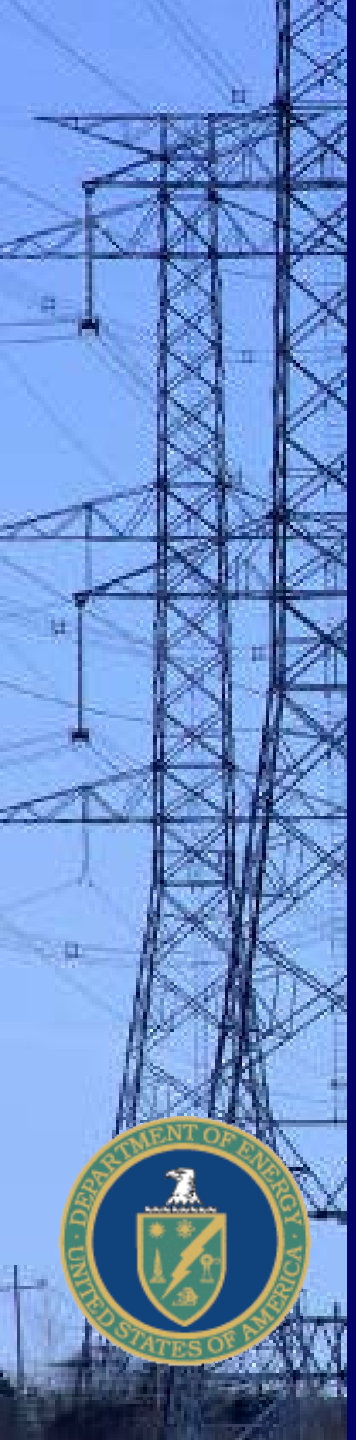

Some Ideas About A Maine Energy Roadmap

E2Tech Annual Meeting
Portland, ME

November 17, 2016

David Meyer, Senior Advisor
DOE Office of Electricity Delivery and Energy Reliability

Disclaimer

The views expressed below are my personal opinions. They should not be taken as official views of the U.S. Department of Energy.

An Electricity Perspective -- but Consider Growing Interdependencies…

- **Electricity and natural gas**
- **Electricity and IT infrastructure**
- **Electricity and transportation sector**

Result:

Electricity perspective ~ all-energy perspective

A Massive Electricity Transformation Is In Process

Multiple causes:

- **Penetration of new technologies and services, particularly at distribution level**
- **Digitization of entire electricity supply system**
- **Major changes in relative prices among generation fuels**
- **Broad support for cleaner, low-carbon resources**

No stable end-state is in sight – meaning that planners and policy makers must:

- **Weigh major long-term uncertainties**
- **Consciously seek to build in greater system optionality and flexibility**

Importance of Big Picture Thinking

- **A sustained, holistic view is essential to avoiding unintended consequences.**
- **But: A holistic view involves major complexities. Recall the growing interdependencies mentioned earlier.**
- **These complexities can be managed through an conceptual approach DOE calls *Grid Architecture*.**
- **Grid architecture is a systematic, rigorous way to think about *your* energy system, one component or subsystem at a time, without losing sight of the big picture. *It is not prescriptive.***
- **For more detail, google "Jeff Taft on Grid Architecture."**

Need for Balance Among Basic Objectives

- **At DOE, we usually think of the electricity grid in terms of an inclusive set of six basic "-ilities":**

  -- Reliability **-- Resilience**

  -- Affordability **-- Security**

  -- Flexibility **-- Environmental Sustainability**

- **The six are interactive and compete for resources.**
- **All are important, all the time – but typically not *equally* important.**
- **Establishing and maintaining an appropriate balance among them is the policy makers' challenge. (The Big Picture, again.)**

Where to Start?

- Map out the system you have, using a grid architecture approach. Include all elements that significantly affect the system's operations.
- What do you want your system to look like in 5 years? In 10 years? Longer term?
- What are the present system's strengths and weaknesses?
- What under-utilized resources do you have that might be used to better advantage?
- What policy and program changes would best take you in the directions you want to go?
- The hard part: Analyze the options, move incrementally, monitor responses, and be alert to unintended consequences.

For more information …

- **DOE has 88 projects under way at its national laboratories related to grid modernization.**
- **Go to: http://energy.gov/doe-grid-modernization-laboratory-consortium-gmlc-awards.**
- **Or, contact David.Meyer@hq.doe.gov**