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51st State Roadmap: Leveraging the Natural Advantages of the Electric Utility

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Key Insights

Distributed energy resources (DER) can provide net benefits to the electric system (e.g., congestion relief) and broader society (e.g., emission reductions); however, despite these advantages, the deployment of high penetrations of DER has proved challenging for the following reasons:

- **Newness of Technology** – Despite some high-profile markets, DER assets are relatively new to the electric grid. Electric utilities and grid operators continue to learn how to efficiently integrate these technologies
- **Lack of Granular Information and Data** – Historically, the electric grid consisted of a small number of centralized generation units. Electric utilities and grid operators did not require granular information and data to safely and reliably operate the grid
- **Misaligned Regulatory Model** – A regulatory model focused on long planning cycles, and risk aversion is ill-suited to manage the rapid growth of DER assets and technology innovation. In addition, the current model includes inappropriate or lacking price signals and incentives

Against this backdrop, the electric utility is often singled out as a fundamental barrier to deployment of DER assets. To overcome the perceived electric utility shortcomings, many stakeholders conclude that a completely new model is needed for the electric industry. We disagree with this assessment and instead believe electric utilities maintain natural advantages that can be leveraged to deploy renewables and DER assets as well or better than some models being offered. Specific natural advantages of the electric utility include:

- **Customer Relationship** – After providing a reliable and valuable service for decades, the electric utility is well positioned to introduce and educate customers about DER assets and other new technologies
- **System Management** – The electric system will continue to exist, continue to provide value to customers, and continue to require active management. In addition, the laws of physics will continue to dictate where and how electricity moves through the system. The utility has long managed this dynamic system and is best positioned to continue to serve in this role
- **Reliability and Security** – Along with system management, the electric utility is responsible for the reliability and security of the grid. As the composition of the grid changes, the electric utility needs to continue to meet reliability and security standards
- **Transaction Costs** – The electric utility is in the best position to “balance” transaction costs during operations. The alternative is the implementation of costly administrative overlays

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Key Insights (Cont'd)

ScottMadden believes DER assets can be deployed at high penetrations without creating a whole new model for the electric industry. Instead, we propose leveraging the natural advantages of the electric utility in order to accelerate the deployment and penetration of DER assets

- Our roadmap demonstrates this desired outcome can be achieved by: (1) developing standards, protocols, and codes of conduct, (2) defining interaction between retail and wholesale markets, (3) reforming rates and regulations, (4) modifying utility operations and business model, and (5) iterating and improving the framework
- Properly sequencing these steps will encourage long-term innovation, promote competitive and strategic deployment of DER, ensure cost-effective and reliable grid operations, and provide financial stability and expansion opportunities to electric utilities
- To ensure a successful outcome, our analysis was structured around the following principles:
  - ***Future State Adheres to Comprehensive Guiding Principles* –** Guiding principles are structured to enable high penetrations of DER assets in the future state while ensuring the safe and reliable operation of the electric grid. Further, the principles expand customer choice while defining the critical role of the electric utility and ensuring proper compensation
  - ***Roadmap Facilitates Progress and Stability through Incremental Change* –** The future state and desired outcomes can be implemented through a sequence of incremental changes, as opposed to dramatic shifts to regulatory environment and utility business models. The approach allows the market to continue to deploy DER assets while providing flexibility to modify market and regulatory constructs based on early lessons learned. This also allows the financial community to adjust to new business models so that risk-return are aligned with the new business model. It also provides a framework to innovate and test new technologies
  - ***Future State Relies on Precedent from Existing Utility Business Approach* –** A useful model to examine is existing utility outdoor lighting programs. Customers seeking outdoor lighting may choose a third-party service provider to install outdoor lighting or, alternatively, select the electric utility to install, own, and operate outdoor lighting. The customer pays for the utility outdoor lighting through a rate rider on their electric bill. Outdoor lighting is an interesting case study because the model expands customer choice, relies on a simple rate rider, and offers new business opportunities for the electric utility. A second important model comes from local natural gas distribution companies. A residential customer using natural gas for heat may have a different rate structure than a similar customer using natural gas for heat and water. The different rates recognize the different impact each type of customer has on fixed cost recovery

