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# How Renewable Energy and other technologies are affecting regulation around the world

## Governing Green Power II, University of Hawaii - Manoa


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# RAP Global Work

- Sustained presence working with governments in
  - US
  - China
  - India
  - Europe
- Recent work in Mexico, Southern Africa

How are Renewable Energy and other technologies affecting regulation around the world?

# A Lot!!!

- Technology advances are immutable
- People will want and use new technology -- inevitable
- Government and Policy can nurture and accelerate
- Government and Policy can stifle and slow

Utility

Stakeholders

Regulator

# Power Sector Transformation

Reform

Innovation

# Organizing A Big Topic

- What do utilities and government do?
  - Plan
  - Operate
  - Invest
  - Protect
  - Set and Implement Policy
  - Access/Entry
  - Serve, new dimensions

# The One Way Grid

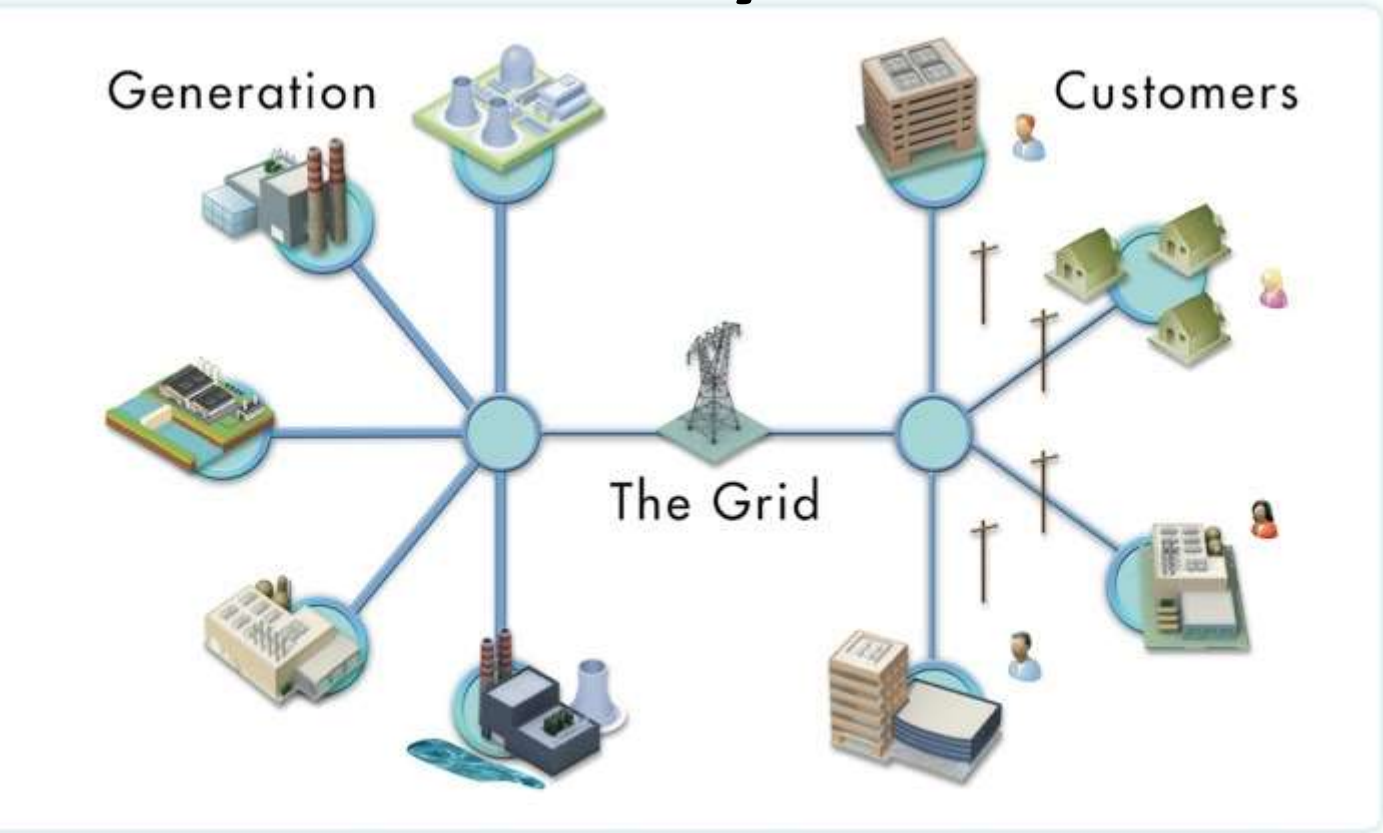
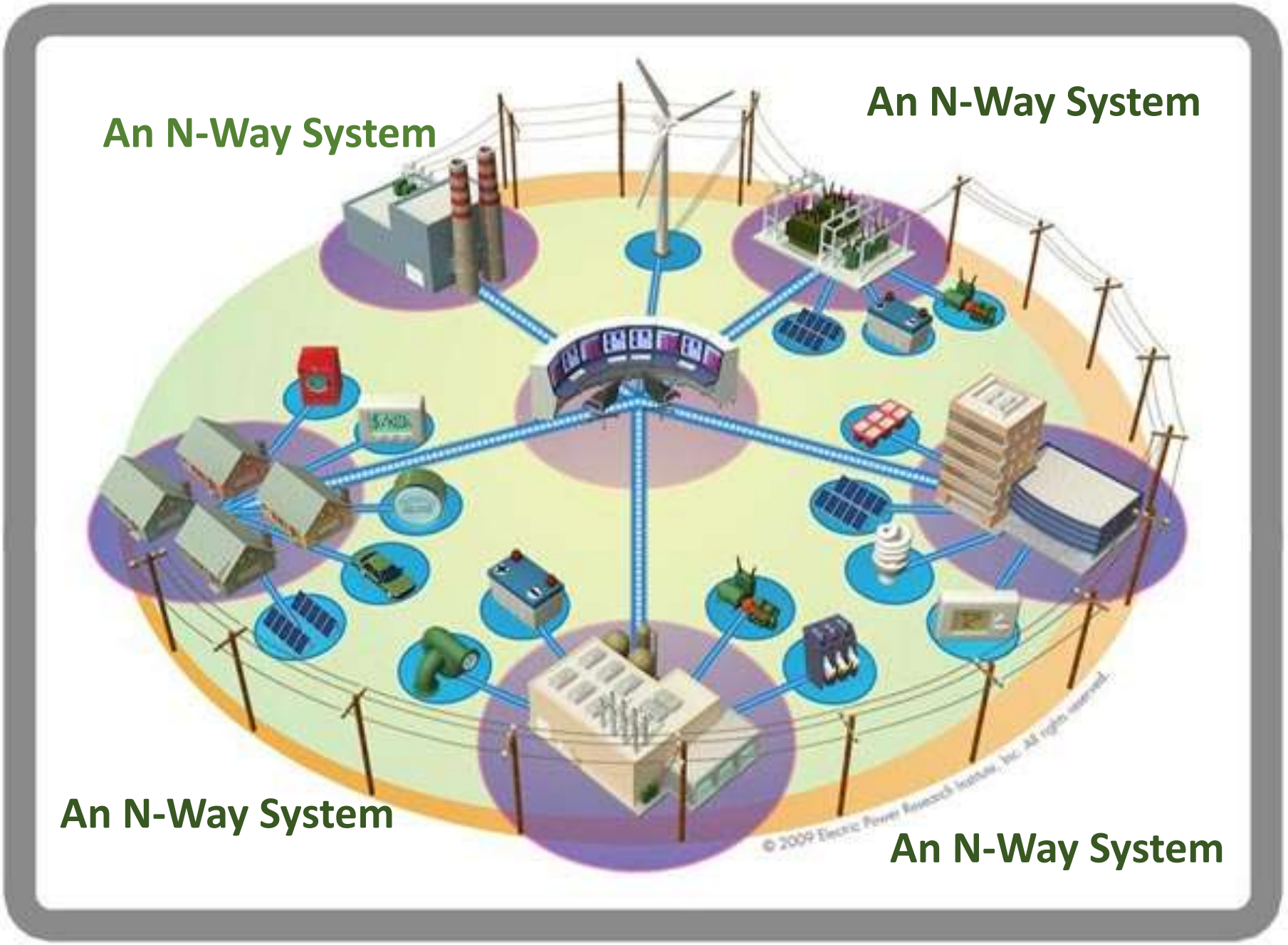



