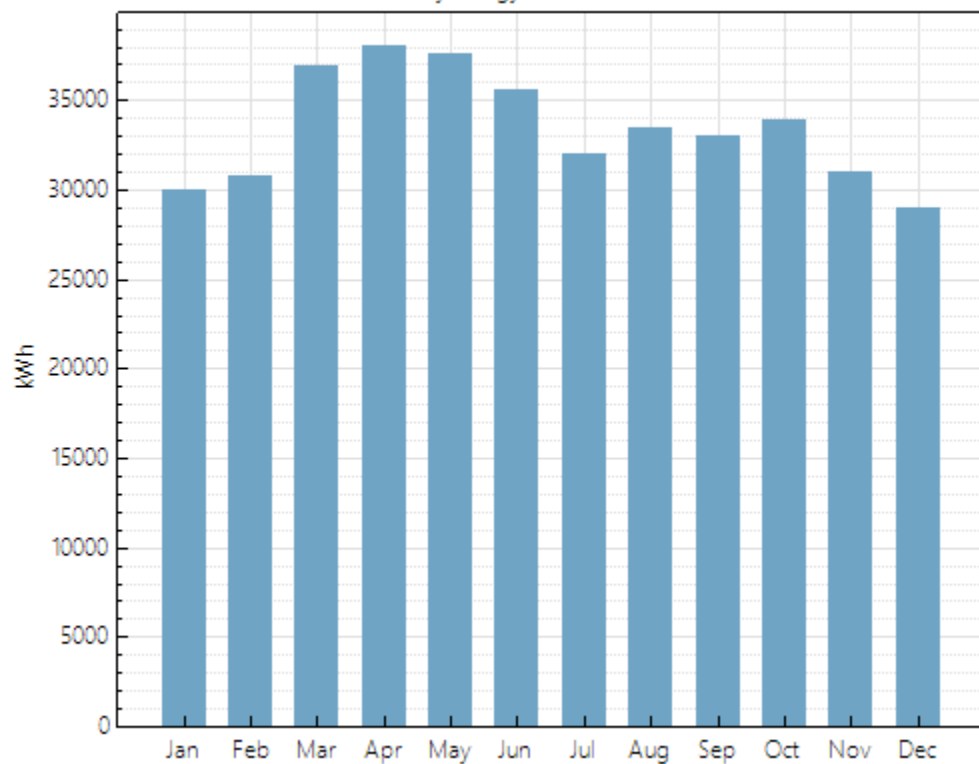
Inverter power consumption
-3.397 %

Inverter nighttime consumption
-0.369 %

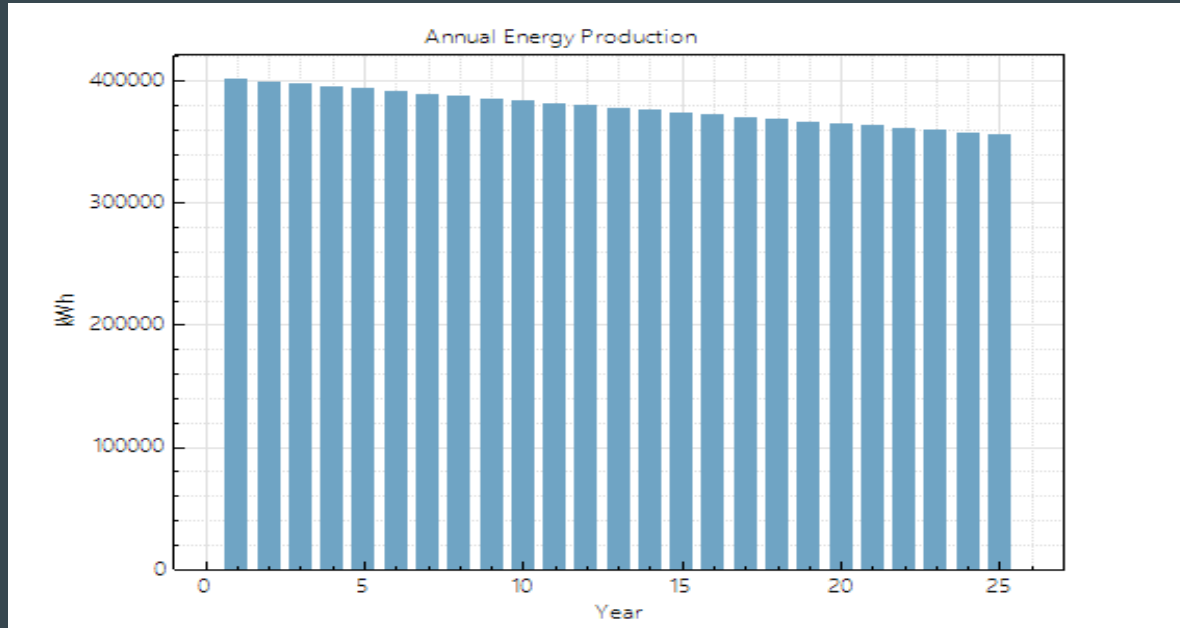
Inverter efficiency
-1.306 %



Monthly Energy Production



- annual energy yr 1: 401,293 kWh



Fixed Rack Design

- We will be designing our own rack using:
 - Concrete pier foundation: cheaper than full concrete foundation. Made up of piers/columns
 - The rack will be made of a galvanized steel body



Questions That We Have

- What's the project direction?