Utility Business Models in a Low Load Growth/High DG Future: *Gazing into the Crystal Ball?*

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Committee on Regional Electric Power Cooperation (CREPC)/State-Provincial Steering Committee (SPSC) Meeting

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Motivation and Context

- **Framing question: Is there an "existential threat" to the business model of regulated utilities?**
- **Utilities are observing and publicly stating threats from declining demand and lost investment opportunity in supply and energy services**
  - **"Disintermediation" – Jim Rogers, President and CEO Duke Energy**
- **Significant activity across a range of actors in identifying, understanding, and addressing questions related to utility business models**
  - **Limited experience to date with fundamental changes to regulated utility business models in US; more experience with incremental changes to COS regulation**

Outline

- What does a low load growth, high DG future look like?
- What are the implications of this future for utility business models?
- Who is doing what?
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- What are the countervailing forces?

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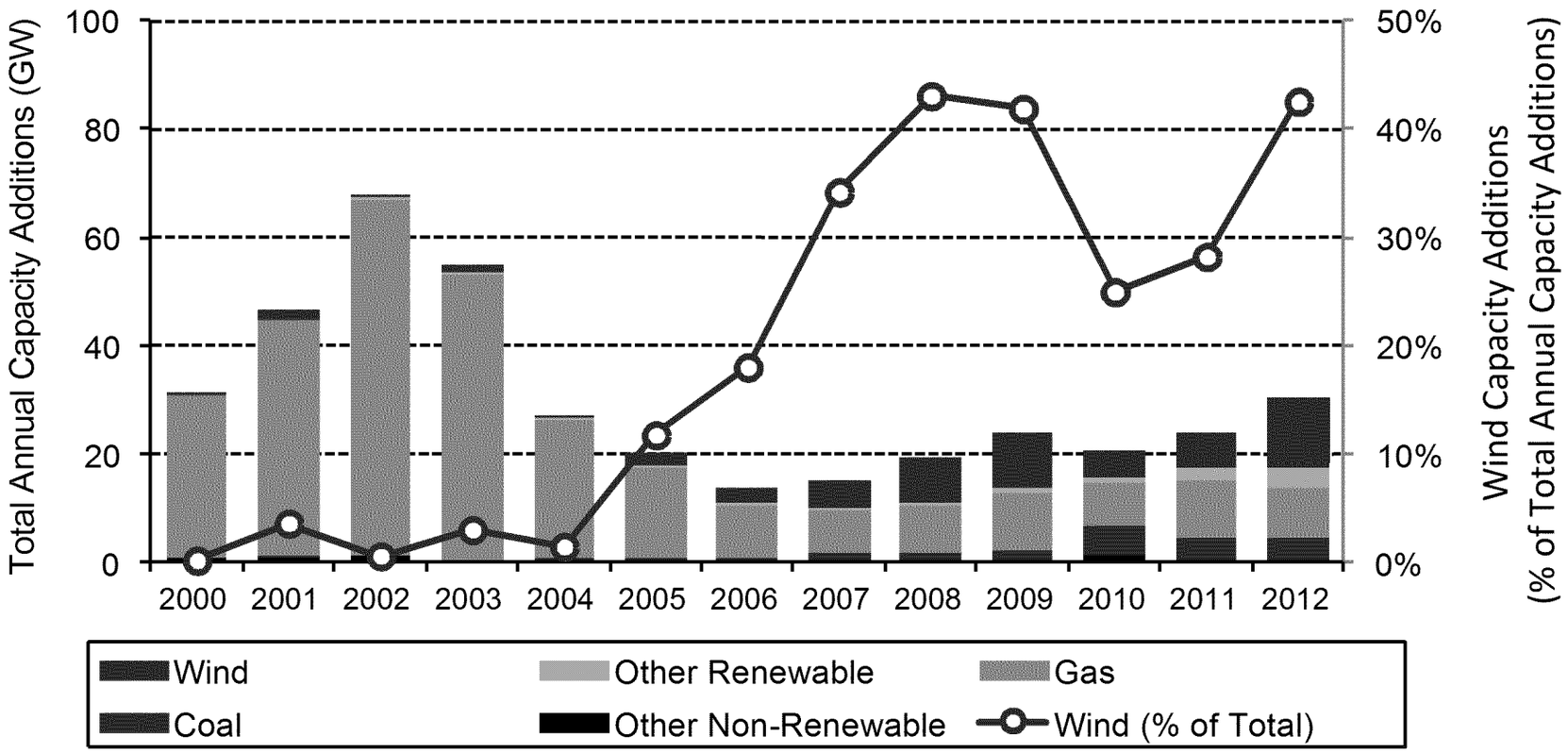
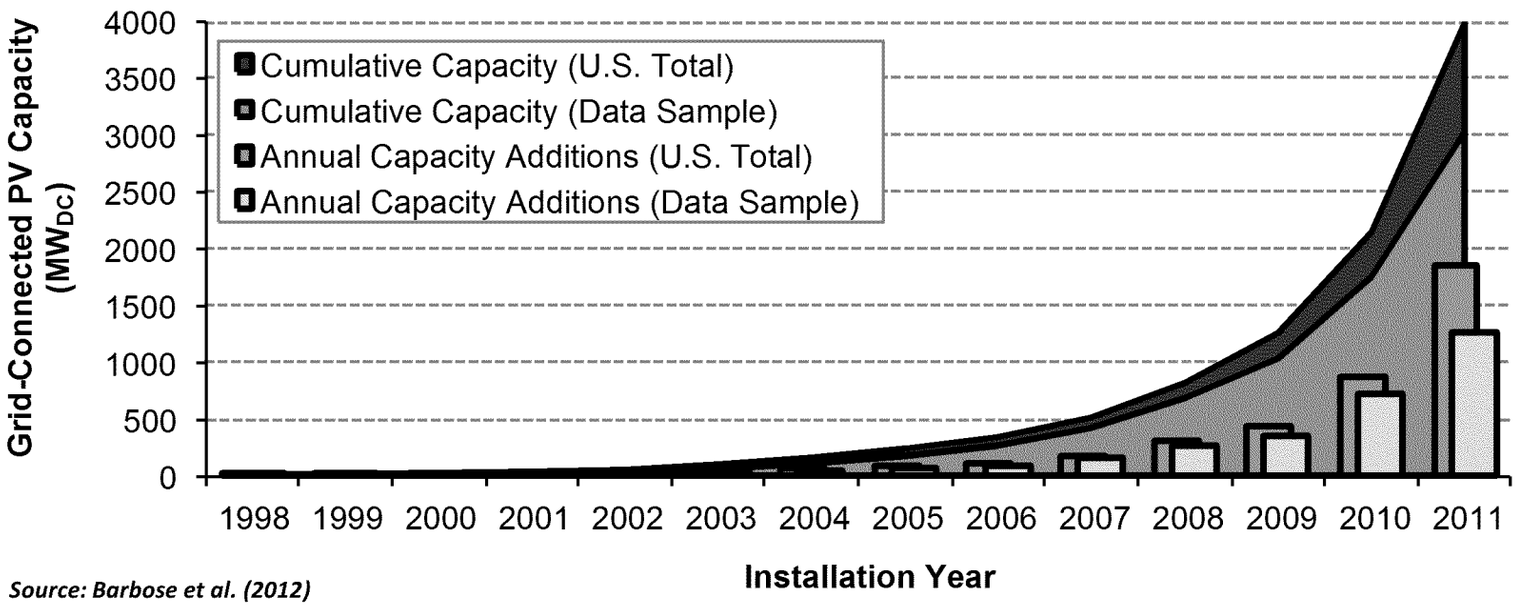
Renewable Generation Accounts for Increasing Share of U.S. Capacity Additions



Source: Wiser and Bolinger (forthcoming).

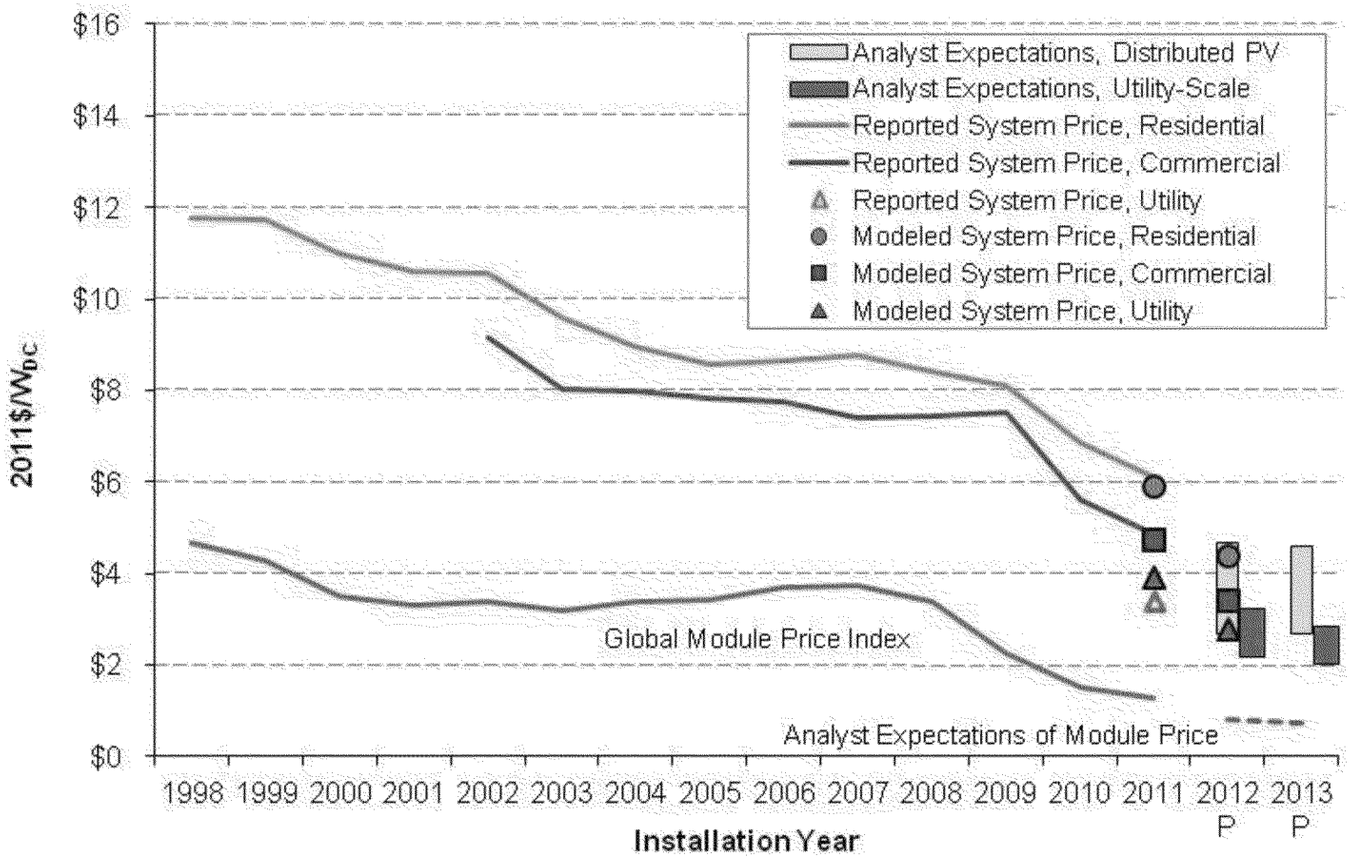
U.S. PV Capacity Increased Substantially Over Past 5 Years