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Current State

Current State Characteristics

- The current state assumes an investor-owned distribution utility operating in a deregulated market. The utility serves a combination of urban and rural customers who may select their energy provider. The utility may not own any generation assets and serves as the provider of last resort. The wholesale market is managed by an RTO/ISO
- The current state does not include aggressive state-level policies supporting renewable energy. In particular, there is no renewable portfolio standard nor state tax credit. Third-party ownership of distributed generation is not permitted in the current state
- The only policy mechanism supporting DER is net metering. Regulations require electric utilities and energy providers to offer net metering. There is no cap to the number of net-metered assets permitted on the system. Customers earn monthly bill credits at retail rates for net excess generation. At the end of an annualized period, the utility or energy provider compensates customers for excess generation at the avoided cost of wholesale power
- The policy environment in the current state has resulted in a small, but growing base of distributed solar PV systems. Growth can be attributed to declining technology costs making distributed solar PV attractive to customers willing to accept long payback periods and customer tastes and preferences for green, distributed energy
- A summary of the current state is provided in the following table:

Market Feature	Description
Service Territory	Mix of urban and rural
Utility Type	Investor-owned utility
DER Penetration	Small, but growing
Utility Structure	Distribution only
Wholesale Market	Organized market (RTO/ISO)
Retail Market	Fully deregulated
State Renewable Policy	None
Net-Metering Policy	Monthly retail credit; annual compensation at avoided cost of wholesale power
Third-Party Ownership of DER	Not permitted

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Future State

Guiding Principles

- Guiding principles can be used ensure the future state is sustainable and meets long-term objectives
- In this 51st State Roadmap, the future state must align with the following guiding principles:
  - Expand customer choice and access to DER in a manner that promotes competitive and strategic deployment based on value, benefits, and costs while ensuring cost-effective and reliable grid operations
  - Maintain a simple, easy-to-understand basic service with simple rates. Offer alongside it additional services with differentiated pricing—as occurs with almost any other good or service. For additional services, minimize complexity in market design and transactions
  - Promote least-cost operation of the electric system. When customer choice does not result in least cost, price accordingly using an equitable, cost-causer-pays basis
  - Ensure the electric utility retains an obligation to serve all customers and remains the energy provider of last resort
  - Ensure the electric utility retains the opportunity to earn a return on prudent investments and is neither constrained nor advantaged in offering new services
  - Ensure third-party DER service providers are granted non-discriminatory access to the distribution grid. Conversely, allow the electric utility to leverage comparative advantages (e.g., low cost of capital) when offering new services
  - Ensure safe and reliable operations of the electric grid while encouraging testing and deployment of new technologies that improve operational performance

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Future State Characteristics

Key Features

- Customers connecting DER to the distribution grid receive a payment or incur a charge through a rate rider on their utility bill as authorized by DER rate schedules. The payment or charge is commensurate with the positive or negative value the DER asset provides the electric system
- The value of a particular DER asset is influenced by the time and location at which the asset is installed. DER rate schedules may include caps (e.g., maximum MW of distributed solar on the system or a circuit) and are updated at regular intervals (e.g., annual update). Rate rider values may change significantly between updates, thereby reflecting current grid composition and value of DER. While the rate rider may change for new customers, existing customers are grandfathered on their original rate
- DER rate schedules may include a wide range of services, including energy efficiency, solar PV, EV charging stations, microgrids, and demand response assets. Depending on the DER, rate schedules may allow unmetered resources similar to utility outdoor lighting programs. DER rate schedules may also include flexibility to accommodate the interests of large commercial or industrial customers
- Customers may obtain a portfolio of DER assets from the electric utility or third-party service providers. The electric utility may install, own, and earn a return on investment on DER assets in their service territory. Regulations establish size limitations (or other criteria) to ensure a utility does not own utility-scale generation. Third-party service providers may also install and own DER assets
- The introduction of DER rate schedules is coupled with the phasing out of full retail rate net metering. In addition, a system charge (or similar mechanism) is implemented to ensure the electric utility is being adequately compensated for the reliability, backup ancillaries, and other values of the grid that are essential to the economy. This includes maintaining and operating the distribution system
- Retail and wholesale markets interact by allowing DER assets to be aggregated and providing services to the RTO/ISO operating the wholesale market. Despite the interaction, a clear line of demarcation remains between these markets in terms of administration and jurisdictions
- In summary, the future state allows the electric utility to earn revenue in three ways:
  - A system charge provides the revenue and return necessary to adequately maintain and operate the distribution grid
  - The DER rate schedule may provide revenue, but only in instances where DER assets result in a net increase in grid operating costs. In this case, the customer compensates the utility for the incremental cost associated with operating the DER asset
  - The utility may also own and operate DER assets or provide unregulated services to electric customers (e.g., insurance products) or DER services providers (e.g., rooftop solar lead generation)

