



# **Customers First! Power Dialogue: What is Grid Modernization?**

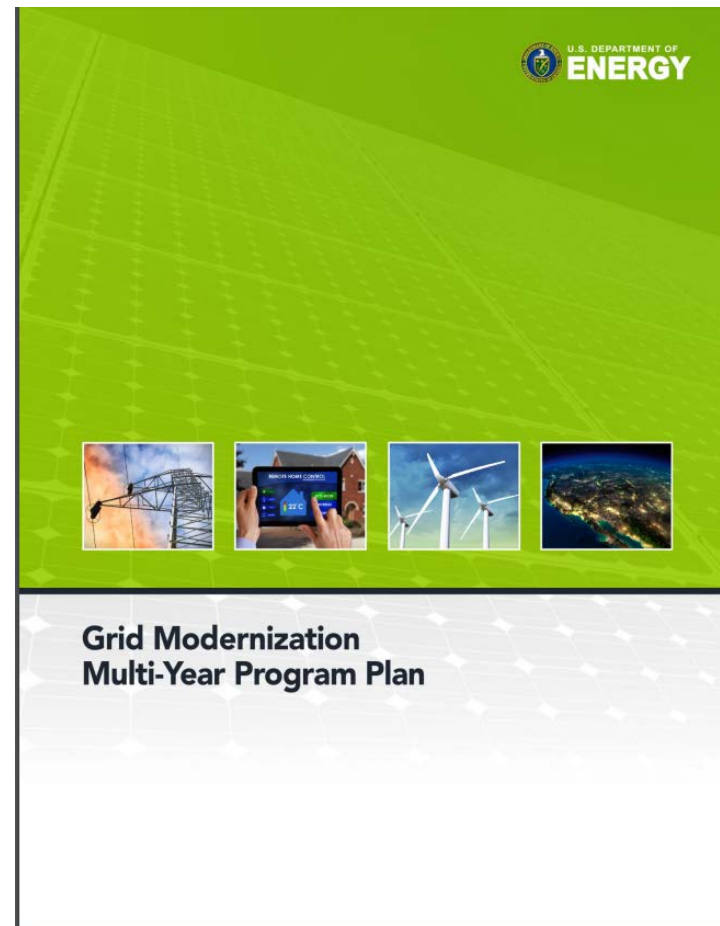
**Steve Kihm, CFA  
Principal and Chief Economist**

November 1, 2017

# U.S. Department of Energy

## Modern Grid Characteristics

- **reliable**
- **resilient**
- **secure**
- **flexible**
- **sustainable**
- **affordable**



# U.S. Department of Energy

## Modern Grid Characteristics

- reliable
- resilient
- secure
- flexible
- sustainable
- affordable

**Panel:**

**Which of these  
is (are) most important?**

**Are we missing any  
key issues?**

# U.S. Department of Energy

## Pacing

*The current business-as-usual trajectory for the electricity industry **will not result in a timely transition** to a modernized grid.*

# U.S. Department of Energy

## Pacing

*The current business-as-usual trajectory for the electricity industry **will not result in a timely transition** to a modernized grid.*

**Panel:**

**Do we need to  
pick up the pace?**

# U.S. Department of Energy

## Pacing

*Innovation in the electric power sector is inhibited by **regulatory, market, and business model uncertainties.***

# U.S. Department of Energy

## Pacing

*Innovation in the electric power sector is inhibited by **regulatory, market, and business model uncertainties.***

