

# Tacoma Power and Solar Energy

**Tacoma Power**

**May 9, 2017**

# Presentation Overview

- ✓ Tacoma Power's Power Supply Portfolio
- ✓ Focus on Solar, Facts and Challenges
- ✓ Tacoma Power's Programs

# BACKGROUND

# Tacoma Power's Service Area



- 180 square mile service area
  - Tacoma, Fircrest, University Place and JBLM;
  - Portions of Fife, Lakewood, Federal Way, Steilacoom, unincorporated Pierce County
- ~174k customers (435k people)
  - 155k residential, 18k commercial/industrial plus JBLM
  - 54% inside Tacoma city limits
- 3<sup>rd</sup> largest Public Utility in WA
  - Average use about 530 aMW
  - Winter peak use about 900 MW

# Tacoma Evaluates the Need for Resources to Meet Customer Use Every Two Years

- Objective:
  - Minimize cost and risk to customers
  - Maintain high reliability
  - Environmental stewardship
- Review all potential resources, including solar
- 2017 IRP update in development

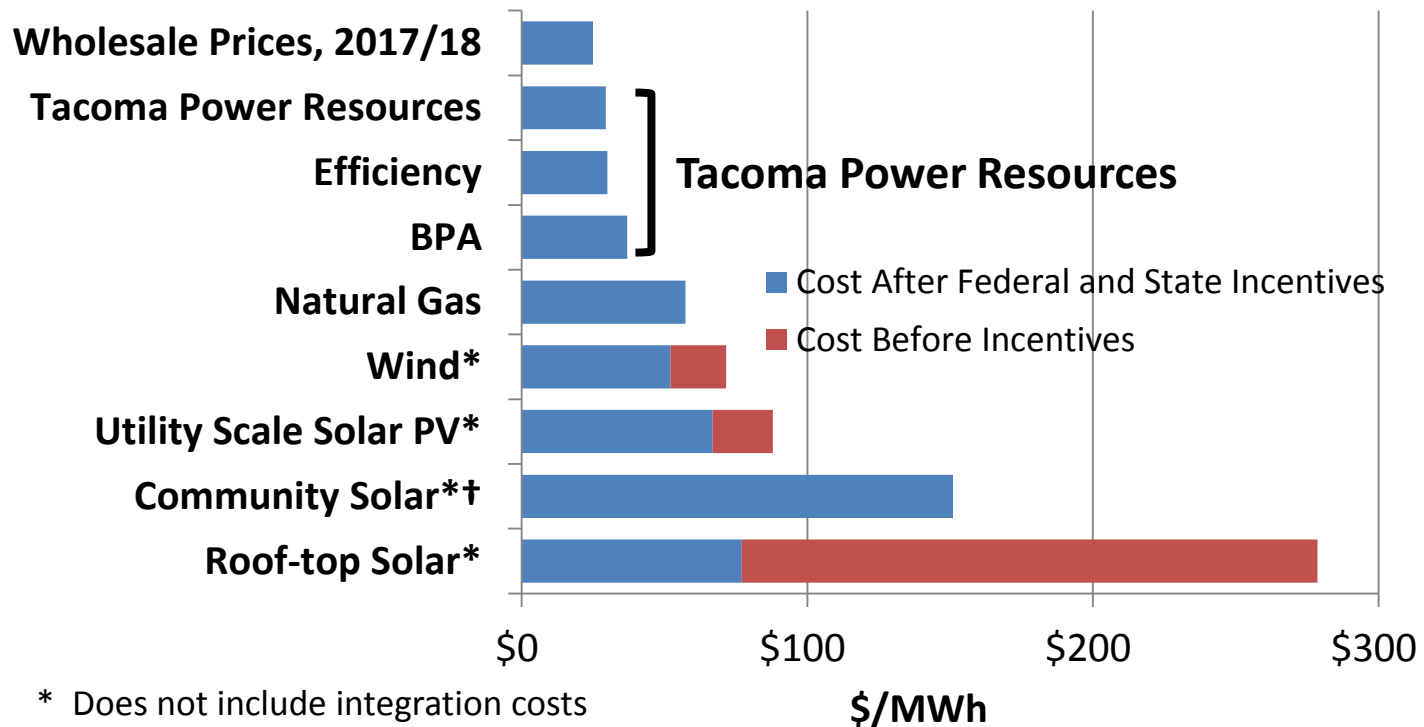


# Tacoma Power's Renewable Resources

- Major Hydroelectric Projects
  - Mossyrock/Mayfield (Cowlitz)
  - Cushman No. 1 & 2 (Cushman )
  - Alder/La Grande (Nisqually)
- Long-Term Contract with BPA
  - $\frac{1}{2}$  to  $\frac{2}{3}$  of annual energy resources
- Central WA Irrigation Projects
- Other Smaller Resources
  - Wynoochee, Hood Street Canal, Portion of Grant County PUD hydro
- Renewable Energy Credits (RECs): Wind and pending solar



