City of Phoenix
Lake Pleasant Solar Generation Facility

2017 Better Buildings Summit
Washington, DC
May 15-17, 2017

Better Buildings®
U.S. DEPARTMENT OF ENERGY

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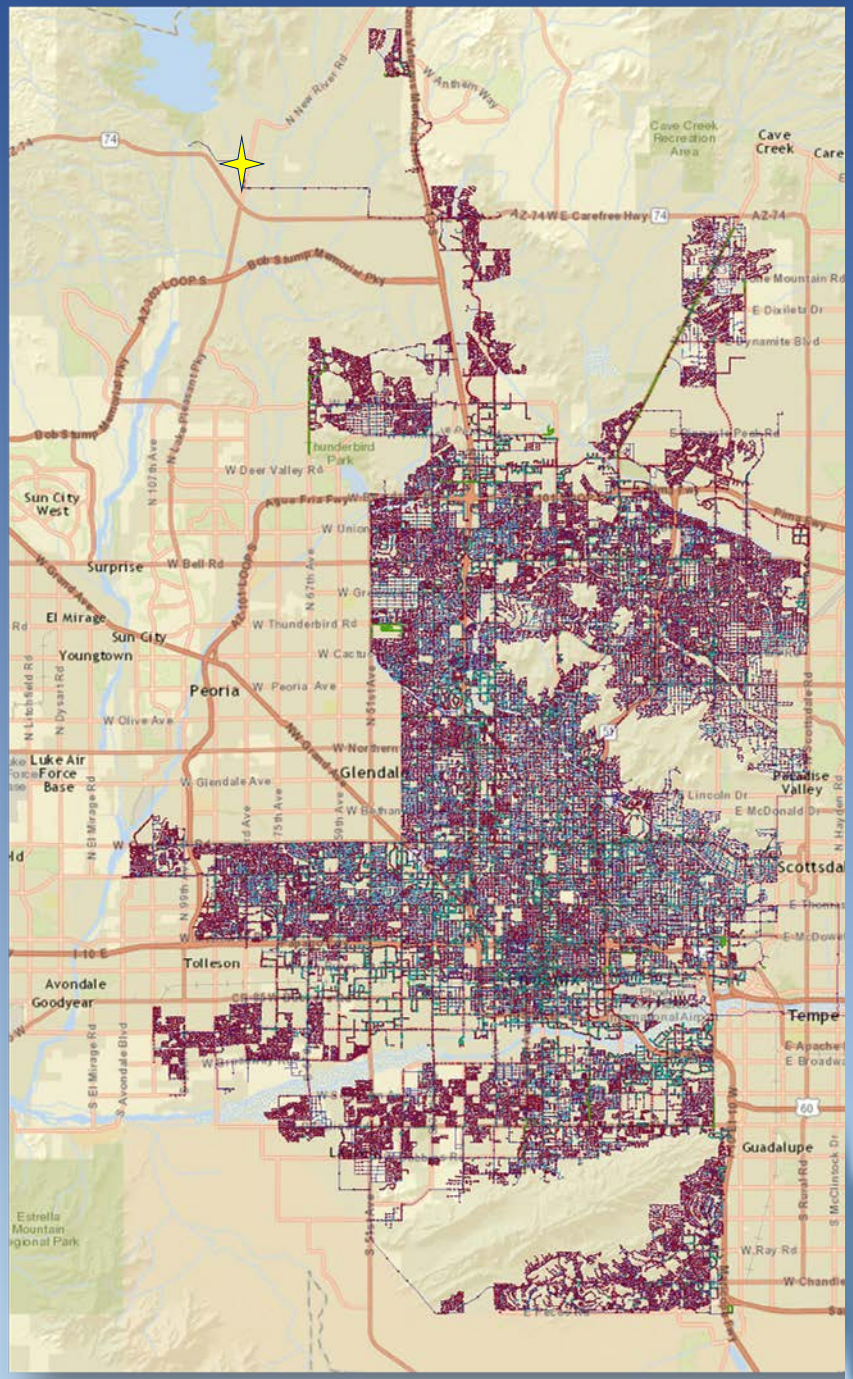
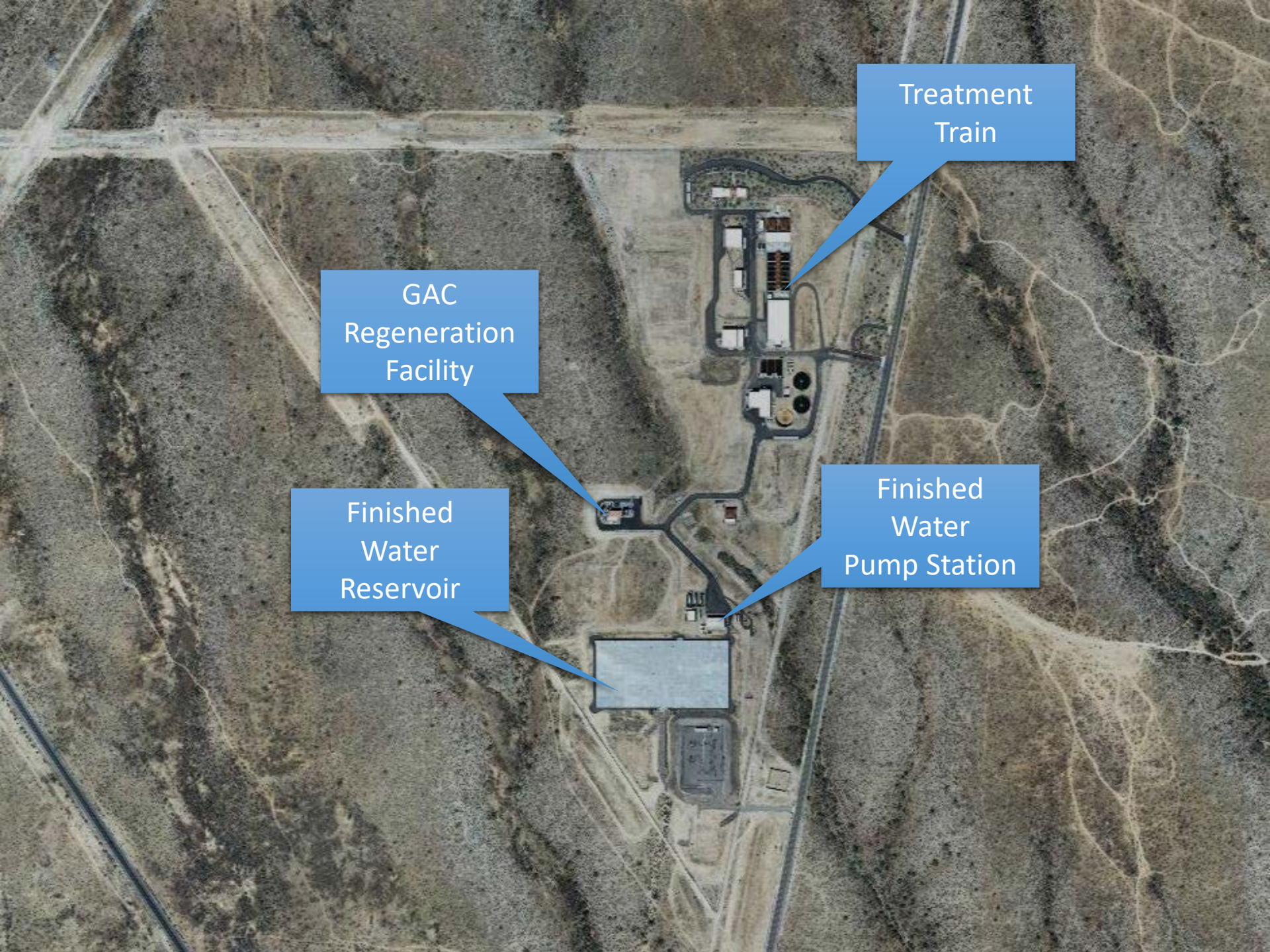
City of Phoenix
Water Services Department