- **Starting in 2007, US cumulative PV capacity was ~500 MW.**
- **Total installed capacity doubled by 2009, doubled again in 2010 and then doubled again in 2011**
- **Annual growth rate of PV in the U.S. has exceed 30%/yr since 2001**



Source: Barbose et al. (2012)

Installed Solar PV Prices Continue to Decline

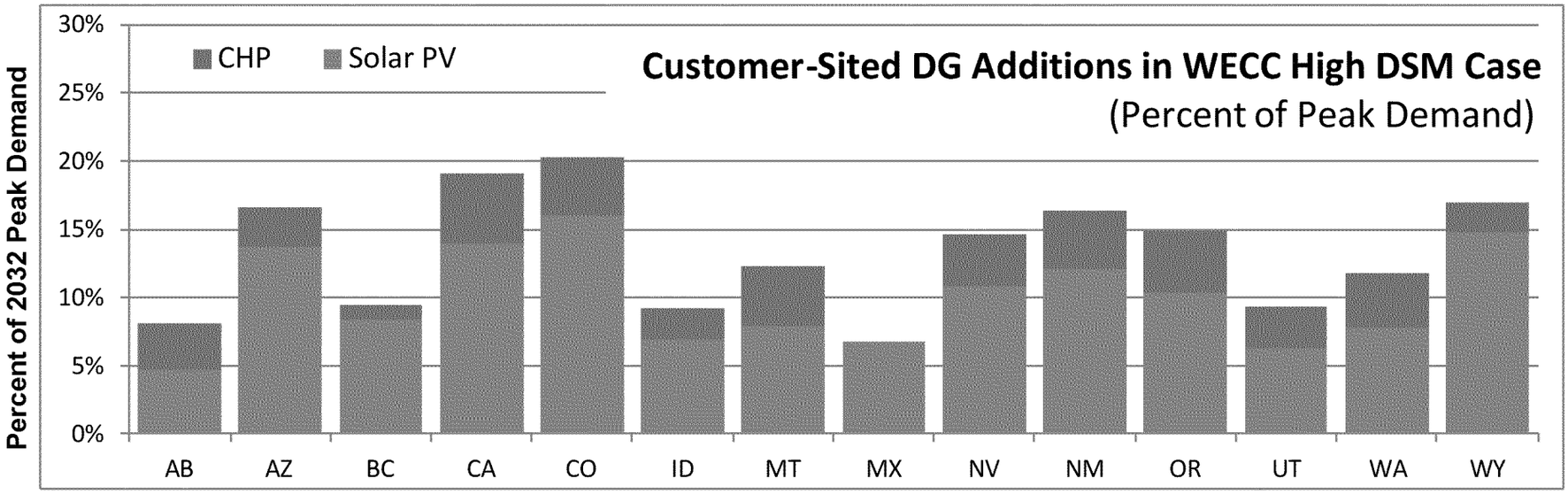


Source: Feldman et al. (2012)

No state incentives needed to compete at retail grid parity in some markets (third-party ownership flourishes)

Solar PPAs for 10 MW+ plants in Southwest now well below 10 cents/kWh

Potential Bypass Threats from Distributed Generation are Large

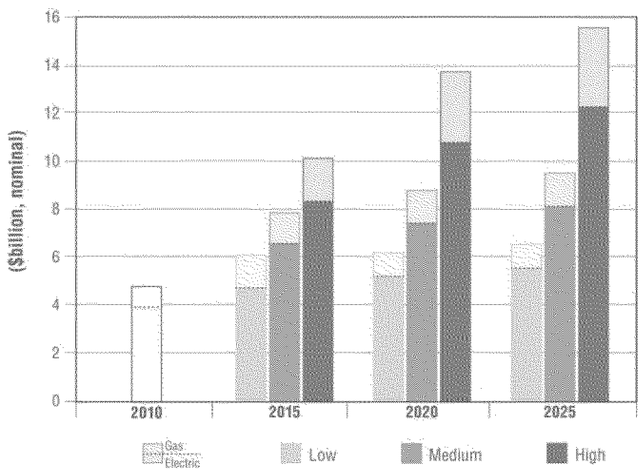


Source: E3 (2013).

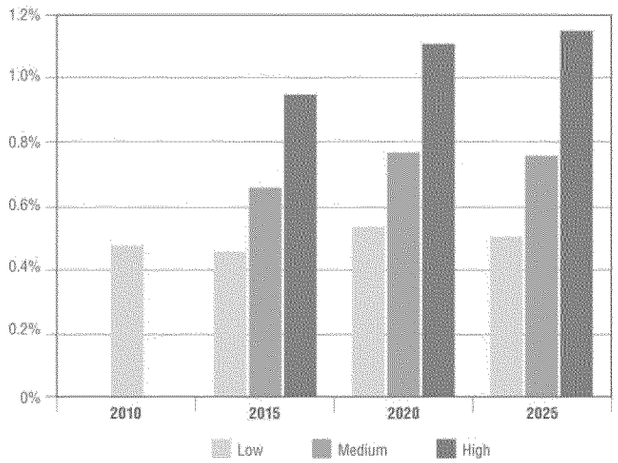
- **WECC-wide Behind-the-Meter DG: 19 GW of solar PV + 7 GW of CHP**
- **Distributed PV based on "interconnection potential" (no back-flow through feeders), with adjustments to reflect relative economics among states**
- **CHP additions represent a fixed percentage (~40%) of technical potential in each state**

Electric Savings Could Offset a Large Portion of Projected Load Growth

Projected Utility Customer Funding for Electric and Gas EE Programs



Projected Incremental Annual Electric EE Savings from Customer-Funded Programs (Percent of Retail Sales)

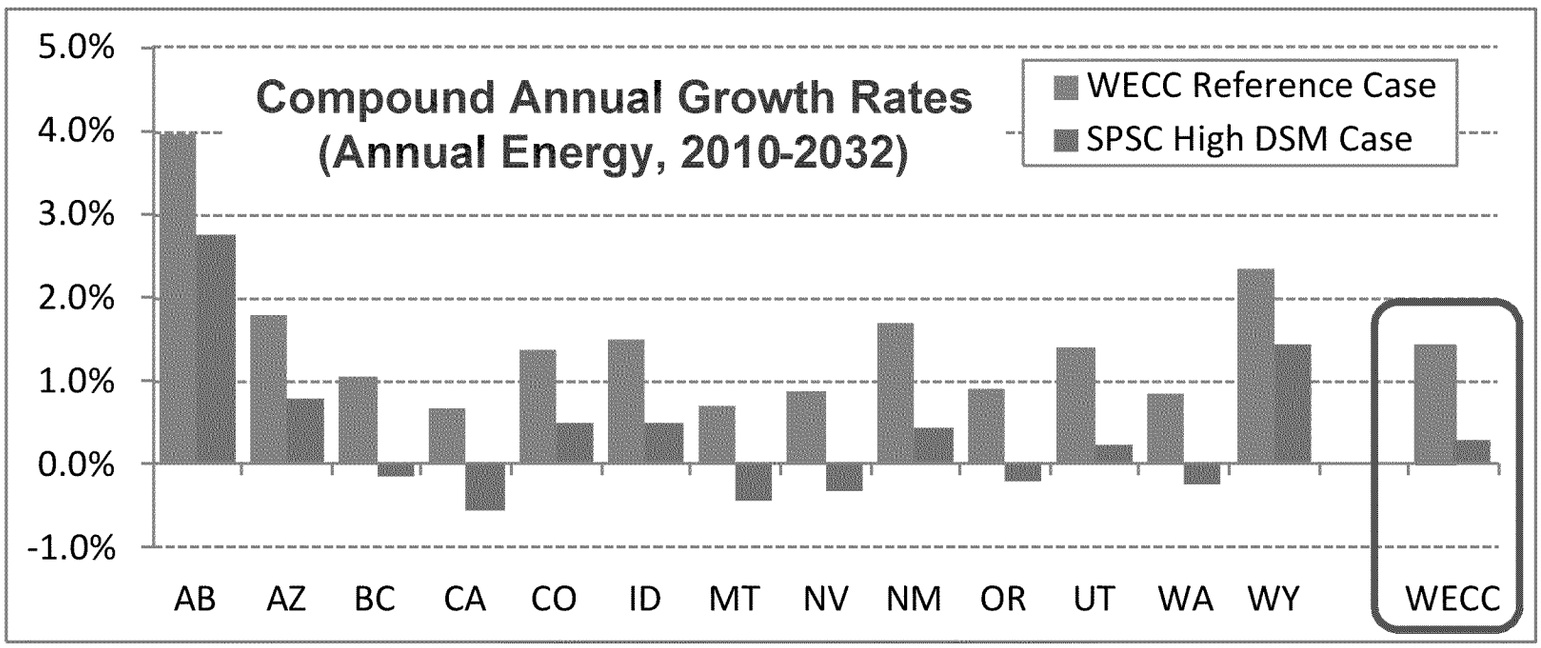


Source: Barbose et al. (2013)

