

Carbon-free by 2050: How do we get there?

Julia Hamm, President & CEO January 2020

Clean + Modern Grid

Utility Business Models | Regulatory Innovation | Grid Integration | Transportation Electrification







Solar Electric Power Association





solar electric power association



1999 – U.S. Energy Production





Quadrillion Btu U.S. EIA, Annual Energy Review

Today's Electricity Landscape





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C&I, DER, MICROGRIDS, ROOFTOP, SOLAR

U.S. solar market soars in Q1 2019

By Renewable Energy World Editors | 6.18.19



Today's Electricity Landscape



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Generation T&D Solar Storage Demand Response Distributed Energy Regs Tec

US energy storage market sees 232% year-on-year growth



Credit: Ernesto Sanchez

Today's Electricity Landscape





Windmills spin near Adrian, Texas, next to Interstate 40.

(CNN) Wind never has surpassed and for the first time in Toyas, associating to a new report









Clean Energy Renewable Energy

Alternative Energy



Energy





Vision

A carbon-free energy system by 2050

Mission

To facilitate the electric power industry's **smart transition** to a clean and modern energy future.

















Utility Carbon Reduction Targets



www.sepapower.org/ carbon-reduction-tracker/



major utilities have carbon-free or net-zero goals by 2050 or sooner

18

56%

of customers are served by a utility with a goal of 50% or greater reduction

> Smart Electric Power Alliance

More Than Just Lofty Targets



Xcel Energy's Carbon Emission Reduction Trajectory Compared to 2 C Scenarios





Arizona Public Service

2050 Target





65% Clean/Carbon Free



45% Renewable Penetration

Interim 2030 Goal









Retiring Coal





Next Steps

New IRP filed in April 2020

Tri-State G&T Association

Retiring Coal



Retiring last coal plant in NM by the end of 2020







Retiring last coal plant in CO by 2030

Next Steps



- Working with Colorado General Assembly to achieve by 2030:
- 90% reduction in CO2 emissions across generation facilities



70% reduction in CO2 emissions associated with wholesale electric sales









Pathways



Utility Business Models

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Sustainable Utility business models to facilitate and support a carbon-free energy future.

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Regulatory Innovation

State regulatory processes to enable the timely and effective deployment of new technologies, partnerships and business models.

Grid Integration

2		

Seamless integration of clean energy yielding maintained or improved levels of affordability, safety, security, reliability, resiliency and customer satisfaction.

=•	

Transportation Electrification

The nation's fleet of light, medium and heavyduty vehicles powered by carbon-free electricity.







Utilities are the key to the energy system of the future even as business as usual changes



Utility Business Models



Utilities can actively embrace new technologies and partners, act as integrators and accelerants, and continue to serve as trusted partners to their customers and local communities.

FIGURE 4. MICROGRID BUSINESS STRUCTURES ARRANGED BY LEVEL OF UTILITY CONTROL

THIRD-PARTY MODEL

- End user(s) or 3rd party own and finance microgrid
- End user(s) or 3rd party determine economic dispatch (potentially with utility guidance)
- Utility, end user(s) or 3rd party agree on appropriate islanding conditions

CUSTOMER

CONTROL

End user(s) see net change in bills

UNBUNDLED MODEL

- Utility or 3rd party owns and finances microgrid on behalf of end user(s)
- Utility or 3rd party dispatches DER assets on behalf of customer(s)
- Utility and end user(s) agree on appropriate islanding conditions
- End user(s) pays utility for grid assets, pay implementer (utility/3rd party) for microgrid assets, receives credit from DER

INTEGRATED UTILITY MODEL

- Utility owns and finances microgrid
- Utility dispatches DER assets based on system economics
- Utility and end user(s) agree on appropriate islanding conditions
- End user(s) pays utility for resiliency/premium power service

UTILITY

Regulatory Innovation Regulatory innovation is necessary to enable scalable deployment of clean energy technologies





Regulatory Innovation 50 unique states but common challenges





People & Knowledge

Managing Increased Rate of Change

Managing Risk & Uncertainty

Complexity of Objectives



Regulation • Innovation • Process

Regulatory Innovation



Regulatory innovation will enable new utility business models to keep pace with changing technology, economics, and customer demands for clean energy



Standards

Grid Interaction ₅

Construction

Grid Integration Reducing the friction points in grid modernization will accelerate clean energy



TECHNOLOGIES	ENERGY	GENERATING CAPACITY	DISTRIBUTION CAPACITY	VOLTAGE REGULATION	FREQUENCY REGULATION	FOLLOWING	BALANCING	SPINNING RESERVES	NON-SPINNING RESERVES	BLACK START
DISTRIBUTED SOLAR	Energy Generator	0	0					No	No	Nc
DISTRIBUTED SOLAR + ADVANCED INVERTER FUNCTIONALITY	Energy Generator	0	0	0	0	0		No	No	No
BATTERY STORAGE	Energy Storage	0	0	0	0	0	0	Yes	Yes	Yes
INTERRUPTIBLE LOAD	Load Shaping						0	Yes	Yes	No
DIRECT LOAD CONTROL	Load Shaping					0	0	Yes	Yes	No
BEHAVIORAL LOAD SHAPING	Load Shaping		0			0	0	No	No	No
ENERGY EFFICIENCY	Reduce Load		0					No	No	No
Unsuitable for reliably per May be able to perform a Able to perform a service,	forming the specif service, but is not but may be limited	ied service well suited d by factor	e. d or can p rs such as	provide pa s availabil	artial sup ity or cus	port. tomer be	havior.			

Source: SEPA's DER Capabilities Guide

https://sepapower.org/resource/distributed-energy-resources-capabilities-guide/

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Grid Integration Friction points will be reduced through standards, process and framework development



Transportation Electrification Transportation Electrification is the opportunity of the century for utilities -- Start preparing now





Figure 4. EEI/IEI Annual EV Sales Forecast Compared to Selected Forecasts

24 | sepapower.org

Transportation Electrification EV adoption and VGI supports clean energy deployment --Prepare to leverage EVs as grid assets and engage with customers







We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten.

Bill Gates



Carbon-free by 2050 starts now!

Julia Hamm President & CEO jham@sepapower.org 202-559-2025