The Future of Distribution Investment and Cost Recovery:

How new regulations and rates can help create a more efficient and cleaner grid

Beia Spiller, PhD
Lead Senior Economist
NBER Electricity Markets Workshop
May 2019

EDF
ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

Overview of Talk

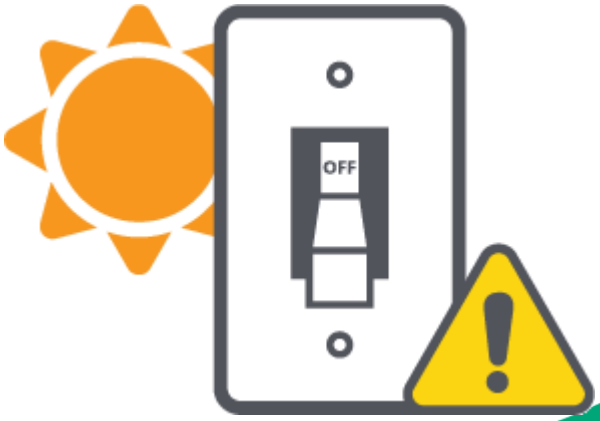
1. Challenges to distribution grid: how we use, interact with the grid is changing
2. Current rules/regulations/rates are not set up for the future grid
3. Inefficient investments, unnecessary cost recovery
4. How new policies, new markets, new incentives can bring about a more efficient system
5. Research project

Challenges to the Distribution Grid

Distribution System Challenges

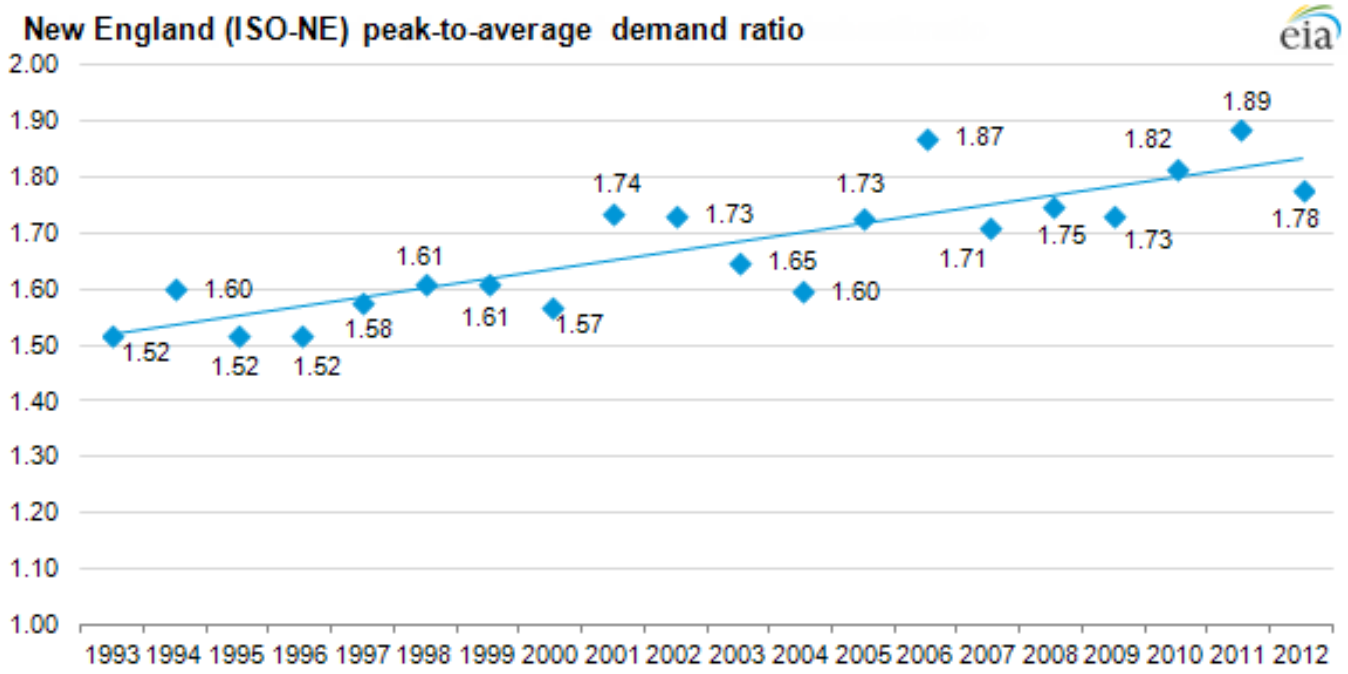
1. Increasing DER adoption
   - Grid moves from one-way energy flows to bi-directional flows
   - Integration of DERs is costly
   - Results in decreased net demand