*Figure 1: Today's Power System Characterized by Central Generation of Electricity, Transmission, and Distribution to End-Use Consumers*


An N-Way System
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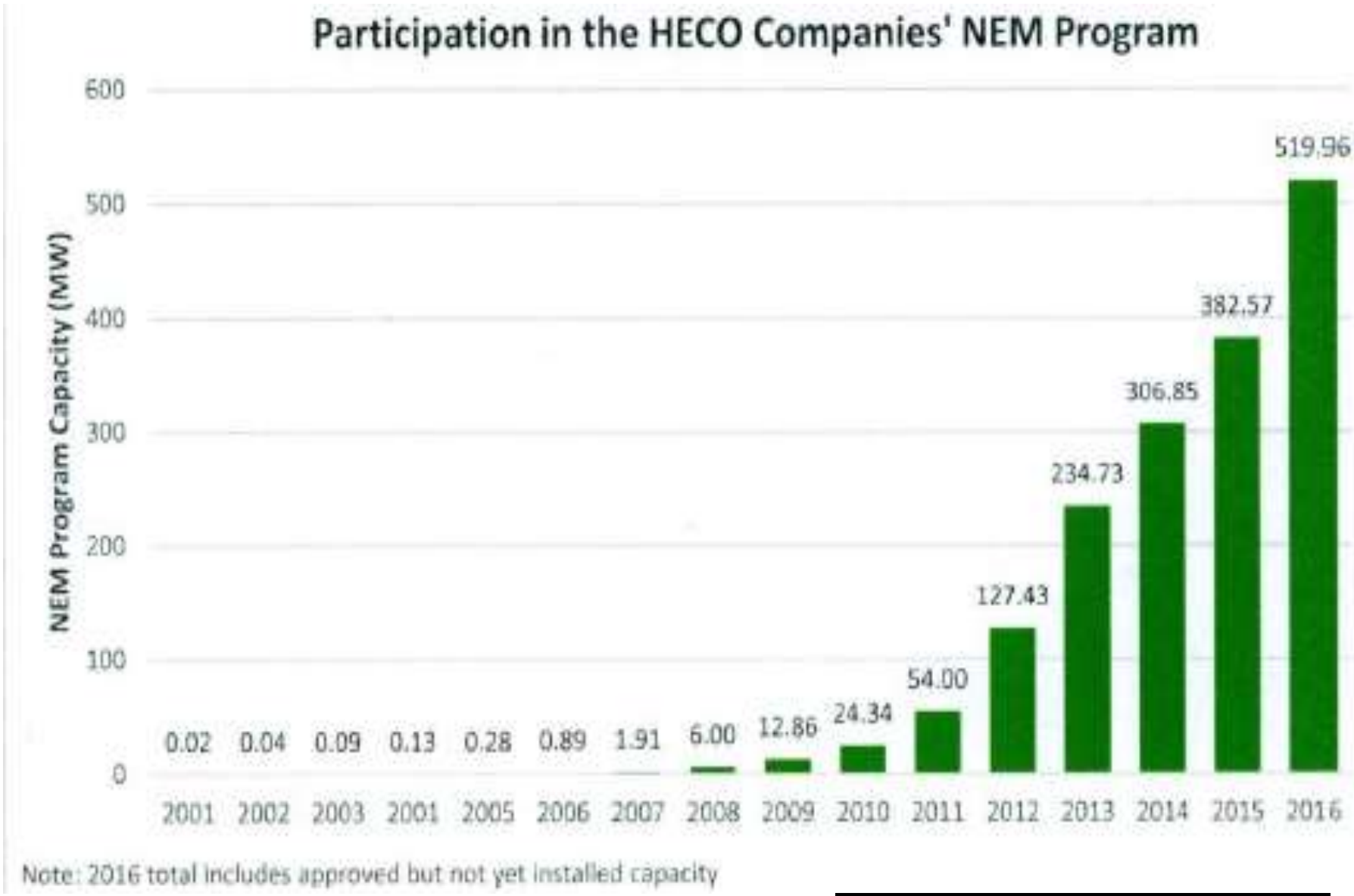



