




A Touchstone Energy® Cooperative 

Power System Transformation: A Distribution Perspective

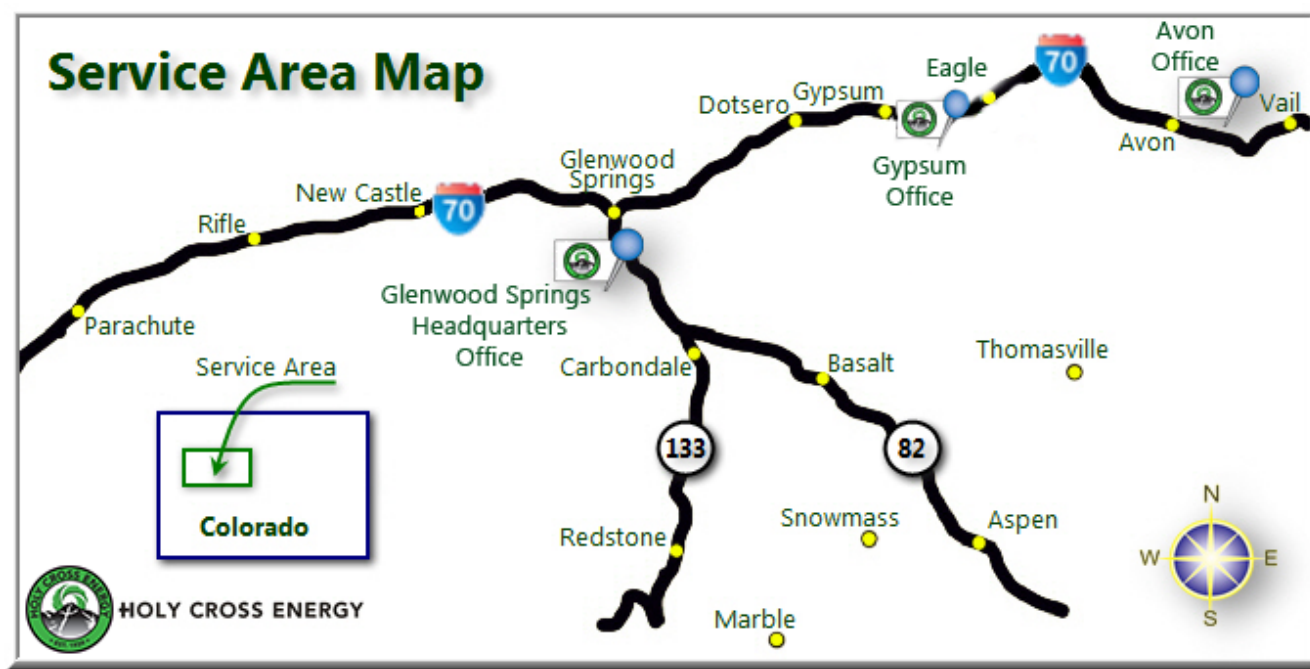
Bryan Hannegan, Ph.D.
President and CEO, Holy Cross Energy



About Holy Cross Energy



A Timbelem Energy Cooperative



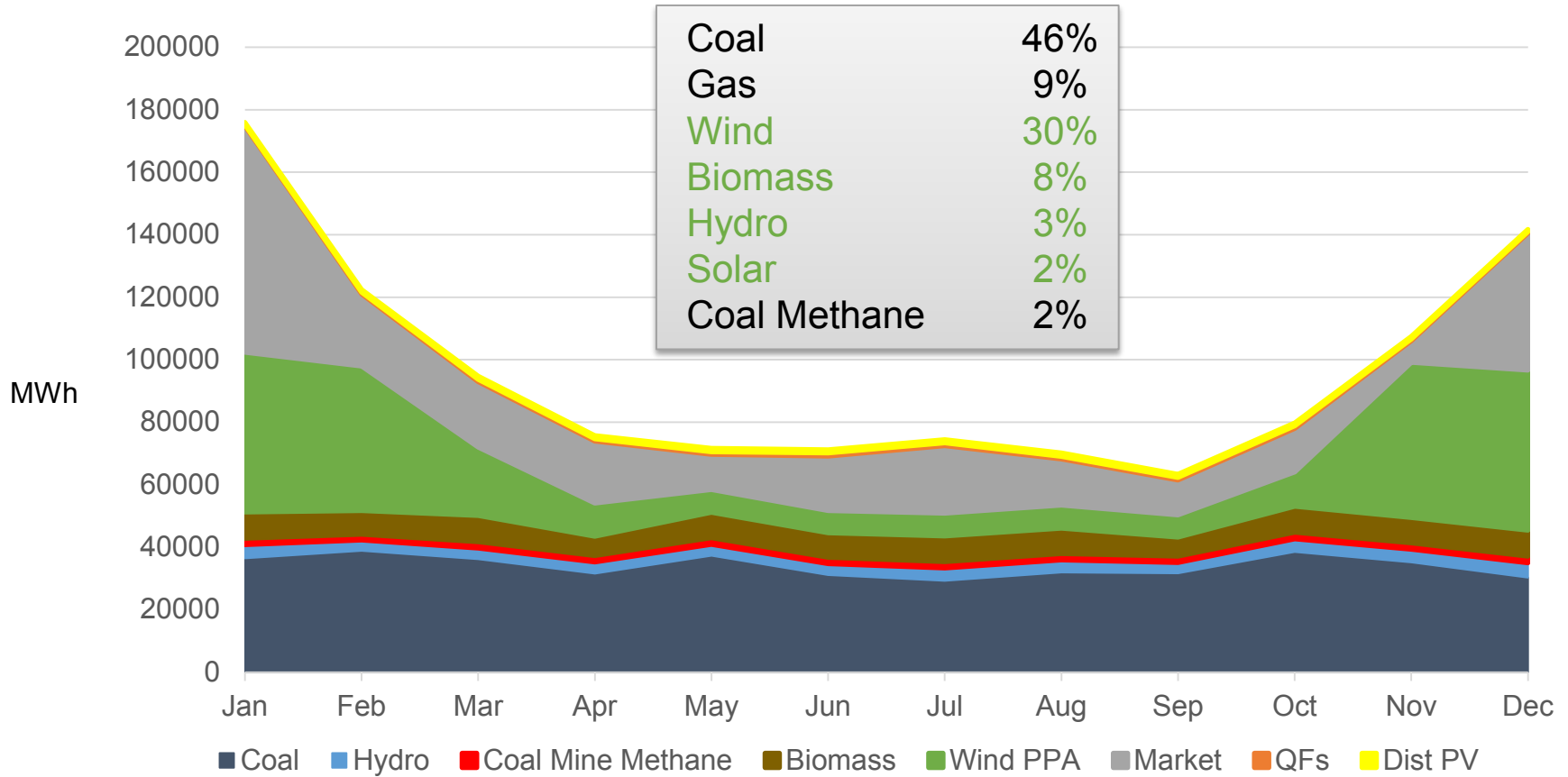
\$120 million revenue
160 employees
240 MW peak demand