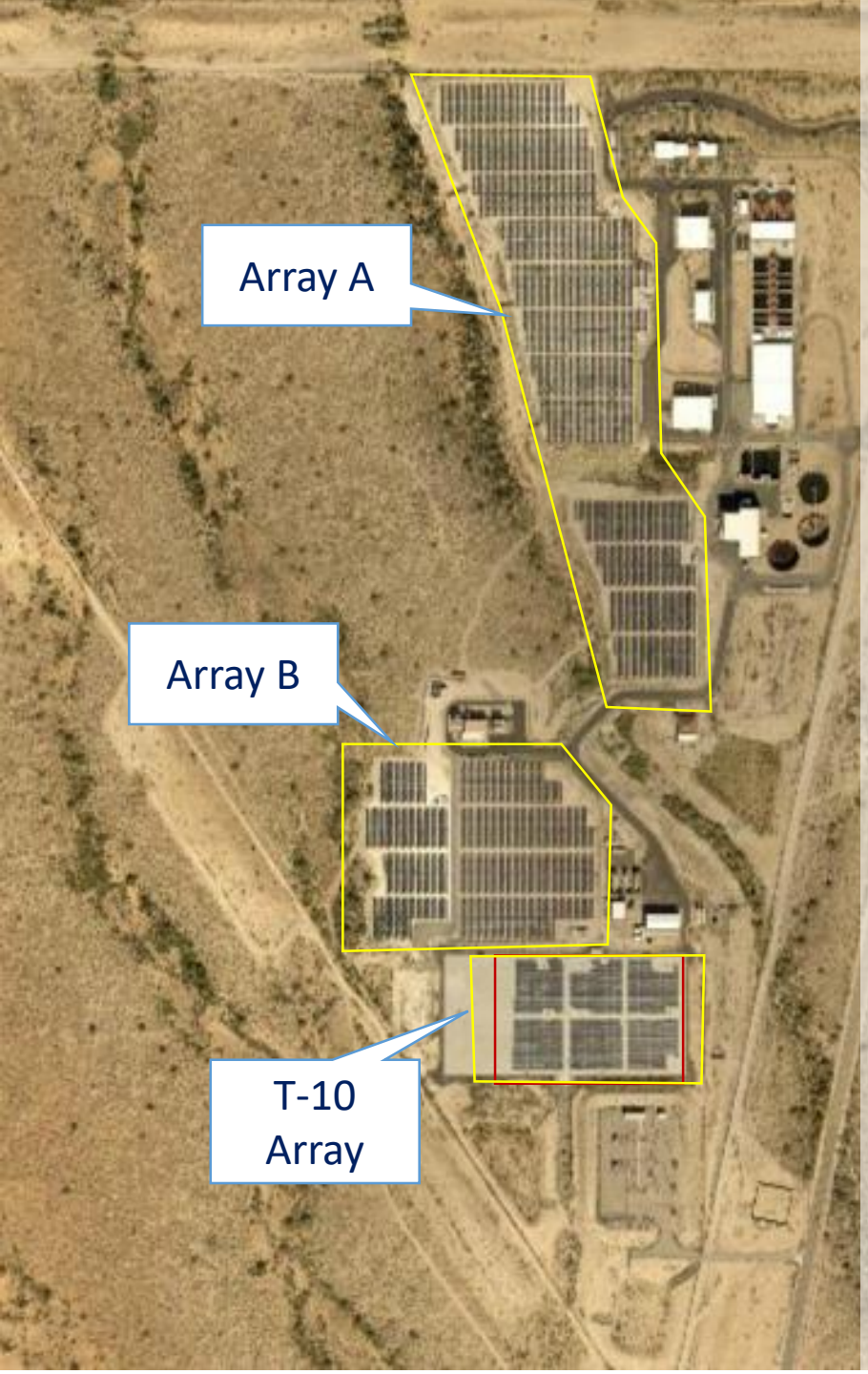


Fast Facts

- 1.5 Million Water Customers
- 8 Water Treatment Plants
- 7,000 Miles of Water Lines
- 74 Pressure Zones
- 2.5 Million Wastewater Customers
- 3 Wastewater Treatment Facilities
- 5,000 Miles of Sewer Lines
- Energy
  - 254M kWh per Year
  - $22M Energy Budget