- **Total electric & gas spending doubles to $9.5B in 2025 in the medium case (low: $6.5B, high: $15.6B)**
- **Projected annual incremental savings rise to 0.76% per year by 2025 in medium case**
- **Projected EE savings in the medium case would offset much of electric load growth forecasted by EIA**

SPSC High DSM Case would result in nearly flat load growth through 2032

- Historical load growth in WECC: 1.6%/yr (1998-2010)
- WECC 20-yr reference case forecast with current EE policies = 1.4%/yr, with growth <1% in 5 states
- SPSC High EE case reduces load growth to 0.3%/yr (WECC-wide), with 6 states projected to have negative load growth



Source: LBNL and Itron (2013).

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Impact of Grid Investments due to Public Policy Goals on Retail Electric Rates – Nationwide

Rate Component	Change in Rate Component
Fuel and Purchased Power	↑
Non-Fuel O&M	↑
Capital Expenditures	↑
Retail Sales	↓
Peak Demand	↓
Customers	–

$$\text{Retail Rate} = \frac{\text{Utility Costs}}{\text{Billing Determinants}}$$

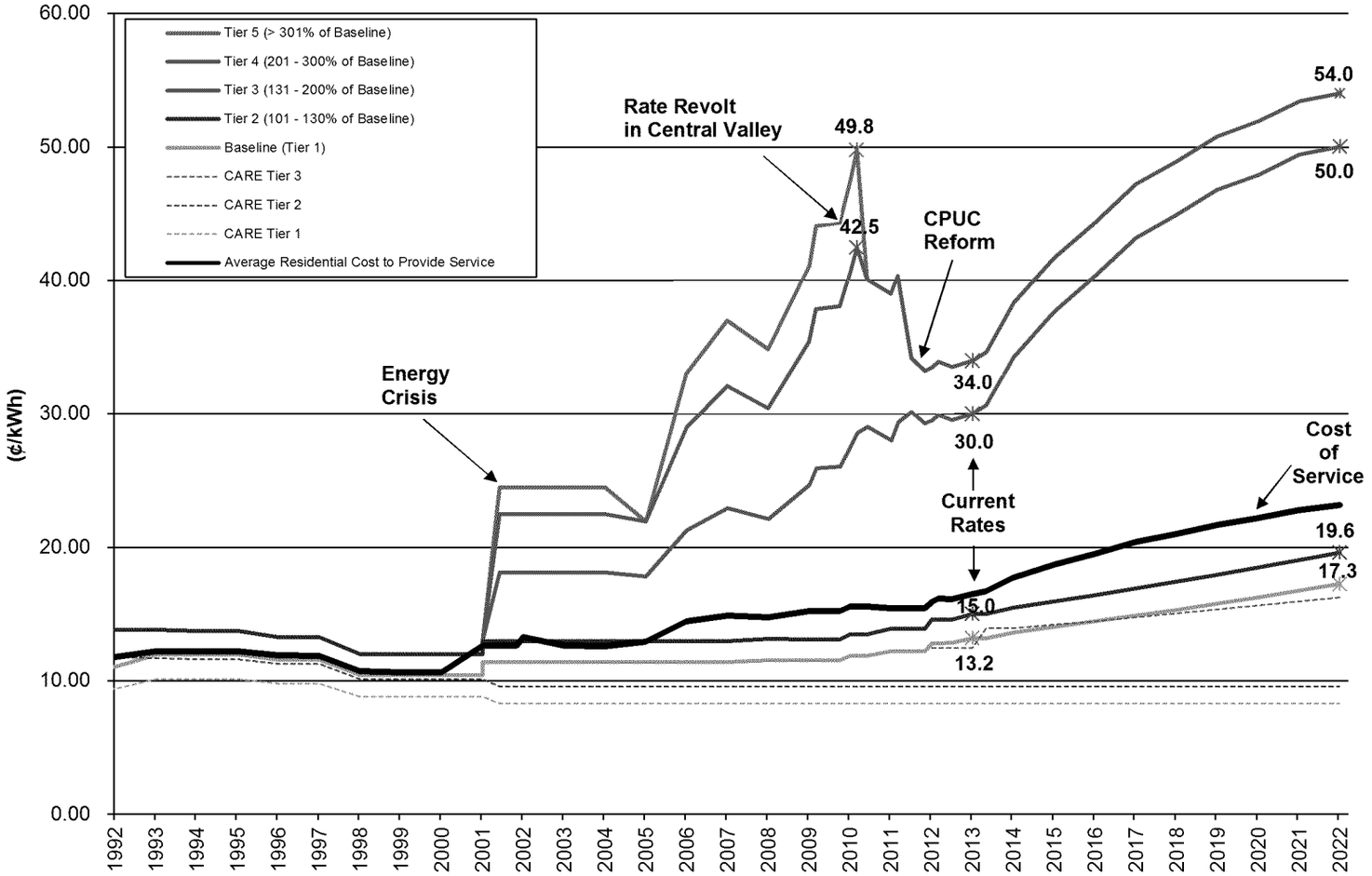
- **350 TWh new green energy from state RPS by 2030: ~$120B**
- **Total generation decarbonization: ~$1T**
- **New transmission to integrate renewables and maintain reliability: ~$250B**
- **Replace aging distribution system with smart grid: $600B**
- **Estimated cumulative investment in customer-funded EE programs due to EERS and other policies in 2025: ~$99.7B**

Source: Fox-Penner. P and Chang, J. (2012); Barbose et al. (2013)

Recent Examples of Major Rate Increases at US Utilities

- AEP customers in parts of Virginia, Kentucky, Ohio and West Virginia have seen their rates increase between 48 and 88% over the past several years; expected to continue rising by 10-35% in the next several years
- Rocky Mountain Power in Wyoming raised rates twice in 2011: by 2% in April and then 8% in September
- Duke Energy in South Carolina requested a 17% residential rate increase in 2011
- Alaska Electric Light and Power got a 24% increase in residential rates
- Residential customers in New Mexico were looking at a 21% rate hike but the state PUC capped it at 9%

PG&E Rates are Expected to Rise Substantially Over the Next 10 Years



Source: PG&E (2013)

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Ongoing Activity

- There is a considerable amount of ongoing research and advocacy aimed at defining, analyzing, and promoting alternative utility business models across various entities:
  - Academia – Several universities with dedicated electricity/energy research centers work on regulatory theory and practice of utility business models, and providing training in partnership with NARUC
  - Advocacy organizations – Efficiency and environmental advocates are producing numerous reports and convening dialogues with industry experts
  - Utility industry associations – Trade associations host conferences for utilities and other industry stakeholders, and support advocacy efforts
  - Consultants – Provide technical expertise and conduct quantitative analysis on alternative utility business models for utility clients
  - National Labs – Provide technical assistance to state regulators and policymakers on alternative utility business models

Position-driven Proposals

- **Efficiency and environmental advocates and foundations: Existing utility business model poses significant challenges to certain types of clean energy futures driven by technology innovation and customer access**

Entity (Project)	Scope of Issues	Expected Outcomes and/or Process
RMI (eLab)	•Costs and benefits to electric system from distributed resources •Aligning regulatory frameworks, business models, and pricing structures •Acceleration of distributed resource adoption	•Multi-year, discussion-based project •Annual working group meetings •Summary report
Ron Binz/Ron Lehr (Utility 2020)	•Considers supply- and demand-side forces (e.g., aging infrastructure, new technologies, environmental compliance, EE/DR) •Encompasses new regulatory options and approaches	•12-month feasibility study (completed) •Interviews of utility CEOs and regulators •Advisory council and development of longer-term project
Energy Futures Coalition (Utility 2.0 Pilot)	•Outgrowth of testimony before Maryland Grid Resiliency Task Force supporting transition of utility to new business model •Developing pilot project with new business model elements (e.g., customer technology, enhanced service reliability, and customer relationship and communication)	•Collaboration with utilities (BGE and PEPCO), and other stakeholders •Pilot project design document (March, 2013)

Investment-driven Proposals

- **Utilities and investors are concerned with managing risks of regulatory uncertainty, maintaining revenue sufficiency, and addressing reliability concerns from under-investment in infrastructure**

Entity (Project)	Scope of Issues	Expected Outcomes and/or Process
Edison Electric Institute (Critical Consumer Issues Forum)	•Considers financial risks and investor implications of changing business model (e.g., declining bond ratings, declining sales and revenues) •User groups focused on energy efficiency business models	•Host/sponsor conferences and events on related topics •Publish reports (e.g., "Disruptive Challenges", January, 2013)
IEE (Focus on the Future)	•Track developments in regulatory frameworks to support energy efficiency •"Focus on the Future" project considers interaction of new technologies and the electric industry	•Host/sponsor conferences and events on related topics •Regularly publish issue briefs and updates on state regulatory frameworks
CERES (The 21st Century Electric Utility)	•Guided by sustainability and low-carbon objectives, the project identifies key utility business model elements and provides recommendations for utility transitions to new business models	•Report to identify and define best practices (July 2010) •Ongoing organization of investors and utilities on increased transparency and sustainability practices

