Economics of Solar PV

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Solar Photovoltaic systems

- where, why, how, and when?
- Yes…sun exposure is Important!
- Location, location, location.
- Environmental, economic, and policy.
- Good design is important.
- Competition helps keep cost down.
- Now vs. later and expected ROI.

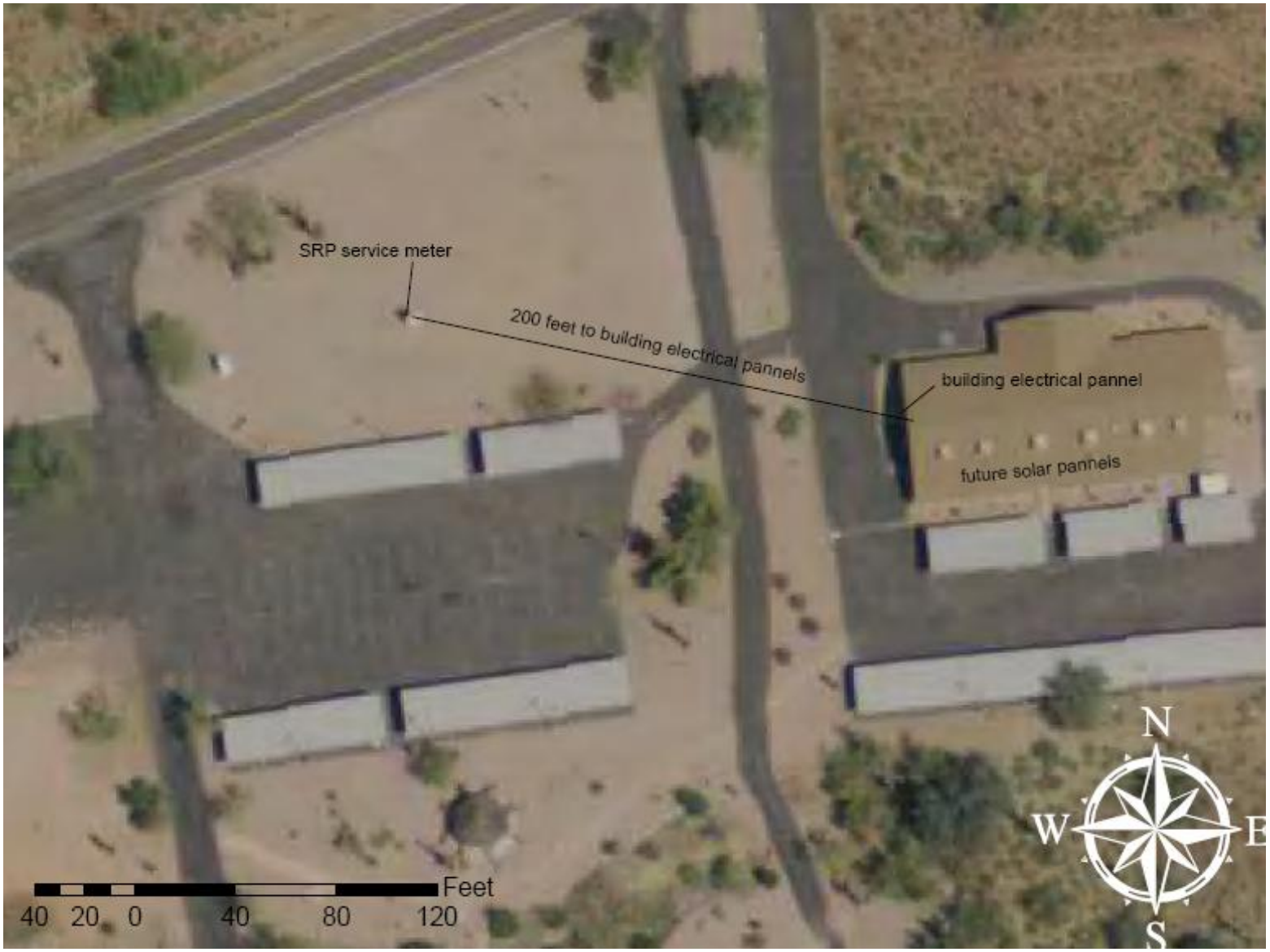
New Energy Paradigm: Distributed Generation (DG)