**Panel:**

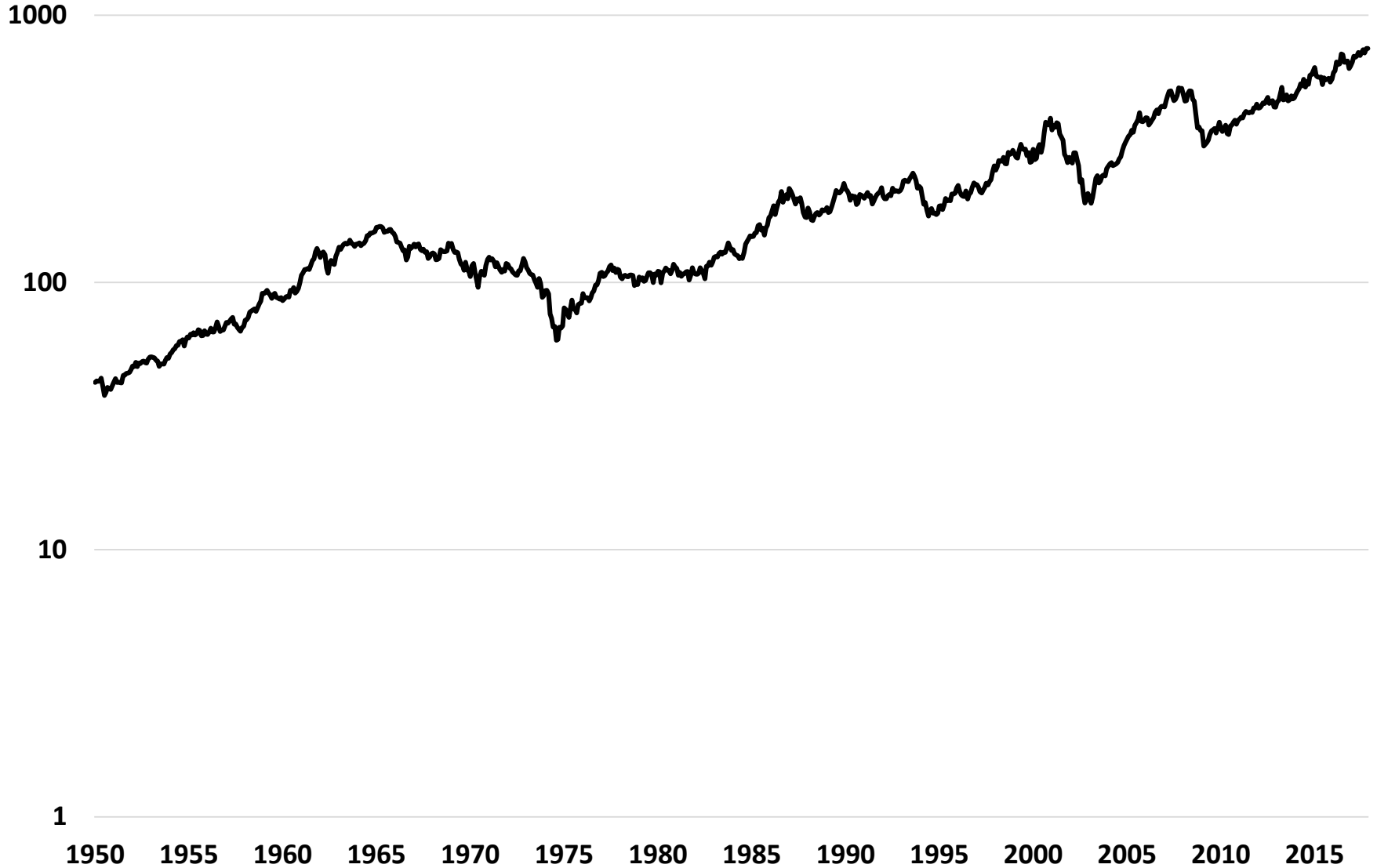
**Is this true, and if so, who holds the key to resolving it?**

# **The Financial Markets and Grid Modernization**



# Dow Jones Utility Index

Jan 1950 - Oct 2017



# Dow Jones Utility Index

Jan 1965 - Jan 1985

The financial markets  
were signaling that  
all was not well  
(and it wasn't)...



