U.S. DEPARTMENT OF ENERGY

Recovering and Allocating Costs

Training for States on Distribution System and Distributed Energy Resources Planning

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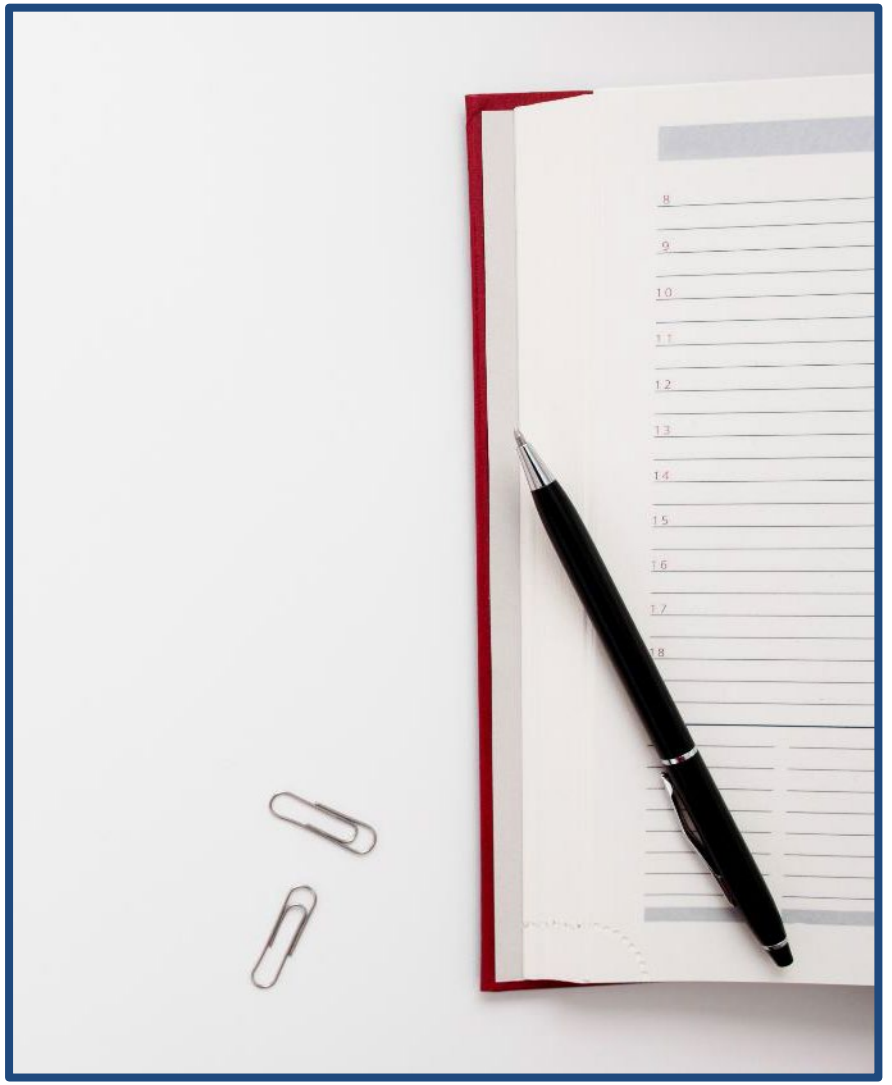
Western Regional Training

Agenda

- Introduction and level-setting
- Regulatory challenges
- Proactive distribution upgrades for distributed energy resources and electrification
- Treatment of projects that receive federal funding
- Ratepayer vs. taxpayer funding
- Resilience investments



“Allocation of costs is not a matter for the slide rule.

