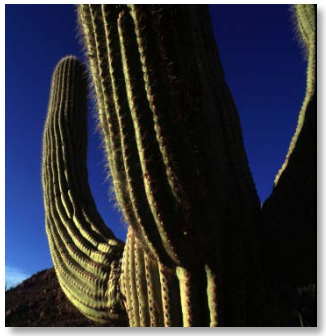
UNS Energy Corporation

TEP and Renewable Resources

TEP

UniSourceEnergy SERVICES



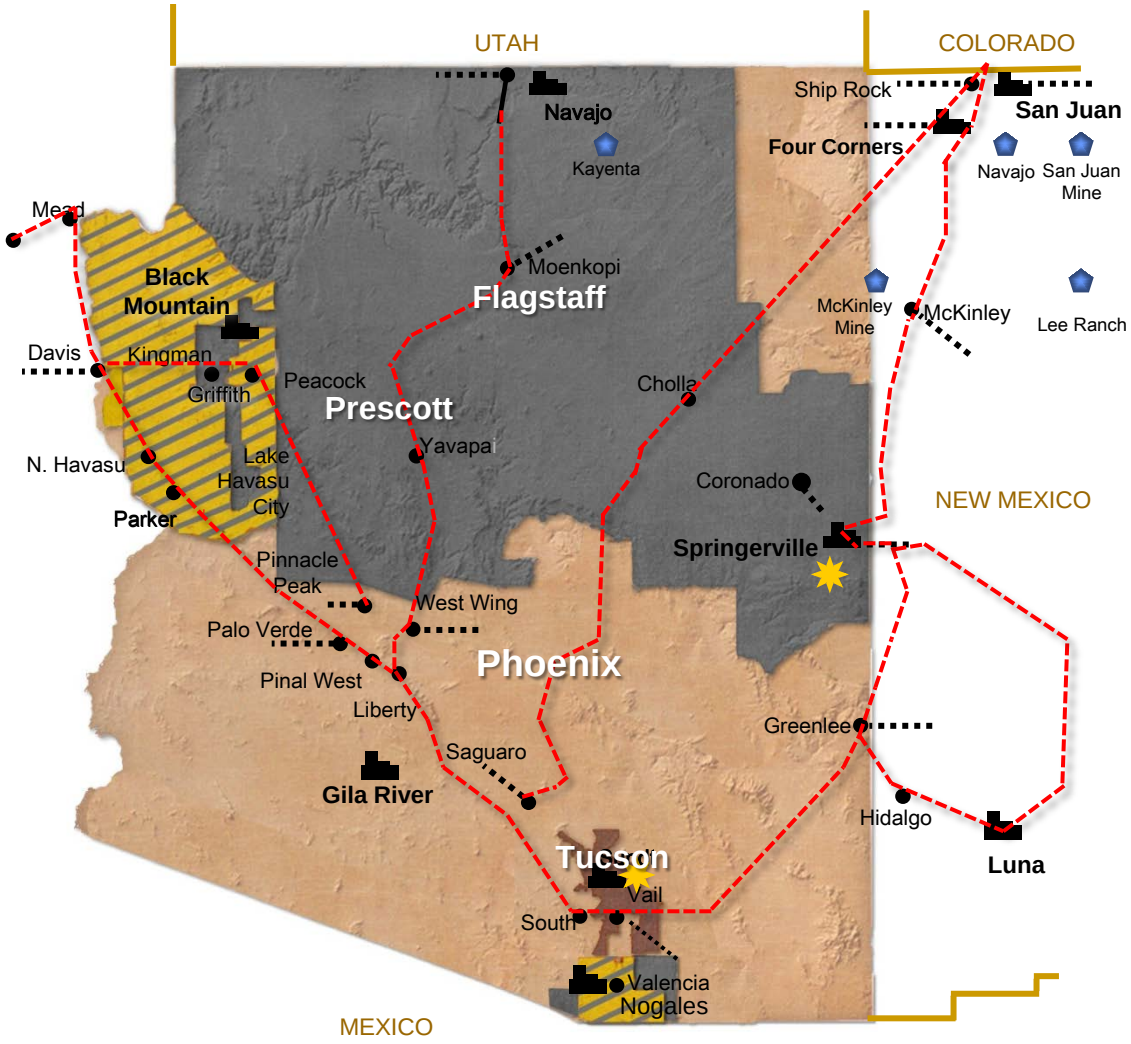





May 2015

Carmine Tilghman
Senior Director – Energy Supply

Generation and Transmission Resources



Service Areas / Customers

- TEP 404,000 customers
- UNS Gas & Electric
- UNS Gas 148,000 customers
- UNS Electric 91,000 customers

- Generating Station
- Coal Mine
- High Voltage Transmission Lines
- Interconnection With Other Utility
- Substation
- Solar Station

What's Required?