Raw Water
Pump Station
Water
Treatment Plant


Treatment Train
GAC Regeneration Facility
Finished Water Reservoir
Finished Water Pump Station



Solar Generation Facility

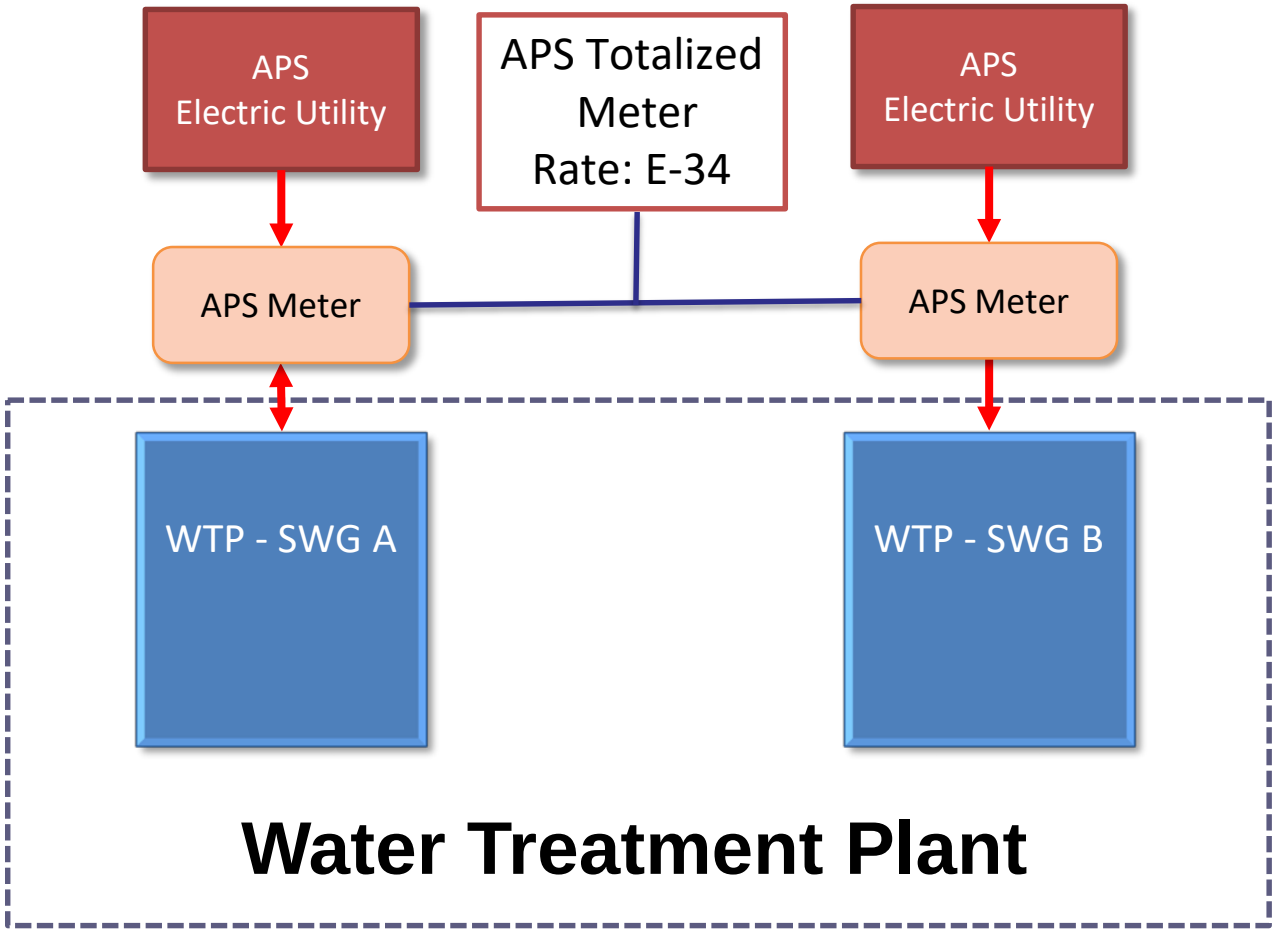
- 30 Acres
- 22,936 Solar Panels
- Power Generation
  - Tracking 6,500 kWp
  - Roof System 1,000 kWp
  - Total 7,500 kWp
- ~ 15M kWh per Year
- CO2 Offset of 9,000 Tons per Year
- $4.2M in Cost Savings over 20-Year Life of System