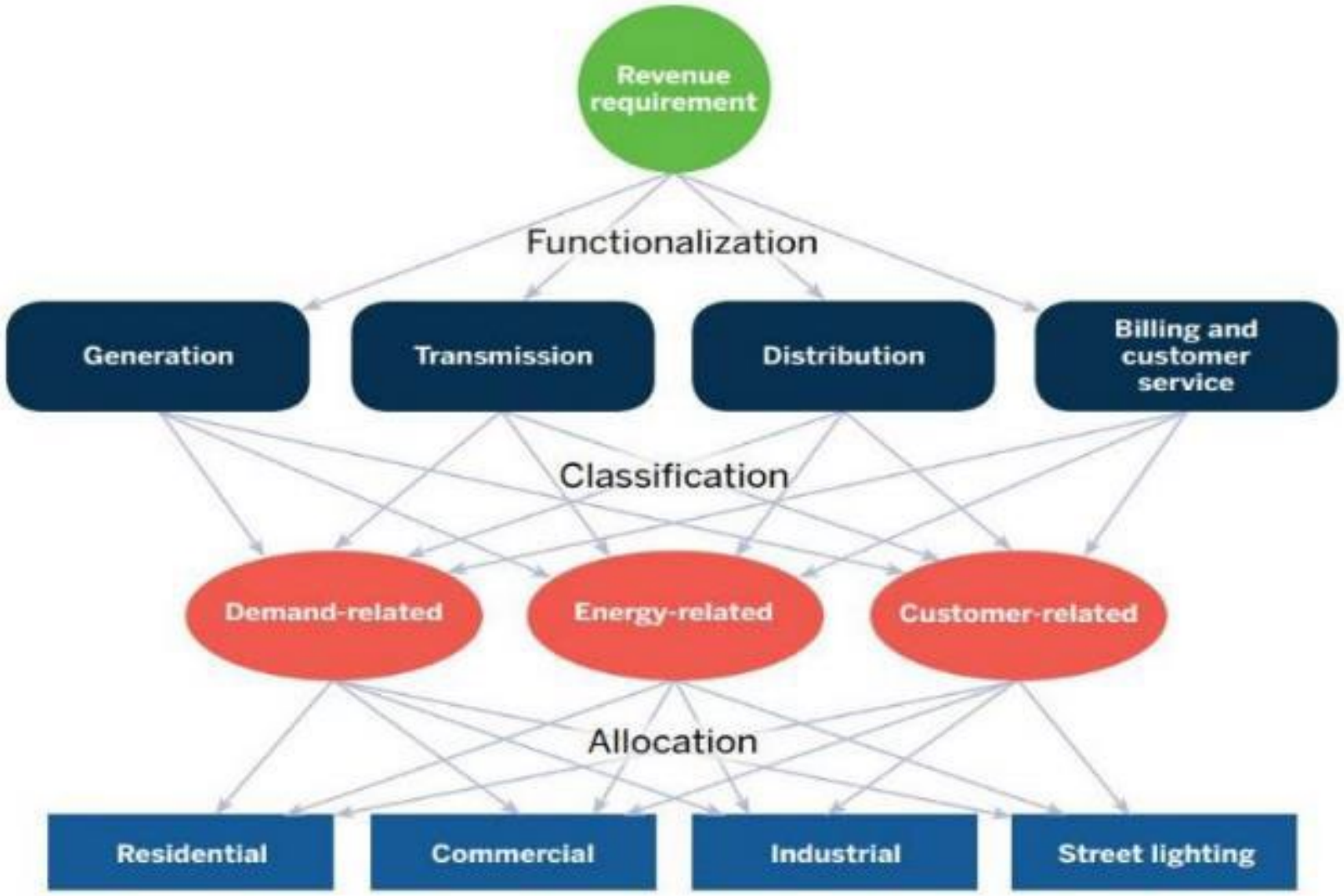
It involves judgment of a myriad of facts. It has no claim to an exact science.”

Justice William O. Douglas, U.S. Supreme Court
Colorado Interstate Gas Co. v. Federal Power Commission,
324 US 581, 589 (1945)

Elements of the Ratemaking Process

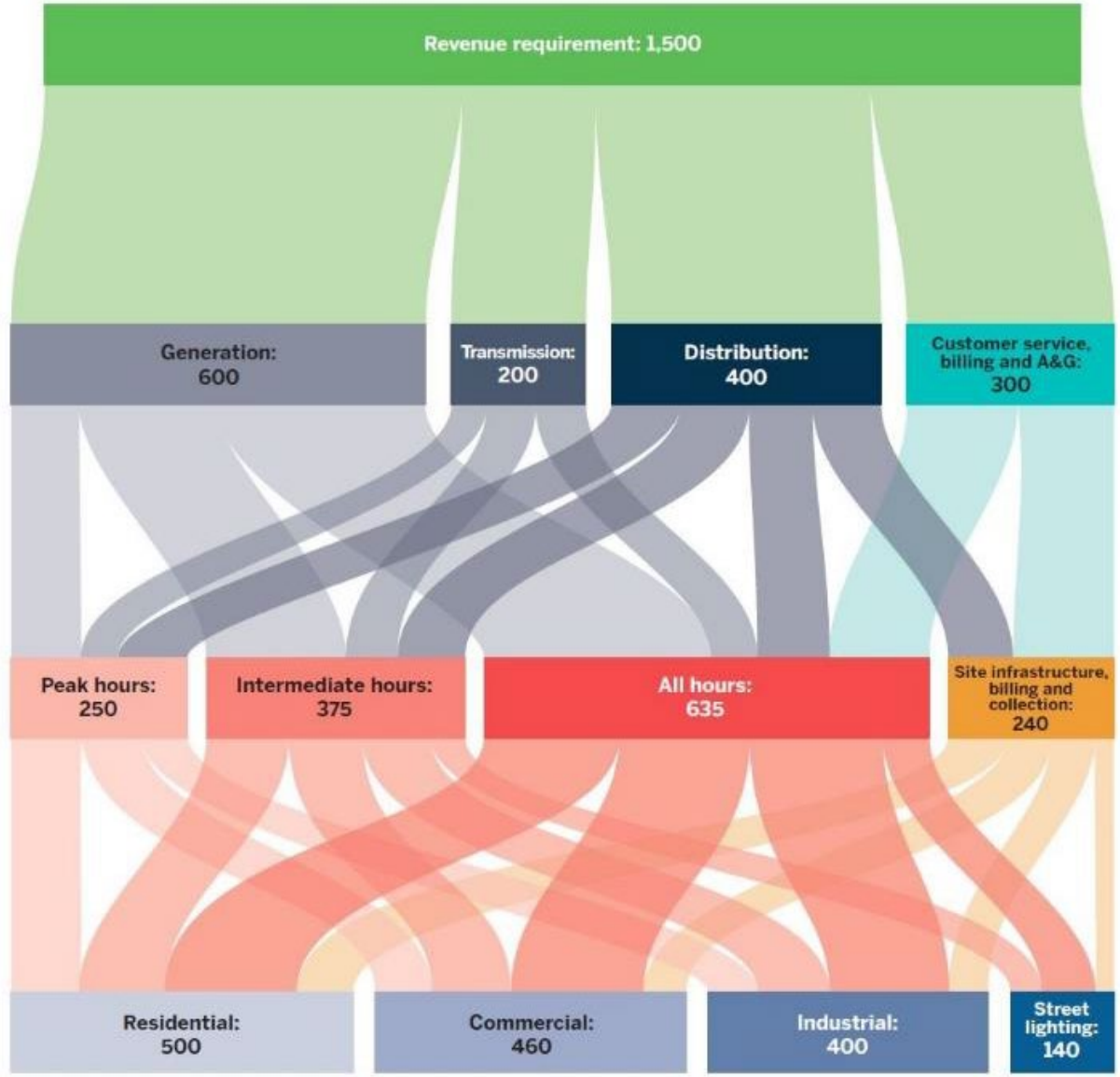
- **Revenue requirement for utility expenditures in providing electric service**
  - (Capital, O&M, Utility Rate of Return, other expenditures)
- **Functional cost categories**
  - (Generation, transmission, distribution, customer service)
- **Classification of costs**
  - (Customer-related vs. energy-related vs. demand-related)
- **Allocation of costs across customer classes**
  - (Residential, commercial, industrial, street-lighting)