60,000 meters
3,000 miles of distribution
120 miles of transmission

Our Power Supply Mix




A Timbeon Energy Cooperative



>40% reduction in GHG emissions since 2012

But Our Members Want More!



A Timbeone Energy Cooperative 

More than half of the Holy Cross Energy electricity demand comes from customers that have committed to using 100% renewable energy by 2030:

Cities and Towns:

- Aspen
- Basalt
- Carbondale
- Eagle
- Minturn
- Snowmass Village
- Vail

County Governments:


- Eagle
- Pitkin

Large Employers:

- Aspen Skiing Company
- Vail Resorts

Our Industry is Changing ... Fast!



A Tri-State Energy Cooperative 

Several trends affecting the electric utility industry:

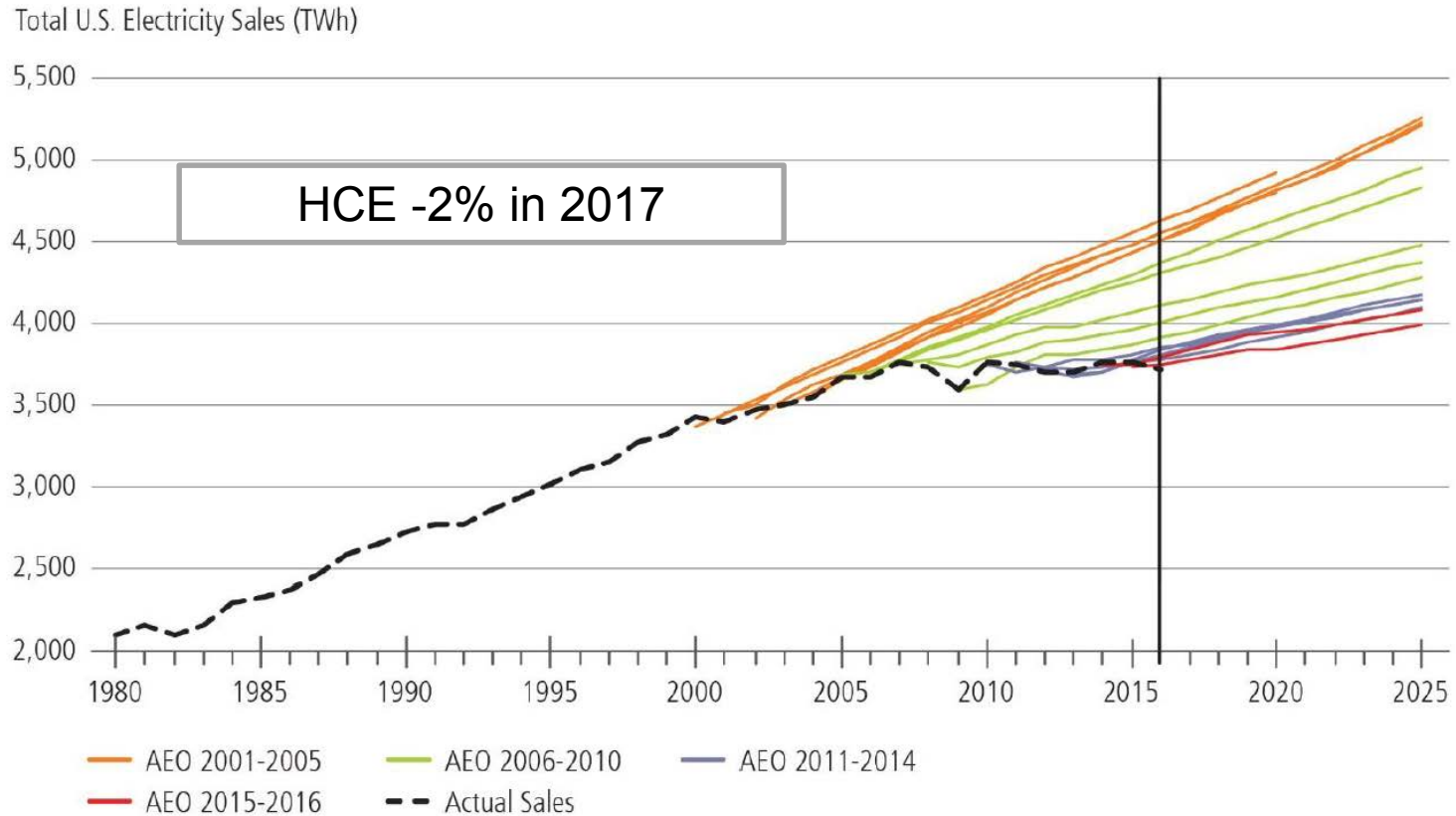
- Flat load growth
- Low natural gas prices
- Lower-cost renewables
- Expanding electricity markets
- Cheaper, better distributed resources
- Connected everything
- More consumer choices