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51st State Roadmap

Roadmap Overview

- Stages represent the major steps required to transition from the current state to the future state. The 51st State Roadmap includes five distinct stages:
  - Stage 1: Develop standards, protocols, and codes of conduct
  - Stage 2: Define retail and wholesale interaction
  - Stage 3: Reform rates and regulations
  - Stage 4: Modify utility operations and business model
  - Stage 5: Iterate and improve framework
- Checkpoints represent a concrete set of criteria that should be met before advancing to the next stage. There a two critical checkpoints in the 51st State Roadmap:
  - Checkpoint #1: Before proceeding to Stage 3, stakeholders must confirm (1) standards, protocols, and codes of conduct are comprehensive and ensure safe and reliable grid operations and (2) retail and wholesale market interaction will promote high DER penetration and efficient system operations
  - Checkpoint #2: Before proceeding to Stage 4, stakeholders must enact rate and regulatory reforms
- Finally, signposts are items outside of the control of those driving the change and signal when the transformation should be sped up, slowed down, or when a new path needs to be adopted. The following signpost should be monitored during implementation of the 51st State Roadmap:
  - Emergence of new technologies or major advances in existing technology
  - Acceleration of DER penetration
  - Change in public policy
- The following pages provide a summary of the 51St State Roadmap as well as specific details on stages, checkpoints, and signposts

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Roadmap Overview (Cont'd)

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Develop Standards, Protocols, and Codes of Conduct	**Define Retail and Wholesale Interaction**	**Reform Rates and Regulations**	**Modify Utility Operations and Business Model**	**Iterate and Improve Framework**
Develop and maintain grid interconnection and integration standards and protocols	Identify DER assets to be supported by retail customer rate riders	Require DER providers to comply with standards, protocols, and codes of conduct	Refine utility operations to reflect growth of DER assets	Modify market and regulatory rules based on early lessons learned
Develop and maintain robust cybersecurity standards	Develop methodologies to price the value of each type of DER asset on the distribution grid	Establish rules for utility ownership and returns on investment in DER	Identify utility-owned DER opportunities and business models	Develop processes and methodologies that integrate DER into long-term distribution planning
Develop third-party code of conduct for customer data	Identify DER assets to be aggregated and provide services to RTO/ISO	Permit stakeholders to aggregate and leverage DER assets in wholesale market	Market test utility-owned DER business models	Develop processes and methodologies that integrate DER into long-term ISO/RTO planning
Update utility code of conduct to ensure fair competition if utility owns DER assets	Develop mechanisms and markets for aggregated DER assets in the wholesale electricity market	Design system charges to cover fixed operating costs to accommodate DER	Select successful utility-owned DER business models	
	Develop infrastructure and processes to allow robust data analytics	Replace net metering with DER rate riders		

KEY ACTIONS

Checkpoint #1
- Confirm standards, protocols, and codes of conduct are comprehensive and ensure safe and reliable grid operations
- Confirm retail and wholesale market interaction will promote high DER penetration and efficient system operations

Checkpoint #2
- Enact rate and regulatory reforms

Swimlanes	
RM	Retail Market Design
WM	Wholesale Market Design
UB	Utility Business Model
AD	Asset Deployment
IT	Information Technology
RR	Rates and Regulation

Signposts
- Emergence of new technologies or major advances in existing technology
- Acceleration of DER penetration
- Change in public policy

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Stage 1: Develop Standards, Protocols, and Codes of Conduct

Develop Standards, Protocols, and Codes of Conduct

Standards, protocols, and codes of conduct are essential to provide clear and transparent guidance to third-party service providers and the electric utility on a range of system control issues. Key topics include data communication protocols, grid operations, and grid visibility (e.g., knowing the location and operating status of DER assets)

Description	
Objective	▪ Develop and maintain grid integration and cybersecurity standards and protocols ▪ Develop and update codes of conduct for customer data and utility DER ownership
Outcome	▪ Development of grid integration and cybersecurity standards and protocols ensure the safe, reliable, and secure operation of electric grid ▪ Development of codes of conduct ensures third-party service providers protect customer data and the electric utility provides non-discriminatory access to the grid
Challenges	▪ Interfacing with national organizations who have responsibility for grid integration and cybersecurity standards ▪ Finalizing and integrating standards into state regulations so they are enforceable