All utilities, under the regulation of the ACC, are required to comply with Arizona Renewable Energy Standard (RES).

- Req'd to serve 15% percent of retail load with renewable energy by 2025.
- 30% of total must be from customer-sited distributed resources, split equally between residential & non-residential.
- Req't for 2015 – 5.0% or the equivalent of approx. 38,000 homes.
- TEP currently at 7%. Current projects under development will push that percentage to almost 9% by mid 2015.

TEP's Philosophy

- TEP understands – and supports – the "evolution" of the electric industry.
- The "grid" – or the interconnected electrical infrastructure that provides reliability – will not be replaced or dismantled.
- The grid will continue to be upgraded to provide for greater "integration" of new technologies.
- Committed to the continued reduction of fossil fuels and integration of renewable energy
- Spent nearly $160 million to develop & own solar facilities, with another $130 million planned by 2020
- Future projects and expenditures will focus on storage, new programs

Challenges

While there are many challenges associated with the integration of renewable energy into the existing electric grid, they can be narrowed down into two categories:

1. Grid operational challenges (volt/VAR & freq, energy supply, ramping, etc.)
2. Rate design issues (grid access, benefits & costs, stranded costs, etc.)

Technical Issues

- DG not integrated with utility's Supervisory Control & Data Acquisition (SCADA) system, leaving utility to "drive blind"
- Inability to integrate and control inverters for volt/VAR & frequency support renders "smart" inverter meaningless
- High penetration level resulting in new system verification check to ensure shared transformers do not exceed capacity based on all combined installed systems
- Neither existing utility infrastructure nor operations designed to efficiently integrate DG

Policy & Pricing Issues

- Solar DG customers' "production" does not align with their own "consumption"
- Solar DG production not coincident with system peak (applies to all solar, but more pronounced with fixed DG)
- Existing rate design that sends uneconomic (system) price signals and shifts costs to non-DG customers under traditional cost-of-service models using historical rate design
- Carbon pricing / Value of Solar / Utility-Scale vs. DG

Rate Design & Net Metering

Existing residential rate – non NEM:

(avg. customer ≈ 11,400 kWh annually)

Customer Charge:	*$10.00*
Delivery Services:	*$57.44*
Power Supply:	*$30.91*
Total:	*$98.35*

