Synapse
Energy Economics, Inc.

Guiding Utility Performance:
A Handbook for Regulators

A Webinar for Members of the Western Interstate Energy Board

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Background

- This slide deck is a preview of a report being prepared for the Western Interstate Electricity Board.
  - Report will be released in February
  - Currently seeking your input
- Handbook for regulators on guiding and motivating utilities to improve performance using:

1) Tracking and reporting metrics

2) Performance Incentive Mechanisms (PIMs)

- The handbook is designed to be useful both
  - Under the variety of regulatory systems currently in place
  - Under new regulatory and utility business models in the future
- Handbook builds off of Phase I work:
  - Phase I: Introductory paper focused on new regulatory models.
  - http://westernenergyboard.org/wp-content/uploads/2014/03/SPSC-CREPC_NewRegulatoryModels.pdf

Why Focus on Utility Performance?

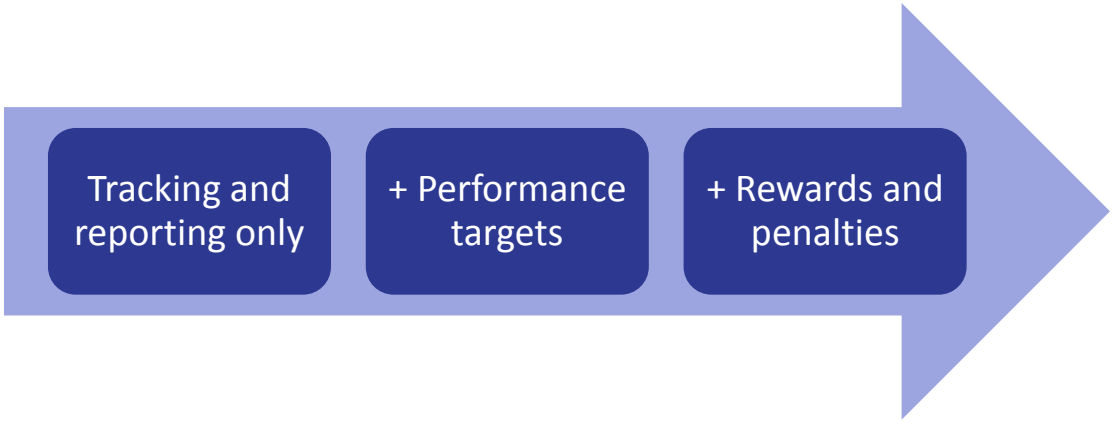
Lack of Correct Incentives	• Current ratemaking practices might not provide the right incentives
	  ○ Too much emphasis on increasing rate base?
	  ○ Too much emphasis on increasing sales?

Need for Improvement	• Utility performance in some areas may be subpar
Prevent Degradation of Service	• Economic and regulatory cost-cutting pressures might result in degradation of service

Need for Greater Regulatory Guidance	• On specific goals (e.g., clean energy, customer satisfaction)
	• On new and emerging utility issues:
	  ○ Distributed generation opportunities
	  ○ Grid modernization opportunities
	  ○ Third-party access to customers
	  ○ Carbon constraints

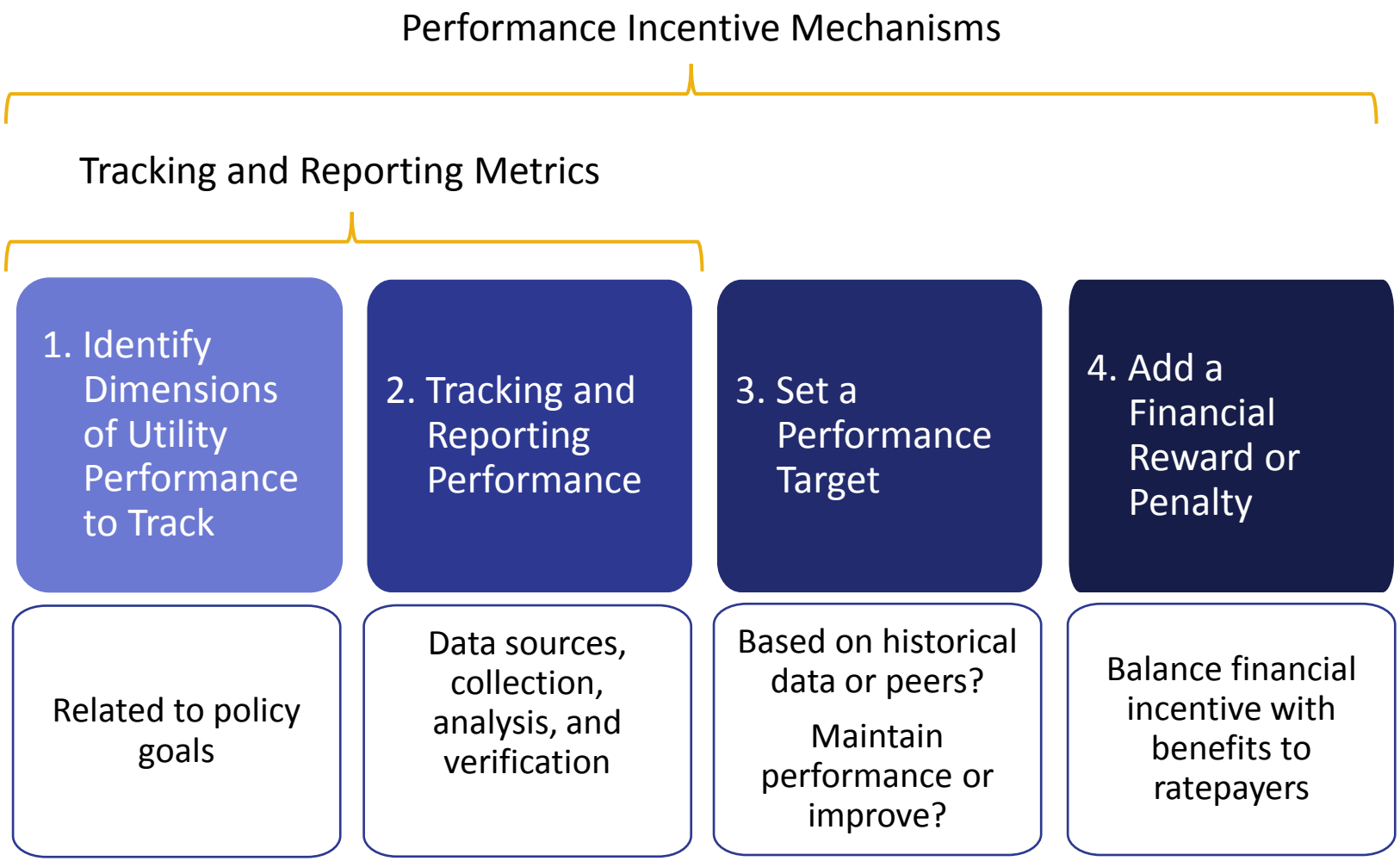
Why Utility Performance Incentives?

- They can capture utility management attention
- They allow regulators to provide specific guidance on important goals
- They allow regulators to be more proactive on certain areas
- They can be applied incrementally:



- They allow for flexibility over time.
- They represent a low-risk regulatory option.

Tracking and Reporting vs. PIMs



Existing Industry Standards

The electricity industry already adheres to a variety of industry standards.

For example:

- Institute of Electrical and Electronics Engineers (IEEE)
- National Electric Safety Code (NESC)
- Occupational Safety and Health Administration (OSHA)
- American National Standards Institute, Incorporated (ANSI)
- Underwriters Laboratories, Inc. (UL)
- National Electrical Code (NEC)
- North American Electric Reliability Corporation (NERC)
- Federal Energy Regulatory Commission (FERC)
- Environmental Protection Agency (EPA)

Examples of Existing or Proposed PIMs

Operation and Costs

- Power plant performance (Florida, Hawaii)
- System average energy costs (Washington)
- Cost of renewable generation (California)
- O&M costs (Alabama, Louisiana, Maine, Hawaii)
- Cost reductions in transmission constraints and inefficiencies (Connecticut)
- Cost reductions through off-system sales (numerous jurisdictions)

Specific Resource Goals

- Compliance with renewable portfolio standards (numerous jurisdictions)
- Energy efficiency and demand savings attainment (numerous jurisdictions)
- Resource diversity (Nevada)

Adapting to Change

- Customer retail choice (Michigan, New York)
- Grid modernization (Illinois)
- Distributed generation installations (Connecticut, Hawaii)
- Renewable energy curtailments (Hawaii)
- Innovation (United Kingdom)
- Long-term planning (Hawaii)

The Regulatory Context(s)

Many Aspects of Regulation Affect Performance

Regulatory Mechanisms	Options and Examples
Prudency Reviews	Disallowances for imprudent investments
ROE Adjustments	Adjustments to ROE related to utility performance
Frequency of Rate Cases	Number of years between rate cases; voluntary or mandatory stay-out period
Adjustments between Rate Cases	Inflation index or other attrition relief mechanism, for example K-factors or Z-factors
Reporting and Tracking Metrics	Reliability standards, RPS targets, etc. with reporting requirements but no financial incentive
Trackers and Riders	Fuel trackers, DSM trackers, etc.
Decoupling	Lost revenue recovery; full decoupling using a revenue-per-customer approach or other escalator
Price or Revenue Caps	Price cap or revenue cap to encourage cost minimization
Performance Incentive Mechanisms	Performance targets with penalties and rewards. Numerous design options (formula shape, deadbands, magnitude of financial incentive).