Embedded Cost of Service Allocation



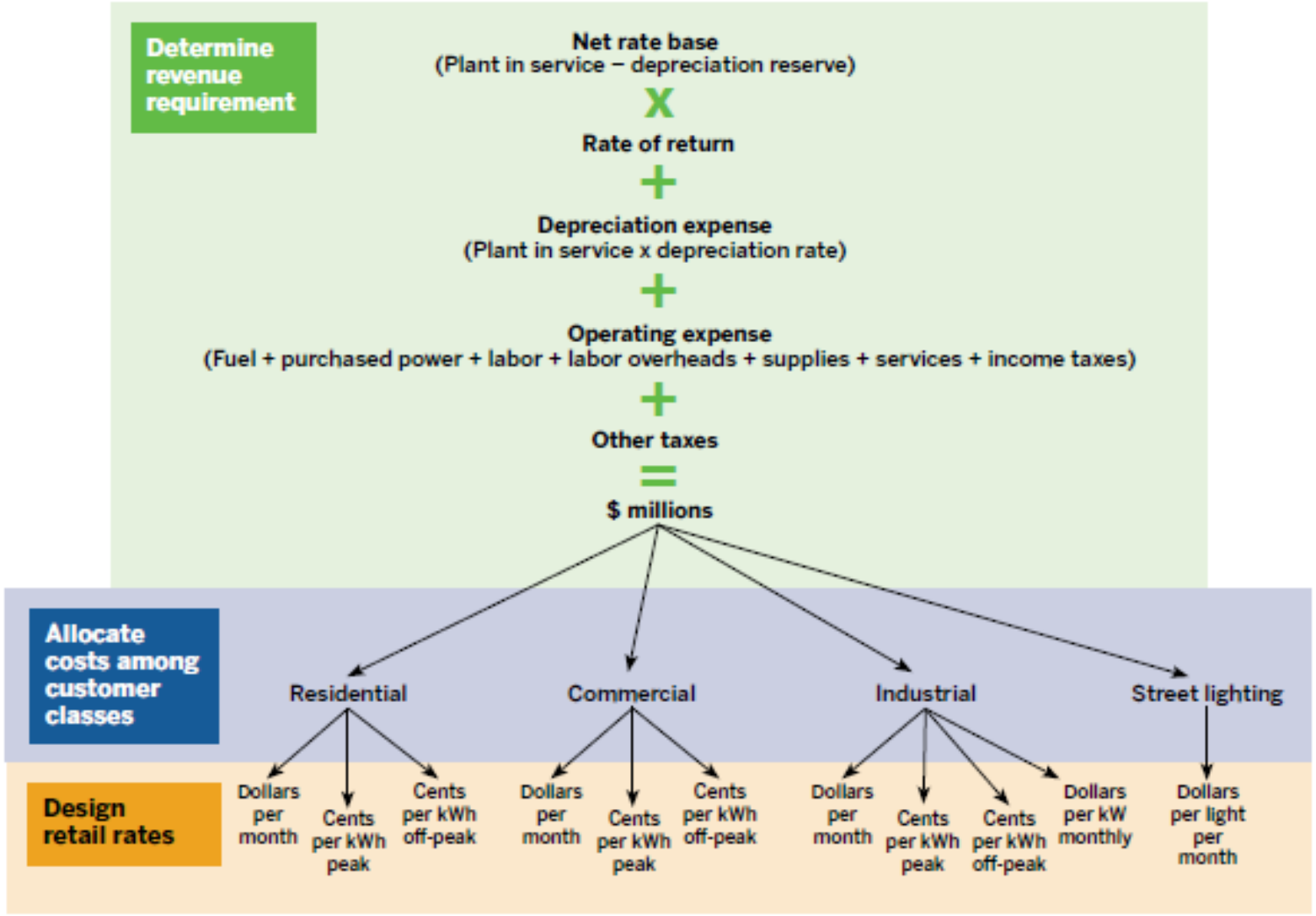
Source: Regulatory Assistance Project |2020 | Electric Cost Allocation for a New Era: A Manual