- Economic Reasons…focus on Solar DG
- Environmental Reasons
- Security Reasons
- Political Reasons

Solar information websites

- http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/
- http://dsireusa.org/
- http://www.arizonagoessolar.org/
- http://www.nrel.gov/eis/imby/

Location considerations



Small office building			PV Watts		
Near Phoenix, Arizona			projected		
			12.1 kw system	12.1 kw system	
	KWhr	KWhr	18.4^0 tilt	18.4^0 tilt	
	according	according	array azimuth 180^0	array azimuth 180^0	
	to utility	to Enlighten	AC energy kwh	AC energy kwh AC/DC default Derate: 0.77	
	production	production	AC/DC derate: 0.95		
	meter	meter			
year 2011					
January	1679	1730	1473	1190	
February	1587	1630	1640	1327	
March	2082	2150	2033	1646	
April	2196	2280	2320	1883	
May	2392	2480	2463	1998	
June	2238	2330	2282	1850	
July	2133	2220	2282	1849	
August	2081	2170	2223	1802	
September	1903	1980	2033	1646	
October	1849	1910	1936	1568	
November	1455	1500	1535	1239	
December	1335	1370	1396	1126	
2011 totals	22,930	23750	23616	19124	
year 2012					
January	1511	1560	1473	1190	
February	1707	1770	1640	1327	
March	2121	2200	2033	1646	
April	2146	2230	2320	1883	
May	2373	2480	2463	1998	
June	2240	2340	2282	1850	
July	1966	2060	2282	1849	
August	1981	2080	2223	1802	
September	1827	1920	2033	1646	
October	1922	2010	1936	1568	
November	1591	1660	1535	1239	
December	1407	1470	1396	1126	
	22,792	23780	23616	19124	

Return on Investment

- 54 PV modules Sharp 224 watt each
- 54 Enphase micro inverters
- Roof mounted March 2010
- Installed cost of $52,644.60
- $4.35/installed watt
- Using PVwatts & 10 cents/kwh
  - 22.3 year payback or 4.5% ROI

Apartment Complex-Mesa, AZ


Out of the desert.
Off of the rooftop.
Into the community.
PowerParasol Parking Lot 59
852 shaded surface parking spaces
Max. Generating Capacity: 2,124.00 kWdc
Est. Annual Production year 1: 3,465,000 kWh
Capacity Factor: 25.05%
Number of Panels: 7,616
Panel Size: 280 watts
System Integrator: Strategic Solar Energy, LLC
System Owner: Lot 59, LLC (NRG)
POWERPARASOL™


SUN DEVIL
SUN DEVIL
SUN DEVIL


investing in a sustainable future
Rio Salado Parkway
700 E
0 N
Packard Drive

By Ryan Randazzo The Republic | azcentral.com Tue Jun 4, 2013 10:53 AM
Interior Secretary Sally Jewell announced Monday that the department has approved a large solar-power plant in western Arizona, as well as two other projects on federal land in Nevada.