The Regulatory Context

- When considering whether and how to apply performance incentives, it is essential to first assess the incentives that currently exist
  - Are there areas of performance that are not covered?
  - Are there unintended incentives embedded in the current system?
  - Are there regulatory goals that are not addressed in the current system?
  - Have utilities' performance been subpar in some areas?
- When designing and implementing performance incentives, it is essential to ensure that it is consistent with the rest of the regulatory system
  - Adjusting for limitations in the current system
  - Addressing areas that are not already addressed
  - Avoiding the creation of too great or too small an incentive
  - Accounting for how the regulatory system might evolve

Current and Emerging Regulatory Contexts

Traditional Cost-of-Service Ratemaking

- Performance incentive mechanisms have been used to address areas that are not well covered by traditional practices, or that provide specific benefits to ratepayers, for example:
  - Shared savings of off-system sales
  - Power plant performance standards

Performance Based Ratemaking (PBR)

- Implemented in several states, typically at the time of restructuring
- Increased the need for performance standards – in order to prevent degradation of service under price or revenue caps

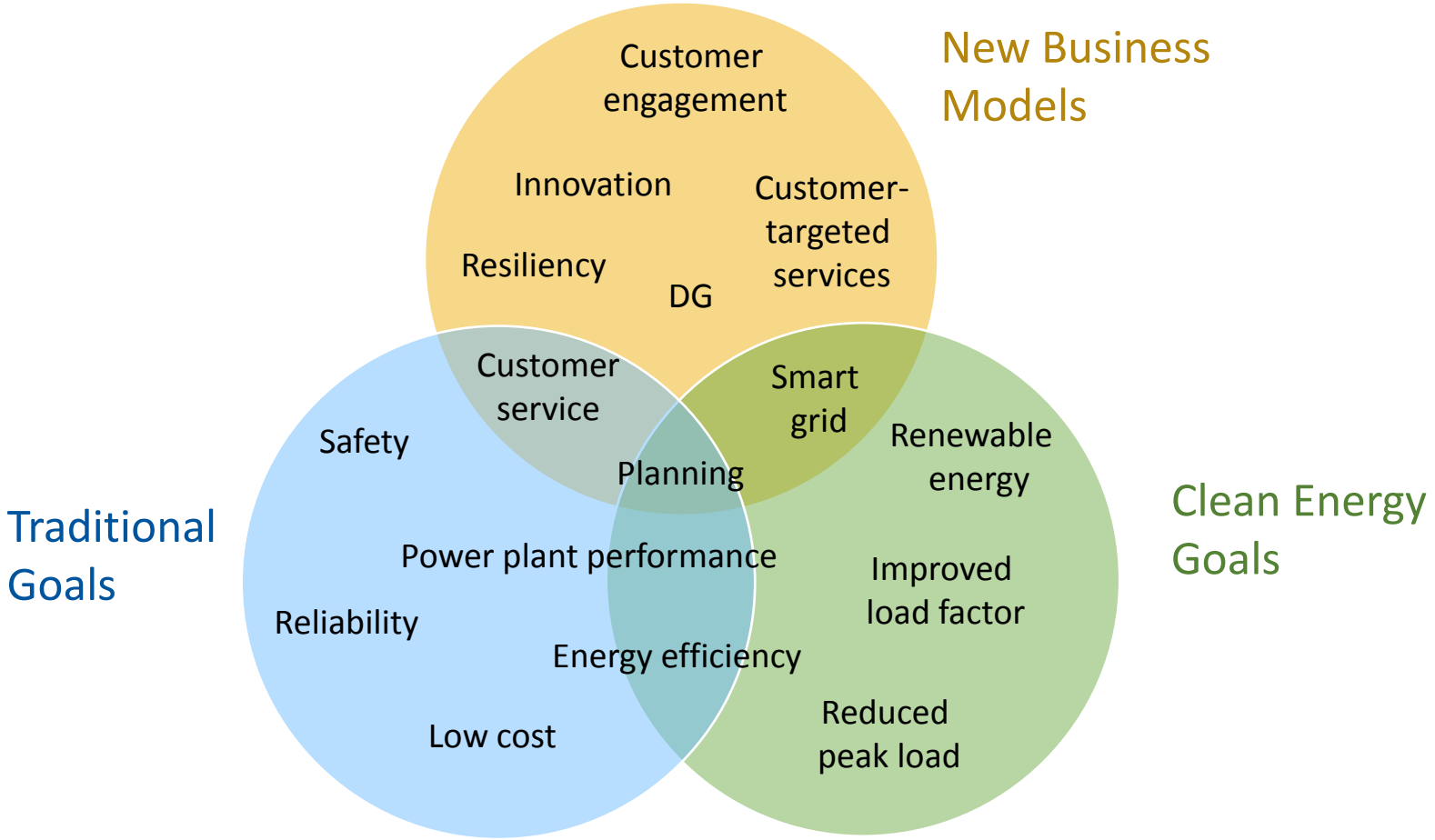
New Regulatory and Utility Business Models

- Several states are seeking new models to guide utility performance in light of evolving markets, technologies and customer needs
- Several proposals:
  - Place an emphasis on performance, results, and outcomes as opposed to specific investments or decisions.
  - Propose to use performance incentive mechanisms to provide a supplemental stream of utility revenues

Identify Areas of Performance that Warrant Attention

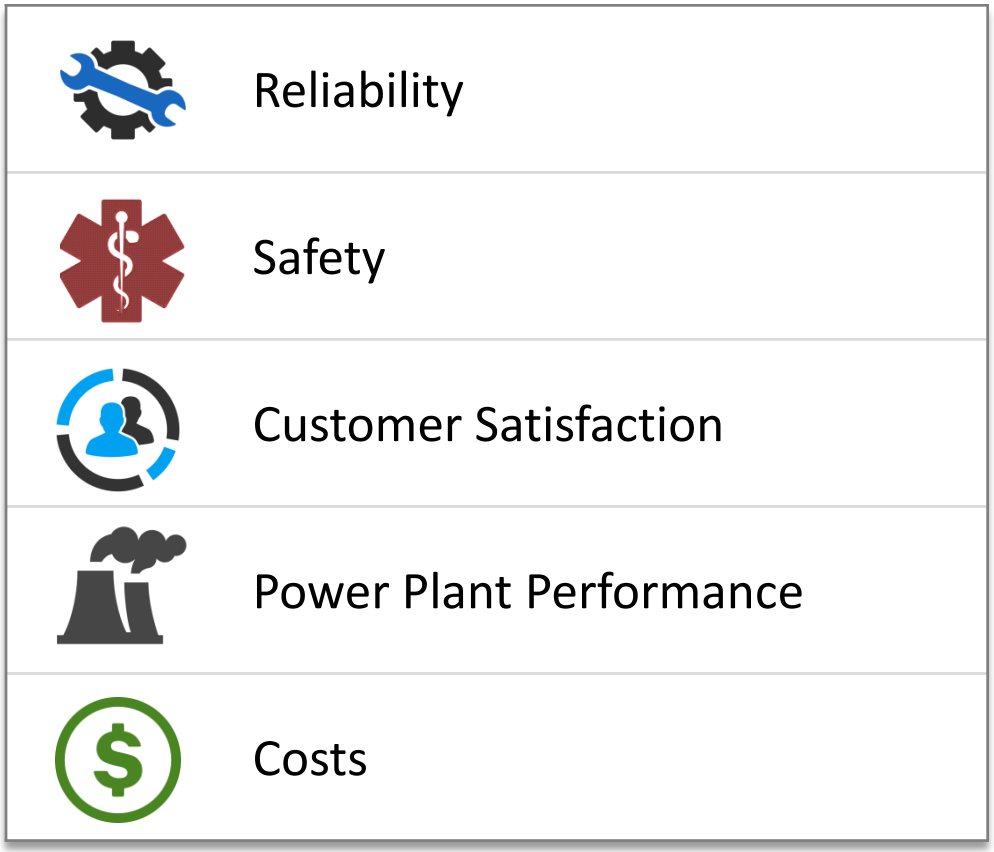
Dimensions of Utility Performance

Dimensions of utility performance that are closely related to state energy policy goals may warrant tracking or incentives.