Source: HECO cited in Hawaii PUC Order No. 34281

# Planning

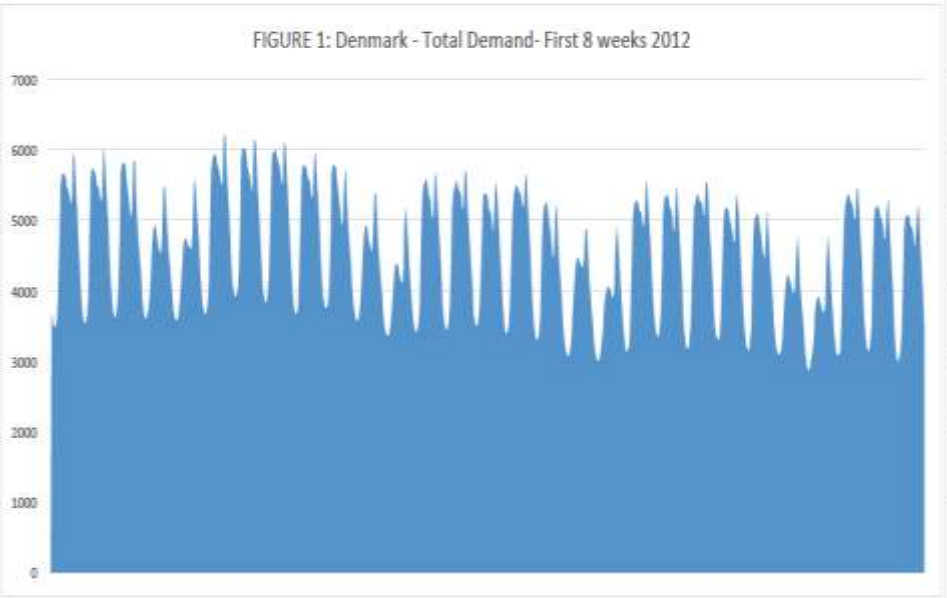
- Long Term Resource and Capital Planning
  - Utility
  - Government
  - Customers
- Short Term Planning
  - Using resources and investments well

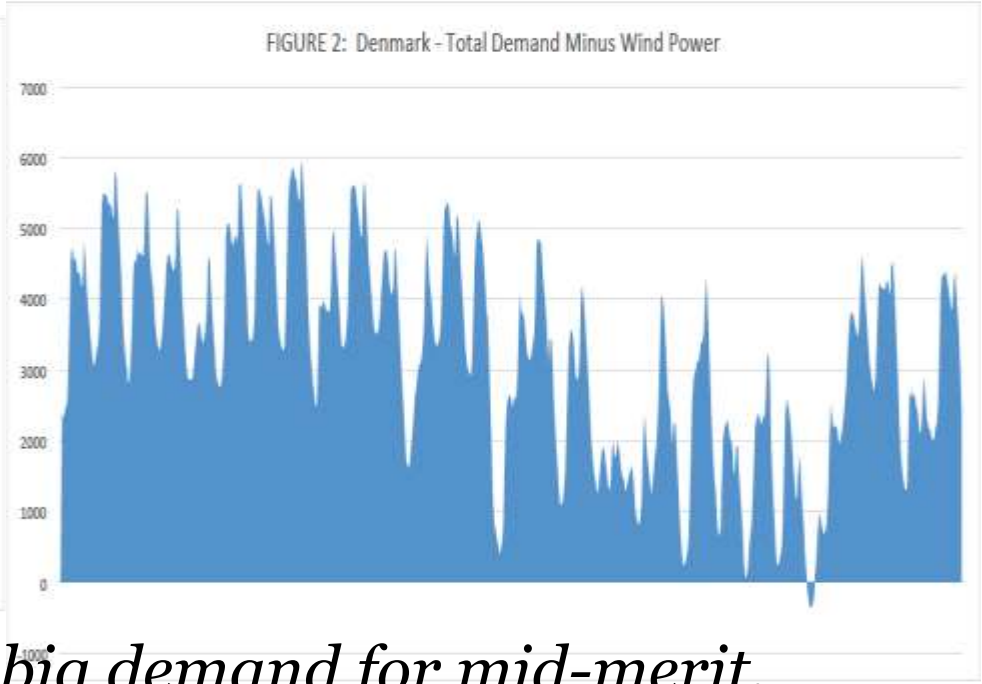
# Operations

- Utility Assets
- Customer Assets
- Computing and Communications:
  - Data
  - Automation

- **Convergence** of energy assets
- **Attention to Net Demand**

# Gross Demand and Net Demand




1) *Little demand for baseload, big demand for mid-merit, demand for peaking pretty much unchanged*
2) *Shouldn't energy & balancing services prices reflect this?*
3) *And if they do, just how "fixed" is the gross demand curve?*
4) *We're only looking at one (small) artificially bounded area….*