Swimlane	Key Actions
Retail Market Design	▪ None
Wholesale Market Design	▪ None
Utility Business Model	▪ None
Asset Deployment	▪ Develop and maintain grid interconnection and integration standards and protocols
Information Technology	▪ Develop and maintain robust cybersecurity standards ▪ Develop third-party code of conduct for customer data
Rates and Regulation	▪ Update utility code of conduct to ensure fair competition if utility owns DER assets

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Stage 1: Develop Standards, Protocols, and Codes of Conduct (Cont'd)

Developing and maintaining grid interconnection and integration standards and protocols is essential to ensuing safe operations of the electric grid

- Utility interconnection standards and protocols must be updated to ensure the safe interconnection, operation, and utility interaction with DER assets. In addition to utility interconnection standards, the Institute of Electric and Electronics Engineers (IEEE) recently launched a working group to complete a full revision of the IEEE 1547 standard, which is a national standard addressing the interconnection of distributed resources. IEEE is also developing the IEEE 2030 standard to address smart grid interoperability. These national standards are critical because they provide clear guidance on how DER assets should be integrated and operated on the electric system

Developing and maintaining robust cybersecurity standards is essential to protect the grid as internet connectivity and the number of access points increases at a rapid pace

- In November 2013, the Federal Energy Regulatory Commission (FERC) approved Version 5 of Critical Infrastructure Standards (CIP) developed by the North American Electric Reliability Corporation (NERC). These standards require all bulk electric system cyber assets be subject to at least some reliability standards. In addition to CIP standards, the National Institute of Standards and Technology (NIST) developed *Guidelines for Smart Cybersecurity,* which provides a comprehensive framework organizations can use to develop effective cybersecurity strategies. NIST has also developed the *Framework for Improving Critical Infrastructure Cybersecurity* in response to Executive Order 13636 – Improving Critical Infrastructure Cybersecurity. Stakeholders must evaluate if current standards are adequate or if additional advances are required before proceeding with rate and regulatory reforms (i.e., Stage 3). Standards must also be continuously updated to protect against new cybersecurity threats

Developing third-party code of conduct for customer data will ensure third-party service standards meet the same privacy requirements as electric utilities

- Third-party service providers connecting or owning DER assets should be held to the same data privacy standards as the electric utility. Therefore, the regulator—with input from the utility and third-party service providers—should develop a third-party code of conduct for customer data. The code of conduct should outline how third-party providers may gain access to customer data, how they may use customer data, and how the customer data will be protected

The electric utility will be permitted to own DER assets in the future state. The utility code of conduct should be updated to ensure fair competition if utility decides to own DER assets

- If the electric utility decides to own and operate DER assets, the company should not have an unfair advantage when competing against third-party service providers. The regulator will need to update the utility code of conduct to account for the new market opportunities available to the electric utility

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Stage 2: Define Retail and Wholesale Interaction

Define Retail and Wholesale Interaction

The interaction between retail and wholesale markets is critical in order to achieve a high DER penetration and efficient system operations. The regulator, electric utility, and RTO/ISO play key leadership roles in defining DER assets eligible for rate riders, developing methodologies that assign value to DER assets, linking aggregated DER assets to the wholesale electricity market, and building IT infrastructure and processes required for robust data analytics

Description	
Objective	▪ Ensure interaction between wholesale markets and DER resources located on the distribution grid maximizes the value of DER assets
Outcome	▪ Identification of DER assets to be deployed with rate riders ▪ Understanding of how DER assets will be valued on distribution grid ▪ Understanding of how assets will be aggregated in the wholesale market ▪ Identification of IT infrastructure and processes required
Challenges	▪ Aligning multiple jurisdictions will be the most significant challenge, especially if the wholesale market is managed by an RTO covering multiple states ▪ Developing clear and transparent methodologies that assign DER value

Swimlanes	Key Actions
Retail Market Design	▪ Identify DER assets to be supported by retail customer rate riders ▪ Develop methodologies to price the value of each type of DER asset on the distribution grid
Wholesale Market Design	▪ Identify DER assets to be aggregated and provide services to RTO/ISO ▪ Develop mechanisms and markets for aggregated DER assets in the wholesale electricity market
Utility Business Model	▪ None
Asset Deployment	▪ Develop infrastructure and processes to allow robust data analytics
Information Technology	
Rates and Regulation	▪ None

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Stage 2: Define Retail and Wholesale Interaction (Cont'd)

The regulator—with input from the utility, customers, and third-party vendors—must identify DER assets to be supported by retail customer rate riders