Traditional Performance Areas

Traditional aspects of utility performance include:



Reliability & Safety

Performance Dimension	Indicator	Metric
1. Reliability 	**System Average Interruption Duration Index**	Total customer minutes of sustained interruptions / total number of customers
	System Average Interruption Frequency Index	Total number of customer interruptions / total number of customers
2. Safety 	**Employee work-related deaths, injuries, and illnesses**	(Number of work-related deaths, days away from work, job transfers or restrictions, and other recordable injuries and illnesses X 200,000) / Employee hours worked
	Time away from work, job transfers, or restrictions due to work-related incidents	(Number of work-related days away from work and job transfers or restrictions X 200,000) / Employee hours worked
	Time away from work due to work-related incidents	(Number of work-related days away from work X 200,000) / Employee hours worked

Customer Satisfaction, Plant Performance

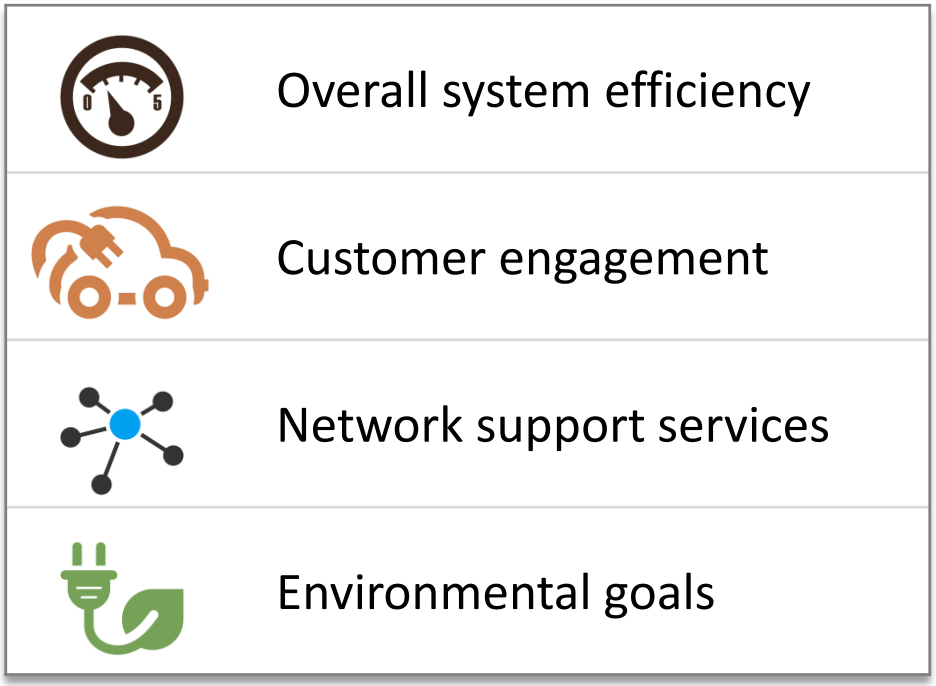
Performance Dimension	Indicator	Metric
3. Customer Satisfaction 	**Residential customer satisfaction**	Electric Utility Residential Customer Satisfaction Index
	Business customer satisfaction	Electric Utility Business Customer Satisfaction Index
	Transaction surveys	% customers satisfied with their recent transaction with the utility
	Customer complaints	Rate of formal complaints to the Commission
	Order fulfillment	Speed with which orders are fulfilled
	Missed appointments	% of appointments met (for appointments where customer is required to be on the premises)
	Call center answer speed	% of calls answered within 30 seconds
4. Plant Performance 	**Fuel usage**	Quantity of fuel burned
	Heat rate	Average BTU per kWh net generation (heat rate)

Costs

Performance Dimension	Indicator	Metric
5. Costs 	**Capacity costs**	Cost per kW of installed capacity
	O&M costs	O&M expenses per net kWh
	Fuel costs	Average cost of fuel per kWh net gen and per Million BTU; total fuel costs
	Effective resource planning	Numerous metrics regarding incorporation of stakeholder input, consideration of all relevant resources, use of appropriate assumptions and modeling tools, etc.

Emerging Performance Areas

Innovative metrics that can help to meet new and evolving challenges:



Emerging Areas: System Efficiency

Performance Dimension	Indicator	Metric
1. System Efficiency 	**Load Factor**	Sector average load / sector peak load
		Monthly system average load / monthly system peak load
	Usage per Customer	Sector sales / sector number of customers
	Power Plant Efficiency	System average heat rate (system average BTU per kWh net generation)
		EFOR = Equivalent Forced Outage Hours / (Period Hours – Equivalent Scheduled Outage Hours)
		EFORd: Equivalent Forced Outage Rate Demand. Measures the probability that a unit will not meet its demand periods for generating requirements because of forced outages or derates
		Weighted Equivalent Availability Factor (WEAF)
	Flexible Resources	MW of fast ramping capacity (load following resources capable of 15-minute ramping and regulation resources capable of 1-minute ramping)
	System Losses	Total energy losses / MWh generation, excluding station use

Emerging Areas: Customer Engagement

Performance Dimension	Indicator	Metric
2. Customer Engagement 	**Energy efficiency**	Number and % of customers enrolled per year, by sector
		Annual and lifecycle energy savings (MWh) and peak demand savings (MW)
	Demand response	Number and % of customers enrolled per year, by sector
		Potential and actual peak demand savings (MW)
	Distributed generation	Number of installations per year, number of customers by sector
		Geographic distribution of installations, ability to defer T&D investments
		Net metering installed capacity (MW) and energy (MWh) sold back to utility
	Storage	Number of installations per year, number of customers by sector
		MW installed by type (thermal, chemical, etc.)
		Percent enrolled in demand response programs
	Electric vehicles	Number of installations per year
		Percent enrolled in demand response programs
	Information availability	Number of customers able to access daily usage data via web
		Percent of customers with access to hourly or sub-hourly usage data via web
	Time-varying rates	Number of customers on time-varying rates

Emerging Areas: Network Support Services

Performance Dimension	Indicator	Metric
3. Network Support Services 	**Advanced metering**	Number and % of customers with AMI and AMR
		Energy served through AMI
	Distributed Resource Interconnection	Average days for customer interconnection of distributed resources
	Interconnection of Bulk Renewables	Speed of turn-around of OATT studies
	Third party access	Open and interoperable smart grid infrastructure that facilitates third-party devices
	Provision of customer data	Customers able to authorize third-party access electronically
		Percent of customers who have authorized third-party access
		Third party data access at same granularity and speed as customers

Emerging Areas: Environmental Goals

Performance Dimension	Indicator	Metric
4. Environmental Goals 	**Criteria pollutants**	Tons SO_2 emissions
		lbs NO_x / MMBtu
	Carbon emissions	Tons CO_2
	Carbon intensity	Tons / customer
	System carbon emission rate	Tons / MWh sold
	CPP carbon emission rate	lbs CO_2 from fossil generators / (Fossil Fuel Generation (MWh) + 5.8% Nuclear Generation (MWh) + Renewable Generation (MWh) + Cumulative Energy Efficiency (MWh))
	Fossil carbon emission rate	Tons / MWh fossil generation
	Fossil generation	Fossil percent of total generation
	Renewable generation	Renewable percent of total generation

Measuring Performance, Establishing Targets, and Setting Financial Incentives

Measuring Performance

Key Principles for Metric Choice

Choose metrics that:

- Provide insight regarding how a utility is performing in a critical performance area
- Are not significantly influenced by external factors, or such influence can be controlled for using statistical or other techniques
- Can be readily measured using available data
- Are easily interpreted

Metric Definitions

- Consistent with national or regional definitions to facilitate comparison across utilities
- Specific regarding what is included and excluded

Reliability example:

- Exclude major storms, with specific definition for "major"
- Definition of a "sustained interruption," consistent with IEEE standards

Data Collection, Analysis, and Verification

- Utility data collection versus use of an independent party
- Avoid complex data analysis that reduces transparency
- Data should be verified (by Commission or third party)

Data Already Available: Traditional areas

Performance Dimension	Indicator	Data Source
Reliability	System Average Interruption Duration Index	EIA Form 861
	System Average Interruption Frequency Index	EIA Form 861
Safety	Employee work-related deaths, injuries, and illnesses	OSHA Form 300
	Time away from work, job transfers, or restrictions due to work-related incidents	OSHA Form 300
	Time away from work due to work-related incidents	OSHA Form 300
Customer Satisfaction	Residential customer satisfaction	J.D. Power Electric Utility Residential Customer Satisfaction Study
	Business customer satisfaction	J.D. Power Electric Utility Business Customer Satisfaction Study
Plant Performance	Fuel usage	FERC Form 1
	Heat rate	FERC Form 1
Costs	Capacity costs	FERC Form 1
	Total energy costs	FERC Form 1
	Fuel cost	FERC Form 1