# Investment

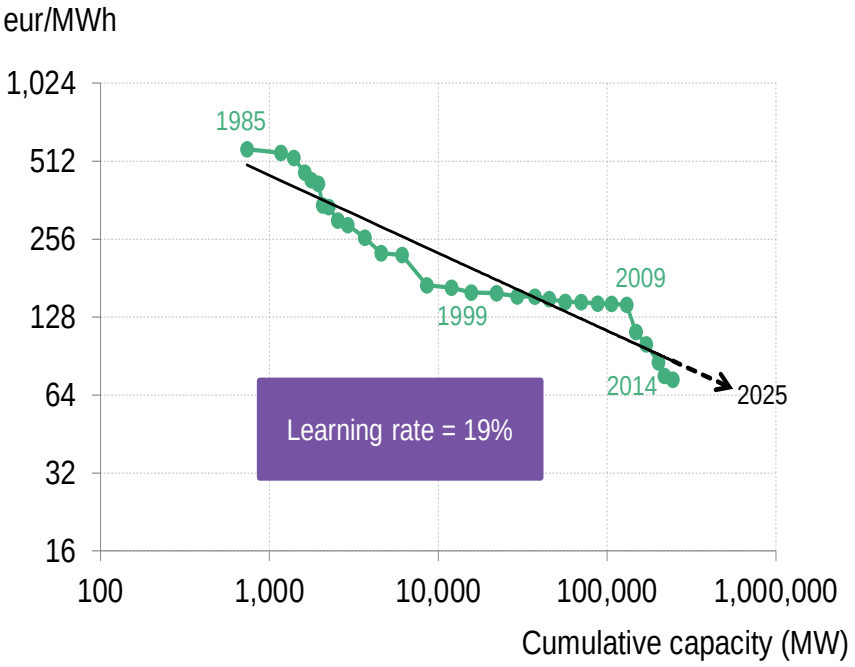
**3, 5, 10, 15, 20, 30, 50 year decisions!**

- Utility Assets
  - Aging infrastructure, congestion
  - Same next year as last year
  - Avoid rate increases
  - RE integration
- Customer Assets
  - More choices

**How does Innovation Happen?**

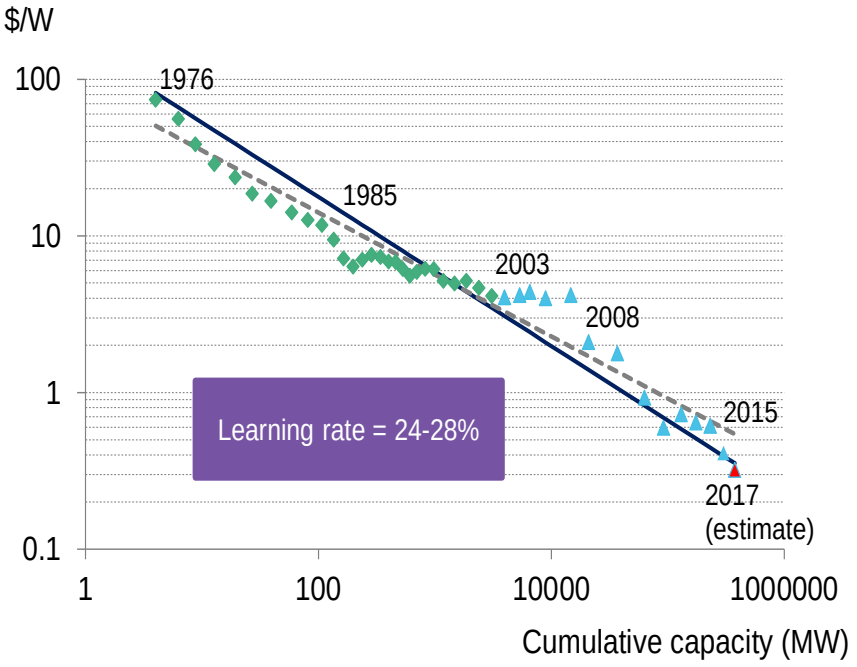
# Wind and solar experience curves

## Wind




*Source: Bloomberg New Energy Finance*

## Solar




*Source: Bloomberg New Energy Finance*

# Protect

- Stay true to the essentials
  - Fairness
  - Quality
  - Attention to vulnerable customers
  - Energy efficiency
- Consider possibility that markets can work well with proper oversight

# What do I mean by markets?

- Decision-makers
- Making operating and investment decisions
- Based on efficient economic signals
  - That reflect short and long term grid value
  - That reflect societal priorities
  - That reflect customer priorities

# Set and Implement Policy

- Statutes set policy
  - Is improving statutes a fearsome process?
- PUC implements policy
  - Pace of change, innovation opportunities indicate more value in pro-active steps
  - Attention to process options
- Leadership is always important

# Access and Entry

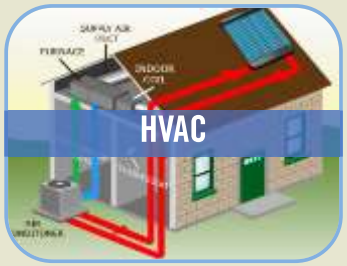
- Customers as a resource
  - Do we believe it? Or is it just a phrase?
  - If we believe it, resources should
    - Have access
    - Be enabled (by utility or other service vendors)
    - Be called for (planning, investment, operations)
    - Be compensated (least cost procurement still applies)

# Service in traditional and new dimensions

- What are customers getting? What will they want?
  - Commodity electricity, and related
    - Customer service and
    - Emergency service
  - Concierge advice
    - Are Hawaii Energy and Hawaii Electric collaborating well for customers?
  - Support for aggregators and service vendors

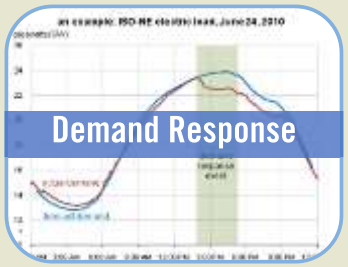
## Figure 8: Energy Management Applications Store