***But, can be an opportunity for positive outcomes if deployed efficiently**



Distribution System Challenges

2. Increasing peak demand
   - Inefficient use of distribution system
   - Increased stress on system infrastructure



Distribution System Challenges

3. Rising system costs/obsolescent infrastructure- need for new investments

Camp Fire near Big Bend, CA; 2018.
Justin Sullivan/Getty Images

Distribution System Challenges

4. Increased storms due to climate change

- Need for resiliency and system flexibility

- DERs can play a role in helping meet this challenge

Photo by Iwan Baan, featured on the cover of *New York* magazine, November 4, 2012.

Investment & Cost Recovery Challenge

- Increased investment needs

→ Investments which won't be fully used due to low usage factor

→ Smaller rate base to pay for the investments results in ever increasing prices for electricity: Who pays?

→ Need to avoid these unnecessary investments for efficiency/equity reasons

Distribution Grid Challenges Exacerbated by Existing Utility Rules/Regulations/Rates

Current Utility Business Models

- ROI based on capital investments
  - Little to no incentive to reduce demand or system costs
  - Little to no incentive to identify alternatives to traditional capital investments
  - Potential incentive to overestimate load forecasts
  - No benefit to the distribution utility from achieving pollution/emission reductions

Deregulation and Ownership of Generation

- In deregulated states, utilities prohibited from owning (most sources of) generation
- Utilities thus unable to participate in DER marketplace, benefit from these investments

Distribution Rates Not Cost Reflective

- Electric distribution rates do not generally reflect costs
  - Sends incorrect price signals for:
    - Consumption
    - Conservation
    - Efficient DER deployment
  - Increasing cross-subsidies from non-DER owners to DER owners

Current vs Future Grid

Current Grid

- ✓Furnish light and power to customers
- ✓Ever expanding capital investments
- ✓Increasing costs
- ✓Increasing peak demand
- ✓Limited environmental improvements

Efficient Future Grid

- ✓Bi-directional energy flows
- ✓Reduction in unnecessary investments
- ✓Stabilized costs
- ✓New business opportunities
- ✓Improved policy outcomes/environmental impact

Policy Pathways to Help Achieve a Cleaner, More Efficient Grid

Building a Smart Grid/Platform

- Advanced Metering Infrastructure
- Efficient deployment of DERs in response to increasing intermittent generation from renewables
- Making granular data available to third parties
  - Important for efficient DER deployment and identification of non-wires alternatives
  - Provide transparency/independence into load forecasting
- Reducing transactions costs for DER investments

Regulators Can Order Change

- Example: Brooklyn Queens Demand Management Program (BQDM)

Background: Brooklyn / Queens without Load Relief

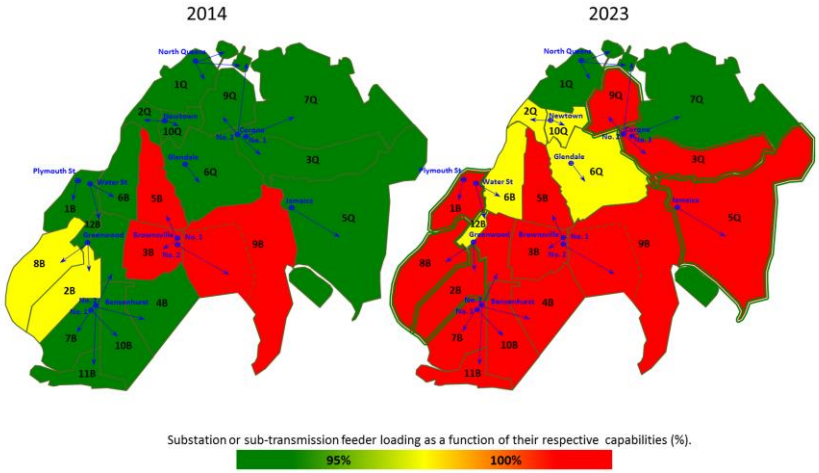
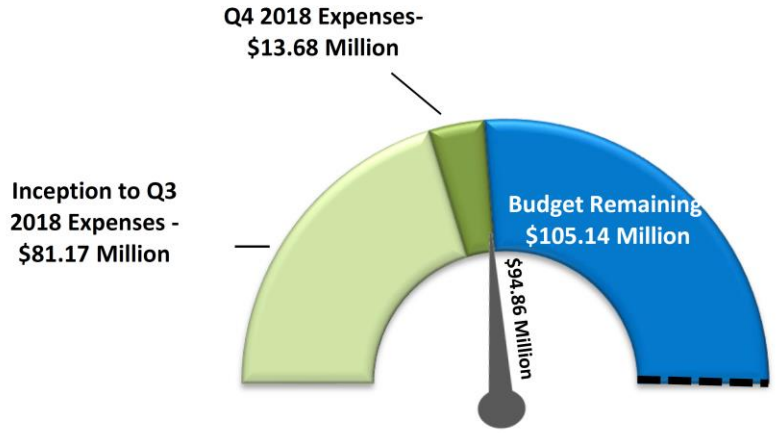