Data Already Available: Emerging areas

Performance Dimension	Indicator	Data Source
System Efficiency	Load factor	FERC Form 1
	Usage per customer	
	Power Plant Efficiency	FERC Form 1*, NERC GADS*
	System losses	FERC Form 1
Customer Engagement	Energy efficiency	EIA Form 861
	Demand response	
	Distributed generation	
	Information availability	
	Time-varying rates	
Network Support Services	Advanced metering capabilities	EIA Form 861
Environmental Goals	Criteria pollutants	EPA Air Markets Program Data
	Carbon emissions	
	Carbon intensity	EPA Air Markets Program Data and EIA 861*
	System carbon emission rate	
	Fossil carbon emission rate	
	Fossil generation	EIA Form 923 and EIA Form 860*
	Renewable generation	

* Metric can be derived using data reported in this database

Establishing a Performance Target

Tie target to ultimate goal	• **Targets should be set in a way that ensure progress toward achieving the policy goal.**
Balance costs and benefits	• **Marginal cost of improving performance should not exceed marginal benefits to ratepayers.** • Surveys can be used to assess customer willingness to pay for benefits.

Set a realistic target	• **Historical data**
	  ○ Normalize to account for unusual events
	  ○ Ensure historical business conditions are still relevant
	• **Peer groups (normalized)**
	  ○ Ensure peer group is adequately similar
	  ○ Econometrics can help control for differences among utilities
	• **Frontier analysis** (e.g., Data Envelopment Analysis)
	  ○ Identifies most efficient firms and assigns other firms a score based on their relative efficiency
	• **Utility-specific studies** (IRP, engineering studies, potential studies)

Establishing a Performance Target (cont.)

Use deadbands	• **Mitigate uncertainty** regarding the optimal performance level • **Allow for some variance in utility performance** due to factors outside management control

Allow targets to evolve	• **Targets should be adjusted only slowly and cautiously** in order to provide utilities with regulatory certainty.
	• **Targets may need to evolve** for two reasons:
	  ○ It may not be possible to immediately achieve the desired level of performance; thus target should become more stringent over time
	  ○ New technologies may lead to new capabilities and new policy goals (e.g., smart grid investments)

Incorporate stakeholder input	• Can be extremely helpful to involve stakeholders in setting targets • Gives validity, buy-in, and credibility so that everyone feels that this is a good target for the utility to be rewarded or penalized for

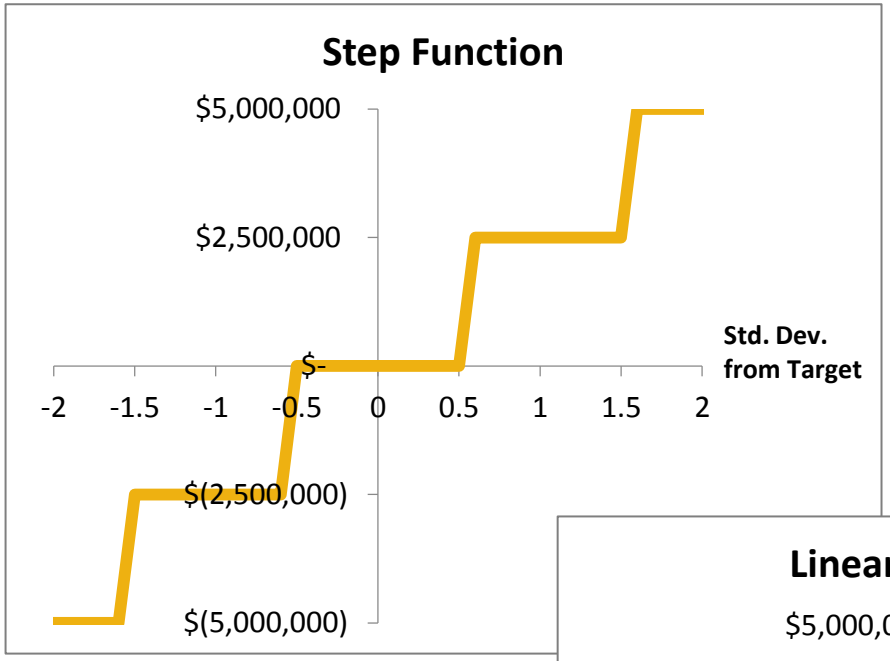
Setting a Financial Incentive

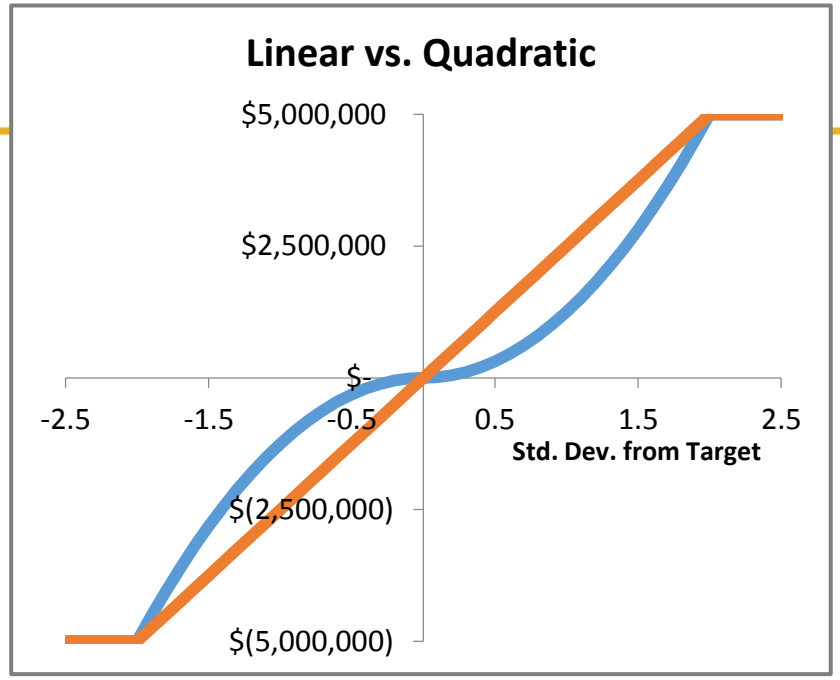
Symmetry	• Symmetry is generally preferred • Asymmetry may be appropriate when performance above target does not provide significant marginal benefits ○ E.g., the benefits of increased reliability may not warrant the cost
Magnitude	• Maximum rewards paid to utility should not exceed total benefits to ratepayers

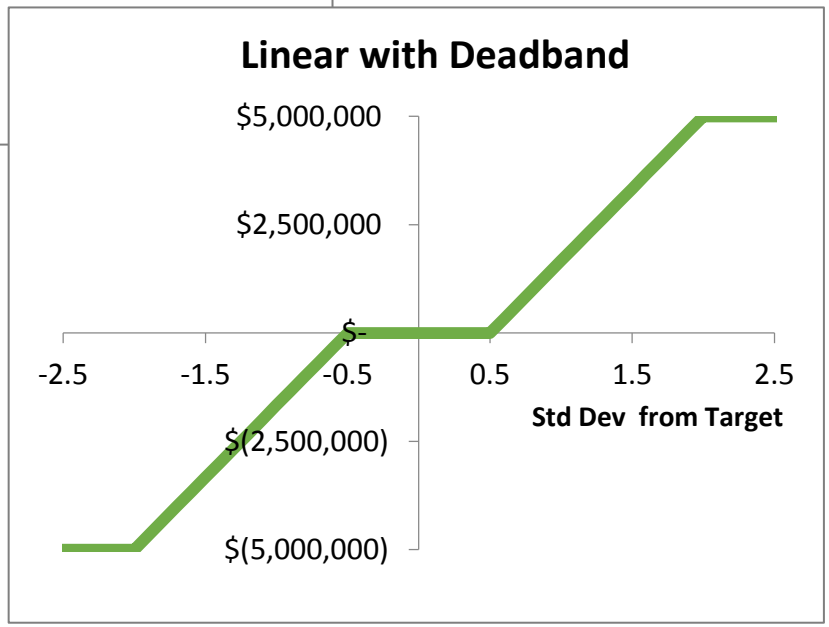
Units for presentation and comparison	• Presentation of magnitude of rewards/penalties:
	  ○ Cents/share
	  ○ Basis points
	  ○ Dollars
	  ○ % of revenues
	• Presenting rewards/penalties in all four units facilitates comparisons and improves understandability