**Efficiency Solutions**



**Load Management Solutions**

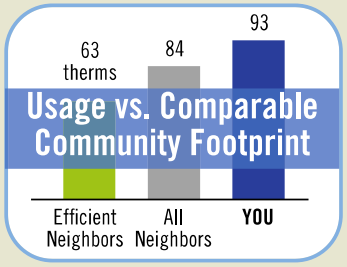





**Distributed Resources**




**My Dashboard**



Pathway to a 21st Century Electric Utility, CERES 2015

# Manifesting change due to renewables and technology

# More Renewable Energy: Manifestations of Change

| Wholesale | Distribution | LT Planning |
| --- | --- | --- |
| Flexibility!!!!! | Interconnection | Policy-driven |
| Balancing area | Value-based DG compensation | Legacy Gen: End or Save |
| Probabilistic | Planning/NWA | Procurement |
| Declining marginal cost | Rate design | Siting |
| | “Smart solar” w/ storage | |

# Advanced Technology: Manifestations of Change

## Wholesale

SystemControl

State of System

New system operation

Do we need fewer reserves

## Distribution

2 way system

Rate design

Reveal value

Automation, smart meters, internet of things

Peer to peer

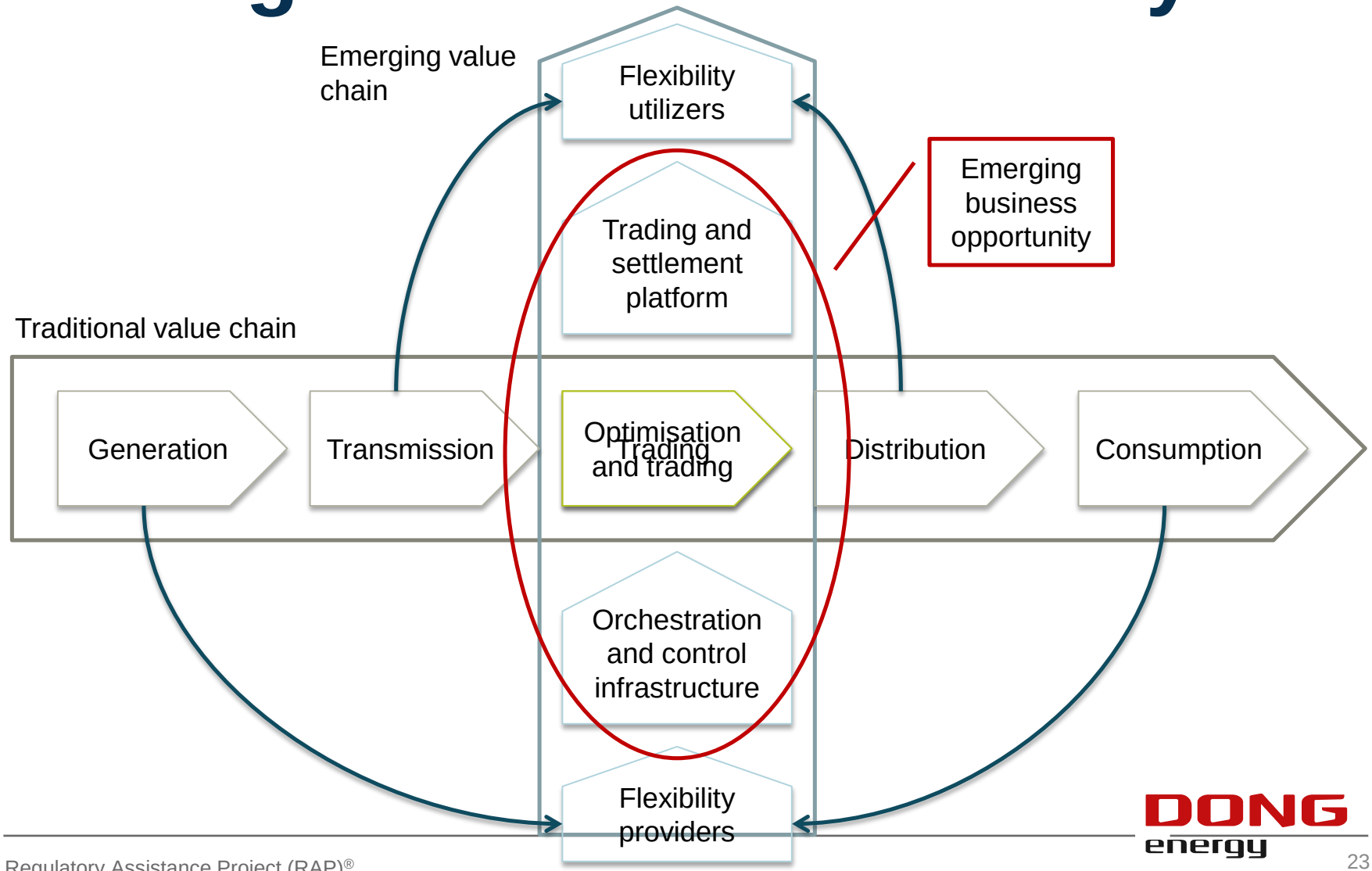
## LT Planning

More manage, less control

New skills to forecast DERs

Virtual Power Plant

# Making a market for flexibility



# Institutional Capabilities

| Utility | Regulator | Stakeholders |
| --- | --- | --- |
| New technical solutions | Risk of action | Defensive |
| New ways of thinking | Risk of inaction | Skeptical |
| Engagement | Staffing | Impatient |
| Protecting owners, mgmt | Routine work | Enthusiastic |
| | Leadership | Self-serving |
| | Near term dilemmas | Insights from elsewhere |

# Stop for a moment: Are we motivating utilities well?

- What do we want regulated companies to do?
- Are we motivating them for that set of outcomes?
- If there is a mismatch, can we reduce it?
- If we do not make changes is there a cost?
- Is the utility job specified for 2025 or the past?