- Building a functioning marketplace requires an understanding of the available products and services. In this case, stakeholders must identify the portfolio of DER assets that will be available to customers. The regulator should open a proceeding that includes a Request for Information to identify the merits of different DER technologies. The proceeding should also include public comment and hearings to identify customer interests. Key considerations should include DER availability, current penetrations, technology readiness levels, capital costs, and system life. The regulator selects initial DER assets to be supported by retail customer rate riders

Under the guidance of the regulator, the electric utility—with input from stakeholders—develops methodologies to price the value of each type of DER asset to be supported by retail customer rate riders

- The value assigned to each DER asset should reflect the net benefit or cost the technology provides to the distribution grid, with specific consideration given to the time (e.g., 2016 v. 2026) and location of an individual installation. The methodologies should avoid excessive complexity and overhead. They should assume that the value of the rate rider is fixed for existing customers (i.e., existing customers are grandfathered on their original rate), but may change for new customers with annual updates due to local constraints (e.g., maximum solar capacity on individual circuit). Ultimately, the net benefit or cost is reflected in the DER rate rider available to each retail customer. The regulator approves each DER methodology

The regulator and RTO/ISO lead a stakeholder group to identify DER assets to be aggregated and provide services into the wholesale electricity market

- The interaction between retail and wholesale markets is critical to achieve a high DER penetration and efficient system operations. The regulator and RTO/ISO should sign a memorandum of understanding to lead a stakeholder group to identify a subset of DER assets that can be aggregated and provide services to the wholesale electricity market (e.g., ancillary services or demand response). The stakeholder group should represent the electric utility, electric generators, third-party vendors, and electric customers

The RTO/ISO develops mechanisms and markets for aggregated DER assets in the wholesale electricity market

- Proper market signals will encourage the participation of aggregated DER assets in the wholesale market. Market protocols, pricing mechanisms, and market processes must be developed by the RTO/ISO to ensure fair competition, competitive prices, and transparency. In addition, market mechanisms must prevent double counting of energy services in both retail and wholesale markets

The RTO/ISO and electric utility must develop IT infrastructure and processes to allow for robust, real-time data analytics

- The growth of DER assets will require the RTO/ISO and electric utility to analyze large volumes of operations data from disparate sources. In particular, developing IT processes and infrastructure will allow real-time exchange of data between grid operators, inform operational decisions impacting grid reliability, and provide accurate price signals to market participants

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Checkpoint #1

Confirm standards, protocols, and codes of conduct are comprehensive and ensure safe and reliable grid operations

Rationale	Considerations
▪ Standards, protocols, and codes of conduct provide the ground rules for connecting and operating equipment on the electric grid ▪ Reforms to rates and regulations should reference and require clear standards, protocols, and codes of conduct for both the electric utility and third-party service providers ▪ Consequently, reforms to rates and regulations (i.e., Stage 3) may not begin in earnest until these items are clearly defined	▪ A key challenge is the time required to develop standards, protocols, and codes of conduct (e.g., multi-year effort). Slow progress could delay reforms to rates and regulations (i.e., Stage 3) and modifications to utility operations and business model (i.e., Stage 4) ▪ Changes to rates and regulations can occur before finalizing clear standards, protocols, and codes of conduct; however, this approach runs the risk of requiring significant updates at a later date

Confirm retail and wholesale market interaction will promote high DER penetration and efficient system operations

Rationale	Considerations
▪ As noted earlier, the interaction between retail and wholesale markets is critical in order to achieve high DER penetrations and efficient system operations ▪ Selecting DER assets eligible for rate riders and understanding their aggregation into the wholesale market is a prerequisite to reforming rates and regulations (i.e., Stage 3)	▪ Stakeholder alignment on the DER portfolio and wholesale market interaction will reduce the potential for contentious debates when reforming rates and regulations (i.e., Stage 3) ▪ Stakeholders should simultaneously develop standards, protocols, and codes of conduct (i.e., Stage 1) and define retail and wholesale market interactions (i.e., Stage 2)

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Stage 3: Reform Rates and Regulations

Reform Rates and Regulations

Reforms use market signals to encourage targeted and incremental deployment of selected DER asset, thereby mitigating stranded costs. Different rate rider payments within a customer class is a break from traditional ratemaking

Description	
Objective	▪ Transform rate and regulatory environment to guide DER deployment in a manner that best supports grid operations
Outcome	▪ Implementation of a flexible rate and regulatory construct that supports strategic deployment of DER assets and efficient system operations ▪ Implementation of a clear definition of responsibilities and market opportunities for the electric utility and third-party service providers
Challenges	▪ Building stakeholder support for a framework that replaces net metering and institutes system charge for all customers ▪ Transitioning to a rate rider model where geographic location impacts the compensation offered to or costs borne by customers (and may change over time) ▪ Ensuring low-income customers are not disproportionally or adversely impacted ▪ Addressing "seams" issues between jurisdictions