- **The Quartzsite Solar Energy Project in La Paz County, about 10 miles north of Quartzsite, would occupy about 1,675 acres of federal land administered by the Bureau of Land Management.**
- **Based on the acreage needed and size of the Quartzsite solar plant, it would pay about $894,000 a year in leases once the plant is operating, all of which goes to the federal Treasury, BLM spokesman Dennis Godfrey said.**
- **Using above information, my calculation:**
- **$894,000/1675 acres = $533.73/acre year**

Can start small

Energy Cost

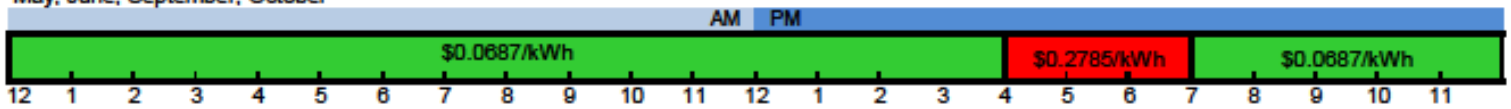
- Utility rate schedules
  - Connection costs
  - Demand charges
  - Power factor charges
  - Kilowatt-hour energy charges
  - Time of Day & seasonal factors
- Future energy cost??
- Energy storage and/or back-up power

Business EZ-3 (E-33) Price Plan

Effective: November 2012 Billing Cycle

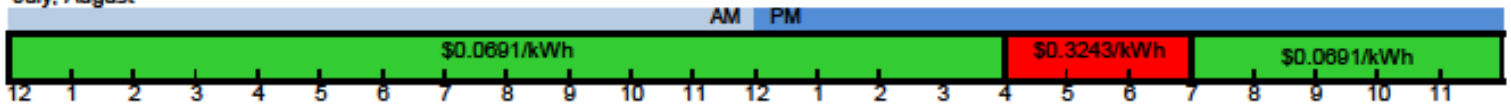
SUMMER

Monday-Friday
May, June, September, October



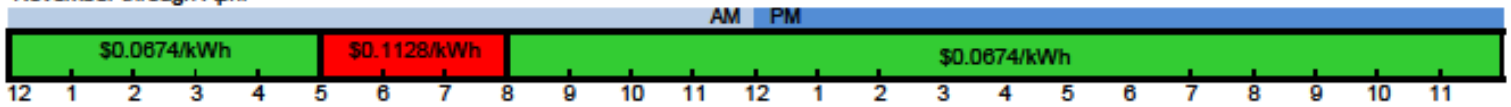
SUMMER PEAK

Monday-Friday
July, August



WINTER

Monday-Friday
November through April



Summer, Summer Peak, and Winter On Peak Demand Charge $3.33
Summer, Summer Peak, and Winter Off Peak Demand Charge $1.00
(Demand charge applies to All kW > 5 kW)

Off-Peak On-Peak

All Weekend Hours are Off-Peak

Monthly Service Charge: $9.27 plus meter charge (CT/PT $21.77 or Demand $15.60)

SRP Rate Schedules

- Rate Increase history
- Adjustments: fuel; purchased power; transmission costs; environmental program costs; & any taxes,fees, or other costs.
- E-23; “M-power; EZ-3 (time of day); Time of Use
- http://www.srpnet.com/prices/home/tod.aspx
- A number of other rate schedules (about 120 pages).

Solar Advantage

- Covered Parking with PV
- LEED points
- Public Relations
- Easy-quick install with few approval issues
- Low maintenance needs
- Easy to monitor
- Proven technology

Success Stories & Examples

- Competition is driving down the cost of installing Solar PV systems.
- Public support for renewable energy.
- Ramped up production.
- Employment.

Works at Home also

- Tax credits
- Utility incentives
- Tax advantages (not taxed on what you save)
- May not impact property tax
- Increase value of home
- Great return on investment
- Inflation Hedge

Should you install solar?

- What return on investment do you need?
- Or should you lease or enter into a PPA?
- Solar exposure?
- Roof mount, ground mount, pole mount?
- Tax credits…can you use them?
- Utility incentives?
- Your expectations about future utility rates?
- Research contractors & get bids.
- Go or no go? You decide!


TED 2210 PSI PIPE

Title for next picture

- It’s not all about the environment
- If you build it they will come
- All work and no play makes for a dull existence
- Solar and water do mix
- Where would you like to be when it is 110 degrees outside?
- Lifestyle Decisions

Questions??

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