Flat Load Growth



A Timbeone Energy Cooperative

Figure 3.31. EIA Annual Electricity Sales 2000–2016 (terawatt-hours) and AEO Reference Case Electricity Sales Projections 2017–2030¹⁹¹

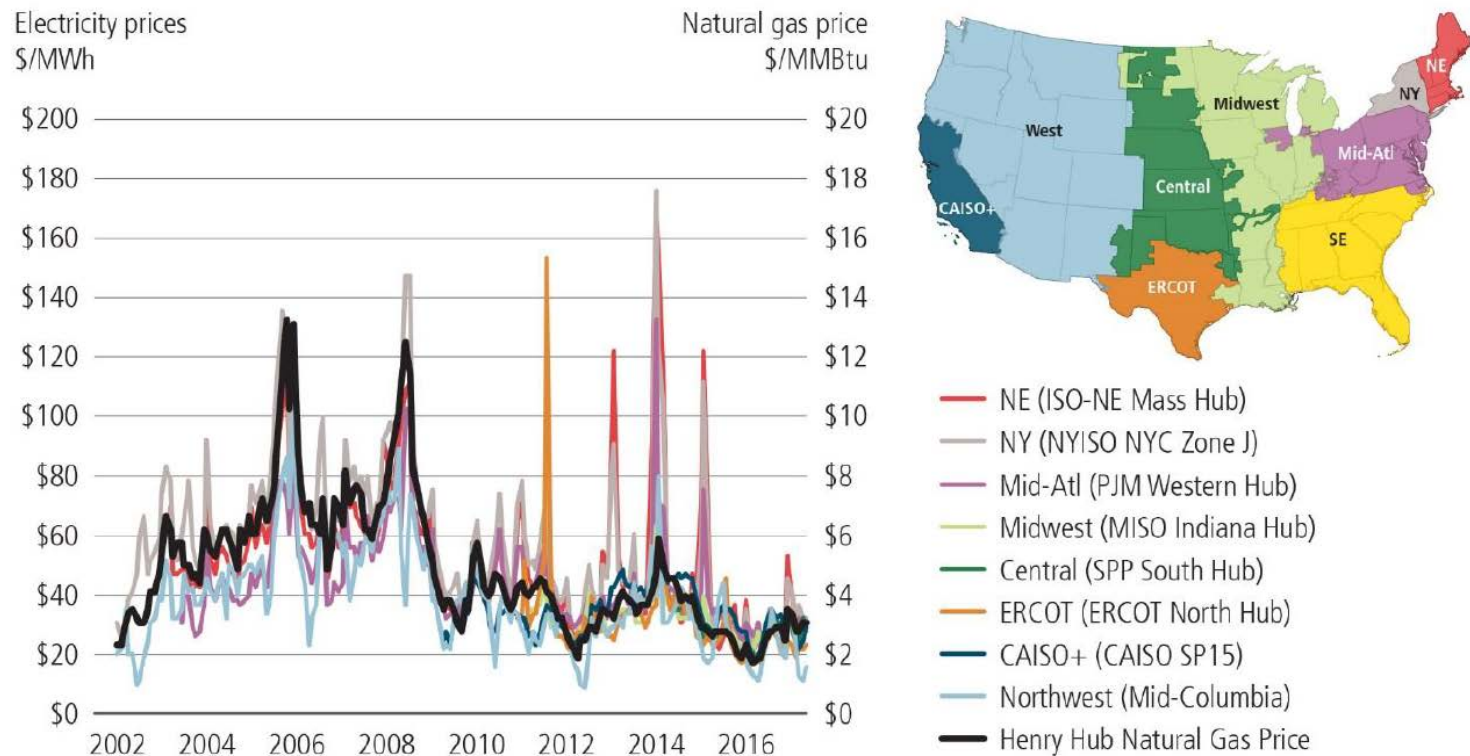


Low Natural Gas Prices



A Trillium Energy Cooperative

Figure 3.18. Wholesale Day-Ahead Electricity Prices vs. Henry Hub Natural Gas Price (Monthly Average)¹⁰⁶