Swimlanes	Key Actions
Retail Market Design	▪ None
Wholesale Market Design	▪ None
Utility Business Model	▪ None
Asset Deployment	▪ None
Information Technology	▪ None
Rates and Regulation	▪ Require DER providers to comply with standards, protocols, and codes of conduct ▪ Establish rules for utility ownership and returns on investment in DER ▪ Permit stakeholders to aggregate and leverage DER assets in wholesale market ▪ Design system charges to cover fixed operating costs to accommodate DER ▪ Phase out net metering and establish DER rate riders

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Stage 3: Reform Rates and Regulations (Cont'd)

Regulations must be updated to require DER providers to comply with established standards, protocols, and codes of conduct

- Standards, protocols, and codes of conduct are not mandatory unless required by state regulation. Consequently, a key step is updating regulations to integrate and require standards, protocols, and codes of conduct. Third-party service providers must also meet operating protocol requirements. This action ensures a level playing field between third-party service providers and the electric utility. The requirement also ensures third-party service providers meet the same standards required of the electric utility and, conversely, the electric utility does not gain an unfair advantage over third-party service providers

Regulations must establish rules for electric utility ownership and return on investments with DER assets

- To ensure robust competition, the electric utility is allowed to own and rate base DER assets. The electric utility may also develop strategic partnerships that leverage their comparative advantage over third-party service providers. For example, one comparative advantage is existing customer relationships that could be leveraged to lower acquisition costs

Regulations must ensure stakeholders can aggregate and leverage DER assets in the wholesale market

- Any barriers preventing customer-owned, third-party-owned, or utility-owned DER assets from being aggregated and providing services to the wholesale electricity market should be removed

Rates will need to be updated to include a system charge designed to cover the fixed costs required to operate an electric grid with a higher penetration of DER assets

- Transitioning to a system charge is critical because it provides certainty that the electric utility will be compensated for meeting the obligation to provide all customers with reliable electricity service. Customers will be encouraged to pursue energy efficiency and other DER options through new DER rate riders. The system charge can differ between customer classes, and special provisions or discounts may exist to protect low-income customers. The system charge should allow for review and update without a full rate case

The final regulatory reform is replacing net-metering policies with the new DER rate riders

- Customers installing DER that provide net system benefits receive fixed, long-term compensation through the DER rate rider. Similarly, customers installing DER that provide net system cost pay fixed, long-term charge through the DER rate rider. The rate rider value is proportional to the net value provided to the system. While the value of rate rider is fixed for existing customers (i.e., existing customers are grandfathered on their original rate), it may change over time for new customers at the same location (e.g., value of new rooftop solar may decline as circuit penetration increases). All DER assets must also meet operational parameters that improve system performance (e.g., utility visibility of DER asset). Overall, the DER rate ride is similar to the value of solar credit offered by Austin Energy; however, the value of the rider depends on location and can result in a customer charge. The electric utility may only offer the DER rate rider; the company may not require customer adoption. Existing renewable energy systems are grandfathered under old net-metering policies until the system is no longer operational

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Checkpoint #2

Enact rate and regulatory reforms

Rationale	Considerations
▪ Rate and regulatory reforms must be finalized before the utility operations and business model can be modified with certainty ▪ Critical rate and regulatory reforms include adding a system charge, establishing rules for utility ownership of DER assets, and replacing net metering with DER rate riders	▪ Enacting a full suite of rate and regulatory reforms could take a substantial amount of time (e.g., multi-year effort) ▪ Further, changes in DER technology, DER penetrations, or public policy could require significant modifications to reforms ▪ As a result, modifications to utility operations and business model should not begin in earnest until rate and regulatory reforms are fully enacted

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Stage 4: Modify Utility Operations and Business Model

Modify Utility Operations and Business Model

Modifications to the utility operations and business model do not require any regulatory action; reforms in previous stage authorize changes to rates and new business models. In this stage, the electric utility will need to address real-time operations, review organizational structure and processes, and conduct customer outreach. The development of utility DER business models should include customer engagement and pilot projects.