Crisis-driven Proposals

- **Some state policymakers and regulators are considering new approaches to elicit improvements in the electric system, given reliability and grid restoration problems during recent weather-related crisis events**

Entity (Project)	Scope of Issues	Expected Outcomes and/or Process
Maryland (Grid Resiliency Task Force)	•Governor O'Malley created Grid Resiliency Task Force in response to poor service reliability during Summer 2012 weather events •Considers incentives based on reliability criteria and penalties if criteria are not achieved	•Task Force Report (September, 2012)
New York (Moreland Commission)	•Governor Cuomo created Moreland Commission in response to extended power outages after Hurricanes Sandy and Irene •Commission is considering oversight and reform of utility regulation	•Public hearings across state •Interim Commission Report (January, 2013) •Final Commission Report with recommendations (Spring 2013)

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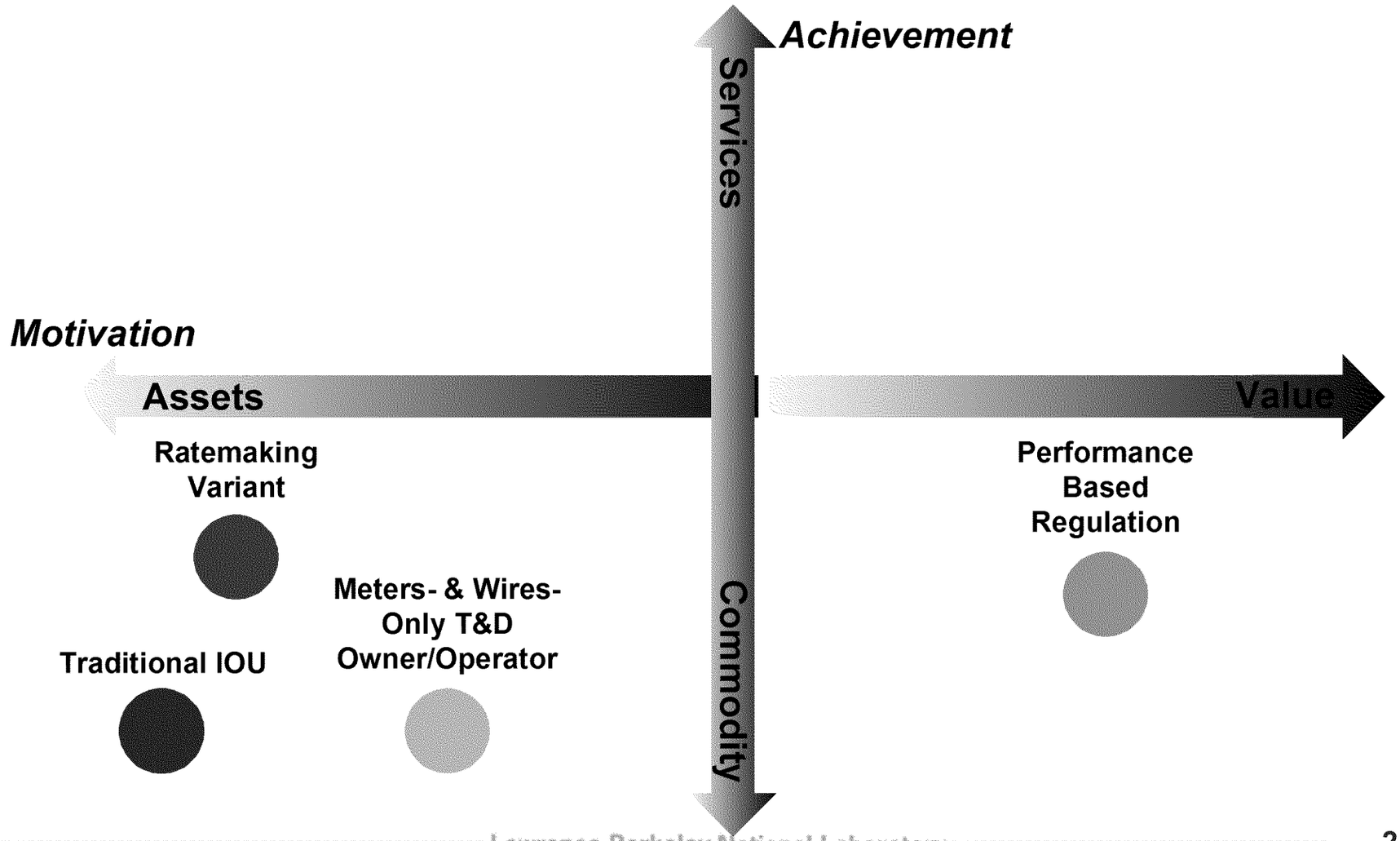
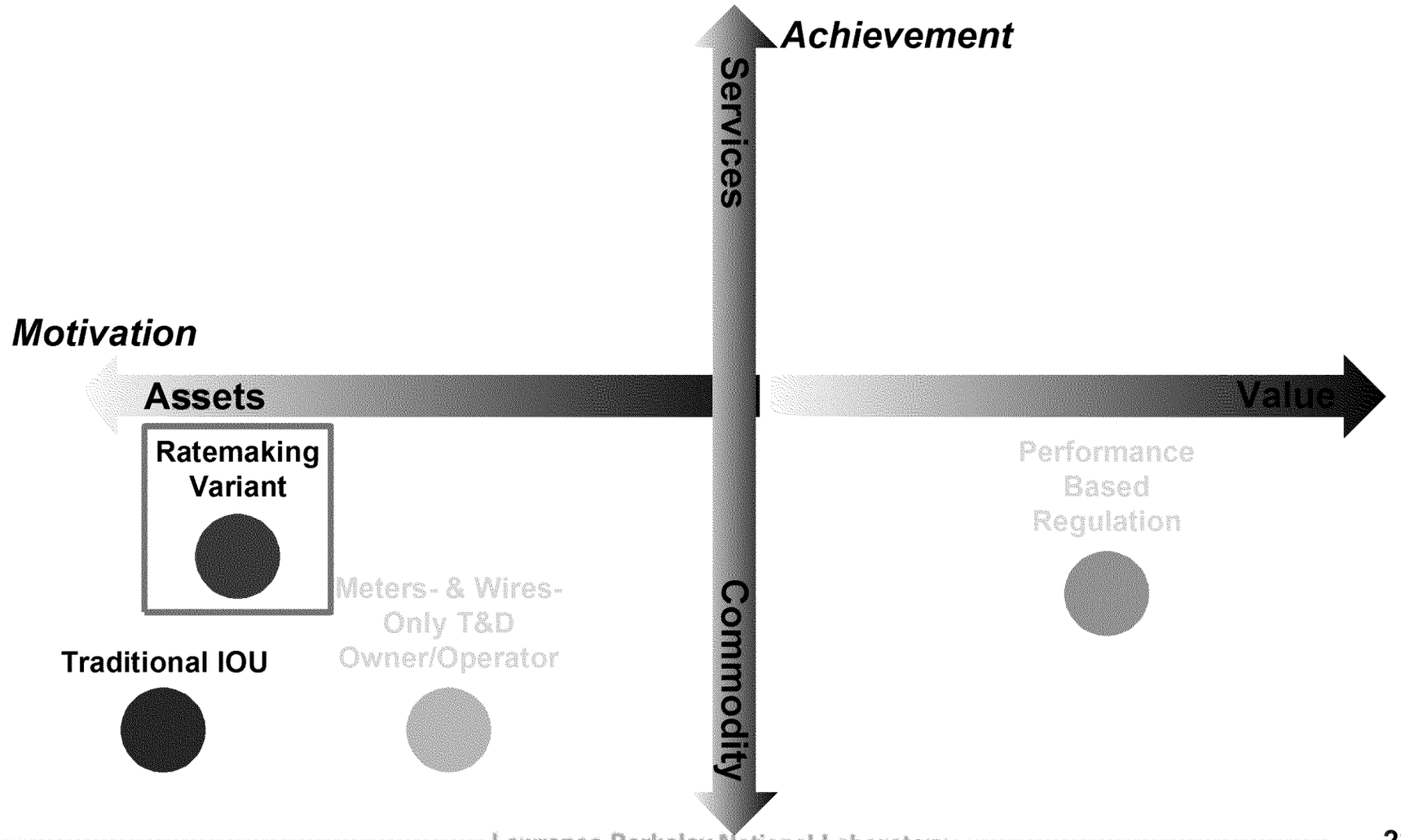
Continuum of Utility Business Models:
Profit Motivation vs. Profit Achievement