Lower-Cost Renewables



A Timbeone Energy Cooperative

RFP Responses by Technology

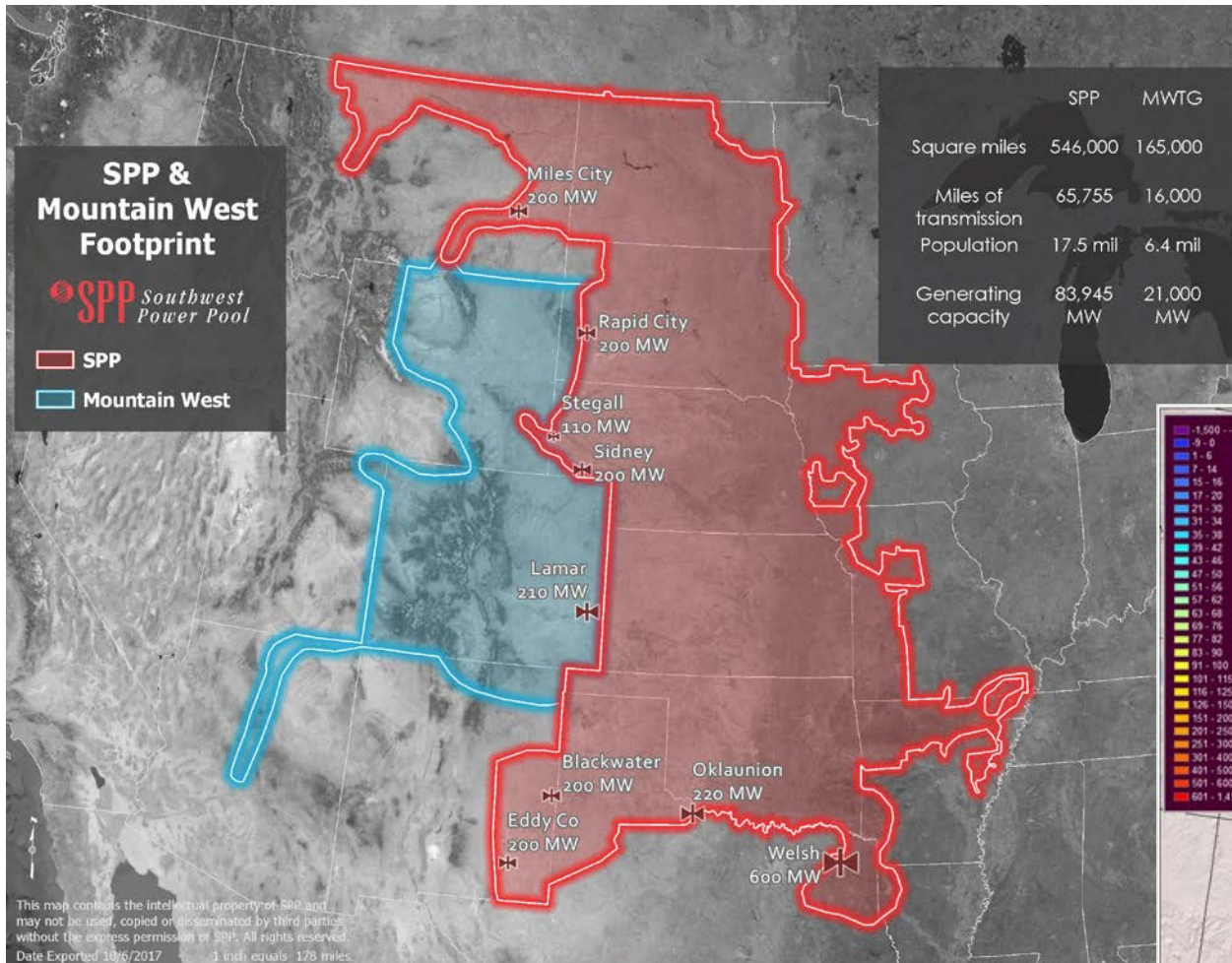
Generation Technology	# of Bids	Bid MW	# of Projects	Project MW	Median Bid	
					Price or Equivalent	Pricing Units
Combustion Turbine/IC Engines	29	6,365	19	4,436	\$ 5.08	\$/kW-mo
Combustion Turbine with Battery Storage	7	804	3	476	6.21	\$/kW-mo
Gas-Fired Combined Cycles	3	873	3	873	█	\$/kW-mo
Stand-alone Battery Storage	28	2,144	24	1,945	10.53	\$/kW-mo
Compressed Air Energy Storage	1	317	1	317	█	\$/kW-mo
Wind	96	41,915	42	16,949	\$ 19.30	\$/MWh
Wind and Solar	5	2,601	4	2,151	19.96	\$/MWh
Wind with Battery Storage	11	5,700	5	2,700	20.63	\$/MWh
Solar (PV)	148	28,382	78	14,085	30.96	\$/MWh
Wind and Solar and Battery Storage	7	4,048	7	4,048	30.41	\$/MWh
Solar (PV) with Battery Storage	79	14,980	57	10,098	38.30	\$/MWh
IC Engine with Solar	1	5	1	5	█	\$/MWh
Waste Heat	2	21	1	11	█	\$/MWh
Biomass	1	9	1	9	█	\$/MWh
Total	418	108,163	246	58,101		

Source: PSCo 2017 All-Source RFP

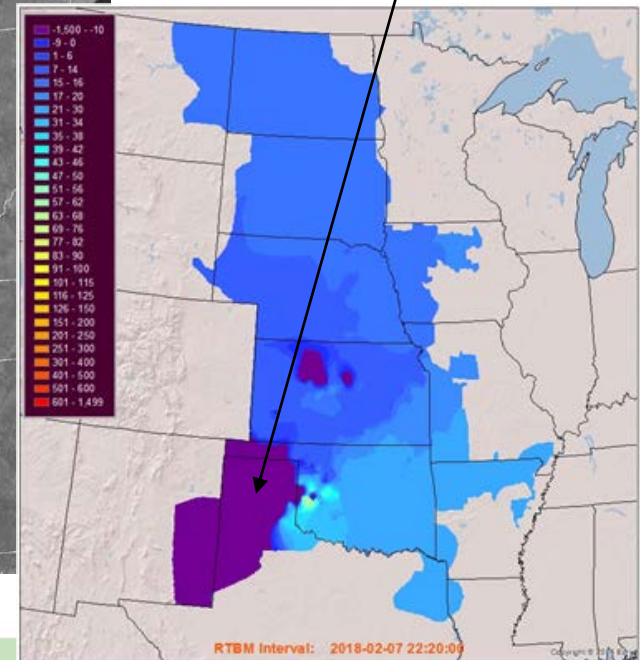
Expanding Electricity Markets



A Tri-State Energy Cooperative



Negative prices!