United Rentals
1-800-UR-RENTS
PREMIER

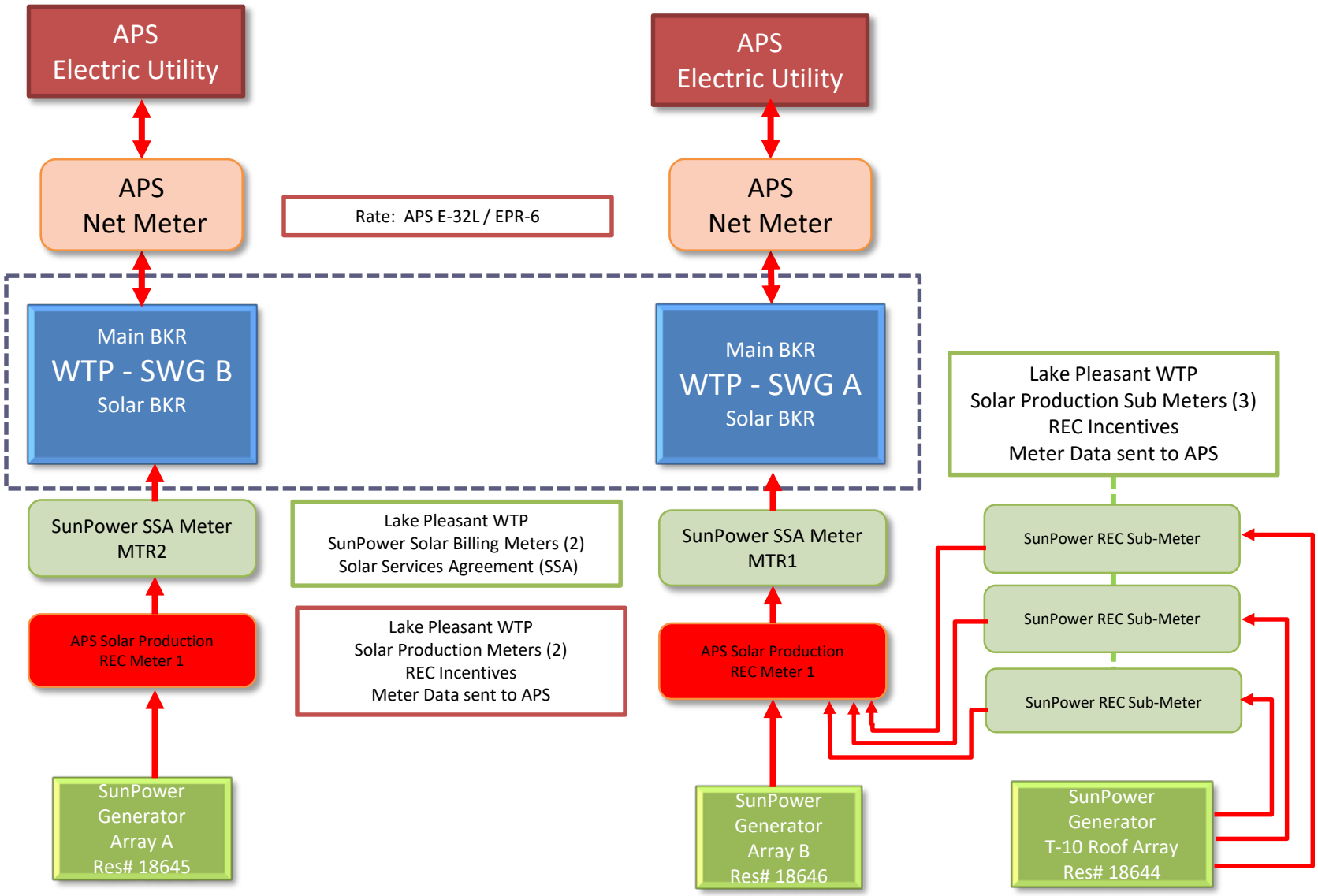
The Deal

- 20 year Agreement
- Phoenix leases land for $10.00 per year
- Solar provider constructs and maintains facility at its own expense
- Energy sold at $0.0674/kWh with a 1% annual escalation factor
- Phoenix purchases all of the kWh produced by the facility
- Solar provider gets the Renewable Energy Credits