Diagram for Modern Embedded Cost of Service Study



Source: Regulatory Assistance Project |2020 | Electric Cost Allocation for a New Era: A Manual

Simplified Ratemaking Process



Source: Regulatory Assistance Project |2020 | Electric Cost Allocation for a New Era: A Manual

Regulatory Challenges Associated with Traditional Investments

- **The cost recovery and allocation process involves more than a just an economic exercise**
- **Advancing priorities such as customer affordability and attracting businesses to a desired location requires intentionality**
- **There are trade-offs involved in every aspect of rate design**
  - Simple rate options can be easy to understand, but don't provide incentives to adjust consumption in a way that makes the best use of customer and system resources
  - Complex rate options (with little use of technologies that automate customer response) can result in customer confusion and limited opportunities to drive intended shifts in behavior
  - Opt-in rates provide customers options for intentional participation in time-variant rates, but may primarily benefit only natural "winners"
- **At some point in the process, a decision must be made on who covers what portions of the costs across the energy system and what rate structures (demand charges, volumetric rates, etc.) will be used to recover these costs**
- **Cost allocation continues to be the foundation of equitable rate design, with additional policy priorities overlayed**
  - Additional priorities, such as support for income-qualified customers, create shifts in this allocation
- **Emerging priorities such as support for electrification and local resilience can create added complexity, as these involve new cost causers and introduce different demand interactions with existing system load shapes**
- **Projects that serve multiple service territories require additional care to ensure customer fairness**

Regulatory Challenges Associated with Distributed Energy Resources

- Customer adoption of distributed energy resources (DERs) that significantly impact distribution system energy flows and congestion can create large costs for the broad customer base
- Distribution system investments may be deployed with demand flexibility tools (such as time of use rates) to relieve local congestion and meet changing energy demand needs
- However, these investments and programs responsive to local demand needs can take some time to deploy at scale
- Unanticipated demand impacts associated with electrification of customer end-use equipment and variable DERs may make it challenging to ensure these demand relief solutions are deployed in time
- Proactive distribution system investments may be made in anticipation of DER and load growth impacts to ensure these assets are in place when needed, however attempting to allocate these costs across customer classes raises questions on the:
    - Adequacy of forecasts to accurately reflect DER growth levels and their location
    - Fairness of allocation decision (Customer cost vs. System Cost)
    - Prudency of proactive investment if the need does not ultimately materialize
    - Contribution from other funding sources, including taxpayer funds

Proactive distribution upgrades for DERs and electrification

Maintain Reliability

Upgrades required to maintain reliability as energy demand and supply becomes more dynamic and distributed

- System monitoring - Advanced Distribution Management Systems, line sensors, Advanced Metering Infrastructure (including communications network)
- System modeling - Using field data obtained from monitoring sources
- Controls – Automatic Circuit Reclosers, voltage optimization equipment, Distributed Energy Resource Management Systems

Optimize Supply and Demand

Upgrades required to optimize the supply and demand profiles of DERs, allowing more value-based customer transactions with the grid

- Utility programs and incentives to shift customer consumption and generation during system constraints
- Market programs to manage market prices, manage demand, and provide ancillary services
- Revenue grade metering for transactions that require it
- Additional customer equipment to maximize participation

Support DER Flexibility and Growth

Upgrades required to accommodate additional DERs and provide flexibility for customers to adopt locally-sited energy solutions

- Hosting capacity analyses
- Energy storage deployments
- Advanced load forecasting capabilities
- Demand flexibility – price signals (including time variant rates and incentives), demand response, load shaping

Who Pays for these Investments?