- Central questions for utility regulation today

# Process – so important in change

## Evidentiary

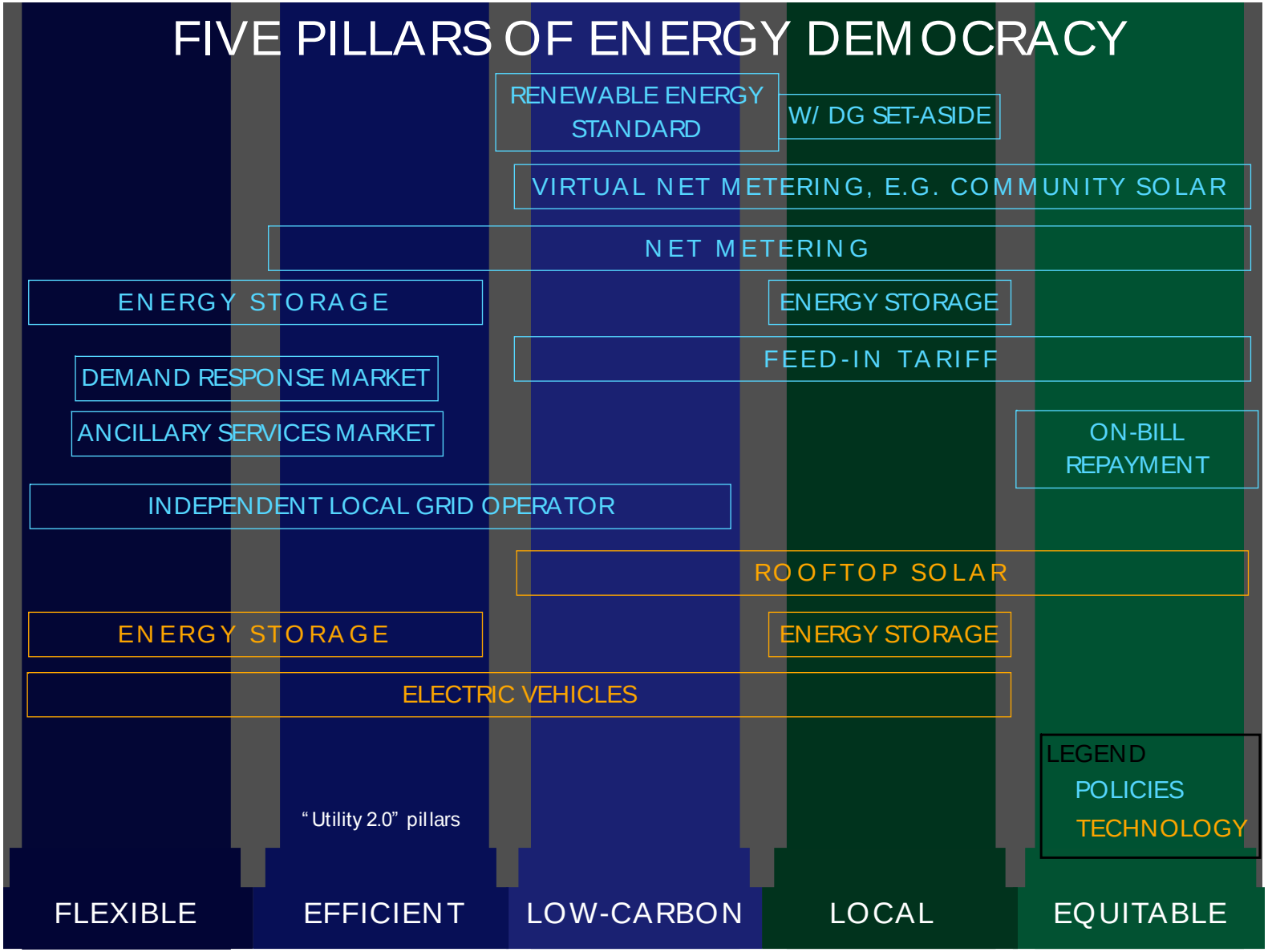
What is right?
Who is right?

## Collaboratives

Problem solving
Learning
Can involve the PUC
Pro-active PUC

## Workshops

Same as collaboratives, inside and serving a docket




Beyond Utility 2.0 to Energy Democracy, Institute for Local Self-Reliance, 2014

# Choices

- Process solutions
- Markets vs. mandates
- Performance standards and shared savings
- Equity and access
  - Corporate buy through
  - Community/Subscription net metering
  - Weigh community interests
  - Environmental justice

# Role of the Utility, Restated

- Delivery, reliability, connection as always
- Procurement of clean energy – policy driven
- Enabling clean energy – platform services
- Reward system
  - Less on assets
  - More on performance
    - Exemplary achievement on Metrics
    - Shared savings from procurements

# International Reflections

# China – Mostly manifesting in bulk power

- Solar development at home to support exports
- Generation quotas – changing
  - New Renewable quota (RPS)
  - Reduce curtailed energy
  - Reduce pollution
- Provinces mobilizing to engage, cooperate more
  - China Southern Grid nimbleness

# India

- Growth served by renewable power
  - Recent realization of outstanding wind potential
  - Solar deployment growing
- States considering unprecedented collaboration to enlarge wind balancing areas, other actions
- Access issues more under control
  - More solutions for energy access

# Price of renewable energy in India

> The cost of solar power is now cheaper than coal in this country.