Continuum of Utility Business Models: *Ratemaking Variant*



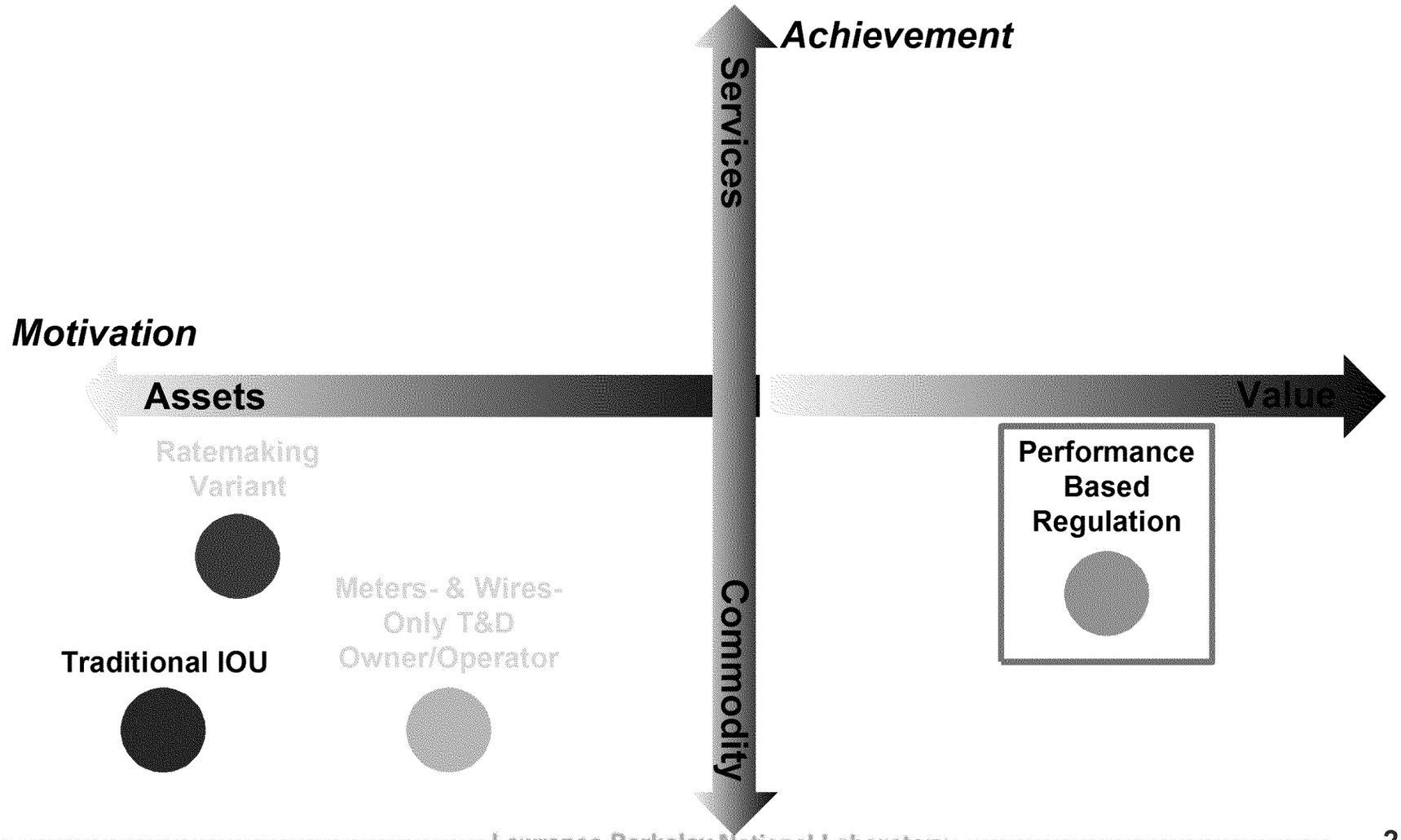
Ratemaking Variant: Incremental Changes to Cost of Service Regulation

Model Element	Value
Assets Owned	(G,) T & D
Commodity Supplier	IOU
Service Provider	IOU
Network Access	Closed
Profit Motive	ROR *(insulated from exogenous factors)* + Incentives

Alter ratemaking to align COS model with public policy values and aims

- **All core functions of the utility are unchanged but fundamentally alter the way revenue is collected to better align utility and policy makers goals**
- **Institute lost revenue mechanisms to eliminate the "throughput incentive"**
- **Apply shareholder incentives to create positive profit motive for IOU to achieve policymaker's goals**

Continuum of Utility Business Models: *Performance Based Regulation*



Performance-Based Regulation: Link Utility Profits to Achievement of Policy Goals

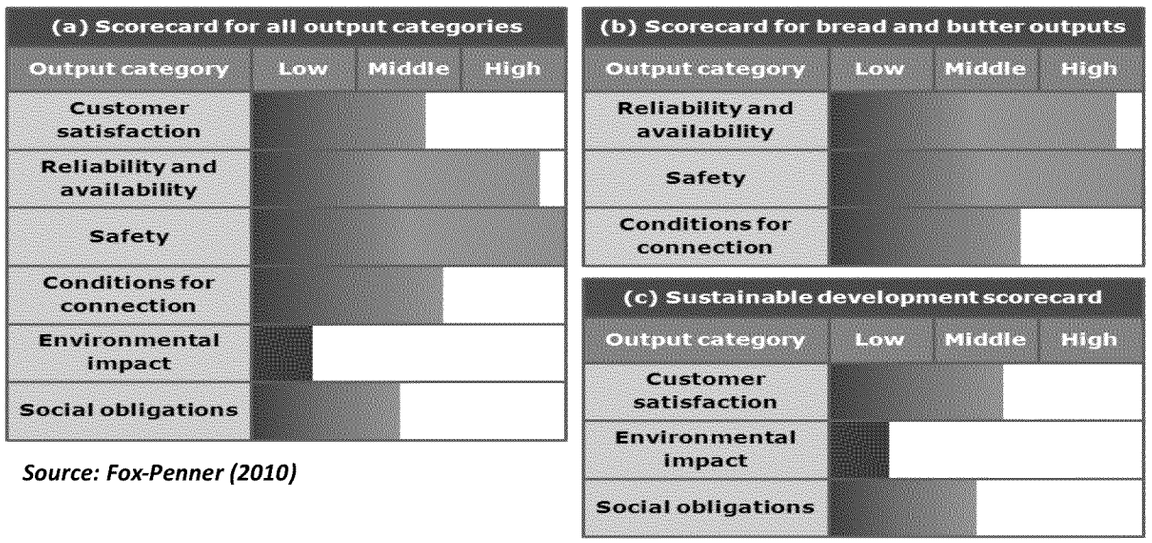
Model Element	Value
Assets Owned	(G,) T & D
Commodity Supplier	IOU
Service Provider	IOU
Network Access	Closed
Profit Motive	ROR +/- Incentives *(achieved level based on achieved policy*

Link utility profits to achievement of public policy goals

- **Economists perceive it as better than COS/ROR because of stronger incentives for cost containment and innovation**
- **But can lead to dissatisfaction with audits, prudence and used & useful reviews**
- **Can take many forms and has a variety of design issues that make creating a system time-consuming and challenging for the uninitiated**

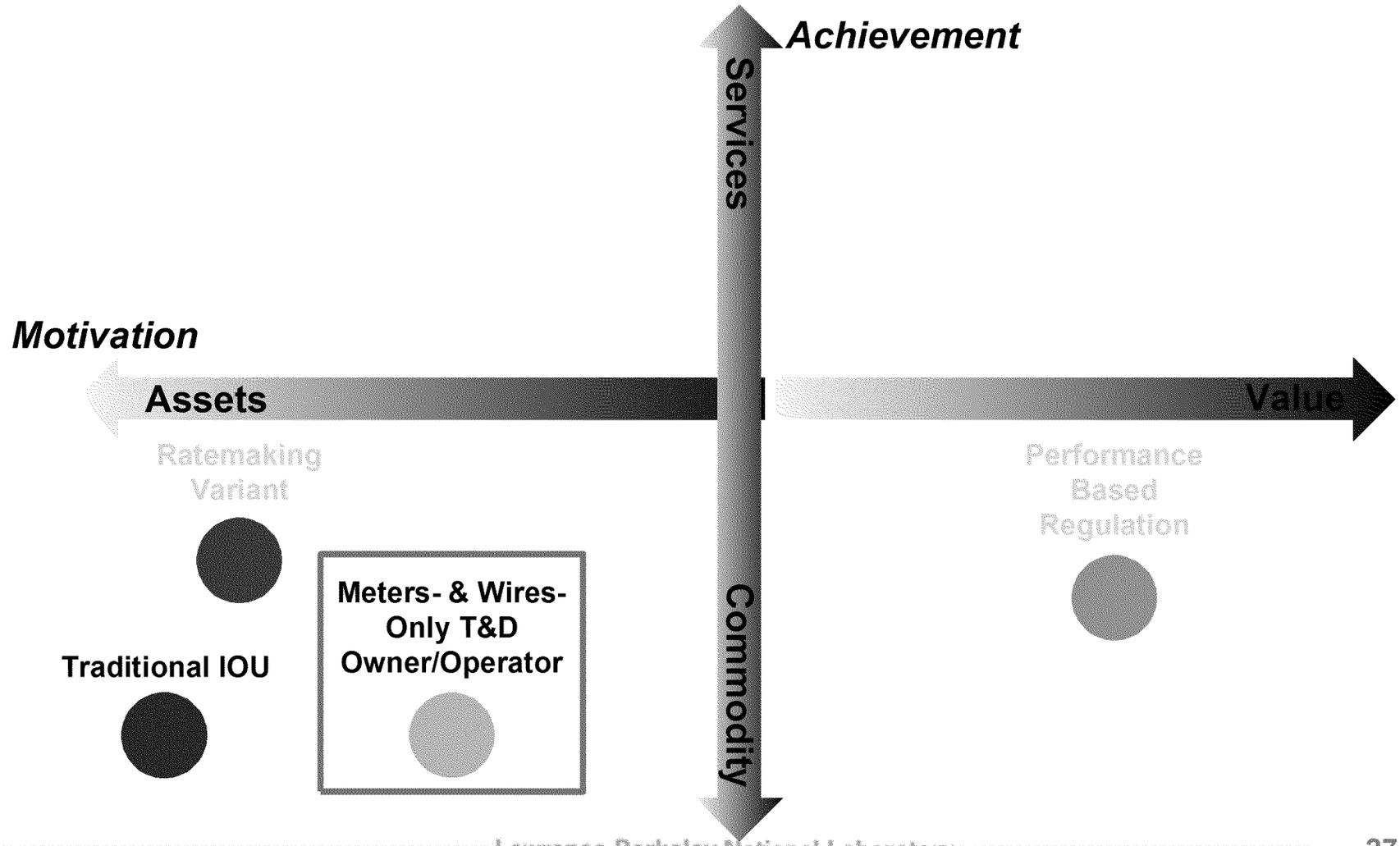
UK Approach under RIIO: Role of the Regulator (Ofgem)