- Private investment at customer sites
- Tax credits and government incentives
- Ratepayers in a manner set by utility regulators

Treatment of projects that receive federal funding

- Identification of funding opportunities that advance customer and local priorities
- Assessment of funding requirements and performance obligations
- Ensuring proposed responses to federal funding opportunities reflect projects that can demonstrate prudency and are in the best interests of ratepayers
- Securing support for use of ratepayer funds to meet cost-sharing obligations
- Managing implementation risk – meeting obligations for grant agreements and customer cost recovery

Select ARRA Project Awards Addressing Resilience

Resilience Dimension	Selectee	State(s)	Project Description	Federal Cost Share	Recipient Cost Share
Adaptive Control Technologies	NSTAR Electric Company	MA	Expand the system's distribution automation capabilities by implementing "self-healing" functions on the grid that will reduce the impact of outages on the system and the power quality and efficiency of the distribution grid.	$10,061,883	$10,061,883
	Hawaiian Electric Co. Inc	HI	Automate high load distribution circuits feeding eastern Oahu, reducing outage duration and community impacts.	$5,347,598	$5,347,598
	Oklahoma Gas and Electric Company	OK, AR	Deploy a smart grid network and implement advanced distribution automation technologies that will facilitate "self-healing" and power restoring properties on the grid.	$130,000,000	$163,201,332
Monitoring and Control / Adaptive Control Technologies	CenterPoint Energy	TX	Strengthen the reliability and self-healing properties of the grid by installing more than 550 sensors and automated switches that will help protect against system disturbances like natural disasters.	$200,000,000	$439,187,435
	Florida Power & Light Company	FL	By incorporating intelligence into the transmission, distribution and customer systems, the utility will be able to anticipate and respond to grid disturbances, empower customers through alternative rate programs, and enable the integration of renewable and on-site energy sources	$200,000,000	$378,963,325
Monitoring and Control	Navajo Tribal Utility Association	AZ, NM, UT	Integrate the smart grid system as part of the distribution network, which will help quickly identify any system outages.	$4,991,750	$5,620,099
	Sioux Valley Energy	SD, MN	Install a smart grid network across the full customer base that will allow for automated electricity readings and additional monitoring of the system in case of outages or disruptions.	$4,016,368	$4,016,368
	Woodruff Electric	AR	Install smart meters that will provide time-of-use data, help monitor demand and reduce outages.	$2,357,520	$2,658,480
	Avista Utilities	WA, ID	Implement a distribution management system, intelligent end devices, and a communication network to reduce distribution system loses, enable automatic restoration to customers during outages, and allow for the integration of on-site generating resources.	$20,000,000	$20,048,996
	Idaho Power Company	ID, OR	Modernize the electric transmission and distribution infrastructure, implementing an outage management system and irrigation load control program that will reduce peak and overall energy use and improve system reliability.	$47,000,000	$47,000,000
	City of Auburn, IN	IN	Integrate and modernize multiple components within the electrical system, including installing a smart meter network, enhancing reliable and fast communication capabilities, upgrading cyber security technologies, expanding grid monitoring and improving responses to power outages.	$2,075,080	$2,075,080

***Source:** Adapted from Recovery Act: Smart Grid Investment Grant (SGIG) Program Projects | U.S. Department of Energy – Office of Electricity| Accessed November 21, 2023 | https://www.energy.gov/oe/recovery-act-smart-grid-investment-grant-sgig-program

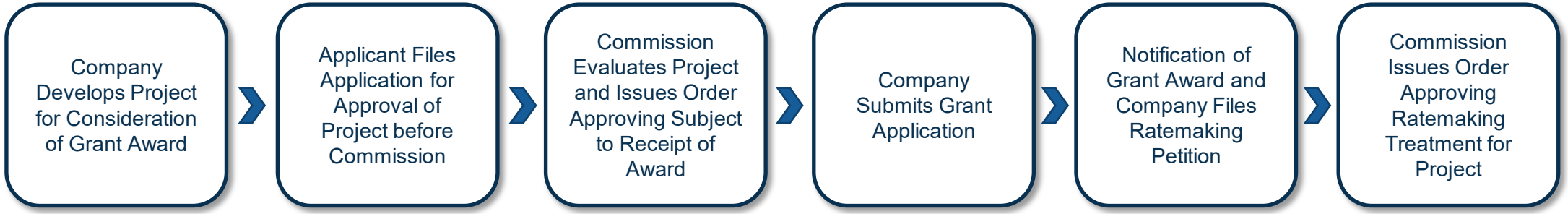
Summary of 2023 Grid Resilience Project Awards