# Tacoma Power's Resources Are Low Cost Relative to Other Renewable Resources

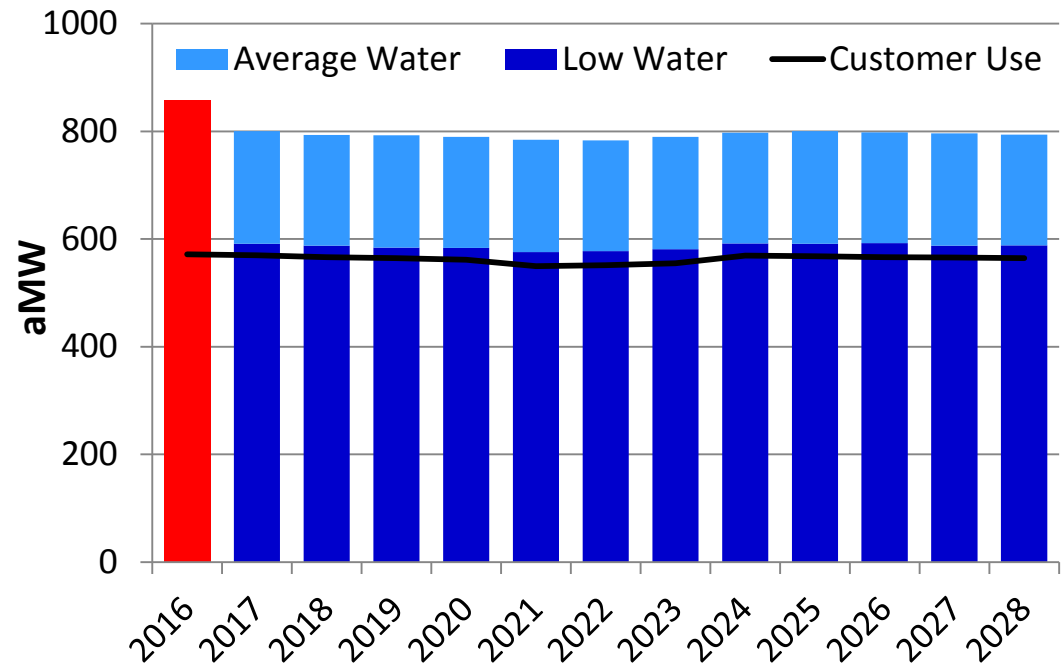


\* Does not include integration costs

† TP's existing community solar project is virtually at the cap for state incentives

# Tacoma Power Has More Renewable Energy Than Our Customers Use

2016 Actuals (aMW)	
Resources	858
Retail Use	560
<b>Surplus</b>	<b>298</b>

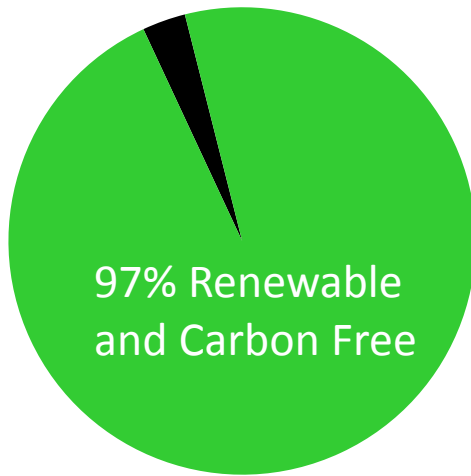


- Tacoma does not need new resources
- Surplus is sold to other utilities: Proceeds helps Tacoma Power to keep customer rates low and lower's the region's carbon footprint

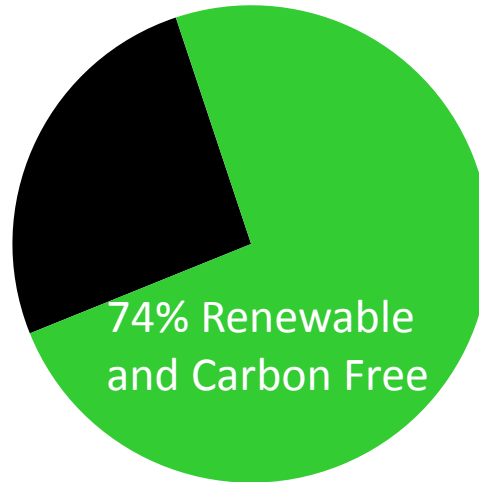


# Tacoma's Power Supply Is Renewable and Virtually Carbon Free

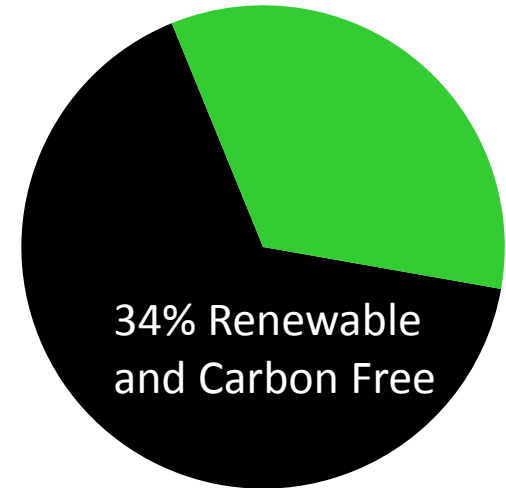
**Tacoma Power**



**WA State**



**US**



**Note:** Tacoma Power and WA state figures from 2014 data from the WA Depart of Commerce  
US numbers from the US Energy Information Agency

# FOCUS ON SOLAR

# Types of Solar Energy Systems

## **Roof-top** (Most expensive)

- Small (3-5kW)
- “Slows down the meter”
- Home/Small business

## **Utility Scale**

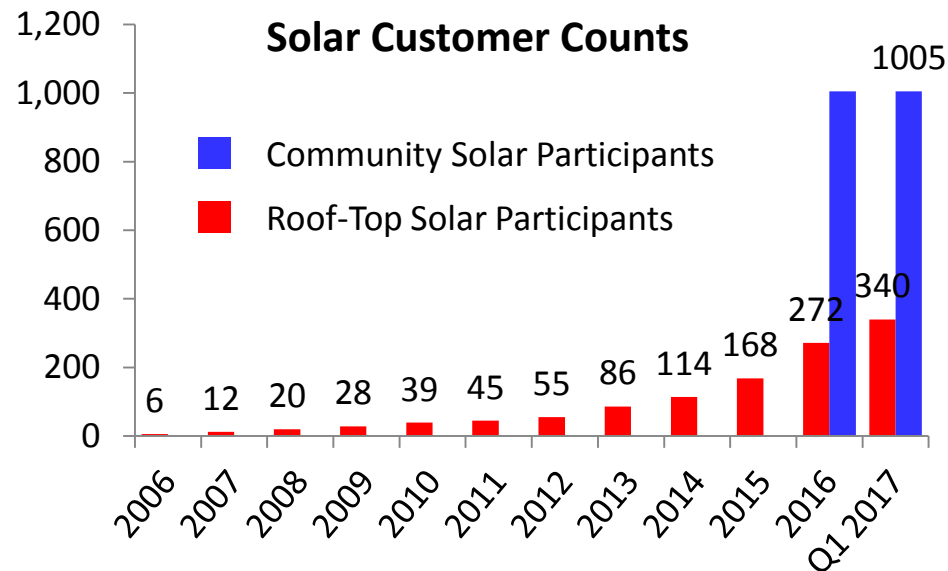
(Least expensive solar)

- Typically large, (1000 to 50,000 kW)
- Economies of scale
- A utility resource used to meet customer use

## **Community** (Expensive)

- Larger (up to 75kW in WA)
- Participants pay a share of the costs and receive a share of the benefits (value of electricity & state incentives)
- More opportunities for customer participation