- *Does not incl. taxes, surcharges, etc.*

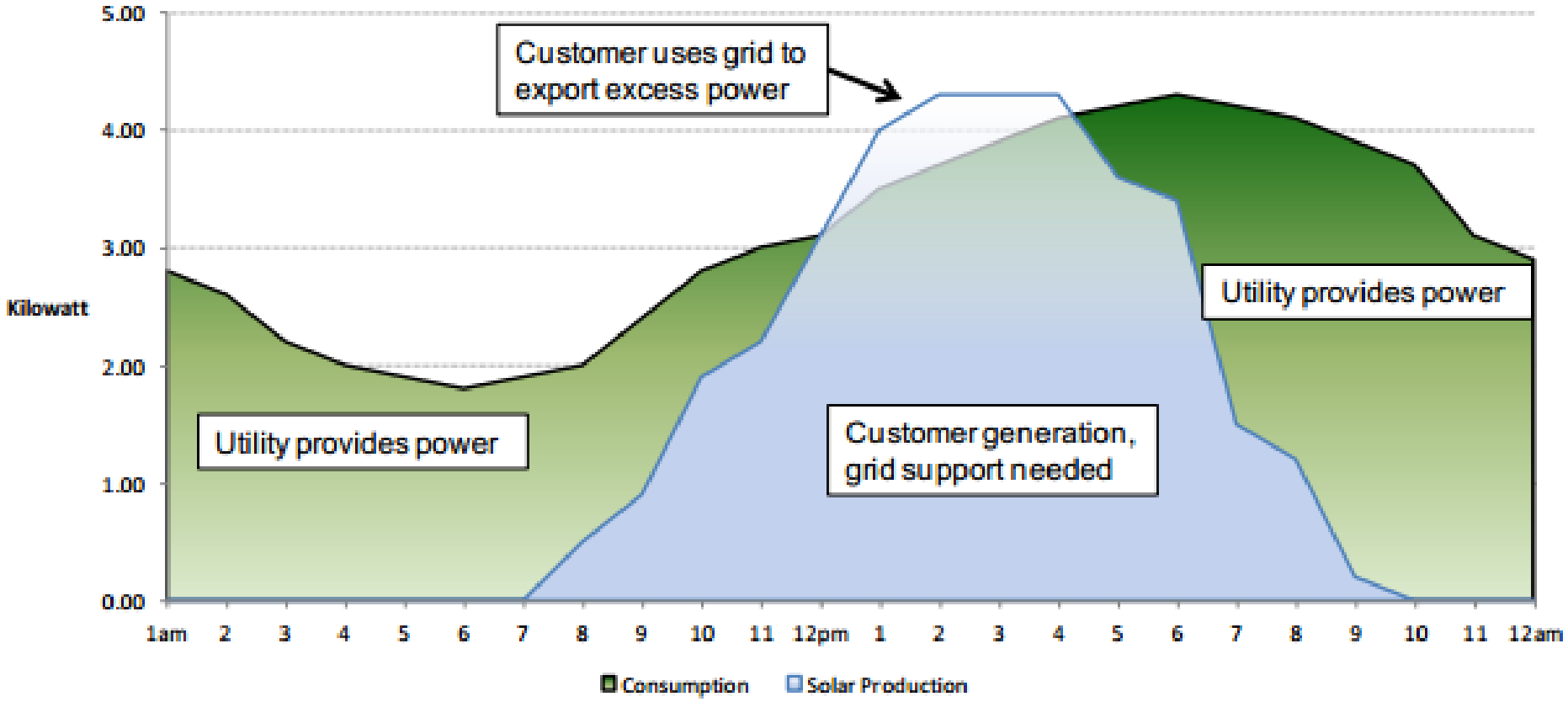
Net Energy Metered (net zero)

Customer Charge:	*$10.00*
Delivery Services:	*$0*
Power Supply:	*$0*
Total:	*$10.00*

- *Delivery Services = cost shift*
- *Power Supply = savings*
- *Loss of taxes, EE & RE recovery*