Resilience Dimension	Selectee	State(s)	Project Name	Federal Cost Share	Recipient Cost Share
Microgrids	Kit Carson Electric Cooperative	NM	Building a Modern, Intelligent Distributed BESS for Resiliency in Northern New Mexico	$15,430,118	$7,715,580
	Jamestown Board of Public Utilities	NY	Jamestown Board of Public Utilities Microgrid	$17,377,945	$5,792,648
System Hardening / Microgrids	PECO Energy Company (PECO)	PA	Creating a Resilient, Equitable, and Accessible Transformation in Energy for Greater Philadelphia (CREATE)	$100,000,000	$156,761,176
	Entergy New Orleans, LLC (ENO)	LA	Line Hardening and Battery Microgrid in New Orleans, LA	$54,828,178	$54,828,178
	Electric Power Board of Chattanooga	TN	EPB Chattanooga Grid Resiliency Upgrades: Network Conversions & Microgrids	$32,375,691	$32,375,691
System Hardening	Sumpter Electric Cooperative	FL	Improving Reliability through Grid Hardening in Florida	$52,857,560	$17,619,190
	Southern Maryland Electric Cooperative		SMECO Transmission, Distribution, and Communications Resiliency Initiative	$33,567,016	$15,642,000
	Fort Pierce Utilities Authority	FL	Mitigating Impacts of Extreme Weather and Natural Disasters Through Increased Grid Resiliency	$5,828,993	$2,907,882
	Consumers Energy	MI	Sectionalization and Circuit Improvements to Mitigate Outage Impacts for Disadvantaged Communities	$100,000,000	$100,310,996
System Hardening / Wildfire Mitigation	Hawaiian Electric Company Inc.	HI	Climate Adaption Resilience Program	$95,313,716	$95,313,718
Wildfire Mitigation	Xcel Energy	CO, MN, NM, TX, WI	Wildfire Mitigation and Extreme Weather Resilience for Xcel Energy	$100,000,000	$142,020,463
	Tri-County Electric Cooperative	SC	Electrical Grid Modernization and Wildfire Reduction in South Carolina	$4,665,803	$2,332,903
	PacifiCorp	CA, OR, UT	PacifiCorp's Equity-aware Enhancement of Grid Resiliency	$99,633,723	$106,105,519
	Mora-San Miguel Electric Cooperative, Inc.	NM	Three-Part Wildfire Damage Mitigation Project	$11,270,193	$3,756,731
	Midwest Energy, Inc.	KS	Transmission Line Rebuild/Replacement for Wildlife Mitigation and Renewable Resource Access	$96,942,707	$47,717,412
	Holy Cross Energy	AZ, CA, CO, ID, KS, MN, MO, ND, NE, NM, OK, OR, SD, UT, WA, WY	Wildfire Assessment and Resilience for Networks (WARN)	$99,328,430	$45,762,816

***Source:** Adapted from Grid Resilience and Innovation Partnerships (GRIP) Program Projects | U.S. Department of Energy – Grid Deployment Office | Accessed November 21, 2023 | https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program-projects

Cost Recovery Process for Grid Investments Seeking Grants

Process Overview



Regulatory Decision Example

Central Maine Power – Advanced Metering Infrastructure

- **June 2008** - Maine Public Utilities Commission reviews Central Maine Power's Advanced Metering Infrastructure (AMI) project.
  - Commission defers decision on project, but examination of cost-benefit issues continues
- **February 2009** – American Recovery and Reinvestment Act is enacted
- **February – July 2009** - Commission and parties carry out a series of meetings and technical conferences on the AMI project
- **July 2009** – Commission issues Order approving AMI installation, subject to receipt of a "substantial" DOE grant award
- **August 2009** – Utility submits a grant application to DOE
- **October 2009** – DOE notifies utility of $95.9M grant award (project costs at this time estimated at $192M)
- **January 2010** – Utility submits testimony in support of AMI project
- **February 2010** – Commission issues Order Approving utility's AMI project and associated ratemaking treatment

***Source:** Order Approving Installation of AMI Technology | Docket No. 2007-215(II), Maine Public Utilities Commission, Feb. 25, 2010

Ratepayer vs. taxpayer funding

- **Potential for taxpayer funds to defray costs that would otherwise be borne by ratepayers**
  - Awards made through federal and state funding opportunities are conditional and come with certain performance requirements that must be met to maximize funds received
  - Funding opportunities are often structured to advance projects that have not already been authorized or are underway – however, projects that have been contemplated and planned to some extent are often allowed and encouraged
  - Awards are subject to negotiation and any cost-share using ratepayer funds requires Commission approval
- **Potential for taxpayer funds to reduce utility returns**
  - Utilities earn a return on their invested capital
  - Grants can reduce the required invested capital by utilities and reduce the utility's absolute return from these projects
  - However, many projects may not have advanced without these awards and may ultimately result in a net-positive return position for utilities
- **Opportunities to optimize ratepayer and taxpayer funds to advance shared goals and minimize redundant costs**
  - Federal and state opportunities often allow various types of entities to apply for funding
  - There may be opportunities to collaborate with other entities to pool together resources for greater impact, including through joint planning, deployment, and funding (formula + competitive grants)
  - Developing funding strategies with partners that harness their respective areas of strength and advance mutual priorities can maximize impact, with more judicious use of resources