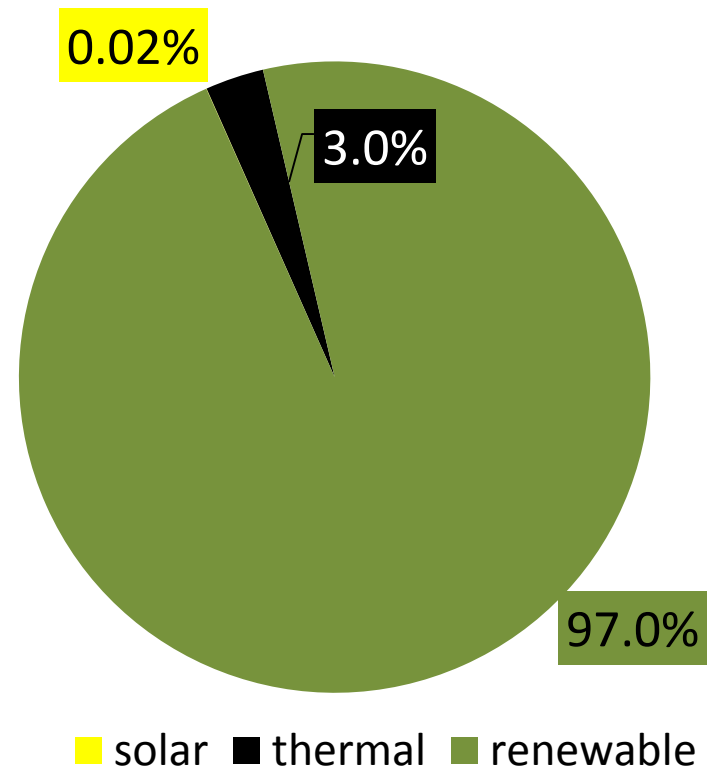
# 1345 Customers Currently Participating, But Only a Tiny Part of Tacoma Resources



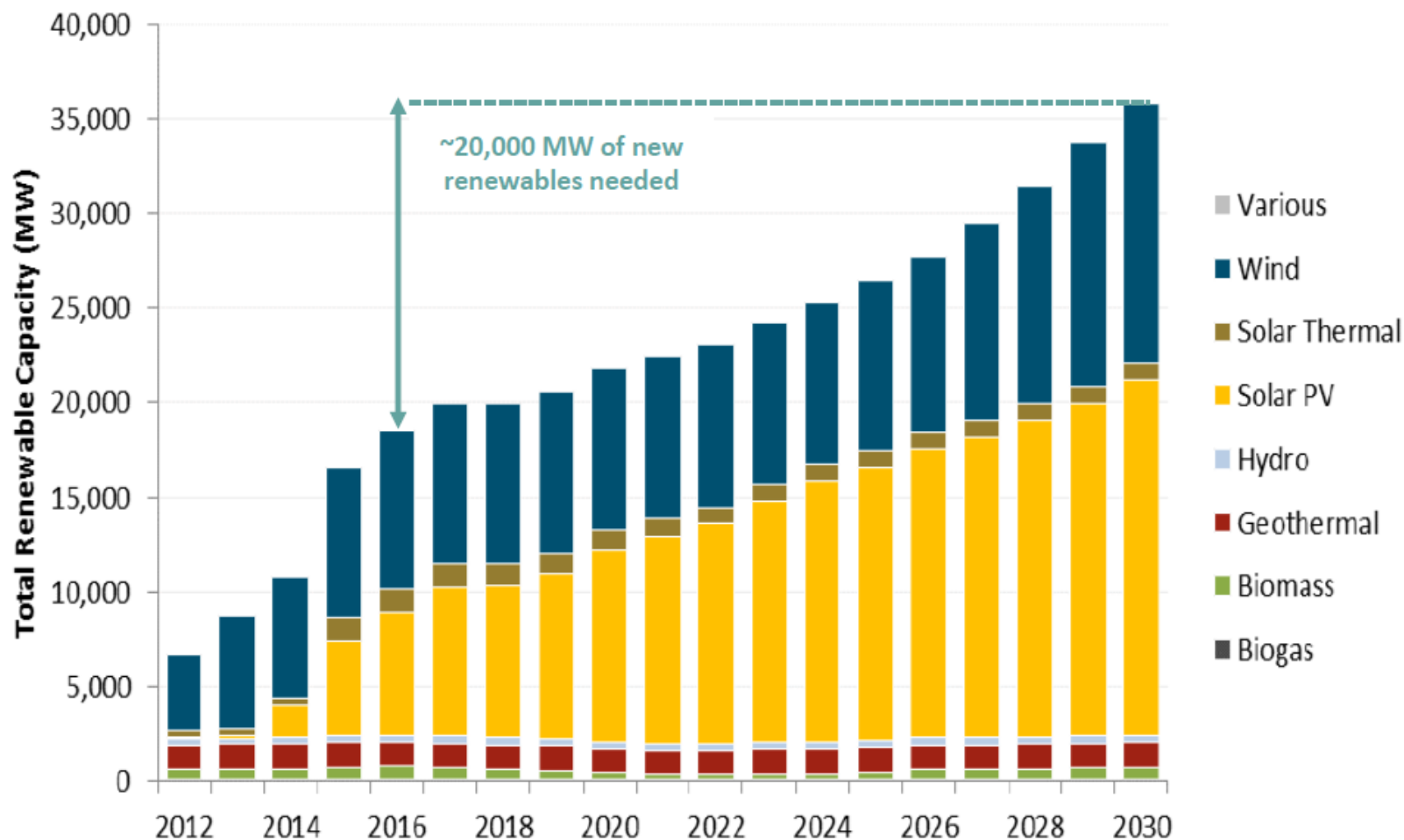
At the end of 2016:

- 300 kW of Com Solar
- 1800 kW of Res Roof-top

**Solar Production Contribution  
to Customer Use**



# California Going Big with Solar



# What about Germany?

- Germany's 2010 "[Energiewende](#)" program provided subsidies for renewable generation and closures of natural gas and coal generation (and following Fukushima, nuclear generation)
- Solar generation provides 6% of the electricity produced in Germany (3% of consumed)
- Renewable energy incentive programs have pushed up what the average German pays for electricity to \$0.39/kwh compared to that of the average American \$0.10/kwh
- Carbon emissions have not decreased as expected because coal generation continues to be used while nuclear plants are closed
- In July 2016, Germany's legislature voted to sharply cut subsidies and have placed capacity expansion caps on renewable energy to mitigate the strain wind and solar power have put on the country's electricity markets