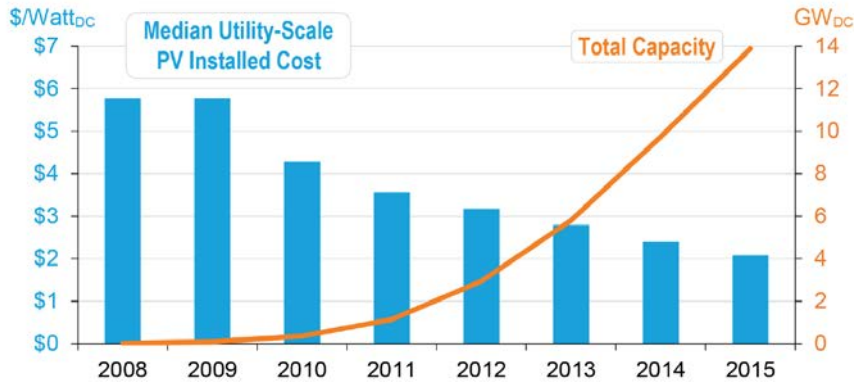


Cheaper, Better, Distributed Resources

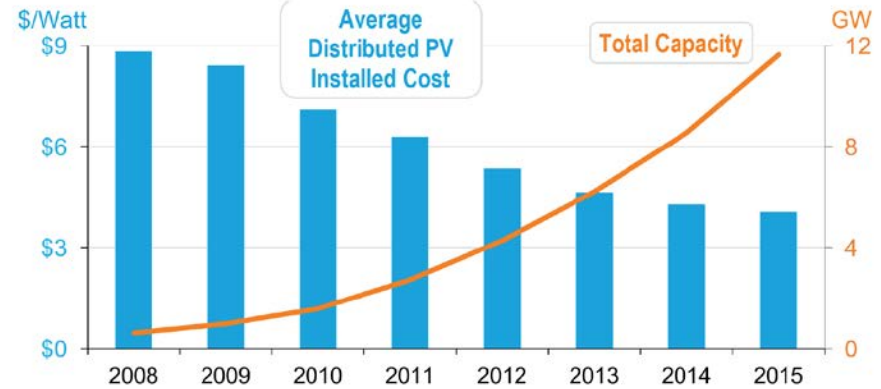


A Timbeon Energy Cooperative

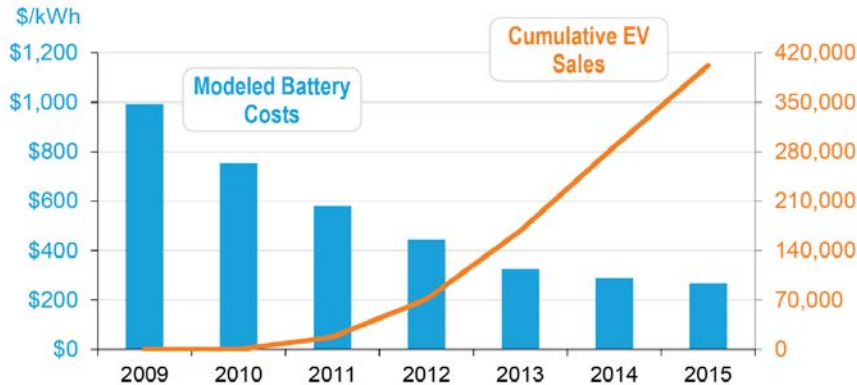
Solar PV: Utility-Scale



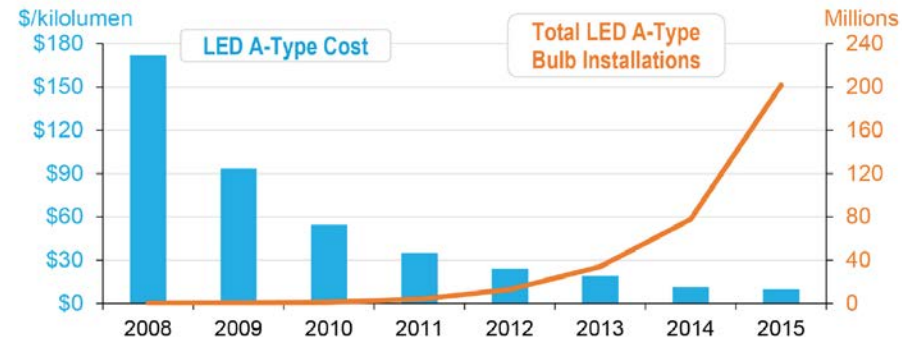
Solar PV: Distributed



Electric Vehicles



LEDs



Connected Everything



A Timbeone Energy Cooperative



Solar PV

Solar PV energy may be self-consumed, delivered to the grid, or stored in a battery.

Smart AC

AC unit can be configured to pre-cool the home with solar output, then allow the home temperature to "drift" up to a set maximum temperature before drawing from the grid.