Units for administration	• Dollars are generally easiest to administer, and avoids utility incentive in increase rate base to benefit from rewards administered as basis points

Types of Incentive Formulas







Dashboards:
Easy access to up-to-date, concise performance information

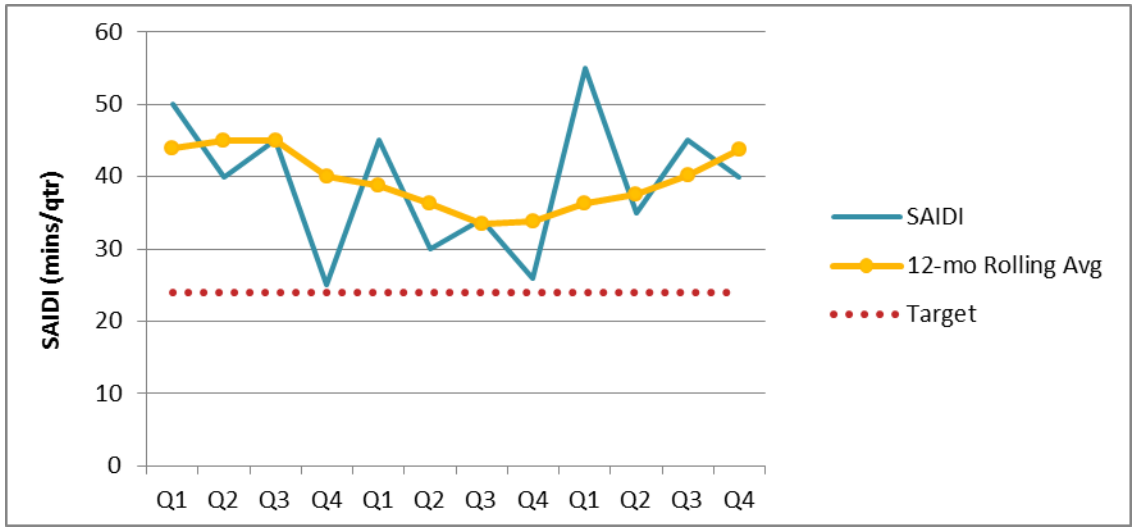
Dashboards

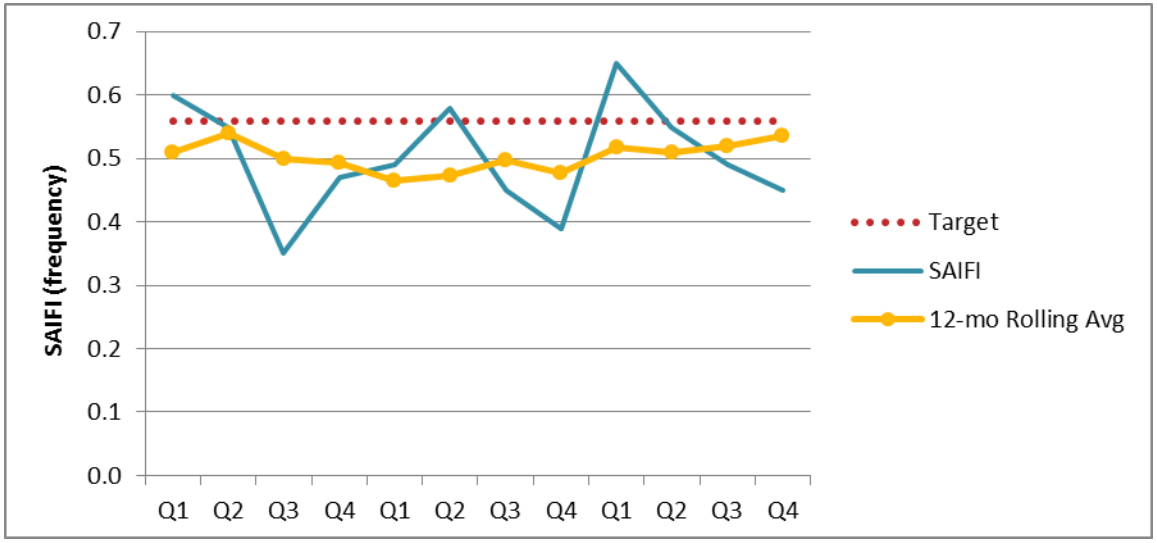
Dashboards provide a way for regulators and stakeholders to easily access utility performance data.

Data should be:

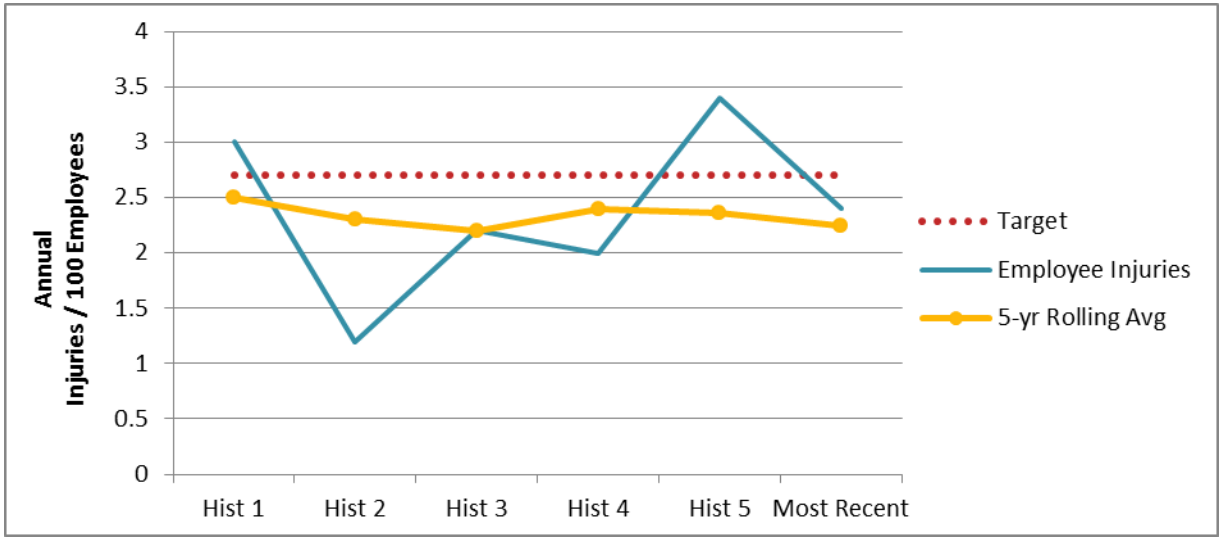
Accessible	• Performance data should be presented on a publicly-accessible website • The actual data should be downloadable in spreadsheet form
Clear and concise	• Performance should be presented in clear graphs • If the utility has a performance target, this should be included in the graph • An explanation of how the metric is calculated should be provided
Comprehensive	• The website should provide data for all metrics that the Commission wishes to track