# SOLAR CHALLENGES

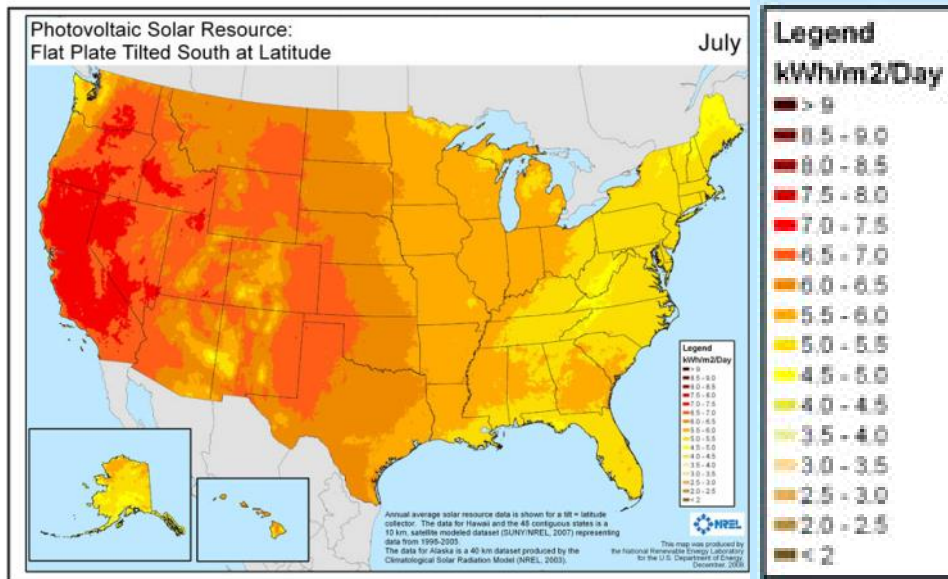
# Solar Power Is A Good Resource When

- Areas receive a lot of sun
- Electric rates are high
- The timing of customer use aligns with the timing of solar production
- Utilities need new renewable resources
- Utilities need to reduce carbon emissions
- Incentives are available