Smart domestic water heater

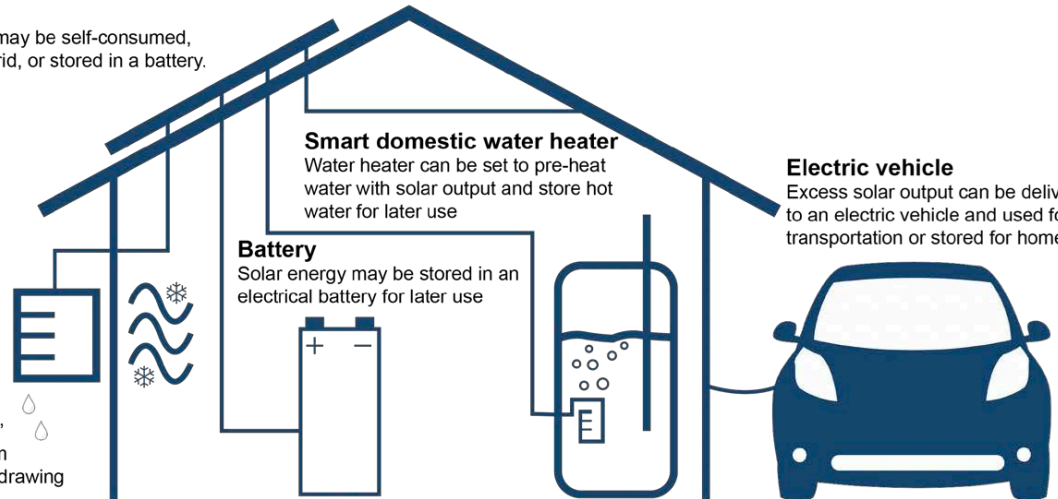
Water heater can be set to pre-heat water with solar output and store hot water for later use

Battery

Solar energy may be stored in an electrical battery for later use

Electric vehicle

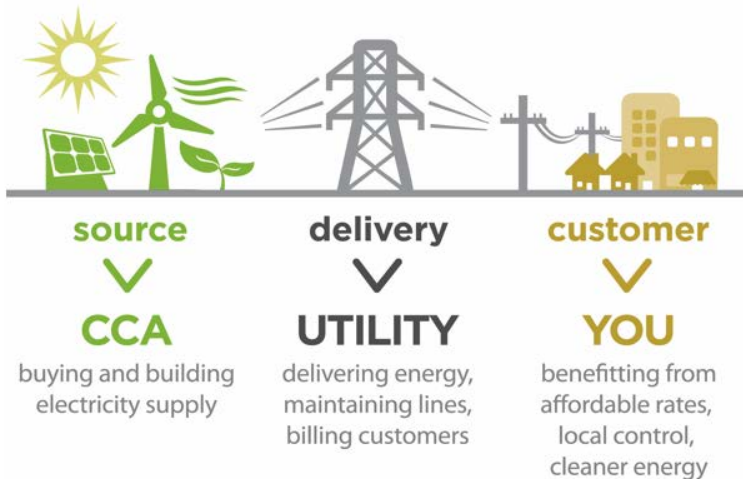
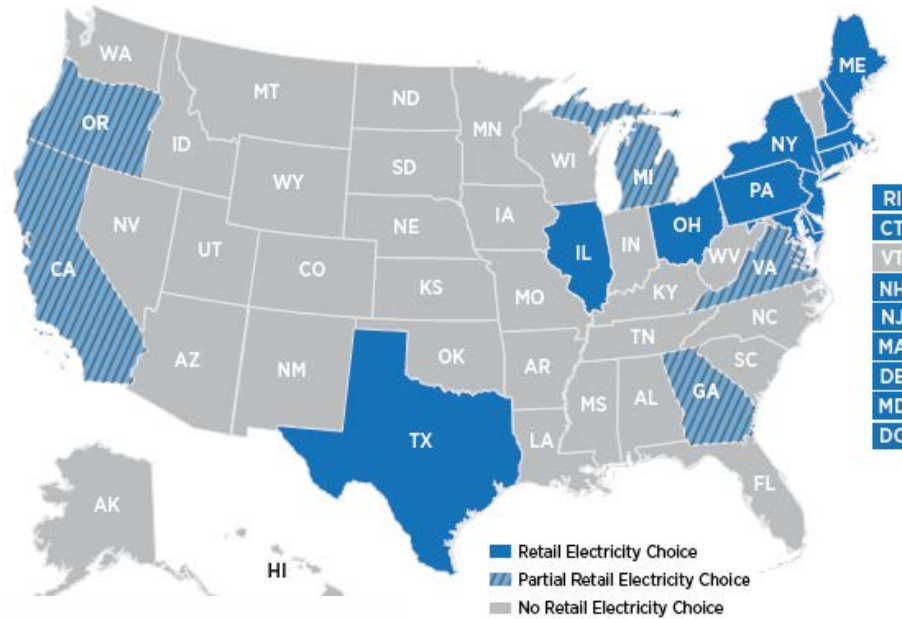
Excess solar output can be delivered to an electric vehicle and used for transportation or stored for home use



More Consumer Choices



A Timbeon Energy Cooperative



Your choice of free:

TXU Energy

Free Nights

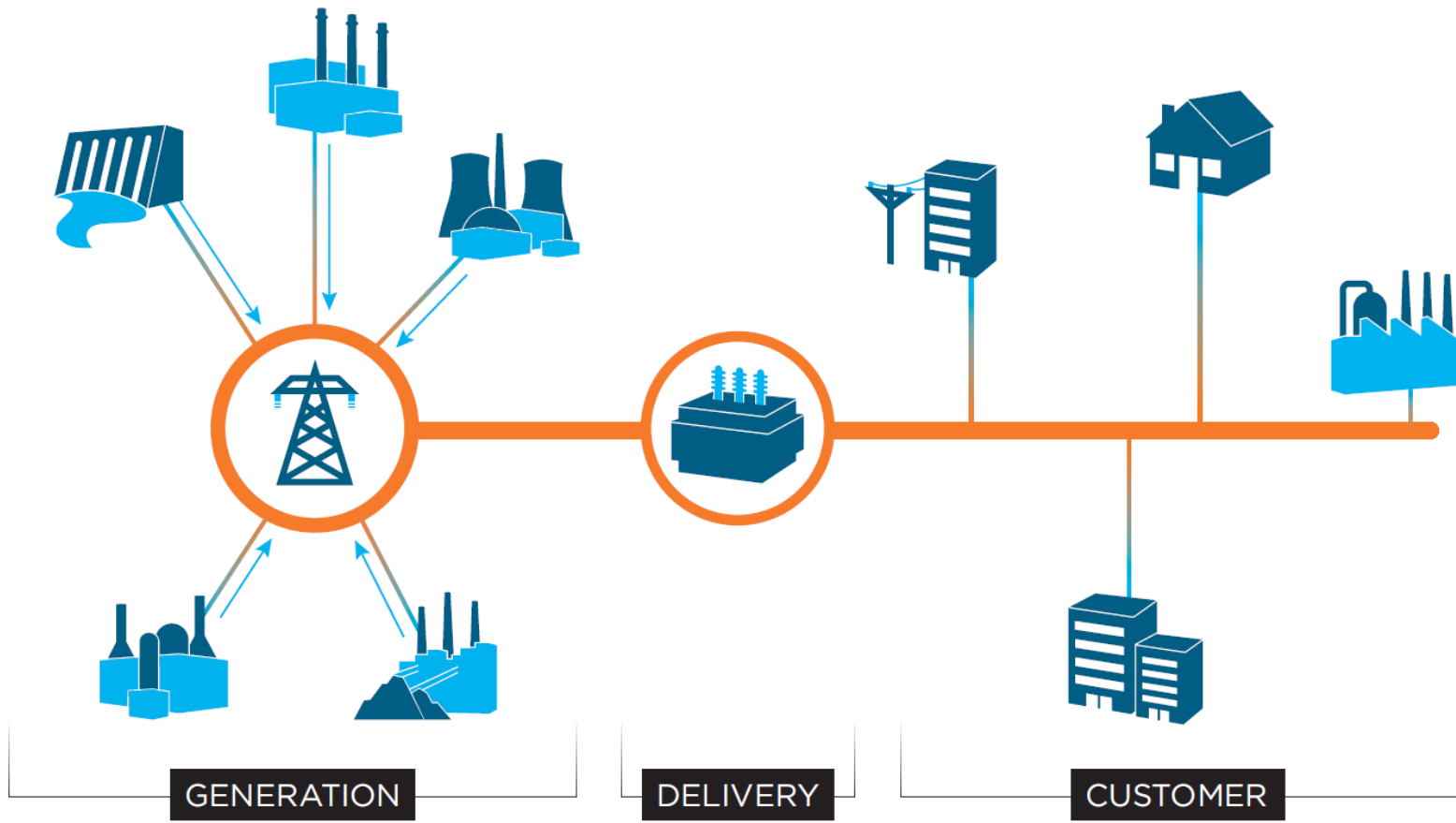
TXU Energy

Free Weekends

Our Electric Grid Used to be THIS...