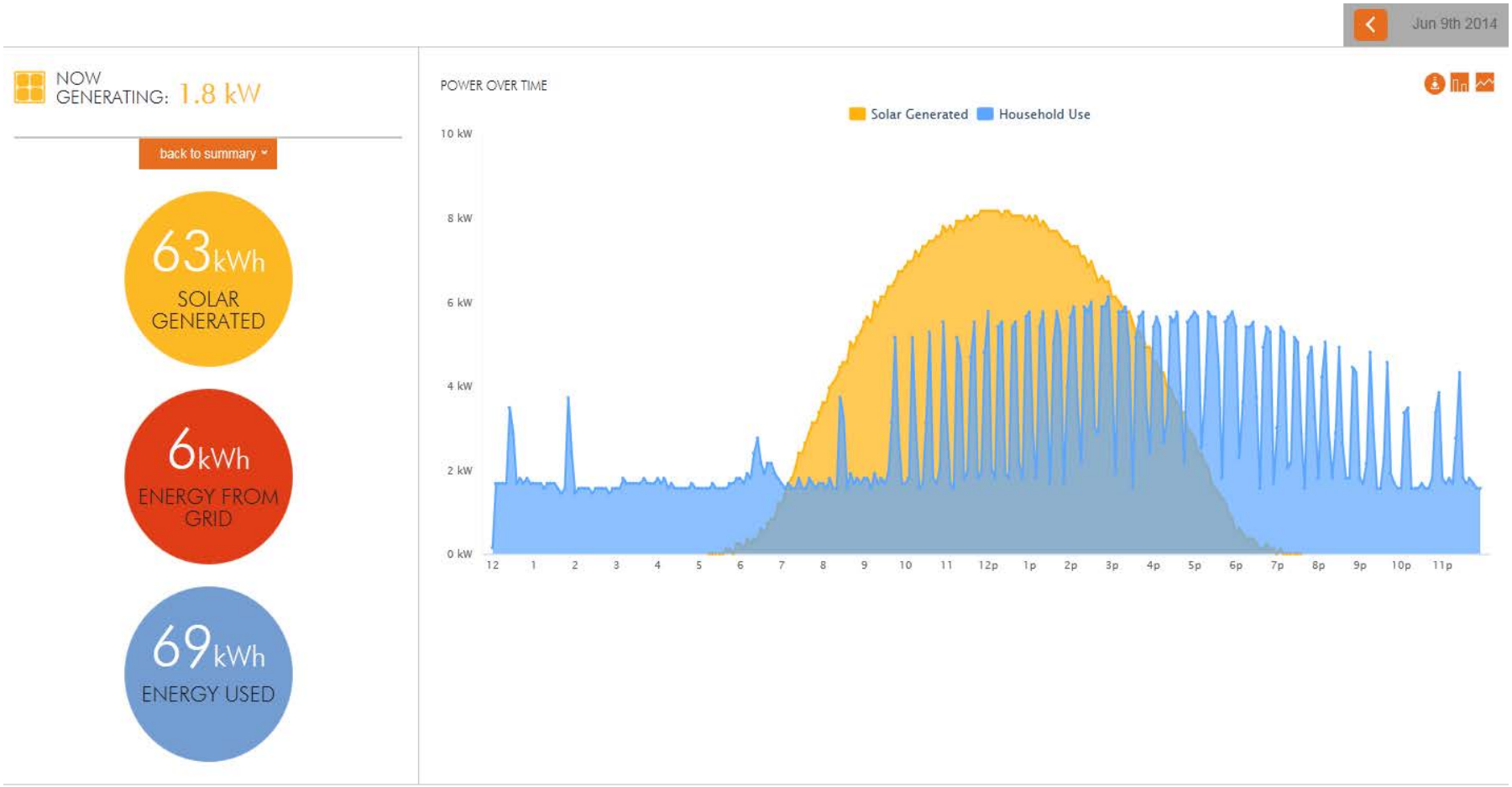
Typical Grid Interaction with Rooftop Solar