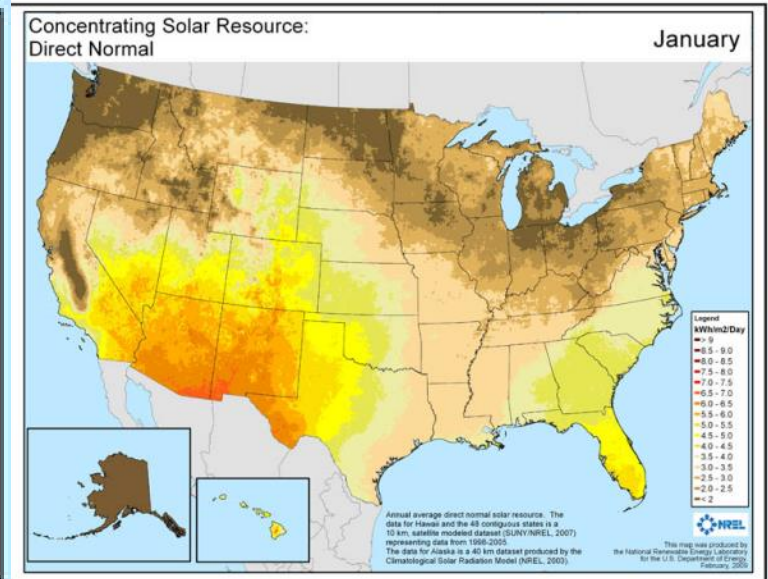


# Areas Receiving a Lot of Sun

## Summer



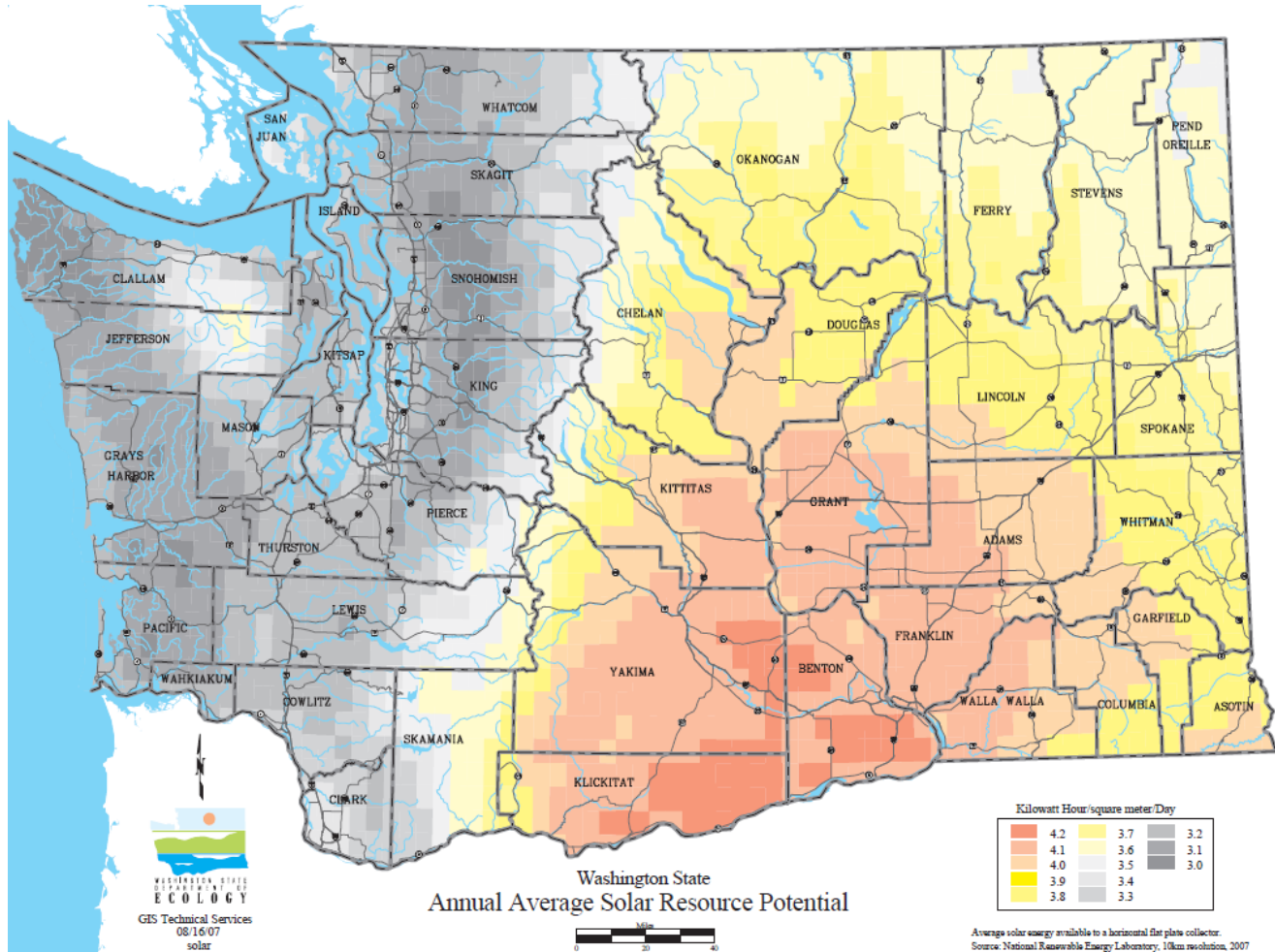
## Winter



**Note:** Maps from NREL at [www.nrel.gov/gis/solar.html](http://www.nrel.gov/gis/solar.html)

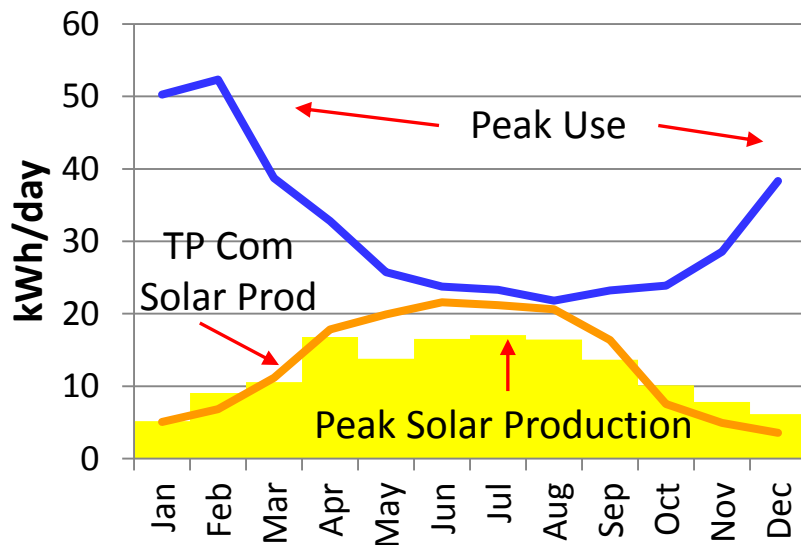
## Washington receives less sun; especially in the Winter

# Western Washington Receives Even Less Sun



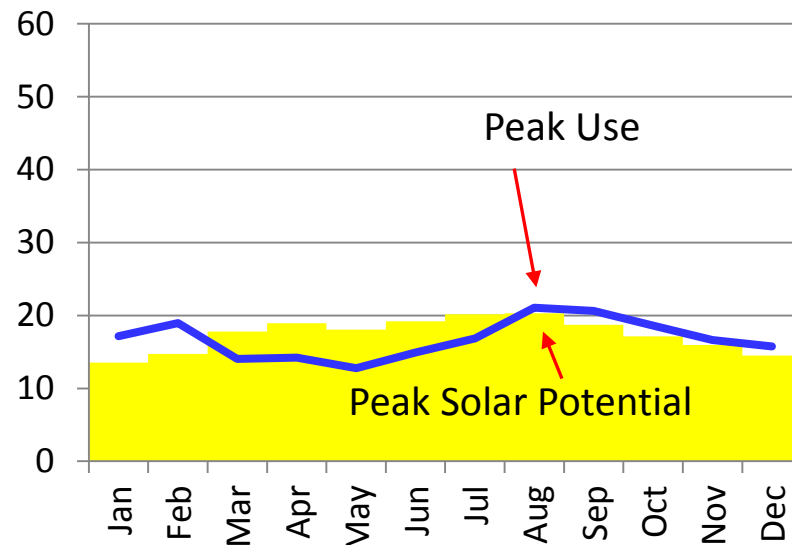
## Solar Potential Does Not Align with Tacoma Power Customer Use

Tacoma, Average Customer



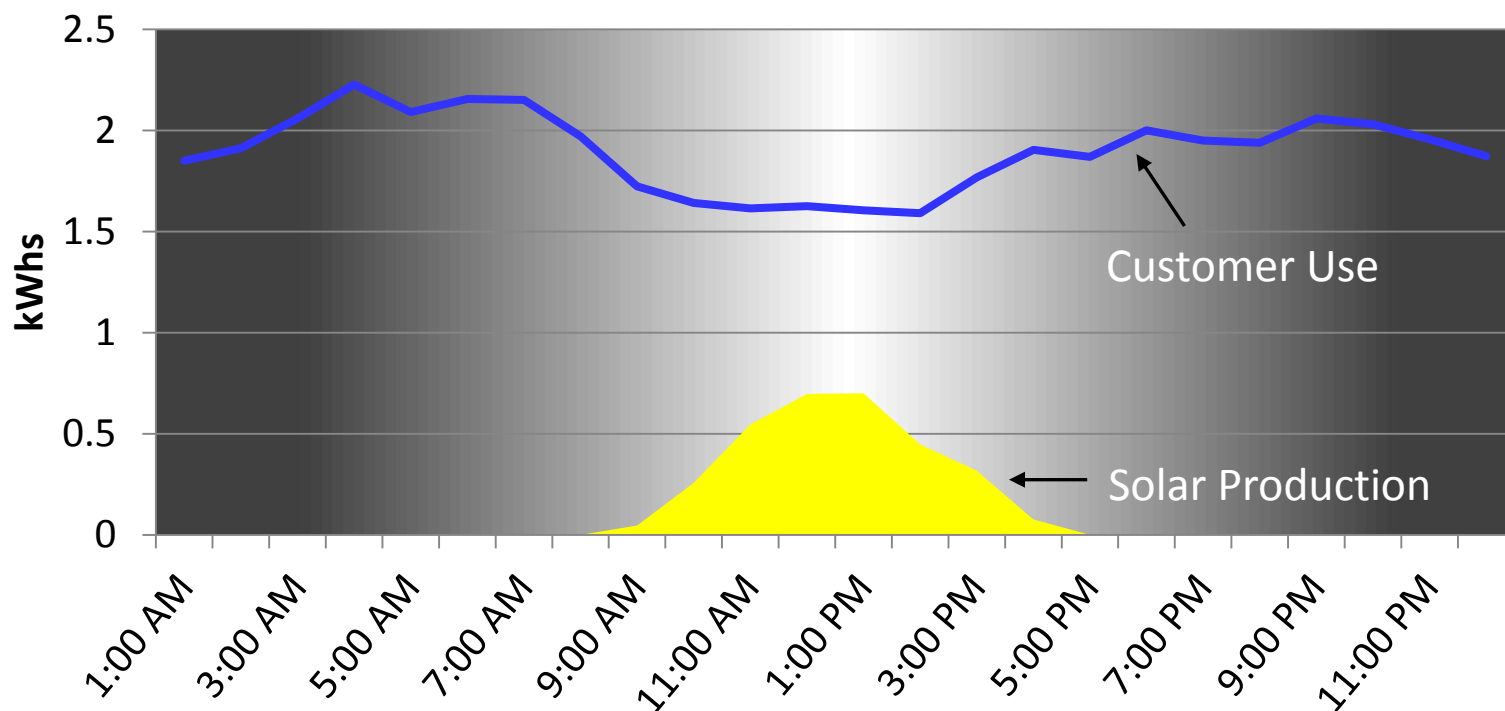
## Solar Potential Does Align with Southern California's Customer Use