*Piyush Goyal*
*Minister of State for Power, Coal, New & Renewable Energy and Mines, India*

*Image: Twitter*

# Mexico

- Current government: sustained embrace of climate goals and industry restructuring
  - New renewables a key design goal
  - State utility broken up, new ISO, rules to enable IPPs, attention to technology end to end

# Southern Africa

- In South Africa, enabling solar power is a key solution to energy shortages leading to rotating blackouts
- In southern African nations are collaborating to produce larger balancing area for wind

# South America

- Clean Energy Ministerial recently recruited South American countries for the first time
  - Significant driver is need to integrate more renewable power and reassess the utility business model with international experience

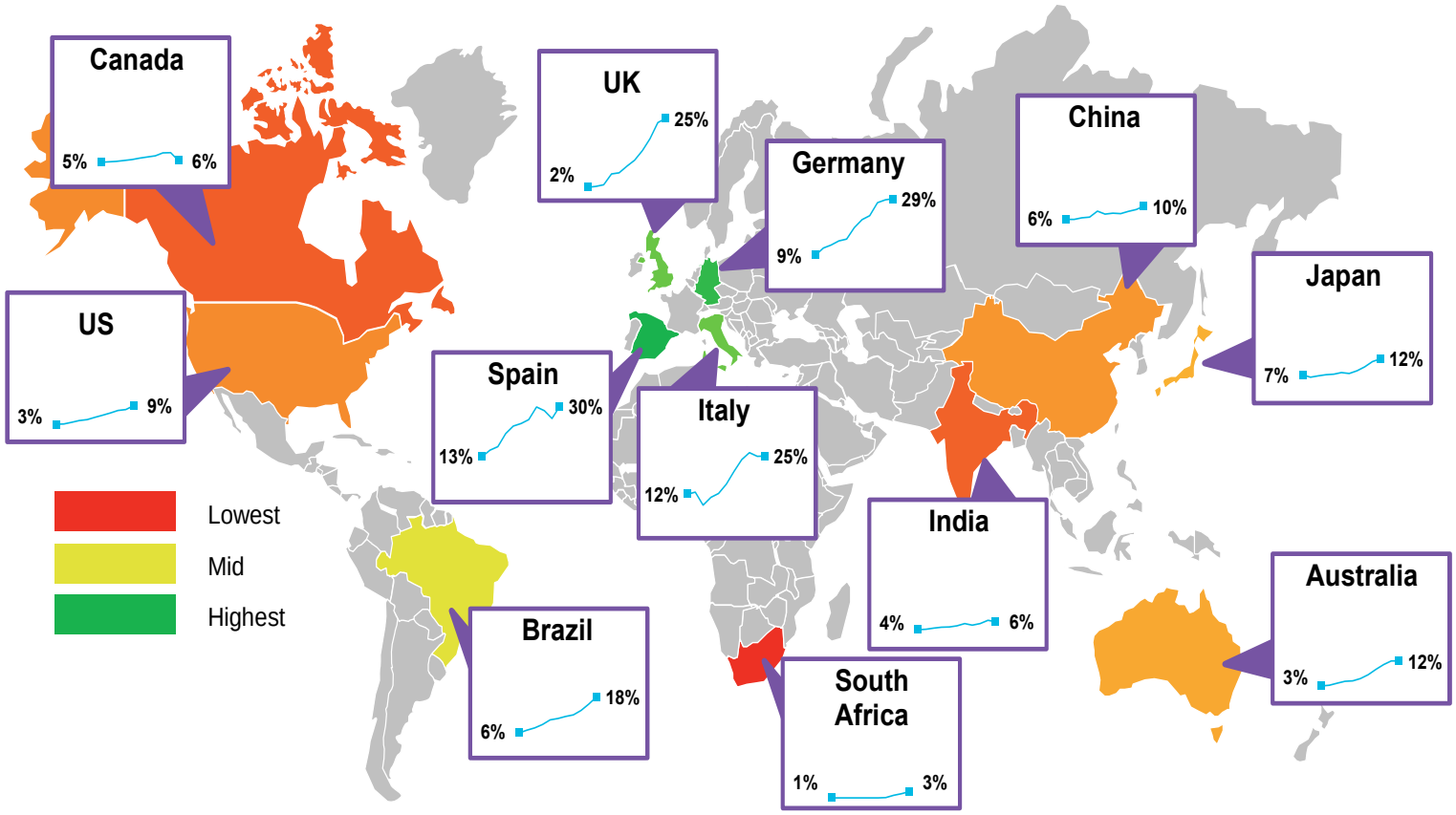
# Europe

- Strong climate statement binds EU
- Renewable capacity and commitment very high in some countries
  - While in others, coal is political
- Portugal demonstrated an extreme, producing 103% of needs in a recent day from RE
  - Interconnection with Spain helps, but…

# Europe

- … generally, interconnection are weak and inadequate to integrate renewable power needed to meet 2050 climate goals
- Nationalism a key structural reason
  - Resulting institutions weak when driving interconnection
- Outcome-based regulation is familiar

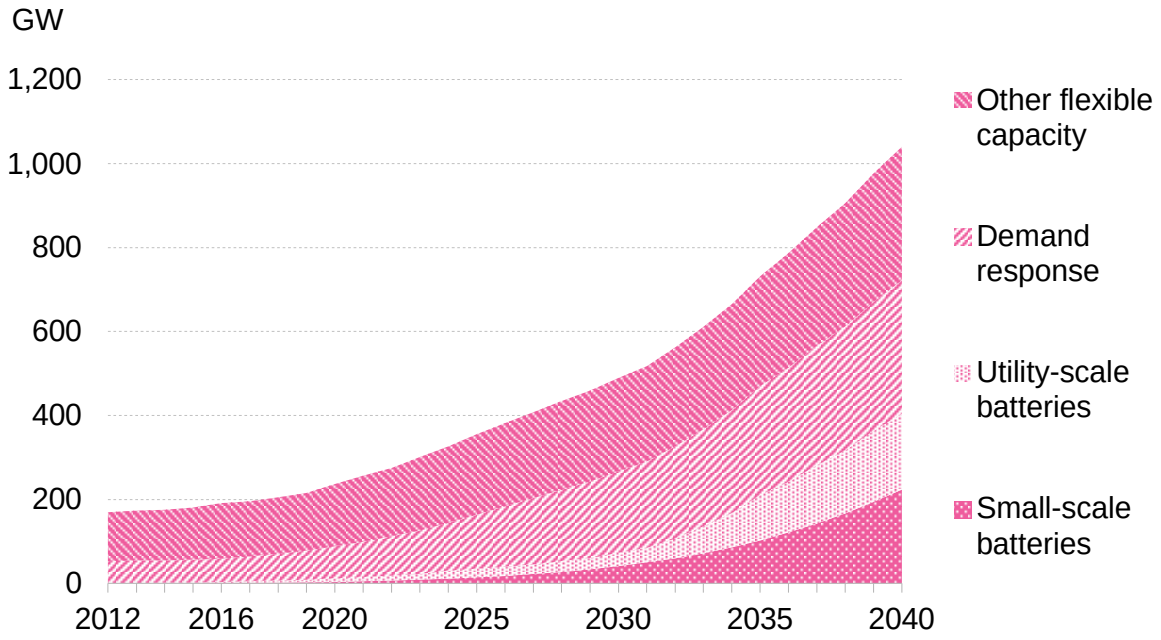
# Renewable energy (exc large hydro) proportion of power generation, 2006-16