Description	
Objective	▪ Adapt utility operations and business model to account for regulatory reforms and a future with high DER penetrations
Outcome	▪ Implementation of improvements in operations, processes, and customer outreach allow the electric utility to become an enabler of high DER penetrations while ensuring safe and reliable grid operations ▪ Implementation of new utility business opportunities that include ownership of DER assets
Challenges	▪ Implementing change management in utility operations in order to accommodate high DER penetrations

Swimlanes	Key Actions
Retail Market Design	▪ None
Wholesale Market Design	▪ None
Utility Business Model	▪ Refine utility operations to reflect growth of DER assets ▪ Identify utility-owned DER opportunities and business models
Asset Deployment	▪ Market test utility-owned DER business models ▪ Scale successful utility-owned DER business models
Information Technology	▪ None
Rates and Regulation	▪ None

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Stage 4: Modify Utility Operations and Business Model (Cont'd)

Once rate and regulatory reforms are enacted, the electric utility operating model will need to refine utility operations to reflect the addition of DER assets to the electric grid, especially third-party DER assets. Ensuring third-party DER assets meet standards, protocols, and codes of conduct requirements will be essential to move to high DER penetrations

- Critical components in this step include updating real-time operations, reviewing organizational structure and processes, and conducting customer outreach. Real-time operation updates may require expanding grid visualization and further distribution automation tools to provide more granular insight into grid operations. In addition, the utility must develop open and transparent forecasting and planning in order to allow stakeholders to make informed investment decisions. A review of organizational structure and processes will ensure the company is prepared to efficiently manage high DER penetrations. Finally, the utility will need to conduct comprehensive outreach to educate customers about the transition to system charges, addition of DER rate riders, and phasing-out of net metering

With a broad portfolio of DER rate riders available to customers, the electric utility must identify utility-owned DER opportunities and business models

- Important criteria for the utility to consider include customer interests, competition from third-party vendors, comparative advantage offered by the electric utility (e.g., low capital expenses), potential strategic partnerships, and ability to remain the primary energy point of contact for customers. Customer engagement—through focus groups or surveys—can provide valuable insights when evaluating potential new utility business models

The electric utility should conduct market tests of utility-owned DER business models

- Market tests or pilot projects provide the electric utility first-hand experience marketing, installing, and operating a variety of DER assets. This knowledge can be used to adjust business models, scale promising endeavors, or discontinue poor-performing efforts

The electric utility should scale successful utility-owned DER business models that best fit with their strategic and business plans

- While rate reforms provide sufficient revenue for core operations (i.e., delivery of electricity), the electric utility can grow revenue by offering DER assets. Market tests or pilot project outcomes should inform the utility on which business models to scale to a broader segment of customers. The utility should also ensure these new business models align with the company's broader strategic and business plans, including changes in the utility cost structure

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Stage 5: Iterate and Improve Framework

Iterate and Improve Framework

The final stage ensures long-term success by evaluating early lessons learned and incorporating DER assets into long-term planning. A cycle of continuous improvements will allow the addition of new DER assets and manage changes in broader market or policy conditions

Description	
Objectives	▪ Modify market and regulatory constructs to account for early lessons learned ▪ Update long-term distribution planning and RTO/ISO planning to account for high DER penetrations
Outcome	▪ Implementation of improvements that contribute to long-term sustainability of DER markets and revised regulatory constructs ▪ Implementation of long-term planning accurately forecasts and adequately accounts for DER growth
Challenges	▪ Developing new long-term planning methodologies may be time consuming and require multiple iterations ▪ Coordinating between the electric utility and RTO/ISO to ensure use of similar market and DER assumptions

Swimlanes	Key Actions
Retail Market Design	▪ Develop processes and methodologies that integrate DER into long-term distribution planning
Wholesale Market Design	▪ Develop processes and methodologies that integrate DER into long-term ISO/RTO planning
Utility Business Model	▪ TBD
Asset Deployment	▪ TBD
Information Technology	▪ TBD
Rates and Regulation	▪ Modify market and regulatory rules based on early lessons learned

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Stage 5: Iterate and Improve Framework (Cont'd)

Regulators and the ISO/RTO review early market performance in order to modify market and regulatory rules based on early lessons learned

- Improvements to the market and regulatory construct will be needed once stakeholders begin deploying and managing DER assets. Lessons learned should be compiled one or two years following rate and regulatory reforms. Market and regulatory modifications should be enacted if they expand growth of DER assets and improve system operations. This process may also include expanding the portfolio of technologies supported by DER rate riders. The state regulator should be the primary lead in this effort; the RTO/ISO providing updates to the wholesale electricity market