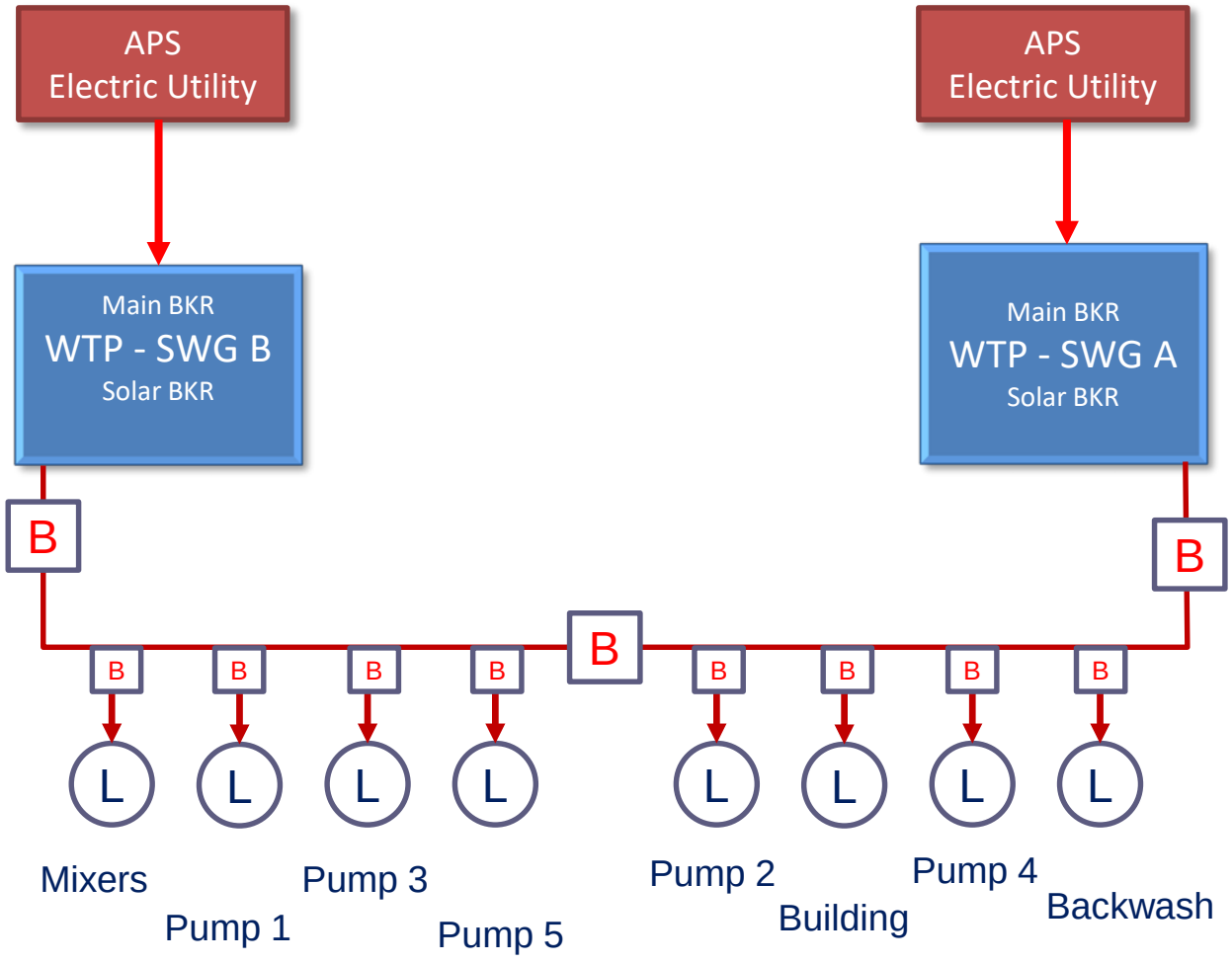
Metering Arrangement Before Solar



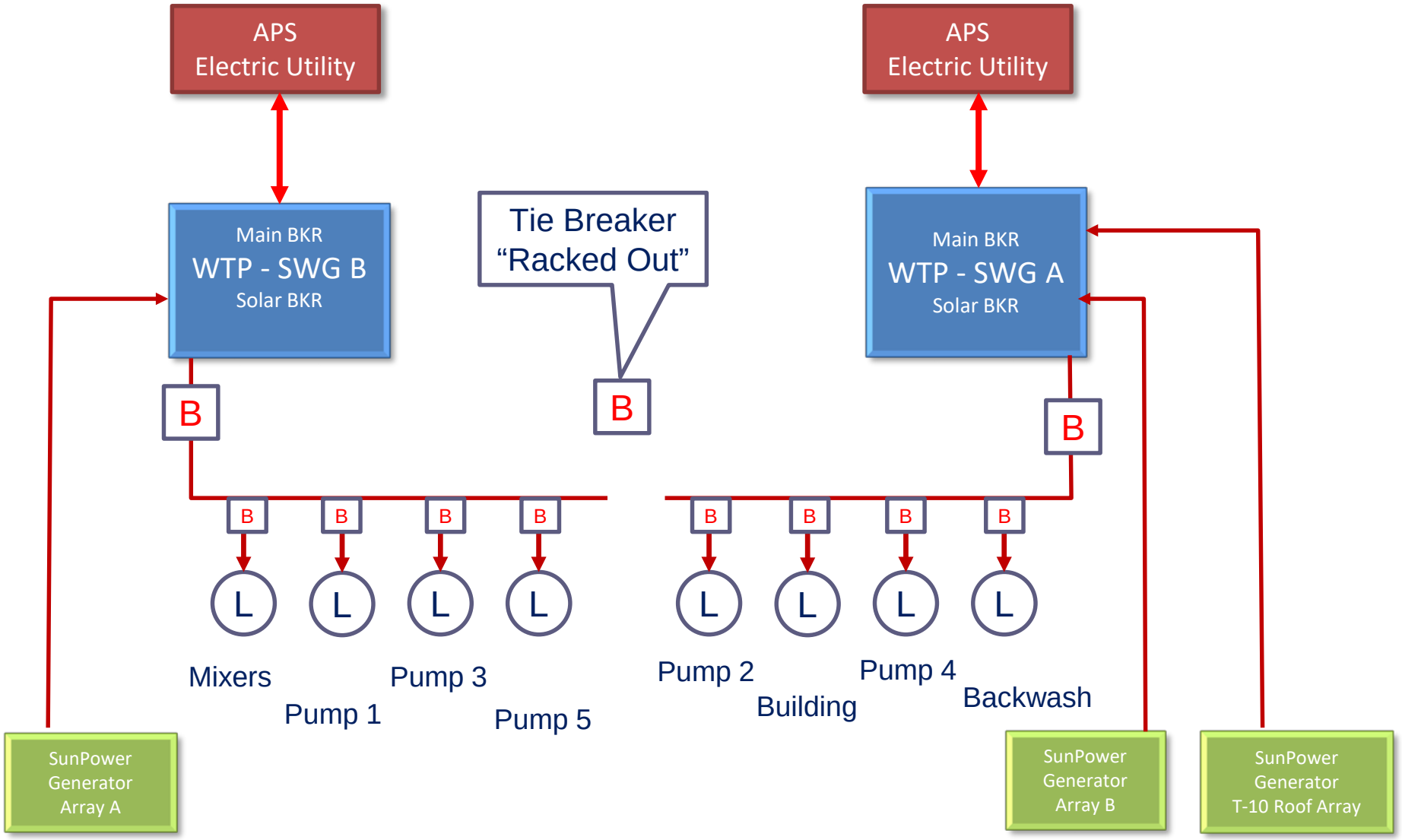
Metering Arrangement After Solar

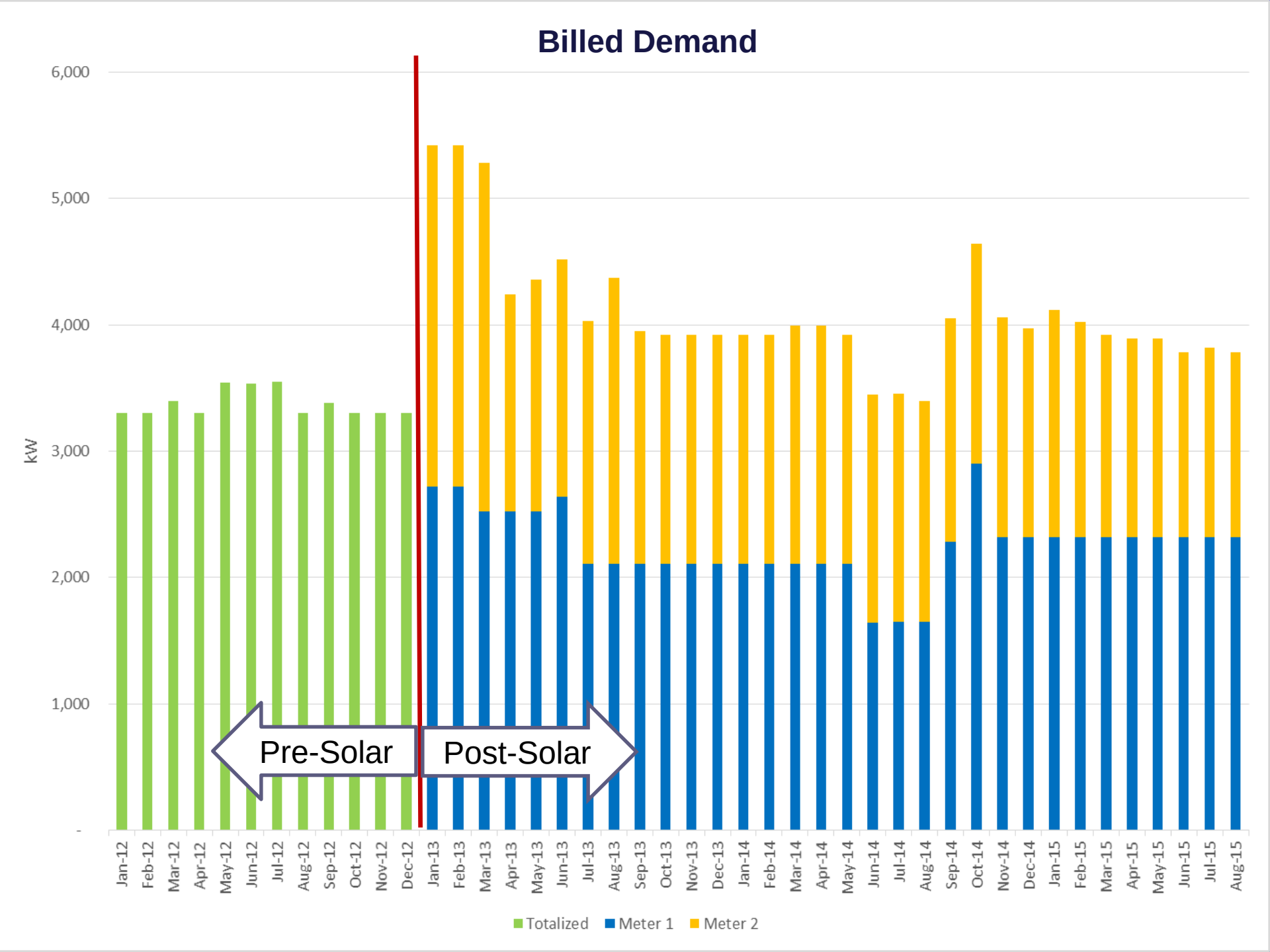


Power Distribution Before Solar



Power Distribution Before Solar




Billed Demand
6,000
5,000
4,000
3,000
2,000
1,000
-
kW
Pre-Solar