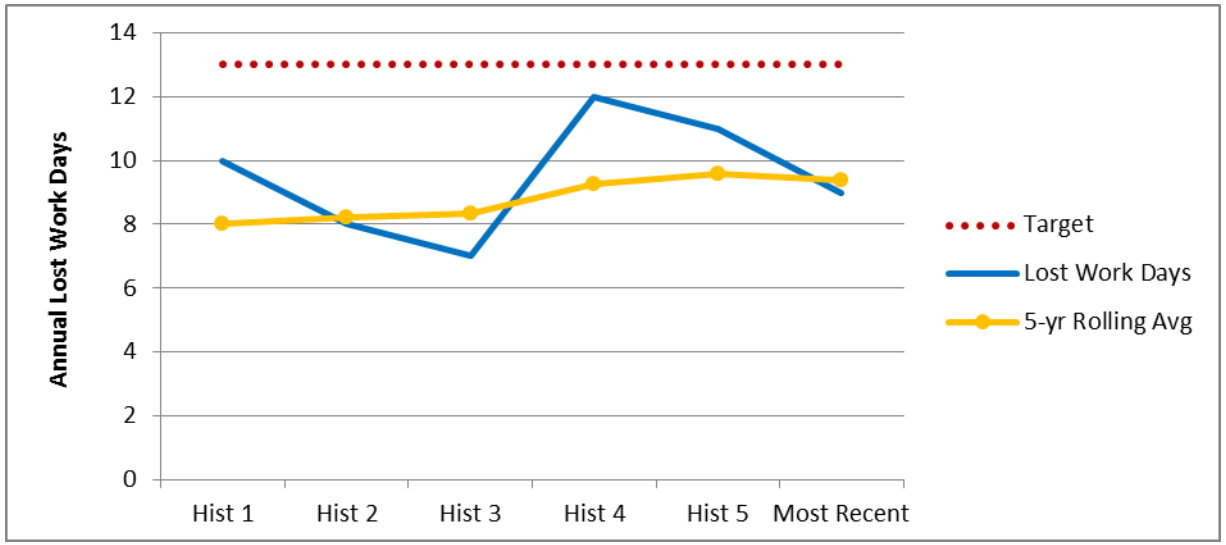
Dashboard: Reliability



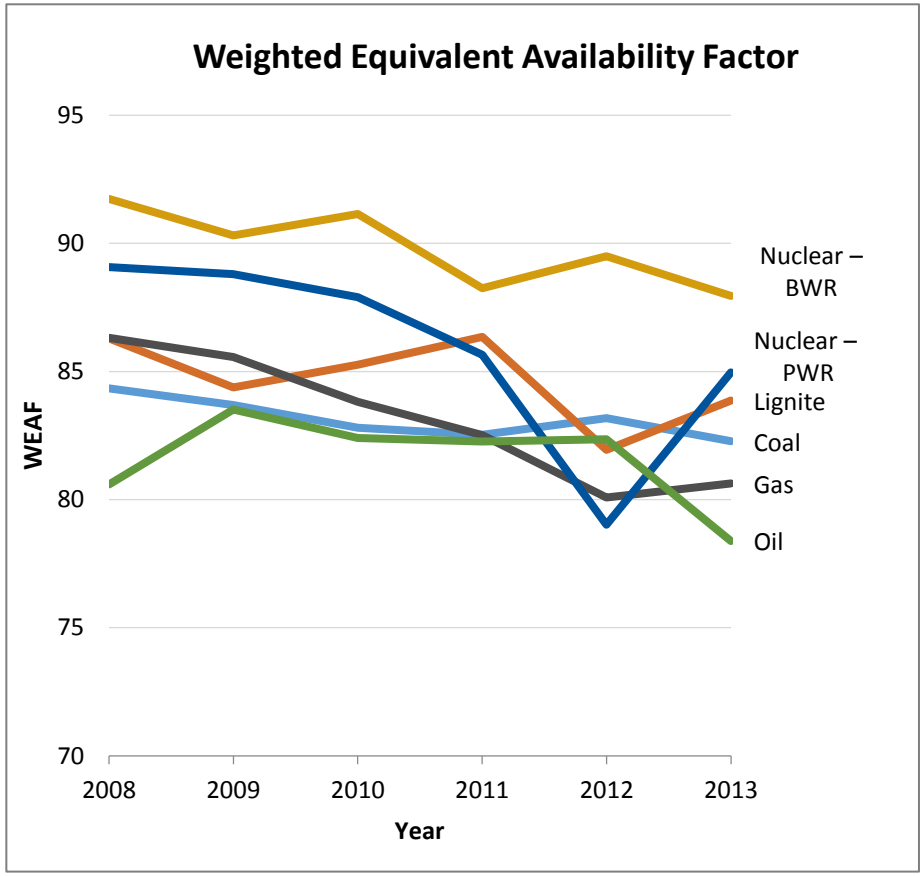


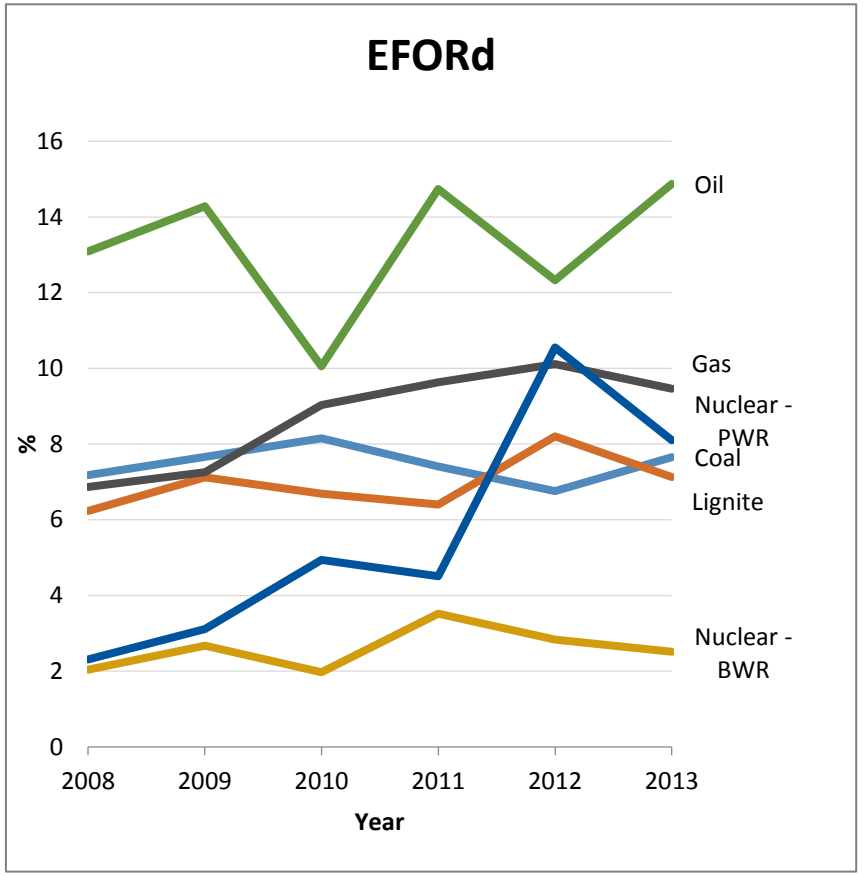
Dashboard: Safety





Dashboard: Power Plant Availability

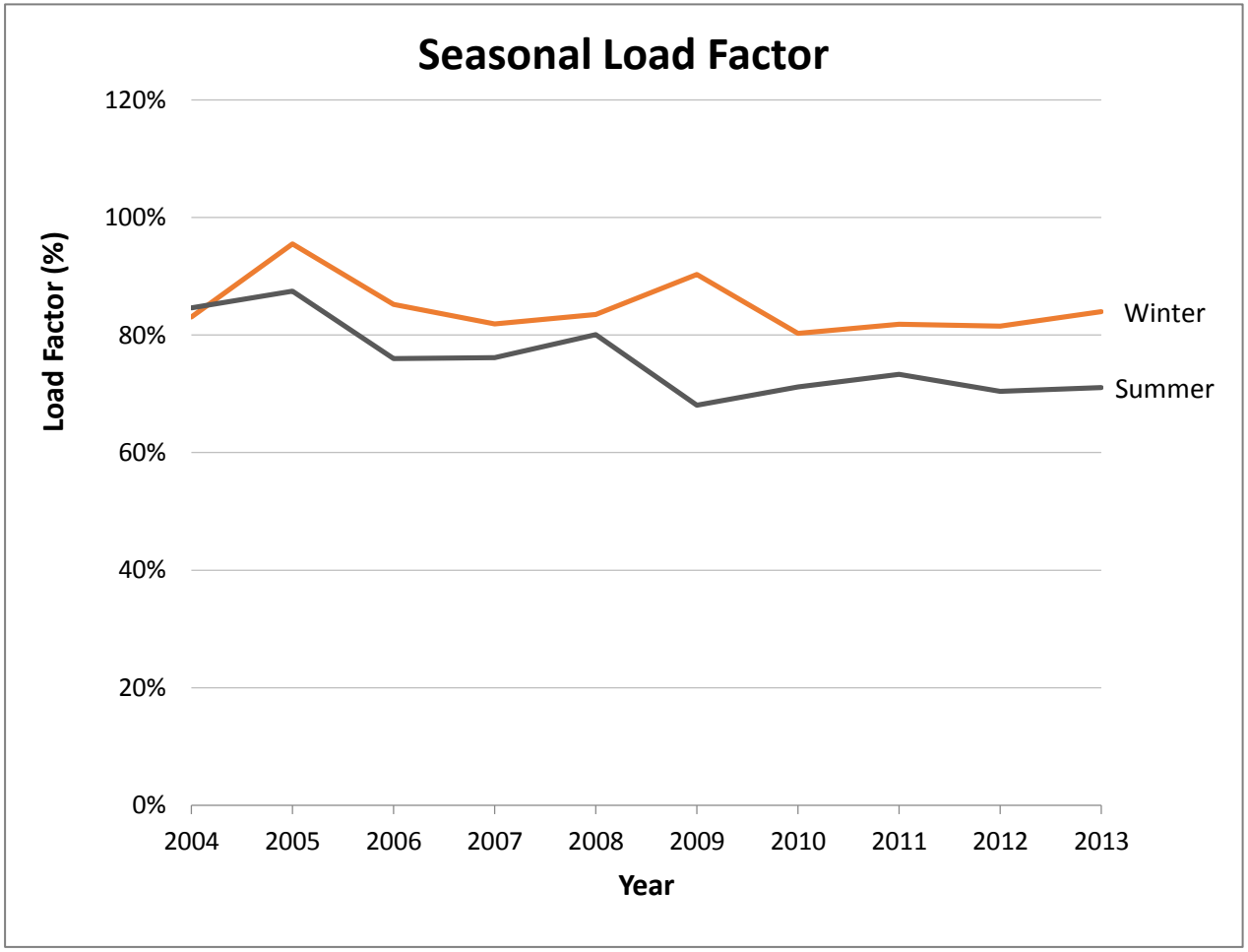




EFORd: Equivalent Forced Outage Rate Demand. Measures the probability that a unit will not meet its demand periods for generating requirements because of forced outages or derates.
Weighted Equivalent Availability Factor (WEAF): The capacity weighted equivalent availability factor for a fleet of units.