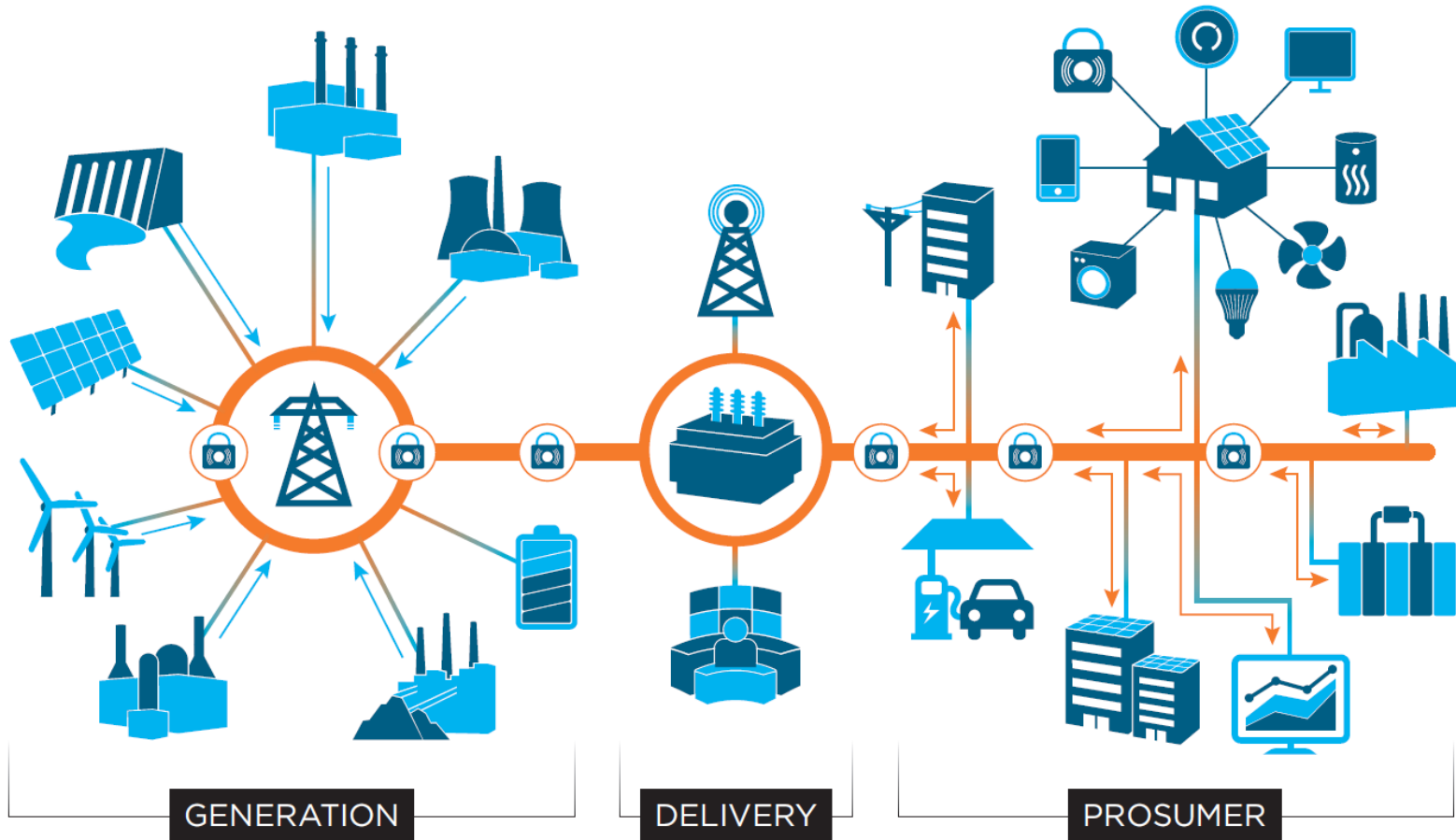
A Timbeon Energy Cooperative



Now, Our Grid is More Like THIS...



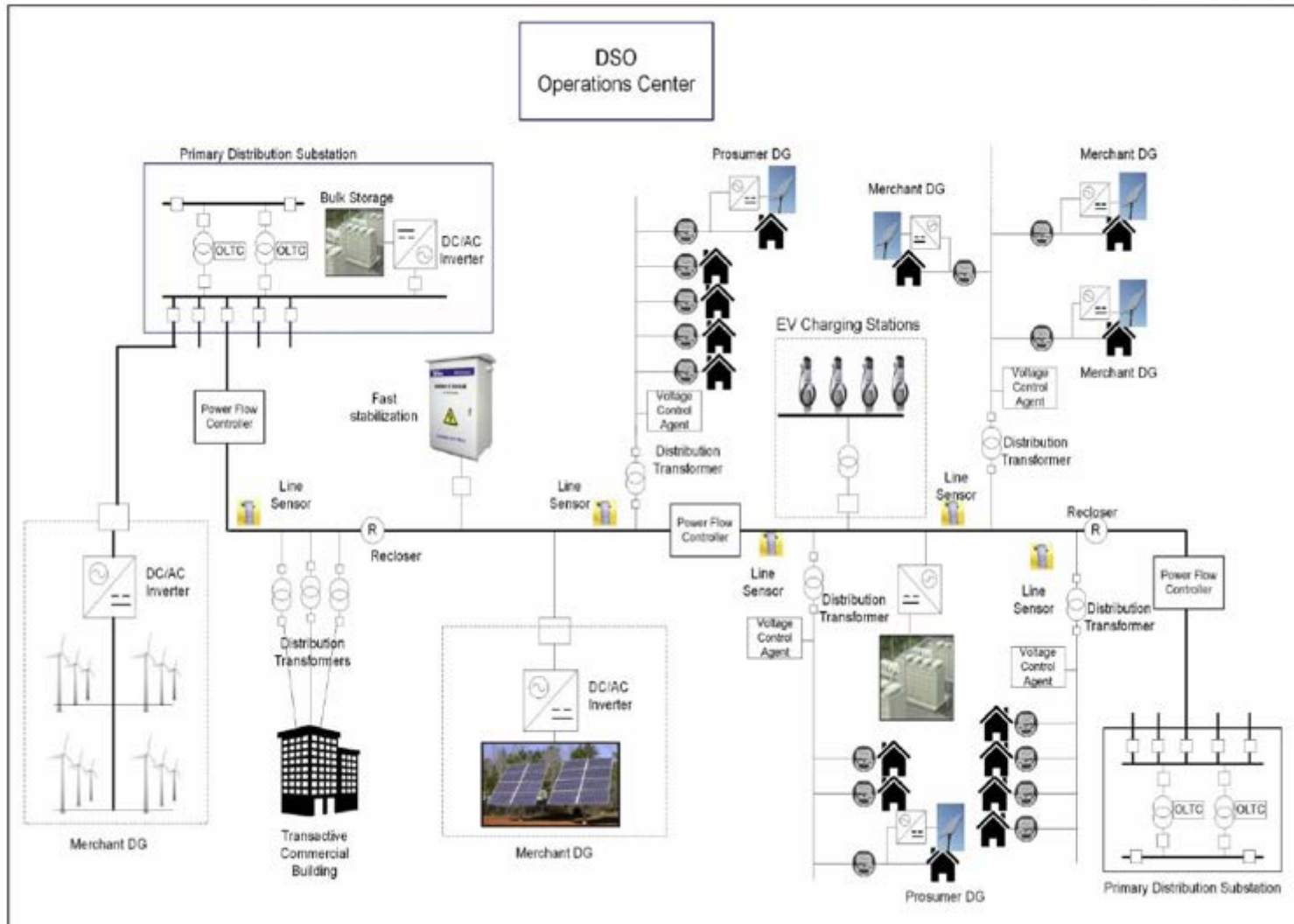
A Timbeon Energy Cooperative






A Timbeon Energy Cooperative

And very soon, it will be THIS!!!





A Timbeone Energy Cooperative 

So What's a Utility to Do?

Respect the Past

- Maintain Poles and Wires
- Ensure Reliable Service
- Procure Necessary Resources
- Answer Customer Needs

Embrace the Future


- Flexible Clean Power Supply
- Grid Visibility and Control
- Sustainable Rate Design
- Know Our Customers Better
- Deliver New Products/Services

“Give our members what they want ...

before someone else does!”

Thank You!



A Tishonean Energy Cooperative 

Holy Cross Energy provides safe, reliable, affordable and sustainable energy and services that improve the quality of life for our members and their communities.

Find out more at www.holycross.com