Figure 4: Projected Load Growth in Brooklyn and Queens

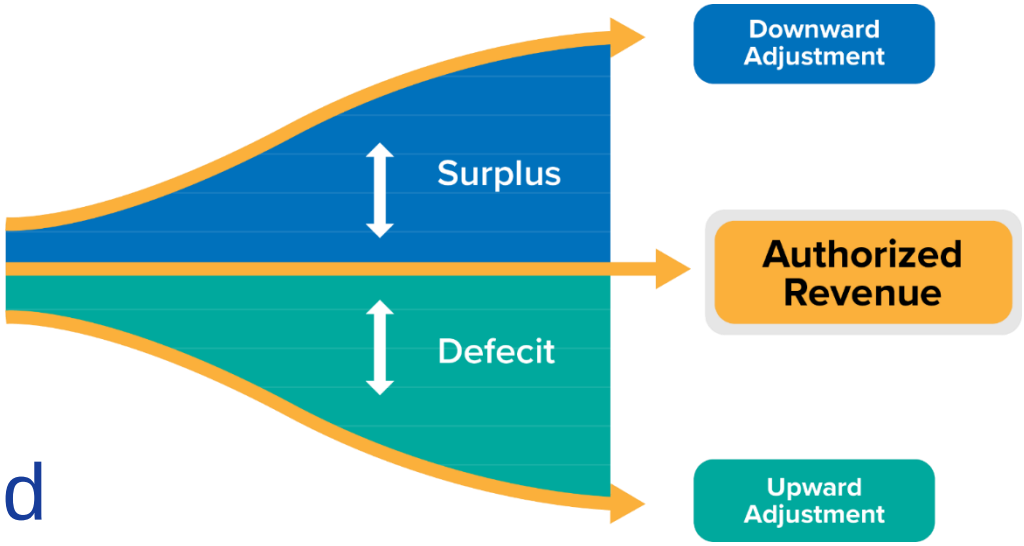


Change Utility Planning

- Change the benefit-cost analysis mechanism to include outcomes of interest
  - National Efficiency Screening Project 2014: **The Resource Value Framework**
  - Implemented in Arkansas 2018, Minnesota 2018, Rhode Island 2016, etc
- Distributed System Implementation Plan
  - Plan for development of distributed system
  - Provide data to market participants for targeted NWA investments
  - Links multiple systems/actors that compose power network for efficient information flows

Change Utility Incentives

- Make them indifferent to load reductions within a rate term: Revenue Decoupling



➢Only fixes short term incentives; incentive to expand network for increased returns remains.

Radically Change Utility Incentives

- Align earnings with socially beneficial outcomes (i.e., Performance Incentives):
  - Non-wires alternatives: pay utilities for avoiding capital investments
  - Earnings adjustment mechanism: pay utilities for investments that lead to beneficial outcomes, such as reductions in GHGs.