Data source: NERC 2014. Generating Availability Data System (GADS) 2008-2013 Generating Unit Statistical Brochure—All Units Reporting. http://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx.

Dashboard: System Efficiency

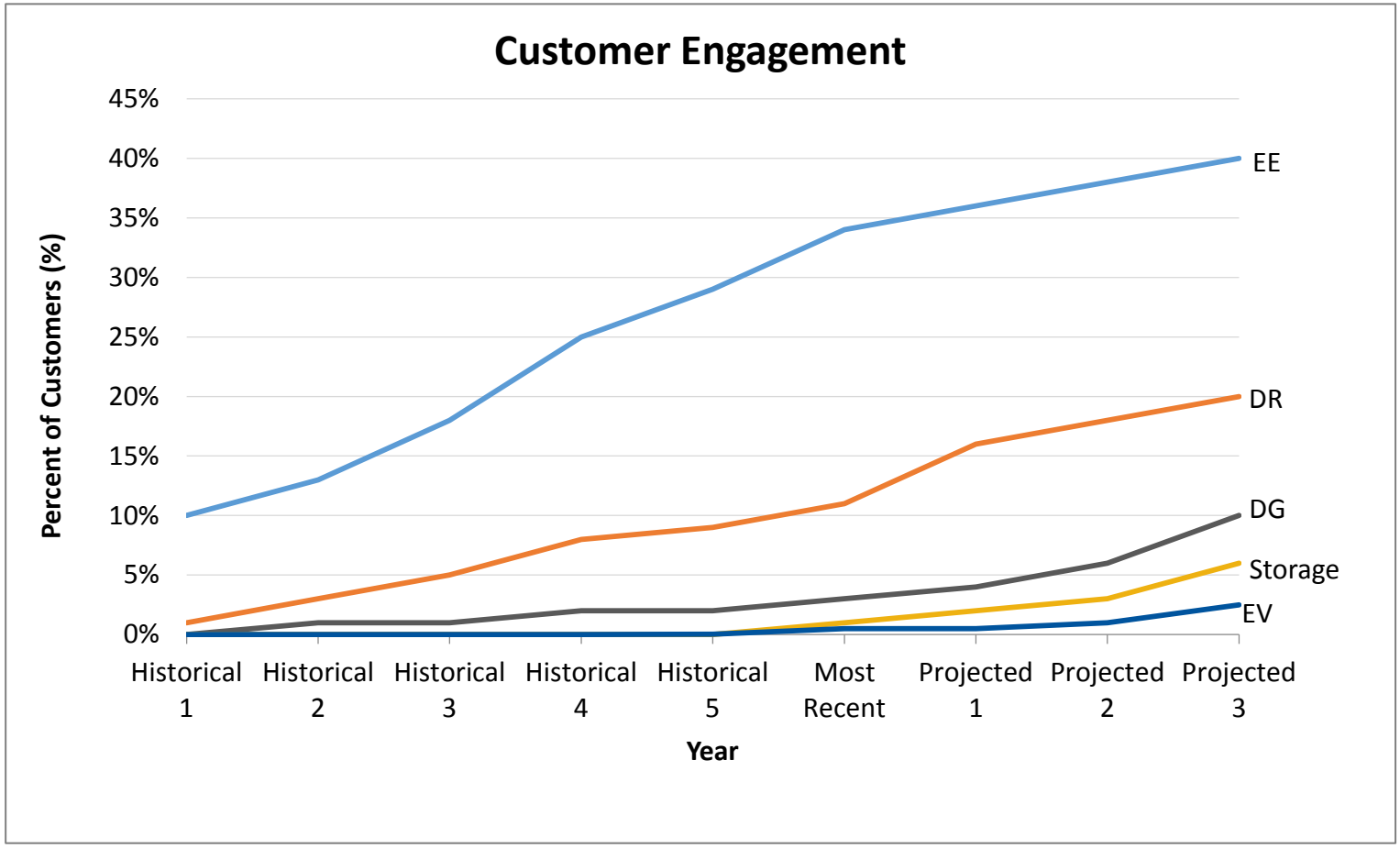


Load factor: system average load for the peak summer (or winter) month / system peak load for the peak summer (or winter) month.

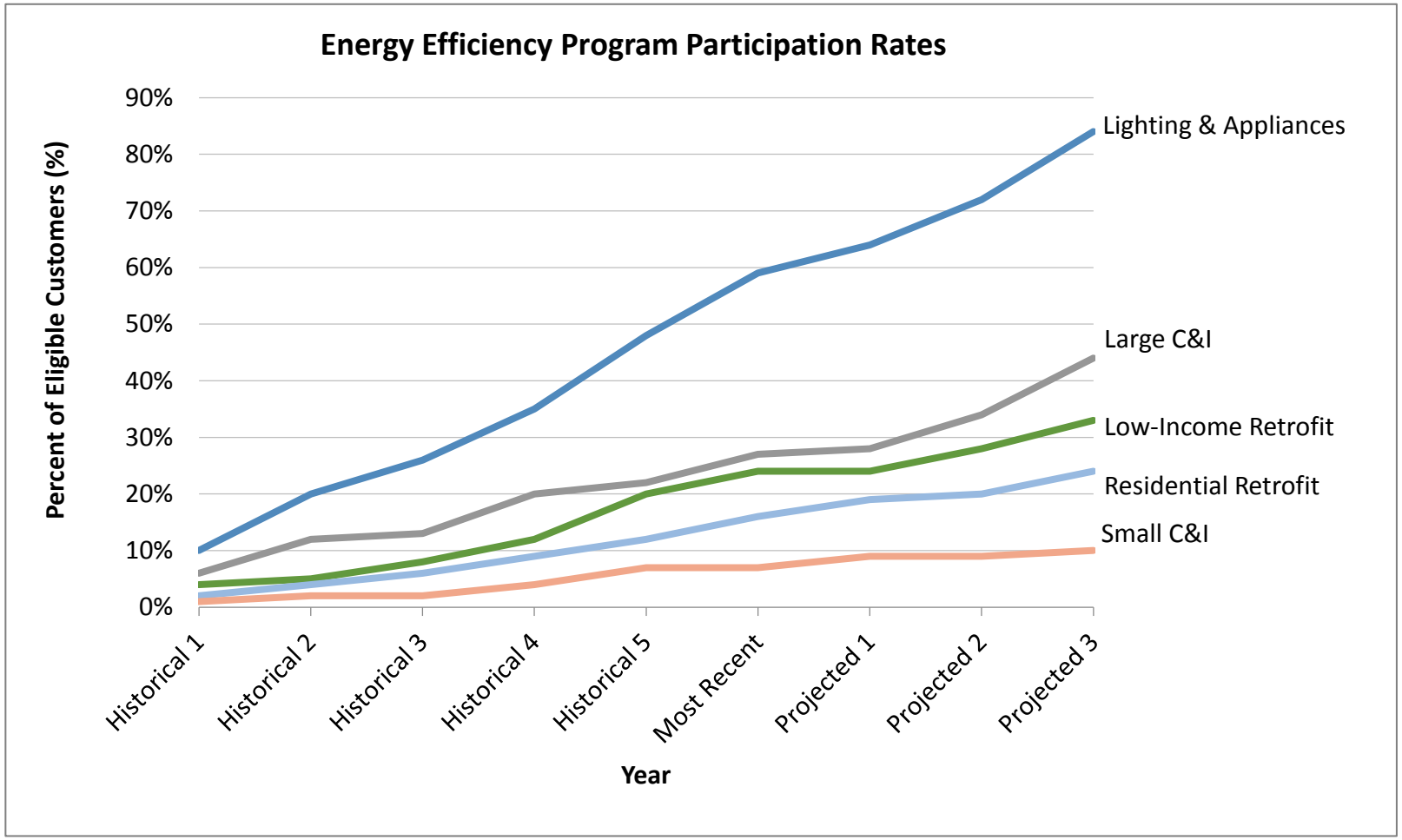
Data source: 2004 – 2013 FERC Form 1, page 401b, for a western utility.