Los Angeles, Average Customer



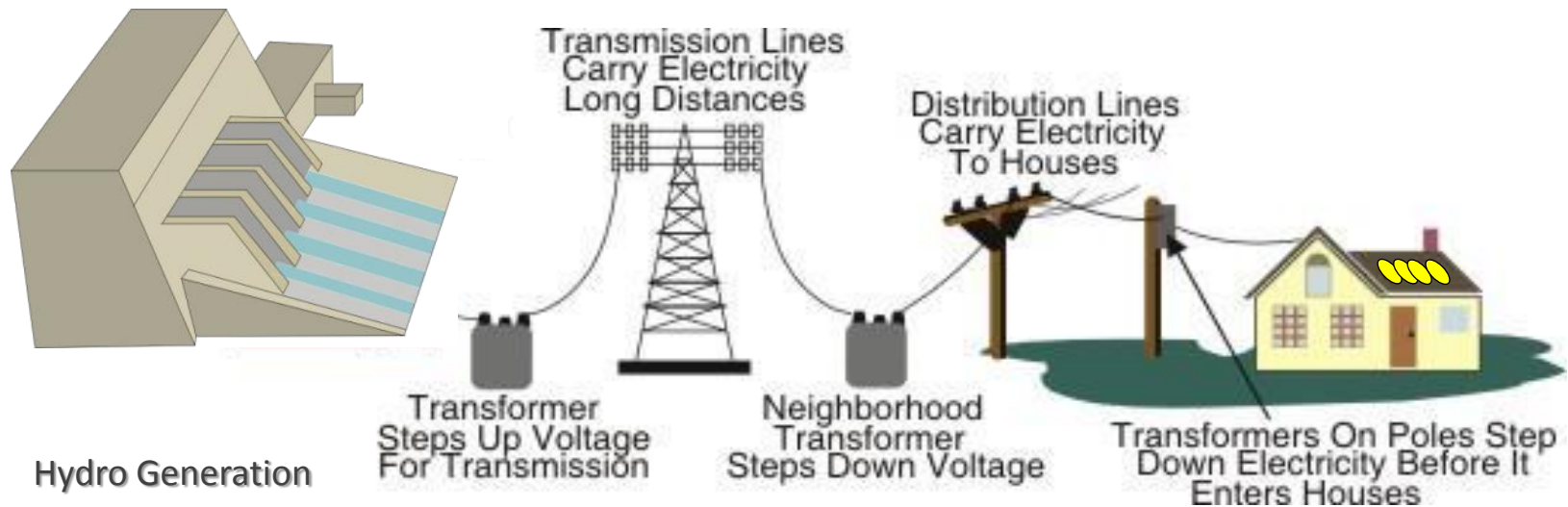
**Note:** Solar production calculated for a 4 kW roof-top solar system using NREL model (McCord AFB & LAX)  
Average customer use from USDOE Energy Information Agency for TP & LADWP in 2016  
TP Community Solar actual production March 2016 through February 2017 – Scaled to 4kW system