# Dow Jones Utility Index

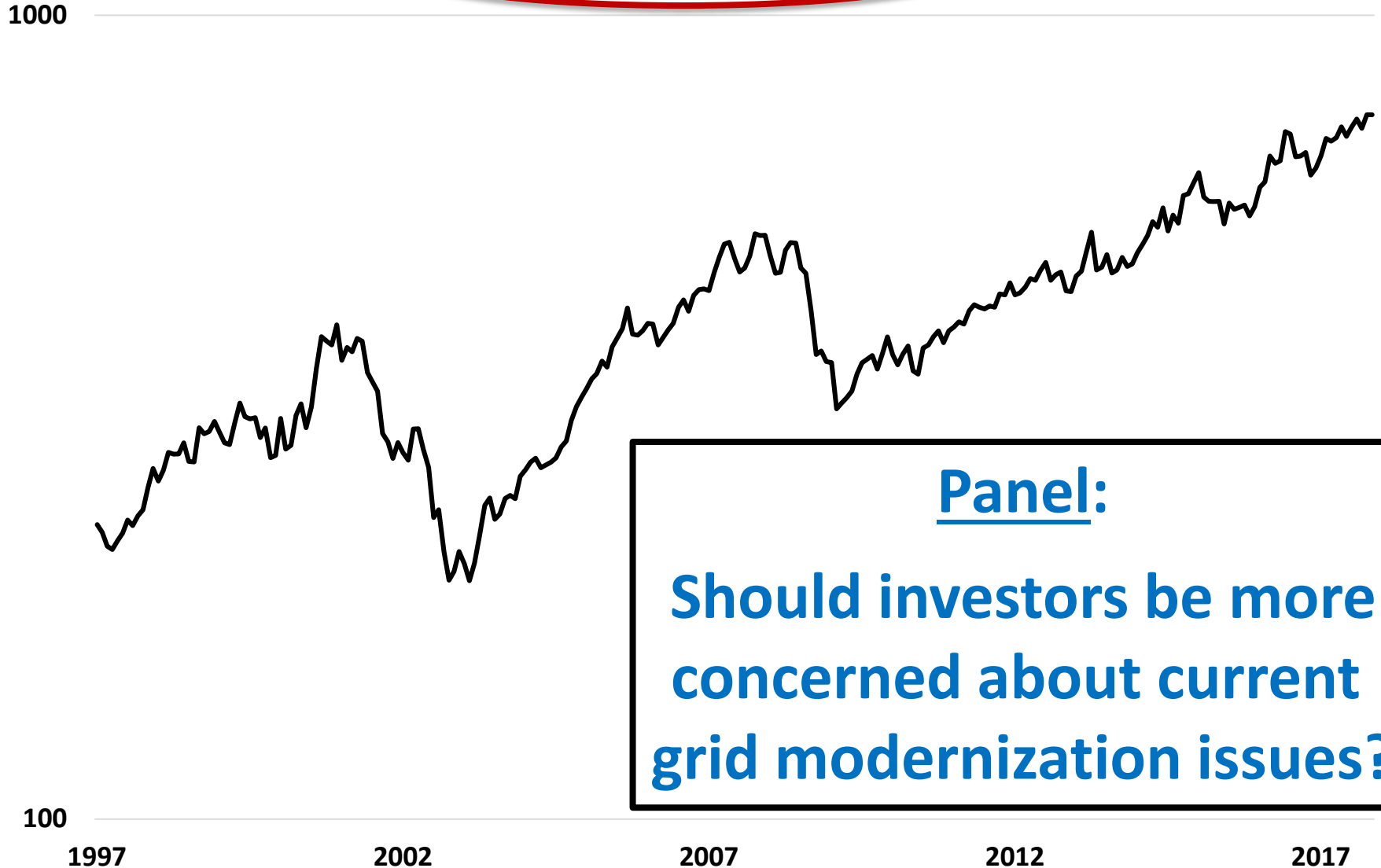
Oct 1997 - Oct 2017



...but we see no such  
signaling in modern times

# Dow Jones Utility Index

Oct 1997 - Oct 2017



Panel:

Should investors be more concerned about current grid modernization issues?