- **Significant role of the regulator in multiple parts of the process**
  - Regulatory sets primary outputs and baseline performance, reviews and approve business plans, performs inspections, and ultimately decides on incentives and penalties to be awarded
  - May revoke distribution company (DISTCO) license to operate
- **Ofgem will develop a report card for performance of all 14 DISTCOs**



Source: Fox-Penner (2010)

Continuum of Utility Business Models: *Meter/Wires Company*



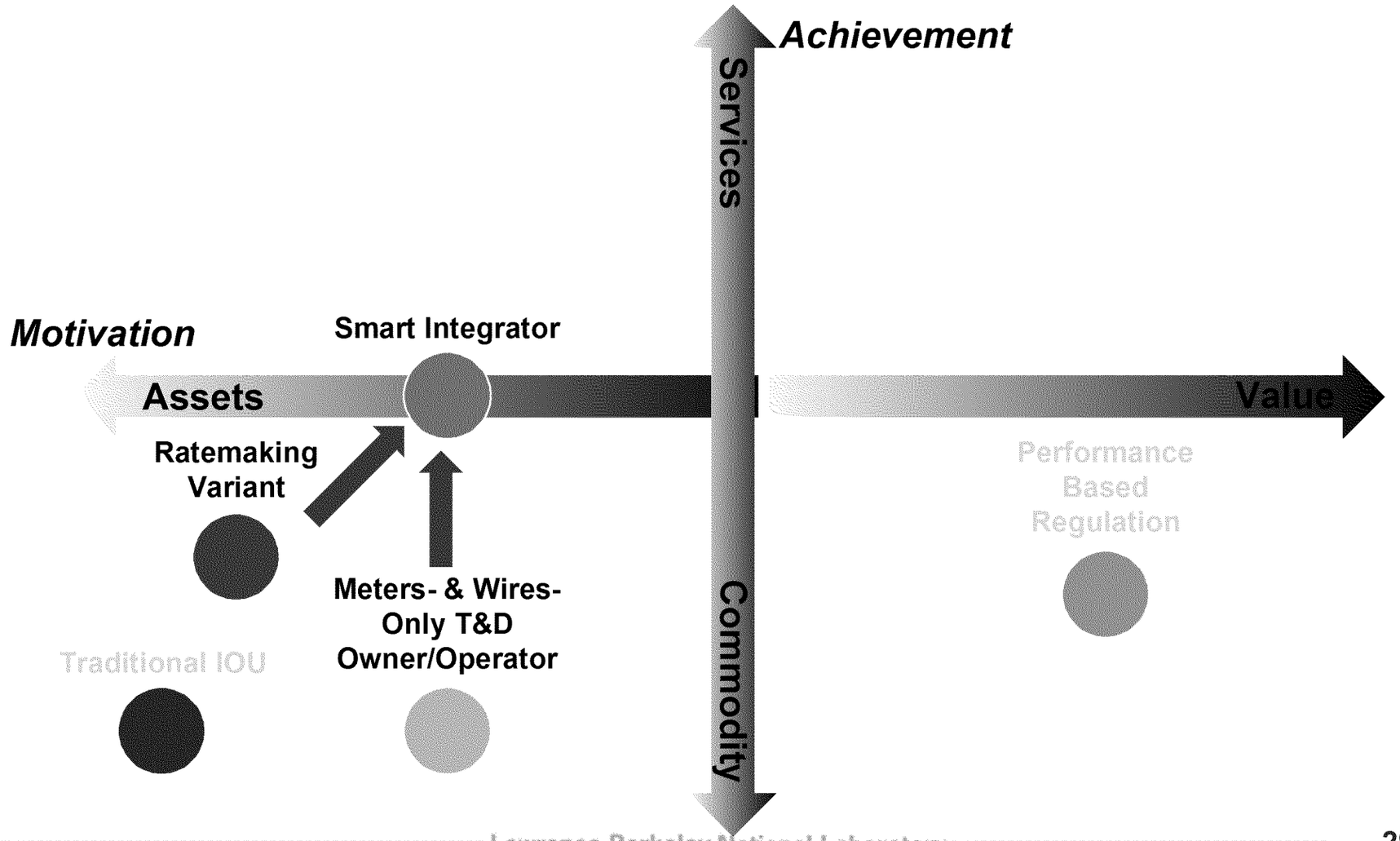
Wires-Only Network Owner/Operator: Utility Divests Generation Assets

Model Element	Value
Assets Owned	T & D
Commodity Supplier	IOU(?)/Other
Service Provider	IOU/Other
Network Access	Closed
Profit Motive	ROR

Continue COS regulation where achieved profits based on cutting costs and/or growing billing determinants between rate cases

- **Removing generation assets from IOU's portfolio means utility is indifferent to public policy that affects timing and quantity of generation expansion**
- **All other disincentives associated with traditional IOU business model still remain (i.e., throughput) and no new positive financial incentives are provided**

Continuum of Utility Business Models: *Combining Existing Models*



Smart Integrator: Utility as Network Integrator

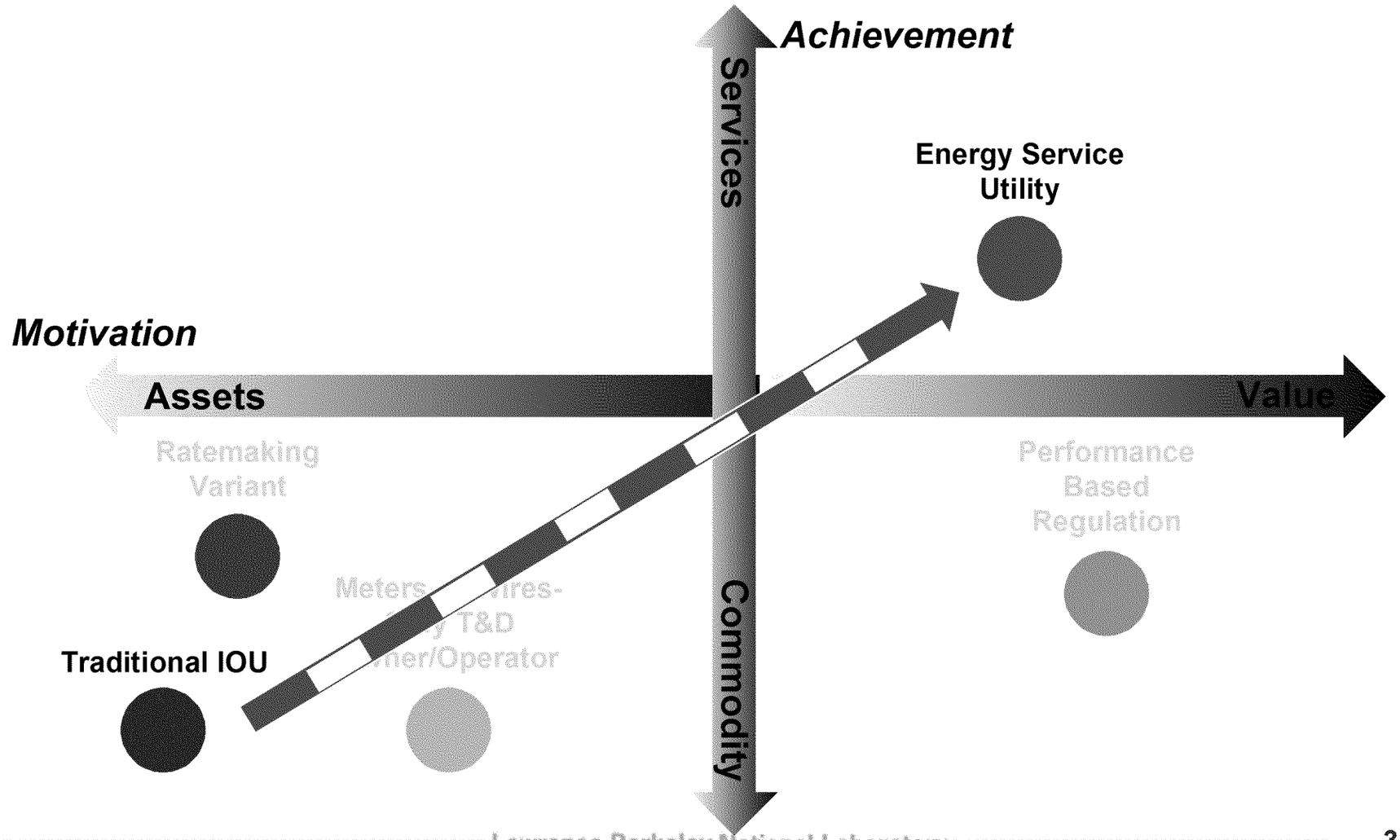
Model Element	Value
Assets Owned	T & D
Commodity Supplier	Other
Service Provider	IOU(?)/Other
Network Access	Open(?)
Profit Motive	ROR *(insulated from exogenous factors?)* + Incentives (*in price of services offered*)

Continue COS regulation on utility assets plus alter ratemaking and include profit in price of services

- **Utility responsible for creating the infrastructure so all entities can readily integrate into all aspects of the smart grid network**
- **To maximize value of smart grid, utility will need to make smart grid network open to all other service providers**
- **Unclear how traditional business model is changed to motivate the utility to play this role**

Source: Fox-Penner (2010)