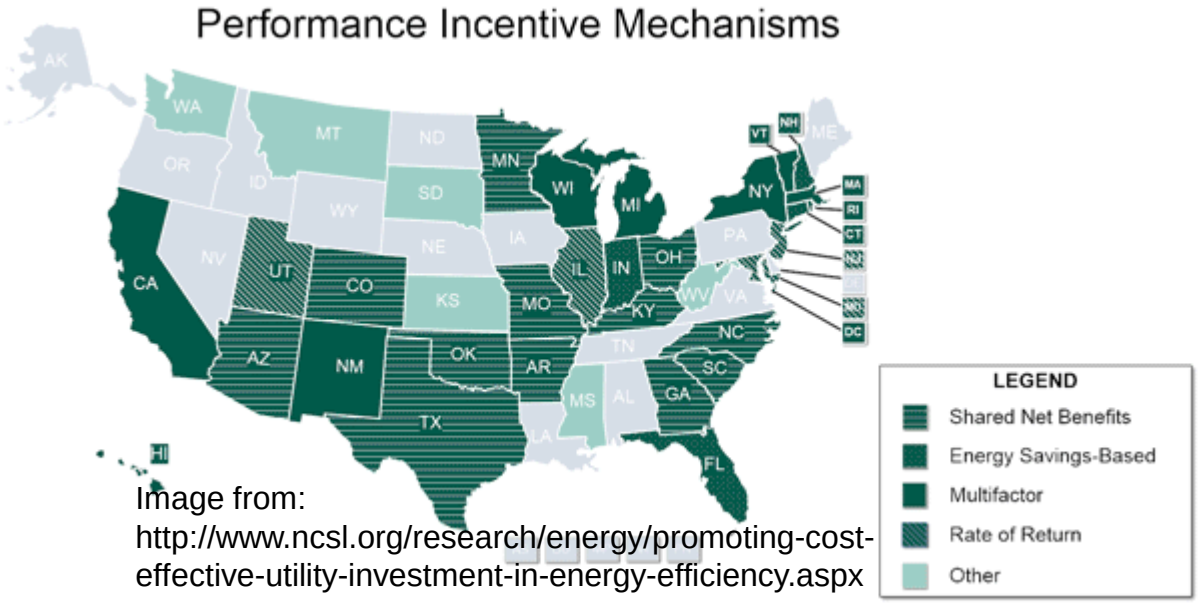


Image from:
http://www.ncsl.org/research/energy/promoting-cost-effective-utility-investment-in-energy-efficiency.aspx

Role of Rate Design

- Ensure costs are recovered through cost-reflective tariffs
  - Reduces cross-subsidies
  - Fair cost recovery by charging those who impose costs for their share
  - Reduces demand, keeps costs down long term
  - Incentivizes efficient DER deployment

Understanding the Effect of Rates on the Distribution System and Society

Need for Testing Rates

- Little testing has been done on distribution tariffs
- TOU rates/pilots abundant but not focused on distribution costs, bundle distribution and supply in one rate
- Notable exception: Con Ed's Innovative Pricing Pilot

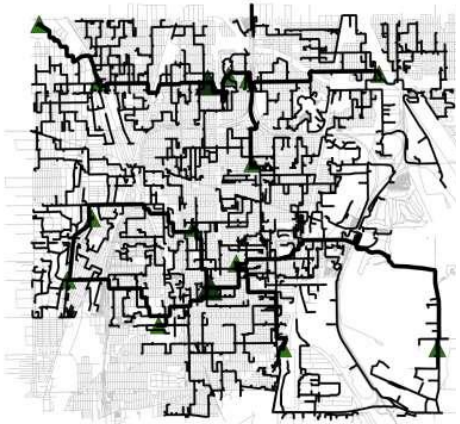
Research Project

- “Rate Design and Distributed Energy Resource Integration: Impacts on the Environment and Distribution System Costs”
- Sloan Foundation Funded Project
- EDF, MIT, NYU

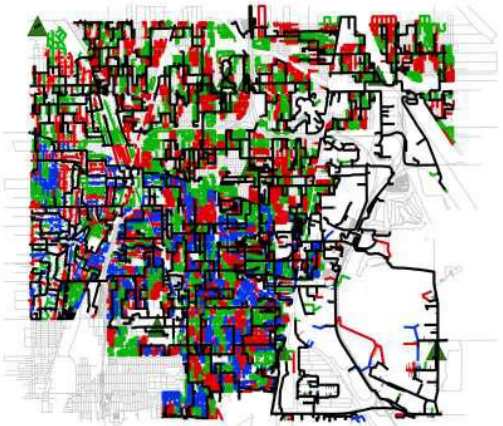
Research Project

- Simulation project
- MIT's Utility of the Future engineering models, adapted to include:
  - Economic utility function
  - Calibrate preference parameters to Commonwealth Edison AMI data 2016
  - Calibration to ComEd network

Substations



HV and MV lines



MV/LV Network

Research Project

- Key question- What is the effect of cost-reflective tariffs on:
  - Environmental outcomes
  - DER adoption/deployment
  - Social/network costs
  - Distributional outcomes
- Results by end of 2019

Conclusion

Conclusion

- The distribution grid is changing
- Need to change the nature of our investments
- Ensure fair cost recovery
- Regulations/rates/market rules need to change to ensure a clean, efficient, and equitable grid
- Need for further research, testing into advanced rates

Thank you!
Questions?

Beia Spiller
espiller@edf.org
212-616-1203

EDF
ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work