Value of the grid: rooftop solar customers use the power grid 24 hours a day

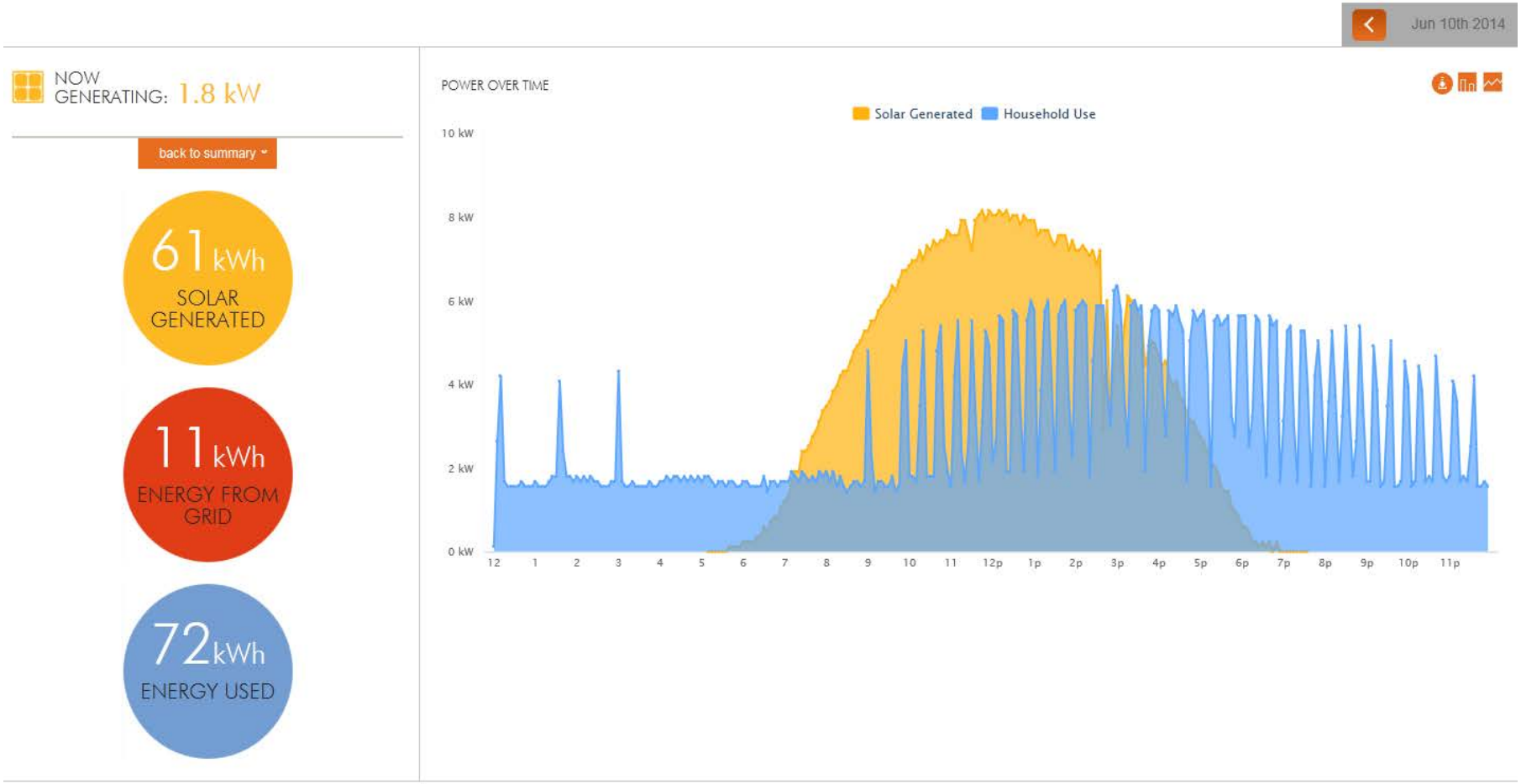


IEE INNOVATION ELECTRICITY EFFICIENCY
An Institute of The Edison Foundation

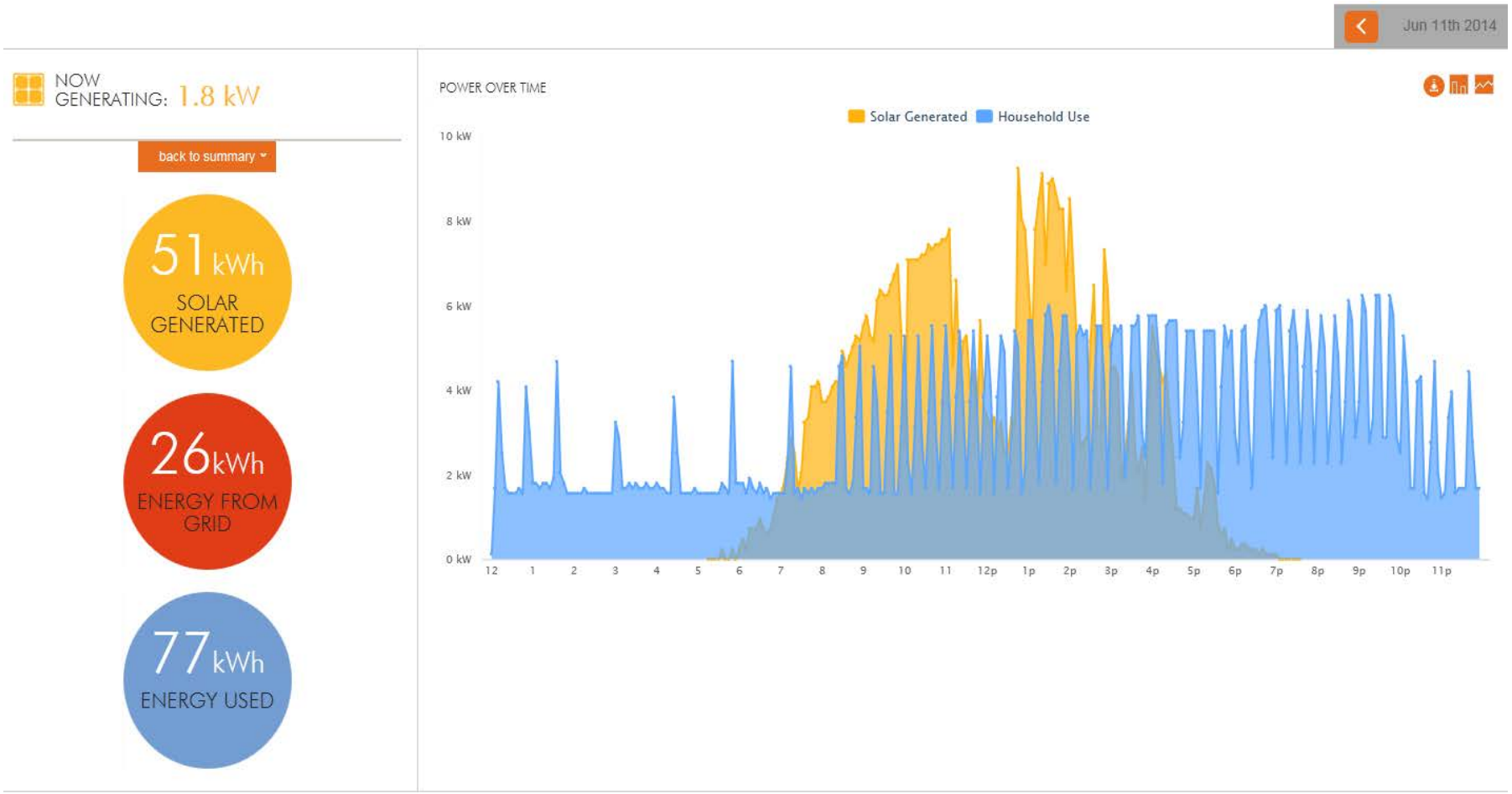
Actual Consumer Usage Vs. DG Production
June 9, 2014