Continuum of Utility Business Models: *Fundamental Paradigm Shift*



Energy Service Utility

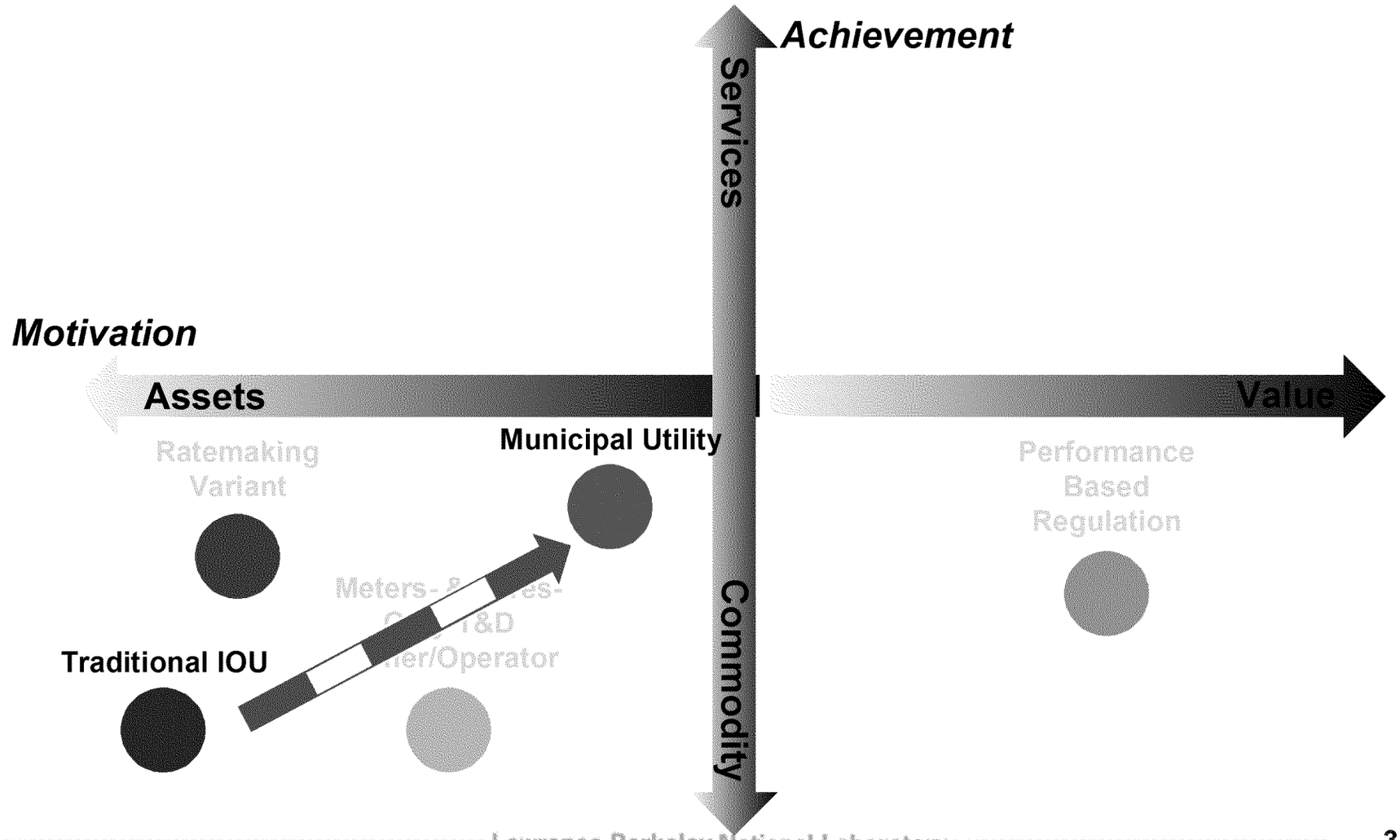
Model Element	Value
Assets Owned	G, T & D
Commodity Supplier	IOU/Other
Service Provider	IOU/Other
Network Access	Open(?)
Profit Motive	Incentives (in price of services offered)

Services are priced to ensure adequate rate of return on investments to provide those services

- **Extension of the SI model with utility owning and operating means to provide ALL services**
- **Fundamental shift in pricing away from commodity sales (¢/kWh) towards services offered (e.g., cooling)**
- **Requires paradigm shift in the way utilities are rate regulated, what a utility offers to customers, and how utility measures what it offers to customers**

Source: Fox-Penner (2010)

Continuum of Utility Business Models: *Fundamental Change in Ownership*



Full Exit for Municipalization

- **Proliferation of public utility/co-op model when goals of utility and community not in sync**
- **Desire for local control, more accountability**
  - **Customer service**
    - Munis employ more linemen and recovered more quickly after Hurricane Irene
  - **Environmental objectives**
- **Latest examples:**
  - **Winter Park, FL**
  - **Boulder** – Following ballot initiative disfavoring 20-year PSCo franchise and disallowal of smart-grid cost overruns
  - **Santa Fe & Minneapolis**

Sources: New York Times (2013); Public Utilities Fortnightly (2013).

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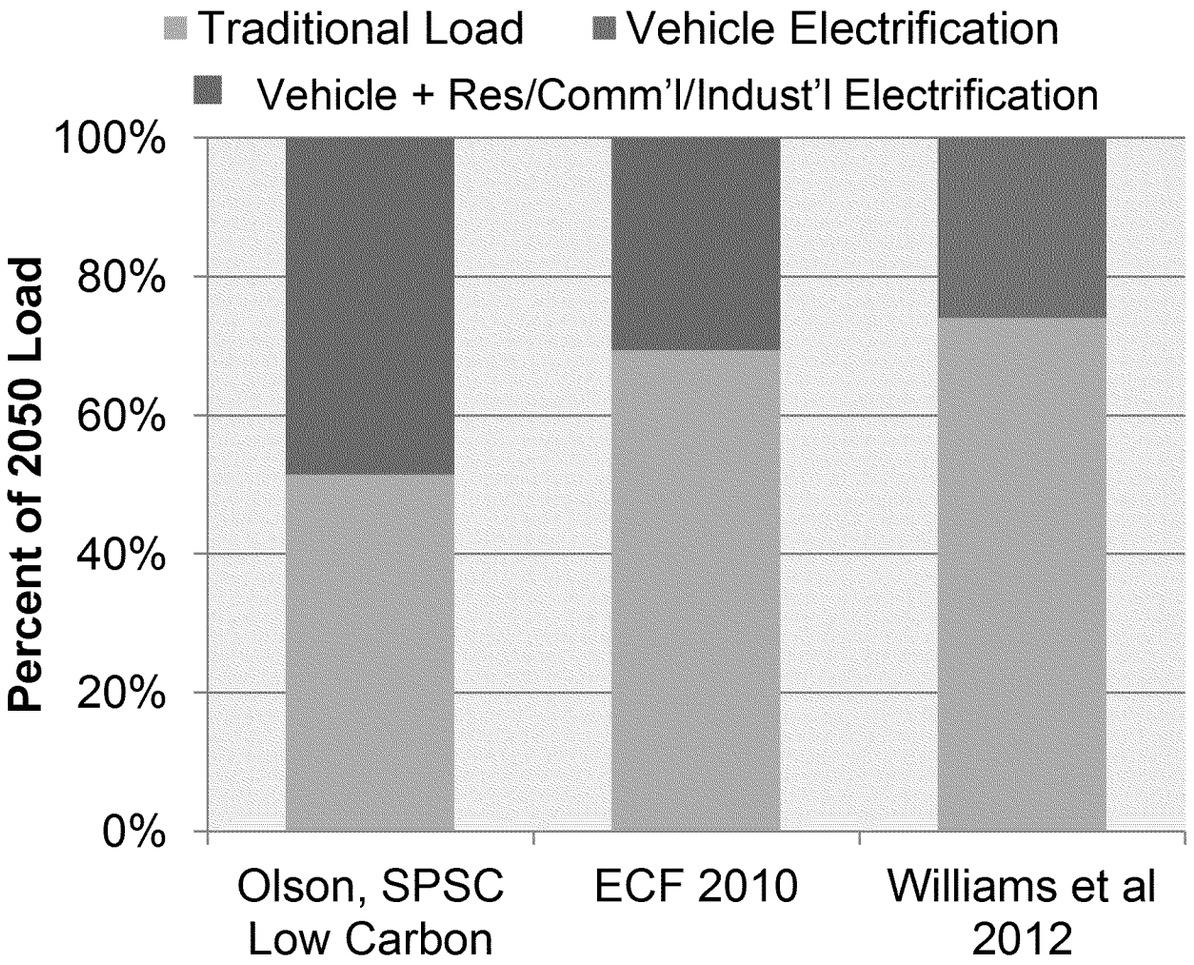
Electrification of Transport and Fuel Switching Could Significantly Increase Electric Loads Over Long Term



- **Uncertainty in adoption of electric vehicles and market growth**
- **Fuel switching may be limited to only certain end-uses**

Sources: Olson (2012); ECF (2010); Williams et al. (2012)

Inertia an Power o Incum ent Utilities May Limit Scope and Rate of Changes to Utility Business Model

- **Utilities likely to pursue other (incremental) strategies to mitigate "threats" to their business model/revenues (e.g., high customer charges, limit net metering) before proposing fundamental changes to regulatory compact**
- **Many proposals would require a fundamental change to the regulatory compact and natural monopolies**
  - **What situations would prompt such changes?**
    - Crisis and catastrophic events
    - Unmistakeable "climate change" signal
    - "Death spiral" for utility
  - **Relative merits and "characterization" of alternative business models (e.g., "government-run" utilities)**

Discussion Questions

- What do you think are the biggest/most significant drivers that are changing the utility business model?
- How do you envision the transition from traditional utility business models to something fundamentally different? Are those transitions incremental or comprehensive?
- What suggestions do you have for regulators and policymakers?
- Where are the venues and places most important for regulator and policymaker participation?

Gaps & Potential Future Work

Information & Education

- Monitor forums where future business models are discussed or tested (UK)
- Track dockets where shifts in fixed-cost allocations are at issue
- How is PBR working at home and abroad?

Actions/Studies

- Define a threshold at which rates (or rate increases) become a problem in your state: What would be a plausible response?
- At what point do increases in customer charges conflict with incentives and public policy goals concerning EE & RE?