Long-term success and efficient grid operations will require the electric utility and RTO/ISO to develop processes and methodologies that integrate DER into long-term planning

- The final step updates long-term planning activities and tools in order to forecast and account for high DER penetrations. More specifically, the RTO/ISO and electric utility should develop methodologies to account for DER assets in long-term distribution and ISO/RTO planning. These methodologies should consider the current DER outlook and the impact of alternative scenarios. This step will also require processes that facilitate coordination between the utility and RTO/ISO to ensure alignment in assumptions, methodologies, infrastructure upgrades, and probable outcomes. Processes must also be developed to ensure long-term planning results become an input into the annual update of DER rate riders

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Signposts

The following signposts should be monitored during the implementation of the roadmap. Changes in any of these signposts could require significant adaptations to the 51St State Roadmap.

Signpost	Description	Implications
Emergence of New Technologies or Major Advances in Existing Technology	▪ Innovation can produce new technologies (e.g., integrated home energy management products) or new applications for existing technology (e.g., EVs offering demand response) ▪ Major advances in existing technology (e.g., increasing PV efficiency) can improve performance and reduce costs of DER	▪ The emergence of new technology could result in new solutions available for grid operators. However, retail and wholesale market designs would need to be modified to accommodate these technologies ▪ Major advances in existing technology could make DER assets more attractive to consumers and ultimately accelerate adoption and increase long-term penetration
Acceleration of DER Penetration	▪ The roadmap assumes modest growth of DER assets, thereby allowing ample time for rate and regulatory reforms and modifications to utility operations and business models ▪ An acceleration of DER penetration would indicate market forces are driving increased customer interest in DER ▪ In particular, consumer tastes and preferences may change over time or there may be significant shifts in the market ecosystem	▪ In this instance, stakeholders would need to expedite rate and regulatory reforms and modifications to utility operations and business model ▪ This approach would be needed to ensure DER assets are strategically deployed in a manner that provides the greatest benefit to grid operations ▪ Otherwise, a larger number of DER assets providing little value to overall system could become grandfathered under the old regulatory regime
Change in Public Policy	▪ Changes in state or federal public policy could accelerate or stall DER deployment ▪ For example, DER deployment would be supported by increasing Clean Power Plan targets, extending renewable energy tax credits, and/or enacting a state renewable portfolio standard	▪ Public policy changes may impact the composition and penetration of the long-term DER portfolio ▪ Distribution and RTO/ISO long-term planning methodologies and outcomes should be updated to account for any changes resulting from shifts in public policy

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Alternative Current State

Alternative Current State: Vertically Integrated Investor-Owned Utility Operating in Cost-of-Service Regulated Market

- The alternative current state considers a vertically integrated investor-owned utility operating in a cost-of-service regulated market. The utility owns generation assets, owns and operates transmission, and delivers electricity to retail customers. The alternative current state does not include an RTO/ISO
- The alternative current state retains other core aspects from the original current state. The service territory consists of a mix of urban and rural customers with a small, but growing penetration of DER assets. The alternative current state does not maintain a renewable energy portfolio standard and does not allow third-party ownership of distributed generation. Customers owning distributed generation may sell excess electricity to the electric utility through net metering. These customers receive a monthly bill credit at retail rate for excess generation and an annual payment for net excess generation at the avoided cost of wholesale power

Modifications to the 51^{st} State Roadmap

- The alternative current state requires modifications to Stage 2: Define Retail and Wholesale Interaction and Stage 5: Iterate and Improve Framework. These stages are impacted because the utility—as opposed to an RTO/ISO—is responsible for planning and maintaining both the retail and wholesale markets. Consequently, the alternative current state results in changes in two swimlanes: retail market design and wholesale market design
- The objective of Stage 2 remains the same: ensure interaction between wholesale markets and DER resources located on the distribution grid maximizes the value of DER assets. However, in this instance, the primary stakeholder managing day-to-day operations is the electric utility. The utility—in coordination with regulators, customers, and stakeholders—is now responsible for ensuring interaction between retail and wholesale markets. The lack of an RTO/ISO should reduce complexity compared to the original roadmap
- The objective of Stage 5 remains the same: update long-term planning to account for high DER penetrations. However, instead of an electric utility and RTO/ISO being responsible—and coordinating—on these tasks, the exercise will be conducted solely by the electric utility. Again, this should reduce complexity compared to the original roadmap
- There are no changes to the other stages or swimlanes. In addition, the checkpoints and signposts remain relevant and unchanged

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