Case Study: CenterPoint Energy Distribution Automation

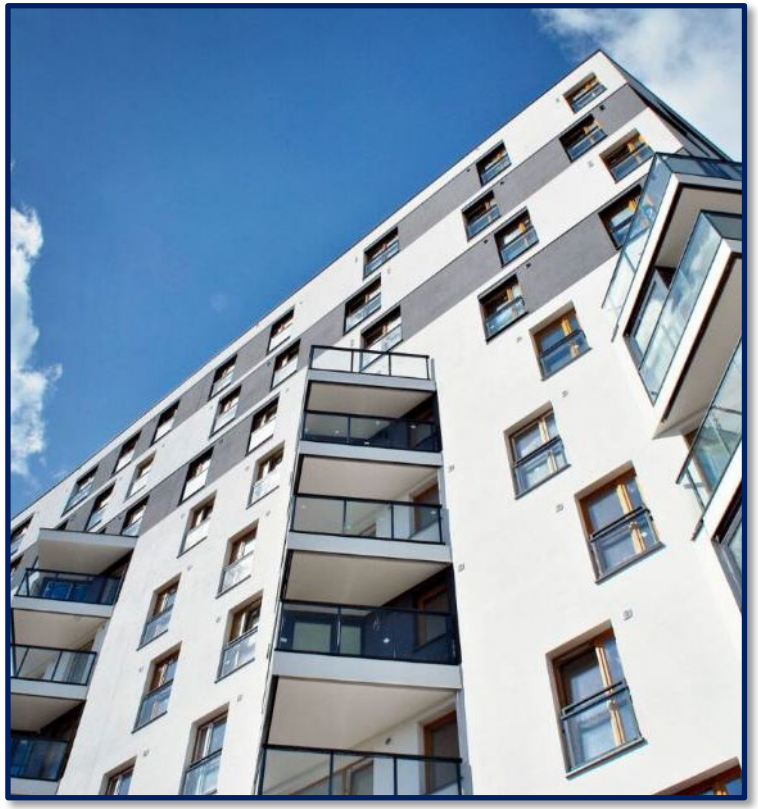
- In 2017, Hurricane Harvey brought 52 inches of rain to Texas and Louisiana
- Distribution automation, including intelligent switches, helped CenterPoint energy isolate power quickly – avoiding 41 million outage minutes for customers
- Other technologies including smart meters provided increased visibility and efficiency of response

Functionalization	Classification	Allocation
Distribution	Energy-related	All Classes

Source: Corporate Responsibility Report | CenterPoint Energy | 2017 | 2017-Corporate-Responsibility-Report.pdf (centerpointenergy.com)

Case Study: New Jersey Energy Resilience Bank

- The NJ ERB provided grants and loans to critical facilities to enhance resilience following Superstorm Sandy
- Operated by the New Jersey Economic Development Authority using $200 M awarded to the State from Community Development Block Grant Disaster Recovery Funds
- Higher grant allocations covering “resilience costs” with project costs not explicitly tied to enhancing resilience supported by smaller cost-share and loans



Functionalization	Classification	Allocation
Distribution and Customer	Customer-related	Commercial and Industrial

Source: ERB Financing Program Guide | New Jersey Board of Public Utilities and New Jersey Economic Development Authority |2014| ERB Financing Program Guide (state.nj.us)

Case Study: Xcel Energy Resilience as a Service Pilot

- Program designed for commercial and industrial (C&I) customers seeking energy resilience and business continuity through power outages
- Xcel Energy of Wisconsin pays most of the upfront costs of these systems and is paid back by participant over 10 years
- As of year-end 2022, one government project was under construction, with additional projects at manufacturing, wastewater, airport, and other facilities in the study stage
- Technologies include solar, storage, microgrids and back-up generators

Functionalization	Classification	Allocation
Distribution and Customer	Customer-related	Commercial and Industrial

Source: Resilience as a Service Program Annual Compliance Report | Xcel Energy |2022 | 4220-TE-106 RaaS Annual Report 2022.docx (wi.gov)

Case Study: Connecticut Green Bank – Energy Storage Solutions

- Program that helps Commercial, Industrial, and Institutional customers install energy storage to maintain operational continuity through power disruptions
- Ratepayer funded program administered by the CT Green Bank and State IOUs
- Upfront and annual performance-based incentives provided, with additional incentive adders for small businesses, critical facilities, and other strategic applications

Functionalization	Classification	Allocation
Customer	Customer-related	Commercial and Industrial

Source: Energy Storage Solutions | Connecticut Green Bank | Accessed April 24, 2023 | Energy Storage Solutions - CT Green Bank | Accelerating Green Energy Adoption in CT

What is Resilience?

- “Resilience is the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions.”
- “Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.”
- High-impact disruptions can create challenges for meeting critical services, as well as result in large economic losses due to a lapse in business continuity

Source: Presidential Policy Directive / PPD-21: Critical Infrastructure Security and Resilience | 2013 | *Cybersecurity & Infrastructure Security Agency*

Measures for Mitigating the Impact of Disruptions

- Hardening of power lines, facilities, substations, and other systems
- Undergrounding of electrical equipment
- Vegetation and fuel-load management
- Monitoring and control technologies
- Use or construction of distributed energy resources for enhancing system adaptive capacity during disruptive events, including microgrids and battery-storage
- Adaptive protection technologies
- Advanced modeling technologies

- **Source:** Grid Resilience and Innovation Partnerships Program| U.S. Department of Energy | Accessed April 24, 2023 | Grid Resilience Utility and Industry Grants Fact Sheet (December 2022).pdf (energy.gov)