# Wintertime Tacoma Customer Use Peaks Before The Sun Rises and After It Sets



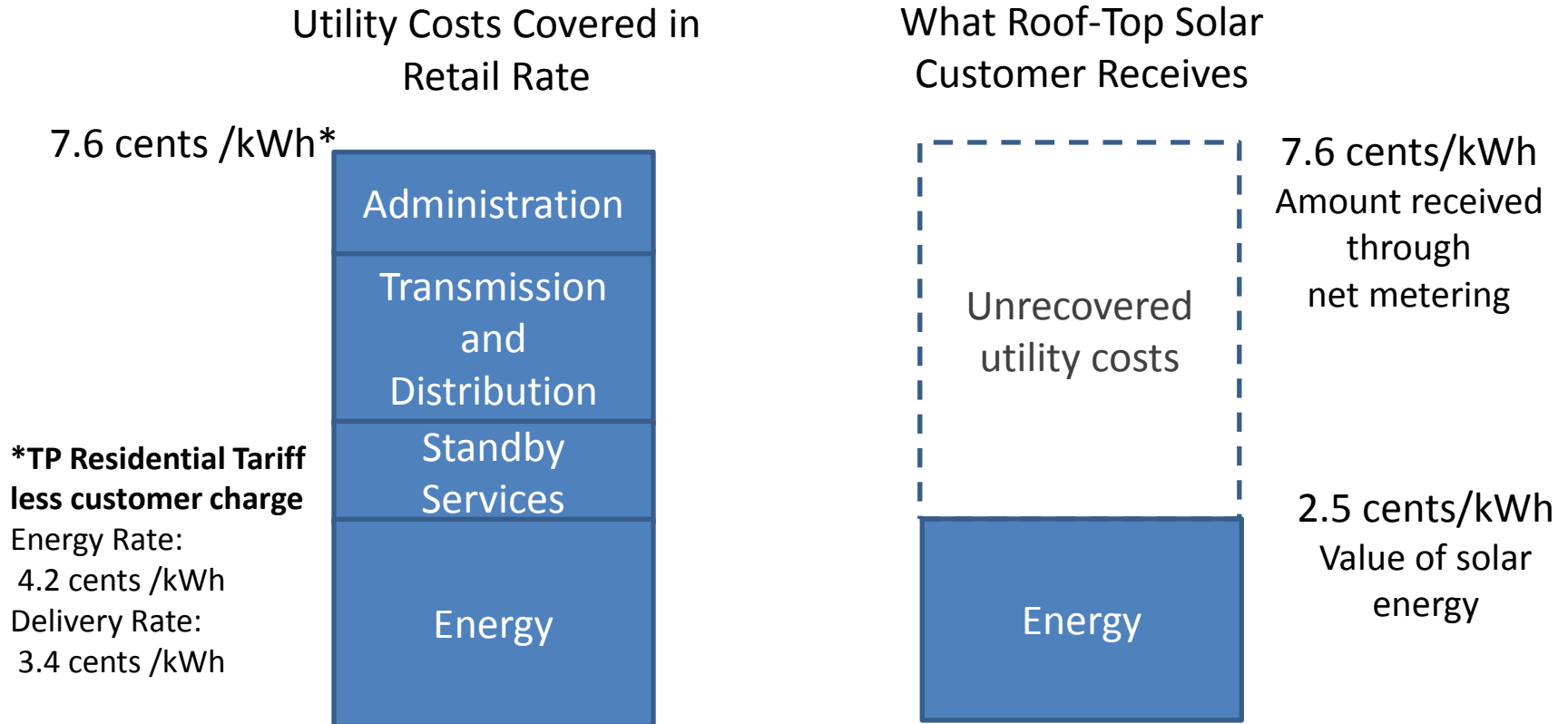
**Note:** Hourly customer use data from Tacoma's residential customers with Gateway meters, average daily use in December 2016  
PV output for a 4kW system based on NREL model

# A Roof-Top Solar System Does Not Allow a Customer To Go “Off Grid”



- Homes with roof-top solar still rely on utility infrastructure to assure reliable power 24/7. The utility:
  - Integrates (e.g., balances) customer use and solar production
  - Provides power when the solar system is not producing – after sunset and before sunrise

# Reliable Electric Service Requires Large Investments that Solar Customers Use But Don't Pay For





# Example Impact on Non-Solar Customers

- Customer “A” owns a 4kW roof-top solar system which annually produces, on average, about 4600 kWhs of electricity
  - Customer “A” receives a credit for the full retail rate of 7.6 cents cents for each kWh of solar energy produced, about **\$350** per year
  - Customer “A’s” rooftop solar system produces energy, but not the other services needed for reliable electric service. This energy is worth about 2.5 cents per kWh, about **\$110** per year
  - The utility continues to provide the other services necessary for reliable 24/7 service
  - The cost of these other services, about **\$240** per rooftop solar system are spread to all other customers

# Most of The Financial Benefit of Rooftop Solar Comes from Federal and State Incentives

- A typical 4kW system costs around \$16,000 in Washington
  - A tax credit of 30% of the cost of the solar system is available to customers paying federal income taxes
- Payback of this upfront cost comes through two sources:
  - A small amount comes from avoiding energy purchased from the utility, or about \$350 per year
  - Since 2005, a much larger amount has come from the WA state production incentive, about \$2500 per year
    - The current generous incentive is scheduled to end in June 2020
    - Future incentives are likely to be lower and will require action by the state Legislature



# State Solar Incentives Are Scheduled to End

- WA has provided very generous financial incentives in support of roof-top solar deployment since 2005
  - Current incentives are amongst the highest in the nation
- Incentive caps for community solar and overall solar
  - Tacoma has nearly reached the incentive cap for community solar and is projected to meet the overall incentive cap by 2020
- All current incentives are scheduled to end in June 2020
- 2017 legislative proposals to extend state incentives appear unlikely to pass this year
  - Utility staff anticipate that the Legislature will eventually provide a replacement incentive, but at significantly lower levels

# Roof-Top Solar is Not Practical for Most Customers

## Economic Barriers

- Upfront costs
- Home ownership
- Credit access

## Housing Barriers

- Structural/Roof integrity
- Manufactured homes
- Home churn
- Orientation/Shading
- Multi-family (common roofs)

**Community solar is a better option for most customers**

# Challenges - Summary

- Solar is a good resource depending upon utility circumstances
- Solar potential (intensity) is low in Western Washington
- Peak solar output does not coincide with peak customer use in Western Washington
- The same infrastructure (and infrastructure cost) is required regardless of whether customer has rooftop solar or not
- No clear path to deal with cross-subsidy issue
- Rooftop solar economics highly dependent on state production incentives, which are scheduled to end in 2020
- Solar generates during periods of the day when wholesale prices are becoming increasingly depressed

# Tacoma Power's Programs

The collage features several documents and images related to Tacoma Power and community solar. The documents include:

- Tacoma Power Value of Solar Analysis**: A document with a map showing solar potential across a region.
- Tacoma Power 2013 Integrated Resource Plan**: A document with the title "Investigating Today's Challenges in Search of a Bright Future" and the Tacoma Power logo.
- Tacoma City Council Infrastructure, Planning, and Sustainability Committee**: A meeting agenda for September 23, 2015, focusing on "Community Solar".
- Conservation**: A document discussing solar incentives and the benefits of solar energy.
- Photograph of a house with solar panels**: A photo showing a residential building with solar panels installed on the roof.
- Tacoma Power logo**: The logo for Tacoma Power, featuring a stylized 'T' and the text "TACOMA POWER TACOMA PUBLIC UTILITIES".
- Stylized orange graphic**: A decorative element consisting of orange lines and shapes.