Dashboard: Customer Engagement

One metric is the adoption rate of distributed energy resources

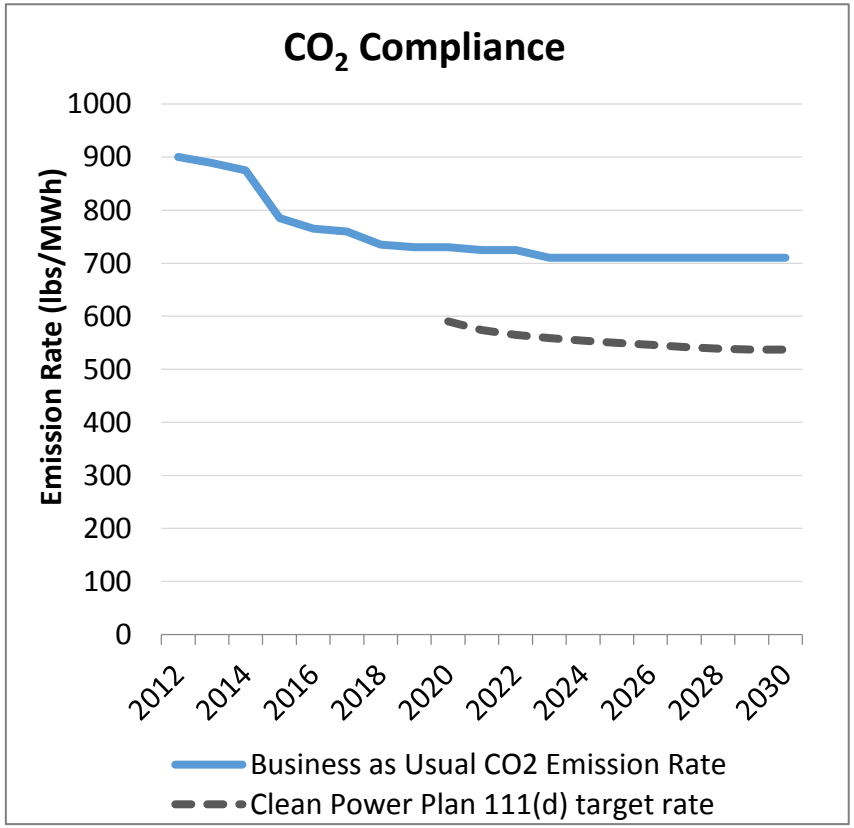


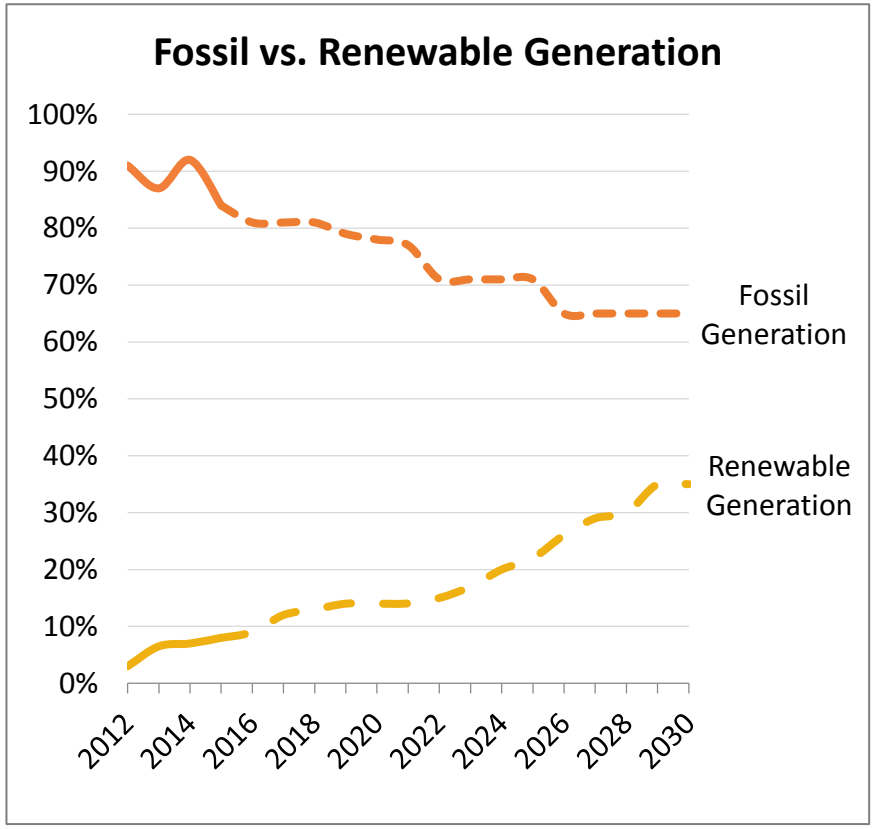
Dashboard: EE Participation Rates, by Sector



Illustrative example of cumulative participation rates, by sector.

Dashboard: Environmental Goals





Summary of Regulatory Guidance

Questions to Help Inform Regulatory Action

1. How well does the existing regulatory framework support utility performance?
   - Are utilities meeting current regulatory goals?
   - Are there areas of performance that require improvement?
2. Is the industry / market / regulatory context expected to change?
   - Do the utilities have the proper regulatory guidance to respond to changes?
   - Do the utilities have the proper incentives to respond to changes?
   - Are there emerging goals that the commission whishes to emphasize?
3. Does the commission prefer to oversee investments, or to guide outcomes?
   - Traditional regulation typically oversees the investments that are intended to achieve outcomes.
   - Performance regulation defines the outcomes, but not the means to achieve them.
4. Does the commission wish to specify the outcomes in advance?
   - Traditional regulation typically oversees investments after the fact (e.g., in rate cases).
   - Performance regulation defines desired outcomes in advance.

Implementation Steps – Incremental Approach

1. Articulate regulatory goals.
    - Historic and current regulatory goals
    - New and emerging regulatory goals
2. Identify performance areas that warrant tracking and reporting.
    - Traditional performance areas
    - New and emerging performance areas
3. Establish tracking and reporting protocols and requirements.
    - Monitor results over time
    - Identify areas of performance that warrant targets
4. Establish performance targets.
    - Monitor results over time
    - Identify areas of performance that warrant penalties / rewards
5. Establish penalties and rewards.
    - Monitor, revise, improve

Pitfalls to Avoid

Over-compensation

- Excessive rewards undermine the whole concept of incentive mechanisms.
- *Potential solutions:*
  - Use an incremental approach: start low and monitor over time.
  - Careful PIM design (e.g., shared savings).

Unintended consequences

- An incentive for one performance area may cause the utility to under-perform in areas that do not have incentives.
- *Potential solutions:*
  - Focus on performance areas that are isolated from others.
  - Be cautious of implications for other performance areas.
  - Consider implementing a diverse, balanced set of incentives.

Regulatory burden

- PIMs can be too costly, time-consuming, or too much of a distraction.
- Can be a problem for utilities, regulators, and stakeholders.
- *Potential solutions:*
  - Streamline using existing data, protocols, and simple designs.
  - Reduce the amount of money at stake.

Pitfalls to Avoid

Uncertainty

- Metrics, targets, and financial consequences that are not clearly defined reduce certainty, introduce contention, and are less likely to achieve policy goals.
- *Potential solutions:*
  - Carefully specify metric and target definitions, soliciting utility and stakeholder input where possible.
  - Adjust targets and financial consequences only cautiously and gradually so as to reduce uncertainty and encourage utilities to make investments with long-term benefits.

Gaming and Manipulation

- Utilities may have an incentive to manipulate results.
- *Potential solutions:*
  - Identify verification measures.
  - Consider using independent third parties (that are not selected or paid by the utility) to collect or verify data.
  - Avoid complex data analysis techniques that are difficult to audit and reduce transparency.

PIM Design Principles

Performance Areas	• Recognize incentives already in place • Address areas of utility performance that have not been satisfactory or are not adequately addressed by other incentives • Anticipate emerging challenges
Measuring Performance	• Choose metrics that are largely free from arbitrary influence and that are easily measured and interpreted • Define metrics precisely, using regional or national definitions where possible • Use independent parties to collect or verify data, and avoid complex data analyses that reduce transparency
Setting Performance Targets	• Tie target to state energy policy goals • Balance costs and benefits • Set a realistic target, using deadbands to mitigate uncertainty • Adjust targets only slowly and cautiously • Incorporate stakeholder input in setting targets
Financial Incentives	• Ensure rewards are not excessive, but sufficient to get attention of utility management • Administer incentives as dollars, not basis points • A simple, linear incentive formula is easiest to administer

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