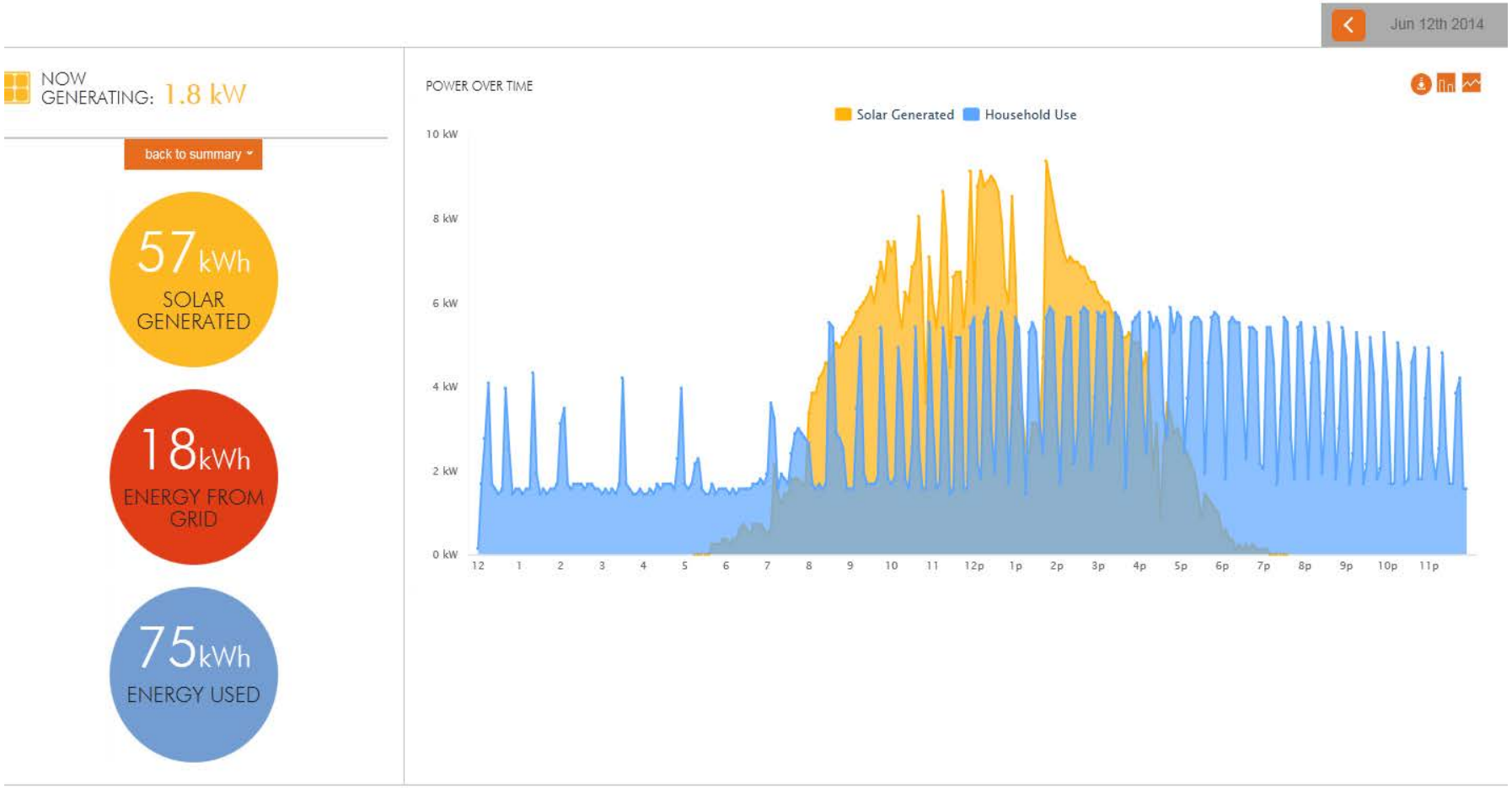
Actual Consumer Usage Vs. DG Production
June 10, 2014