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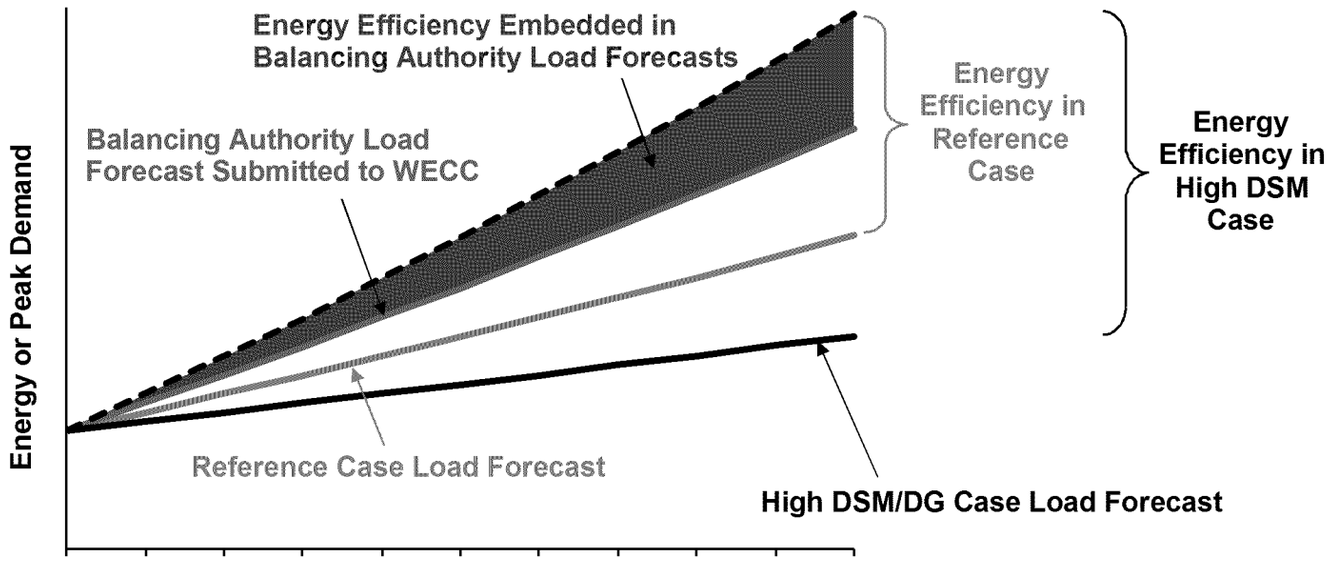
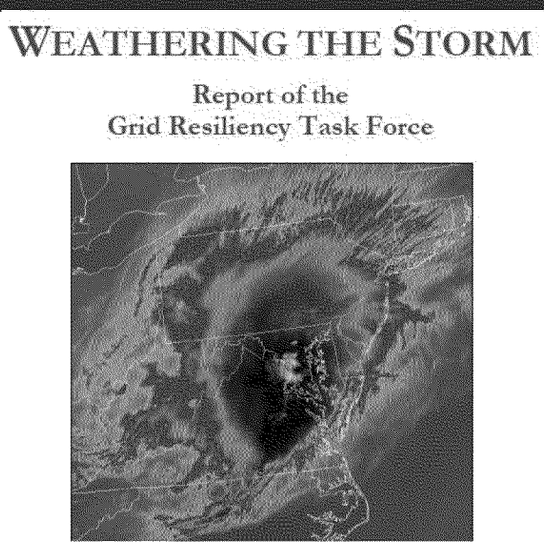
Background Slides

Hig DSM Loa Forecast Requires Explicit Accounting of Energy Efficiency Impacts



- Load forecasts submitted to WECC by balancing authorities include some amount of embedded EE
- Adjustments made for Reference Case load forecast, to fully account for current policies and program plans
- Further adjustments made for High DSM case to reflect more aggressive EE assumptions

Politically-Driven Changes to Utility Business Models



- Gov. Cuomo created Moreland Commission in response to extended power outages after Hurricanes Sandy & Irene
- Gov. O'Malley created this Task force after the "derecho" thunderstorms in the summer of 2012

Overseas Examples of Rapid Rate Increases due to Public Policy Decisions

Australia

- **Installation of domestic solar PV has increased seven fold, doubling every nine months between 2010 and 2011 due to ever falling module prices**
- **Afternoon average demand was down by ~8% in 2011/2012**
- **National Electricity Market revenues in 2011/2012 dropped by 35%**
- **Queensland Competition Authority is recommending a 20% rate increase for 2013/2014**

UK RIIO: Examples of Sample Outputs for UK Transmission Operators

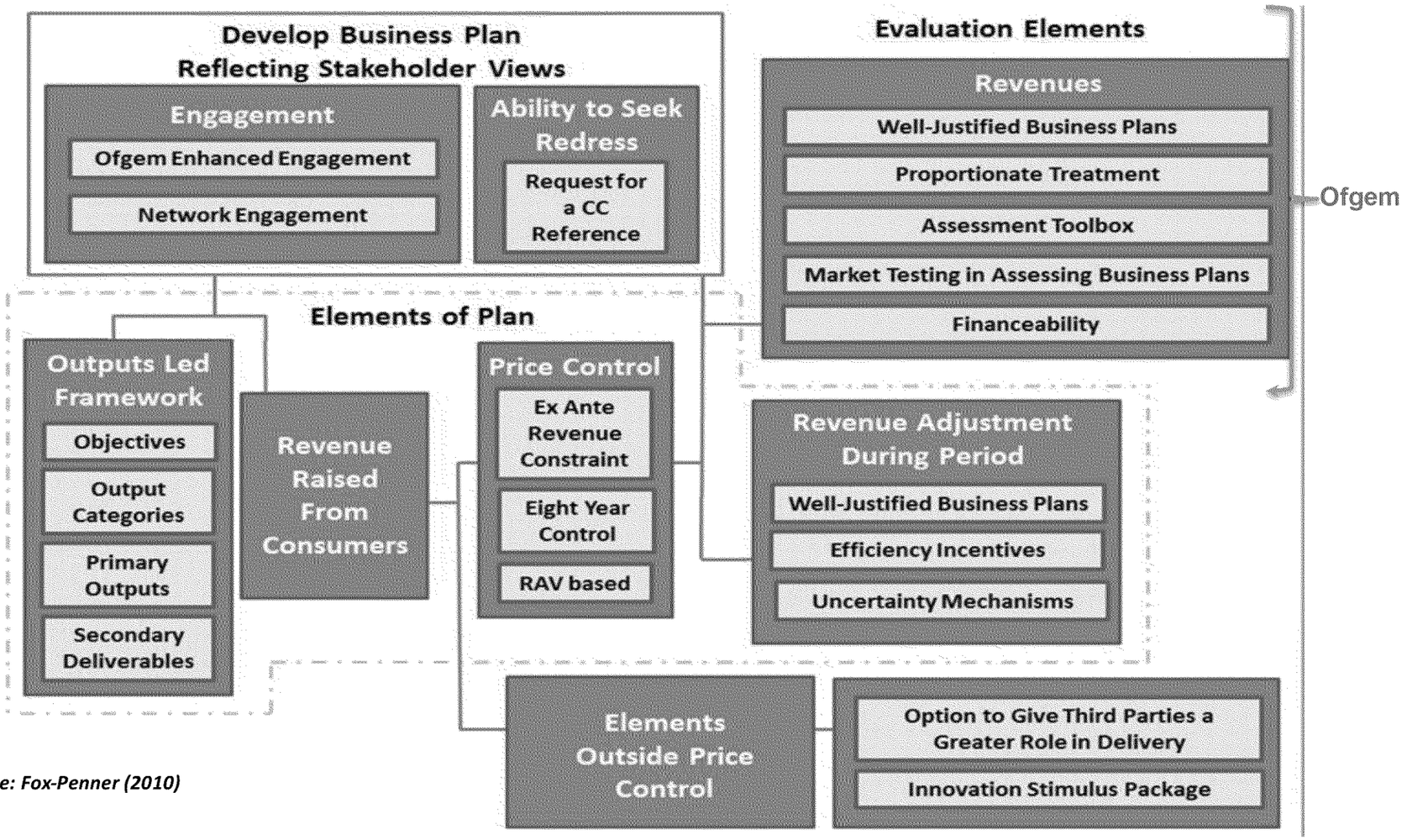
What's being delivered?	How it will be secured through outputs framework?	
	Primary Outputs	**Secondary Deliverables**
Facilitate the energy sector's contribution to decarbonisation & renewables targets	Contribution to targets, timeliness of connections, customer relations and reliable networks. Customer relations gauged by surveys, expert evaluations of stakeholder engagement and complaints.	Encourage efficient & timely delivery of infrastructure to enable sustainable delivery against targets. Monitoring the percentage of low carbon/renewables connected as proportion of low low-carbon/renewables seeking connection.
Secure supply	Energy not supplied, timely connections and customer relations.	Indices for asset health, risk, wider infrastructure
Development of the grid throughout the control period in a timely and efficient way (electric only)	Supported by primary outputs on customer satisfaction and timely connections	Specific metrics on capacity and/or project milestones
Future network development (gas only)	Specific indicators. Also supported by primary outputs on customer satisfaction	
A safe network	Safety obligations that reflect legislative requirements	Supported by secondary deliverables on asset health and risk indices

UK Approach to PBR: RIIO

Revenue = Incentives + Innovation + Outputs

- **A "Regulatory Contract" – Measure of certainty for investors and consumers**
- **8 Year up-front price control regime with elaborate system of incentives, penalties and adjustment mechanisms to account for uncertainties**
- **Regulator sets outputs that reflect what consumers want and enables a sustainable energy sector**
- **Similar to US, UK faces large future investments: £32 Billion in next decade or twice the historical pace of investments. RIIO projected to save £1 Billion.**

UK Approach: RIIO Business Plan Framework



Source: Fox-Penner (2010)