*Note: Excludes large hydro Source: Bloomberg New Energy Finance*

# Will Customers Respond?

## Demand response and batteries meet peak and balance the grid




| Top 5 markets in 2040 | |
|---|---|
| China | 343GW |
| U.S. | 200GW |
| India | 127GW |
| Japan | 62GW |
| Germany | 30GW |

*Source: Bloomberg New Energy Finance*

# Transformation – what it looks like in the midst of it

- Changes to how we work and play
- Changes to the kitchen table conversation
- Changes to our visits to the home store
- Changes to **expectations** of what is possible
- Changes to the meaning of "**consumer choice**"
- Protection maintained, room for innovation

# What does this figure imply?

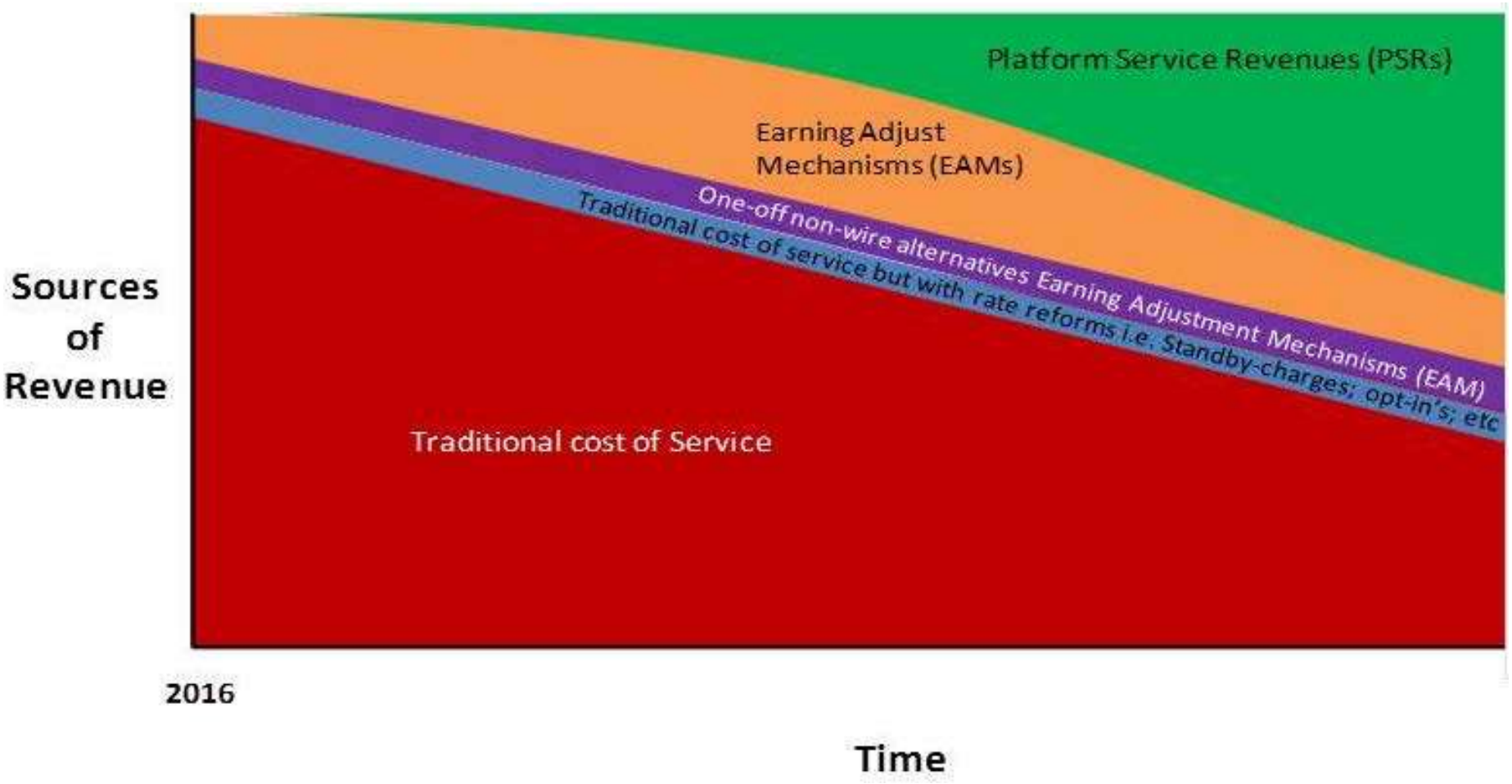



**Figure 2. Sources of utility revenue within NY REV[18]**

# No place has confronted utility profits and rate design as US has

- … in some states
- Two sides of the regulated entity business model
- Both controversial
  - Some will find only practical option to focus on **planning and procurement** practices and avoid “third rail issues”
- Why do it? Virtue of **Economic Efficiency**
  - **Align private interests with public interests**

# Tomorrow we will confront these two key issues

- I am excited to participate with you


Suddenly, knowing a lot about the U.S. power grid became sexy at cocktail parties.

# About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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