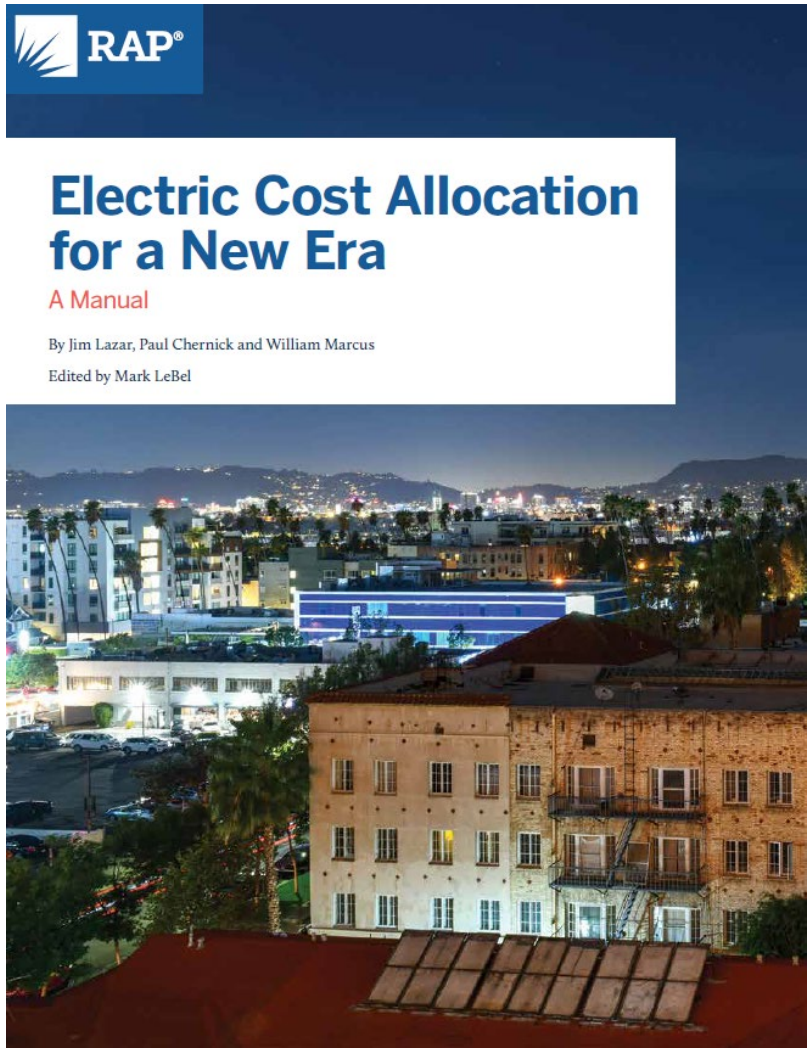
Examples of State Resilience Investments and Cost Recovery

Lead Entity	Program Offering	Grid Dimension	Description	Why It's Notable
CenterPoint Energy	Distribution Automation	Electric Grid	Distribution automation, including intelligent switches supported by smart meters, increased visibility and efficiency of outage response	Investments beyond system hardening avoided 41 million outage minutes for customers during record-breaking Hurricane Harvey
Arizona Public Service	Microgrid Program	Microgrid	Provides support for microgrids, battery storage, solar power and low-emission generators to enhance resilience of large customers	Provides planning, construction, site monitoring, maintenance, and reporting services depending on customer needs
Xcel Energy Wisconsin	Resilience as a Service Pilot	Microgrid	Utility program to enhance C&I customer resilience through solar, storage, microgrids, and back-up generator installation	Utility pays most costs of resilient systems upfront and is paid back by participant (not ratepayers) over 10 years
Connecticut Green Bank	Energy Storage Solutions	Customer	Energy storage offering for C&I customers administered together with IOUs to maintain operational continuity	Upfront and annual performance-based incentives provided, with additional incentive adders for small businesses, critical facilities, and other strategic applications
Alabama Power	Connected Communities	Microgrid	Utility-owned microgrid including energy efficiency, solar, storage, and natural gas generators supporting single-family homes	Can operate independently of the grid to provide community energy service through outages; additional new home construction to have microgrid services at the outset
New Jersey Economic Development Authority	Energy Resilience Bank	Microgrid	Provides grants and loans for critical facilities to enhance resilience following Superstorm Sandy	Leveraged federal funding allocated for recovery to seed bank and offer facility specific support for resilience costs
New Jersey Transit	TransitGrid	Microgrid	Microgrid provides critical transportation services through power disruptions	Leveraged $400M in federal transportation funding to enhance resilience and create 4,000 new jobs

Questions to Ask

- Do the existing cost recovery processes in the state accurately account for the value that grid modernization, distribution system-enhancing, and resilience investments provide? To which entities does this value accrue?
- Do the current cost recovery and allocation processes in the state advance or hinder local priorities, such as ensuring customer affordability, supporting economic growth, and creating a more resilient energy system?
- For investments that create clear societal benefits beyond those provided to energy customers (such as enhanced resilience across life-saving and critical facilities), is there an appropriate role for taxpayer contributions to support their deployment?
- Ratepayers, taxpayers, and private entities all make investment decisions that impact resilience and the level of DERs across the state. Do existing planning processes and stakeholder activities ensure that these investments are coordinated and complementary?

Electric Cost Allocation for a New Era Manual



Source: Electric Cost Allocation for a New ERA | Regulatory Assistance Project |2020 | Electric Cost Allocation for a New Era: A Manual - Regulatory Assistance Project (wpengine.com)

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