# **Geography and Grid Modernization**

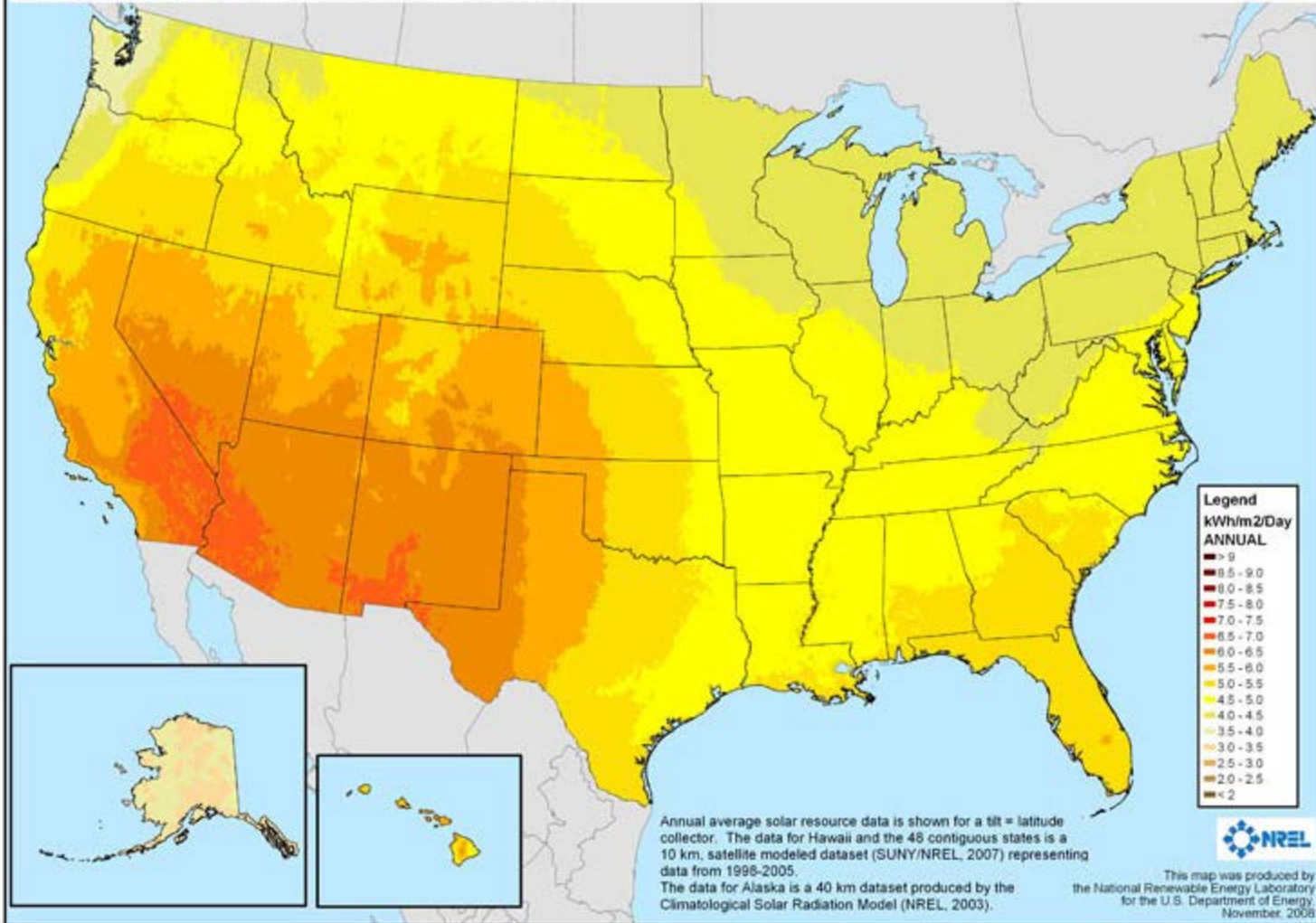
# Top Ten States Solar PV Penetration

Solar Penetration By State - 2016 Through October (In Megawatt Hours)

State	Total Utility Scale	Total Utility PV	Estimated DG PV	Total Solar	% Solar Penetration
CA	169,188,311	16,652,623	7,248,902	23,901,525	14.1%
HI	7,982,639	80,852	623,973	704,825	8.8%
VT	1,616,928	51,638	74,045	125,683	7.8%
NV	33,625,744	2,206,295	324,501	2,530,796	7.5%
MA	27,964,611	561,008	1,108,397	1,669,405	6.0%
AZ	93,456,444	3,285,224	1,427,970	4,713,194	5.0%
NJ	65,482,276	719,511	1,514,765	2,234,276	3.4%
NM	26,994,178	685,430	147,706	833,136	3.1%
NC	111,475,607	3,218,572	138,854	3,357,426	3.0%
UT	31,172,208	677,101	124,942	802,043	2.6%
MD	32,213,122	154,586	573,769	728,355	2.3%

# Photovoltaic Solar Resource: Flat Plate Tilted South at Latitude

## Annual



# Wisconsin Solar PV Penetration

0.1%



# Wisconsin Solar PV Penetration

0.1%

Panel:

**Will solar PV ever be significant in Wisconsin? If not, what will be?**

Potential Game Changer:

Electrification of the  
Transportation Fleet

# GM Is Going All Electric, Will Ditch Gas- and Diesel-Powered Cars

<https://www.nbcnews.com/business/autos/gm-going-all-electric-will-ditch-gas-diesel-powered-cars-n806806>

## Volvo plans to stop making gas-only cars in 2019

By Reuters

July 5, 2017 | 10:39am | Updated

# GM Is Going All Electric, Will Ditch Gas- and Diesel-Powered Cars

<https://www.nbcnews.com/business/autos/gm-going-all-electric-will-ditch-gas-diesel-powered-cars-n806806>

## Volvo plans to stop making gas-only cars in 2019

By Reuters

July 5, 2017 | 10:39am | Updated

### Panel:

**If the auto industry takes the lead, what does Wisconsin need to do to adjust?**

Potential Game Changer:

Going Off the Grid?

# **Segway Inventor Dean Kamen Thinks His New Stirling Engine Will Get You Off The Grid For Under \$10K**

<https://www.forbes.com/sites/christopherhelman/2014/07/02/dean-kamen-thinks-his-new-stirling-engine-could-power-the-world/#ada9f563b2e4>

# Segway Inventor Dean Kamen Thinks His New Stirling Engine Will Get You Off The Grid For Under \$10K

<https://www.forbes.com/sites/christopherhelman/2014/07/02/dean-kamen-thinks-his-new-stirling-engine-could-power-the-world/#ada9f563b2e4>

## Panel:

**Are off-grid alternatives existential threats to the grid, or are they likely to have only marginal impacts on utilities?**

# Panel Discussion



**Tom Content**  
**CUB**



**Tyler Huebner**  
**Renew Wisconsin**



**Greg Flege**  
**Dairyland Power**



**Megan Dyer**  
**Alliant Energy**



**Kira Loehr**  
**Perkins Coie**