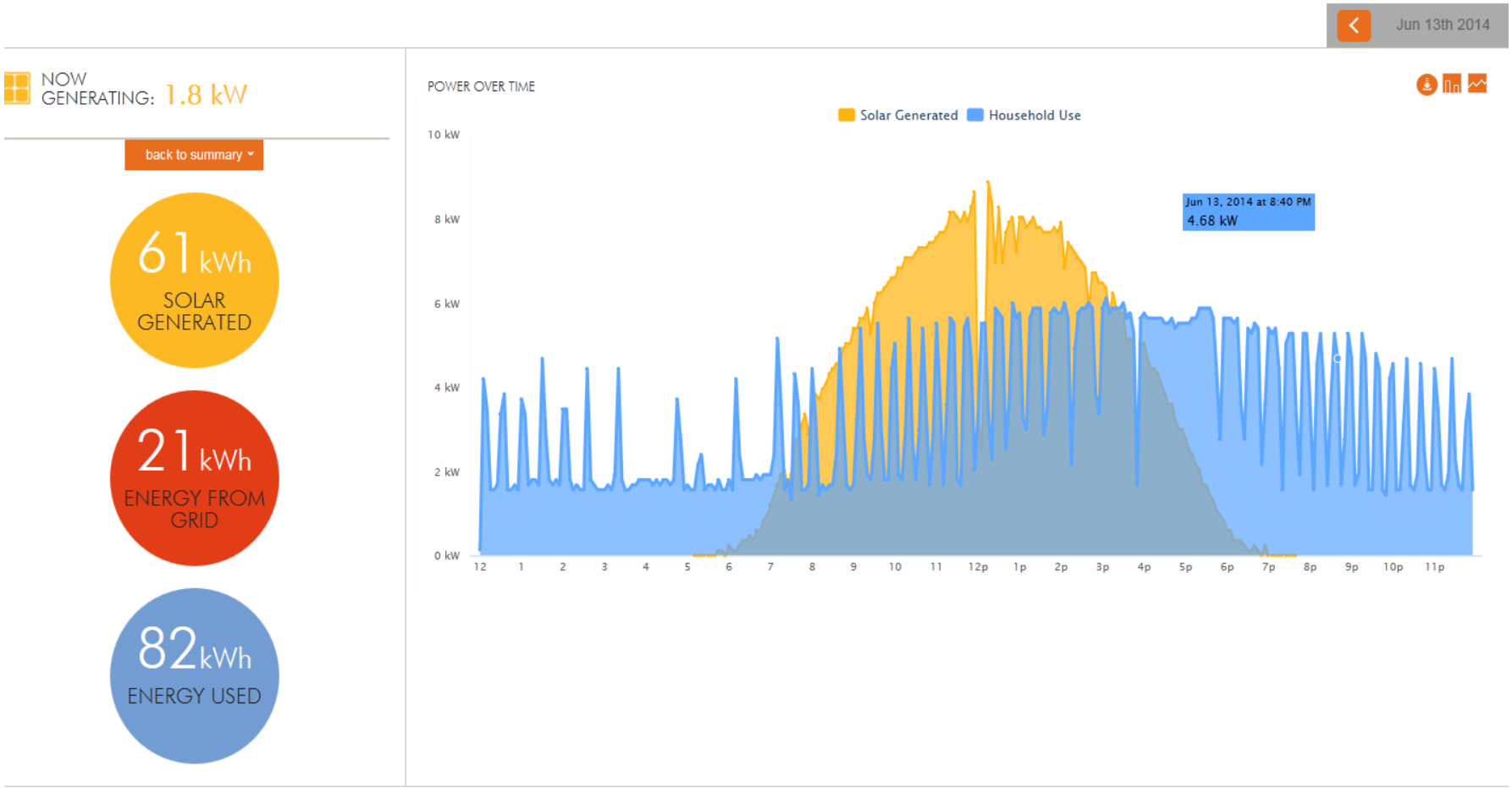
Actual Consumer Usage Vs. DG Production
June 11, 2014