Post-Solar
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Jul-12
Aug-12
Sep-12
Oct-12
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
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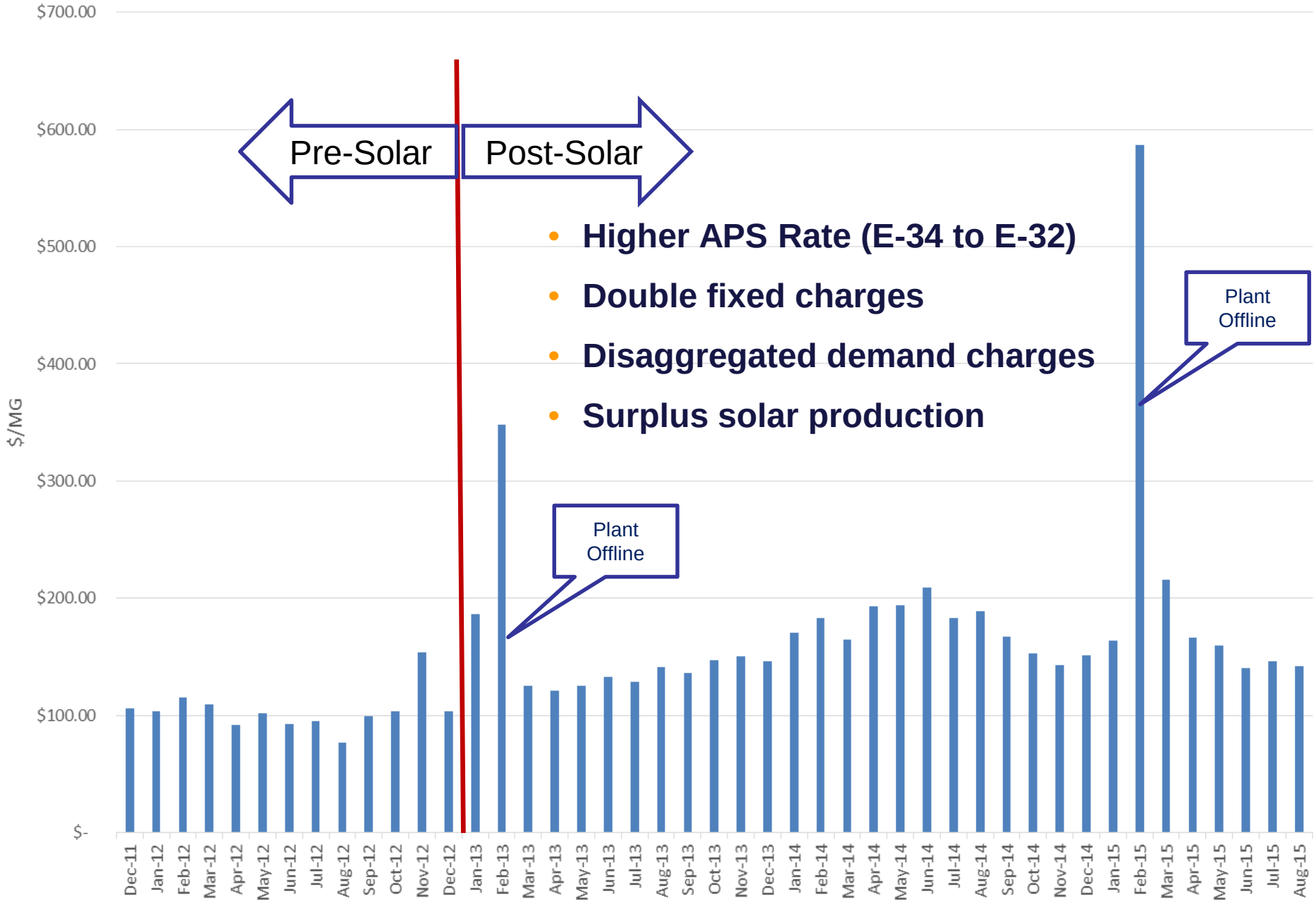
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Aug-15
Totalized
Meter 1
Meter 2