# Conservation Is a Better Investment for Tacoma Power Customers

Criteria	Solar	Conservation
Meets Daily Peak	No	Yes
Meets Seasonal Peak	No	Yes
Carbon Free Resource	Yes	Yes
Utility Need for Resources*	No	Long-term
Keeps rates low**	No	Long-term
Prevents Cost shifts to non-participating customers	No	Some

\* Because solar provides minimal energy in the winter

\*\* Conservation reduces both winter energy use and peak use

# Conservation and Community Solar Are the Better Options for Most Customers

## Conservation

- Conservation helps customers to reduce their bills throughout the year, but especially in the winter
- It's lower cost than roof-top solar
- It's the greenest resource
- It's easier to target conservation to low-income customers
- It provides other benefits
  - Improves household comfort

## Community Solar

- Provides customers access to a less costly way to invest in solar energy
- Customers do need to:
  - Pay a large upfront investment
  - Own a home or business
  - Have the right kind of roof
  - Have an ideal site location or building orientation
  - Worry about ongoing maintenance
  - Worry about permitting and installation challenges
- Lower cost solar option due to economics of scale
- Allows customers access to state incentives

# Tacoma Power Supports Customers Who Want Solar

- **Voluntary State Incentive:**

- Since 2005, Tacoma Power has offered customers the state solar incentive rate of \$0.54/kWh for the power they produce.



- **Net Metering**

- The electricity produced directly reduces customer bills
  - Example: If a home uses 600 kWh in a month and their solar system generates 150 kWh, the customer will pay for 450 kWh on their utility bill



# Tacoma Power Supports Customers Who Want Solar

- **Community Solar:**

- Tacoma Power built four, 75-kilowatt community solar projects
- 1005 Tacoma Power customers bought 10,447 solar units at \$100 per unit
- Those customers will receive an annual state solar production incentive [\(\\$1.08/kWh\)](#), as well as payment for the electricity produced from the project
- About 86% of subscriber earnings come from the state solar production incentive, rest comes from value of energy produced



# Tacoma Power Supports Customers Who Want Solar

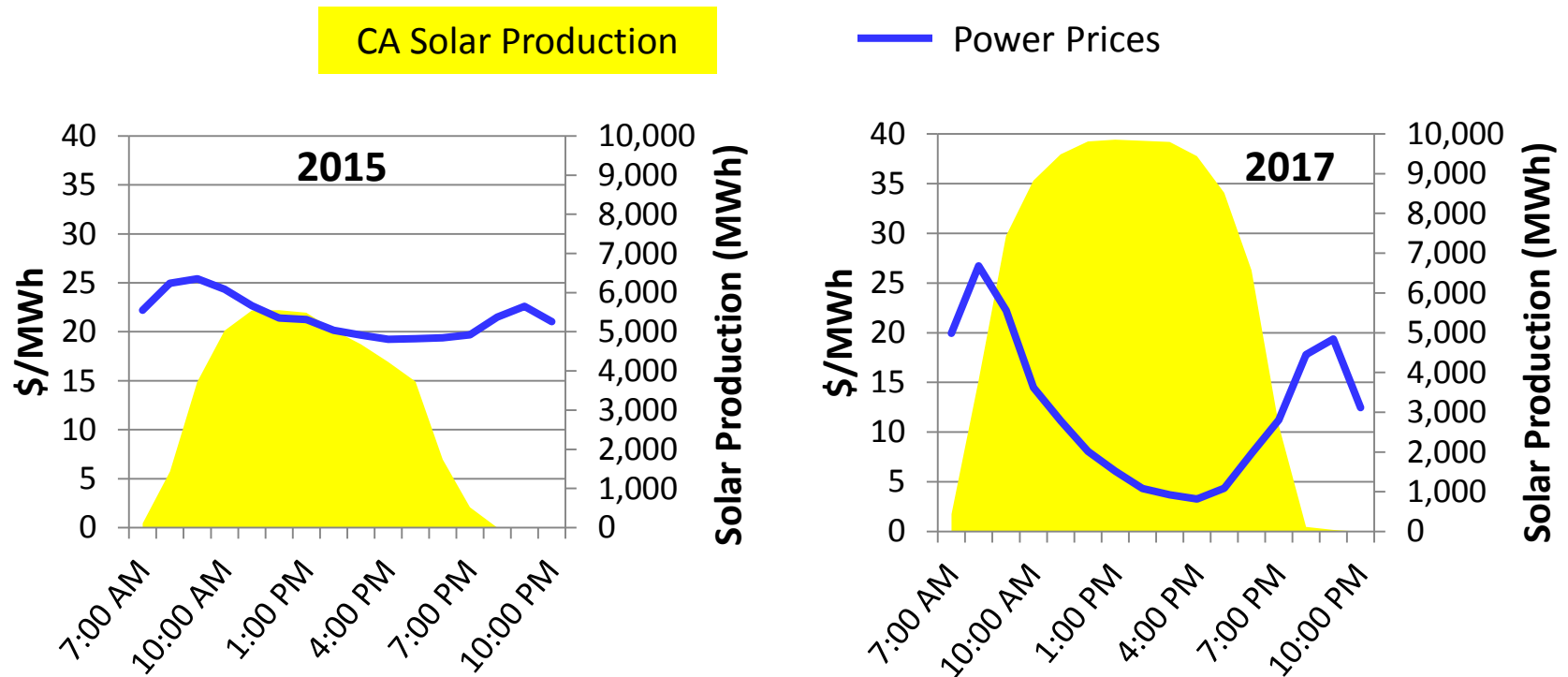
- **An Expanded Evergreen Options program:**
  - Since 2001 Tacoma Power has offered a voluntary program where by customers can pay a little extra to purchase a quantity of new renewables such as wind and solar
  - Tacoma Power is revamping the program so that part of the proceeds can be used for local small renewable energy projects –most likely solar – for non-profit organizations
    - Subscribers will vote to decide among applications for funding

# Summary

- Tacoma Power's current power supply portfolio is reliable, flexible, low cost, renewable, and virtually carbon free
- Tacoma Power is using the flexibility of its hydro projects to help integrate new renewables such as wind and solar
- As a result of continued investment in energy conservation, Tacoma Power will not need any new power supply resources in the foreseeable future
- In spite of challenges with solar, Tacoma Power has and intends to continue to support customer interest in the technology
- Tacoma Power has and will continue to evaluate opportunities for solar related customer programs in the future
- Solar programs have been designed to minimize cross subsidies
- Tacoma Power will continue to evaluate solar in future IRPs

**Thank You!**

# California Solar Beginning to Push Down NW Wholesale Prices



**Note:** Mid-Columbia energy prices from Tacoma Power database for the NW bi-lateral market  
California solar generation from CAISO

# Would Batteries Help?

Not really, too many winter days are overcast and dark making solar generation virtually non-existent