Actual Consumer Usage Vs. DG Production
June 12, 2014



Actual Consumer Usage Vs. DG Production
June 13, 2014



Renewable Update

- **Fort Huachuca Solar**
  - First of its kind and a model for utility-owned renewable projects on military bases
  - TEP-owned 17.2 MW array dedicated in February
  - Will increase by 5 MW
  - 30 year easement using existing GSA area-wide contract; no increase to utility bill
- **AREVA Solar Steam Generator**
  - 5 MW boost project at Sundt Generating Station Unit 4
  - Offsets coal and natural gas
- **TEP-owned Rooftop Solar Program**
  - Currently in soft launch, full launch on July 1
  - ≈ 3.5MW on 600 homes
  - Fixed rate tariff for 25 yrs





In 2015, TEP will have 330 MW of total renewable generating capacity = 70,000 homes

Renewable Update

- **Forecasting**
  - Developed through University of Arizona
  - In place, being fine tuned
  - Renewable Energy Forecaster on staff
- **Energy Storage Solution**
  - RFP currently under way for 10 MW capacity
  - Primary function if frequency control
- **Project expansions**
  - Increased Avalon project from 35 to 55 MW – sub $0.059/kWh
  - Increased Torch Wind & Solar facility to 90 MW - sub $0.051/kWh
- **Programs**
  - One of the Nations' first Community Solar program
  - Expect to revise it in 2016





In 2015, TEP will have 330 MW of total renewable generating capacity = 70,000 homes

TEO Owned DG Example

- **Average residential usage on standard rate**
- **Previous 12 months usage: 11,414 kWh - $117.50/month**

VAIL, AZ 85641-2558

R-10-Residential Solar - Company Owned Program (Service No.) 03/17/2015 to 04/16/2015

Solar Fixed Rate	99.17
Renewable Energy Standard Tariff	2.19
DSM Surcharge - kWh 951.00 @ $0.002311	2.20
ACC Assessment	0.20
RUCO Assessment	0.03
State Sales Tax	5.87
Regional Transportation Authority Tax	0.52
TOTAL CURRENT CHARGES - Electric Service	111.18
With Rate R01, your Bill would have been:	86.75

New Solar Fixed Rate

New Total - Solar Fixed Rate + Taxes

Meter	Unit of Measure	Next Read Date	Current Read Date	Prior Read Date	Days	Current Reading	- Prior Reading	= Reading Difference	x Multiplier	= Usage
AMRS-339176	KWH	5-13	4-16	3-16	31	8250	7740	510	1	510

- **New solar fixed rate: $99.17 - Fixed for up to 25 years**
- **New total monthly payment: $111.18**

TEP 2012 Investor Owned Utility of the Year



Single Axis Tracking Systems 45 MW
- U of A Science & Tech Park
- Foresight & Sun Edison Projects



Sundt
Power Boost
CSP Project 5MW



Flat Panel PV 40 MW
- Springerville
- NRG Solar



Concentrated PV 4 MW
- U of A Science & Tech Park
- Emcore



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Wind 50 MW
- Macho Springs
- Red Horse (2016)