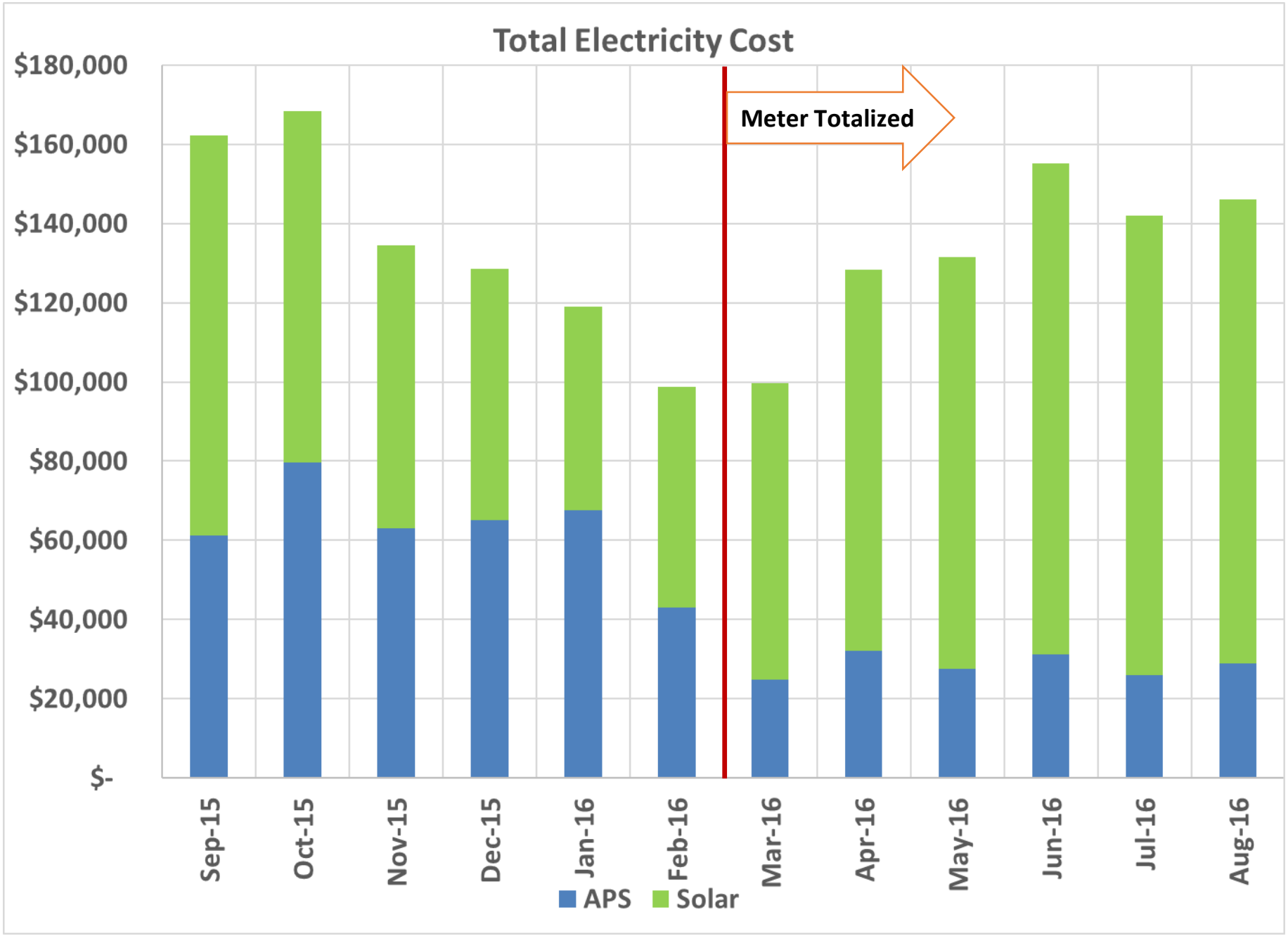
Lake Pleasant WTP Electric Cost
Per-Unit Production

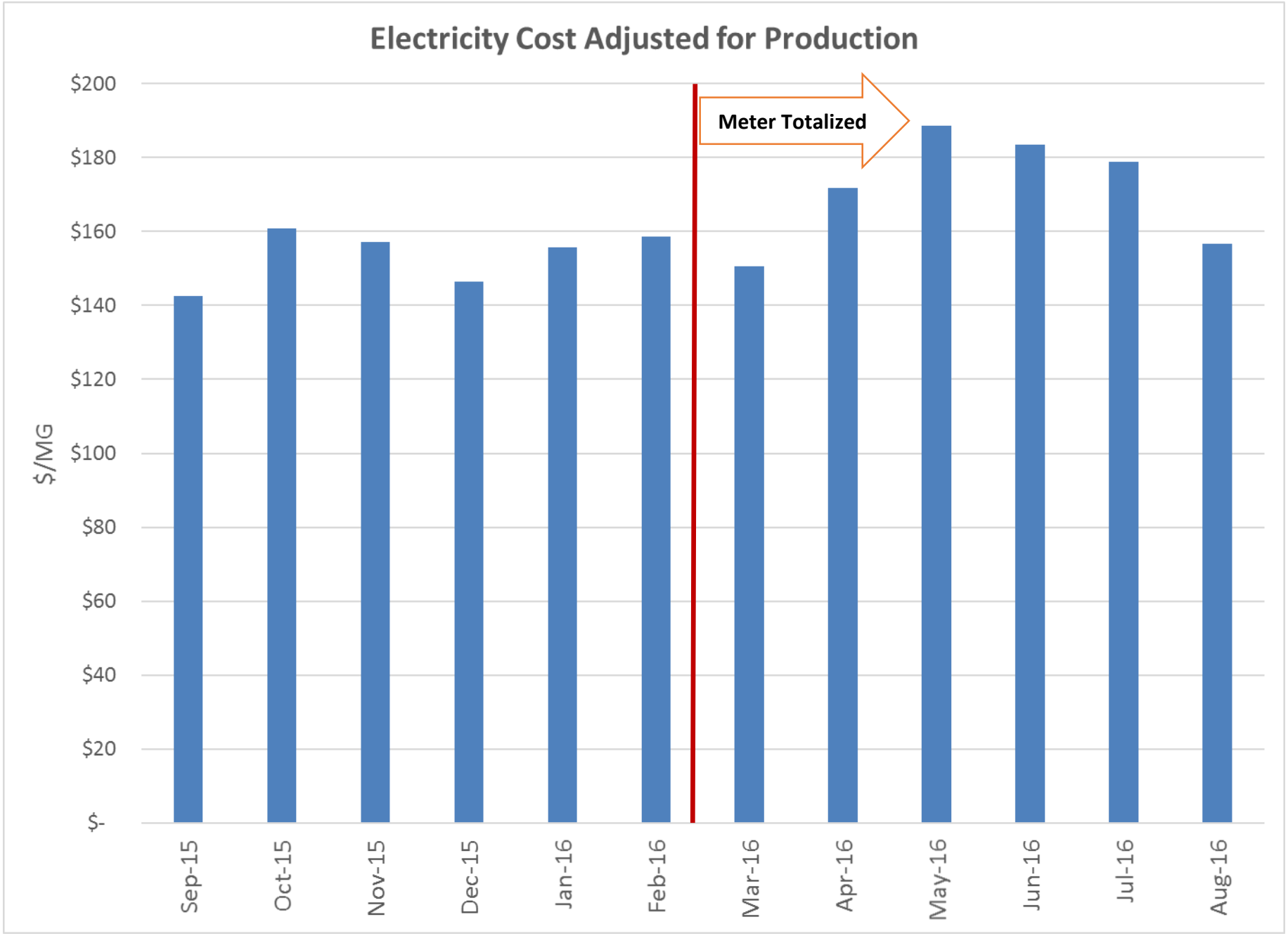


Surplus Energy Credits

	Account 59467284			Account 900647284		
Month	kWh Metered	kWh Credited	Net kWh	kWh Metered	kWh Credited	Net kWh
Jan-14	716,000	142,000	574,000	39,000	274,000	(235,000)
Feb-14	618,000	180,000	438,000	45,000	326,000	(281,000)
Mar-14	14,000	595,000	(581,000)	620,000	196,000	424,000
Apr-14	16,000	661,000	(645,000)	621,000	201,000	420,000
May-14	517,000	426,000	91,000	232,000	553,000	(321,000)
Jun-14	523,000	439,000	84,000	12,000	586,000	(574,000)
Jul-14	547,000	324,000	223,000	4,000	1,808	2,192
Aug-14	338,000	452,000	(114,000)	250,000	1,750	248,250
Sep-14	9,000	529,000	(520,000)	675,000	1,770	673,230
Oct-14	23,000	469,000	(446,000)	666,000	1,740	664,260
Nov-14	47,000	406,000	(359,000)	809,000	1,740	807,260
Dec-14	48,000	224,000	(176,000)	770,000	1,650	768,350
Total	3,416,000	4,847,000	(1,431,000)	4,743,000	2,146,458	2,596,542

Surplus Credits	**1,431,000**	**0**
Puchased from SunPower @ $0.0681 / kWh	**$ 97,414**	
Sold to APS @ $0.02895 / kWh	**$ 41,427**	
Operating LOSS	**$ 55,986**	


Total Electricity Cost
$180,000
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$-
Meter Totalized
Sep-15
Oct-15
Nov-15
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
APS
Solar


Electricity Cost Adjusted for Production
$200
$180
$160
$140
$120
$100
$80
$60
$40
$20
$-
$/MG
Meter Totalized
Sep-15
Oct-15
Nov-15
Dec-15
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16

We're Currently Upside Down

But the future is bright…

- **We are continuing to offset our carbon footprint**
- **We are locked into a low rate of escalation in solar cost**
- **Water production (energy use) will eventually increase so all solar credits are used**

It's Not Easy Being Green

Lessons Learned

1. ***Never every*** have a solar generation system sized larger than what your facility needs on a monthly basis.
2. ***Understand*** how solar may impact how loads can be distributed within your facility.
3. ***Understand*** how solar may impact you electric bill
    1. May shift account(s) into a less attractive tariff
    2. May loose benefit of totalized metering
    3. Demand charges may not go down, but may in fact go up
4. ***Be prepared*** to spend time reviewing both solar and grid electric billing to ensure it is being done correctly.
5. **Get expert advice** from a third party before entering in a solar agreement.