MAINE GOVERNOR'S
Energy Office

Distribution System Operator (DSO) Feasibility Study Update

November 26, 2024

Ethan Tremblay, *Policy and Markets Program Manager*

Meeting Agenda

- Overview of the DSO study process and GEO determination (10 min)
- Strategen presents a study overview and recommendation (25 min)
- Audience Q&A (25 min)
  - Raise hand to ask to be unmuted
- Next steps
- Adjourn

Maine Governor's Energy Office

- Maine's designated state energy office which:
  - Provides policy leadership and technical assistance
  - Develops energy programs
  - Monitors energy markets
  - Reports on heating fuel and energy prices

- To support Maine's goal of 100% clean energy by 2040 and ensure **clean, reliable, and affordable** energy for Maine people

DSO Study Overview

Pursuant to Resolves Chapter 67, enacted in 2023, the Governor's Energy Office (GEO) began a study to determine whether a Distribution System Operator (DSO) could be established in Maine to achieve:

1. Cost savings for customers
2. Improved system reliability and performance
3. Accelerated achievement of the State's climate goals

The Resolve directed up to a two-part study, with GEO determining whether to proceed to Part II following review of Part I:

Part I

- Conducted by GEO's consultant Strategen
- Evaluated whether a DSO could be designed to achieve the above objectives

Part II

- Would develop a design proposal for a DSO in Maine
  - Identify the scope, characteristics, and function of a DSO

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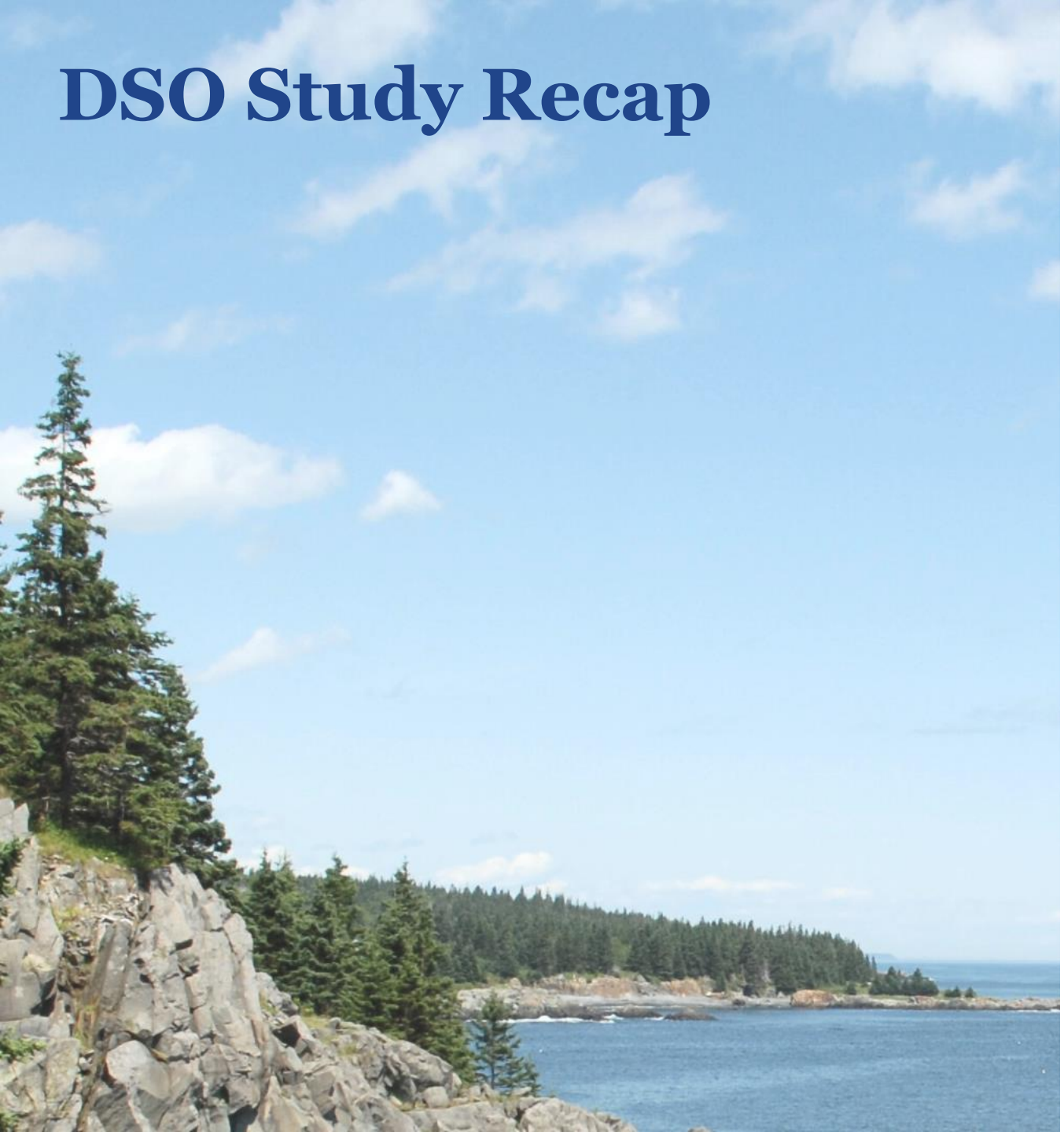
DSO Study Recap



GEO and Strategen hosted an initial webinar in June to introduce and inform the study

- Overview of DSOs and statutory requirements for a DSO in Maine
- Introduction of Strategen's study approach
  - Define current DSO models & implementations internationally
  - Define current Maine regulatory structure
  - Compare current structure to DSO potential to achieve Resolve objectives
- Opportunity for public input and Q&A to inform the draft feasibility report
- Strategen conducted 27 interviews and individual stakeholder meetings following the webinar to inform the draft study

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GEO Determination

- GEO's determination is to not pursue Part II of the study, the formal creation of a DSO design proposal.
- However, GEO intends to consider the findings in Part I of the study to inform future prioritized areas of analysis to support achievement of the broader state grid planning, infrastructure, and management objectives.
- GEO invites comments from stakeholders on this prioritization, next steps, and on Strategen's report.

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Next Steps

Public Comments

Public comments are now being accepted on this draft feasibility study.
Email **geo@maine.gov** with written comments **by December 5, 2024.**

The draft report and request for comment is available at maine.gov/energy

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Thank You

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Maine Distribution System Operator (DSO) Feasibility Study

Webinar | November 26, 2024

Agenda

+ Executive Summary
+ Introduction
+ Study Approach & Assumptions
+ Functional Analysis
+ DSO vs. Maine Functional Comparison
+ Recommendations for DSO Study Part 2

Executive Summary

Executive Summary – Findings and Recommendation

- For the DSO initial study, the Resolve (L.D. 952, *An Act to Create a 21st-Century Electric Grid*) asks the consultant to evaluate whether a DSO could be designed to achieve three objectives:
  - Demonstrable reduction in energy costs for customers
  - Improved electric system reliability and performance
  - Accelerated achievement of the State's climate goals and growth of distributed energy resources (DERs)
- The Strategen team has found ample basis to conclude that a DSO could be designed to achieve the Resolve's objectives

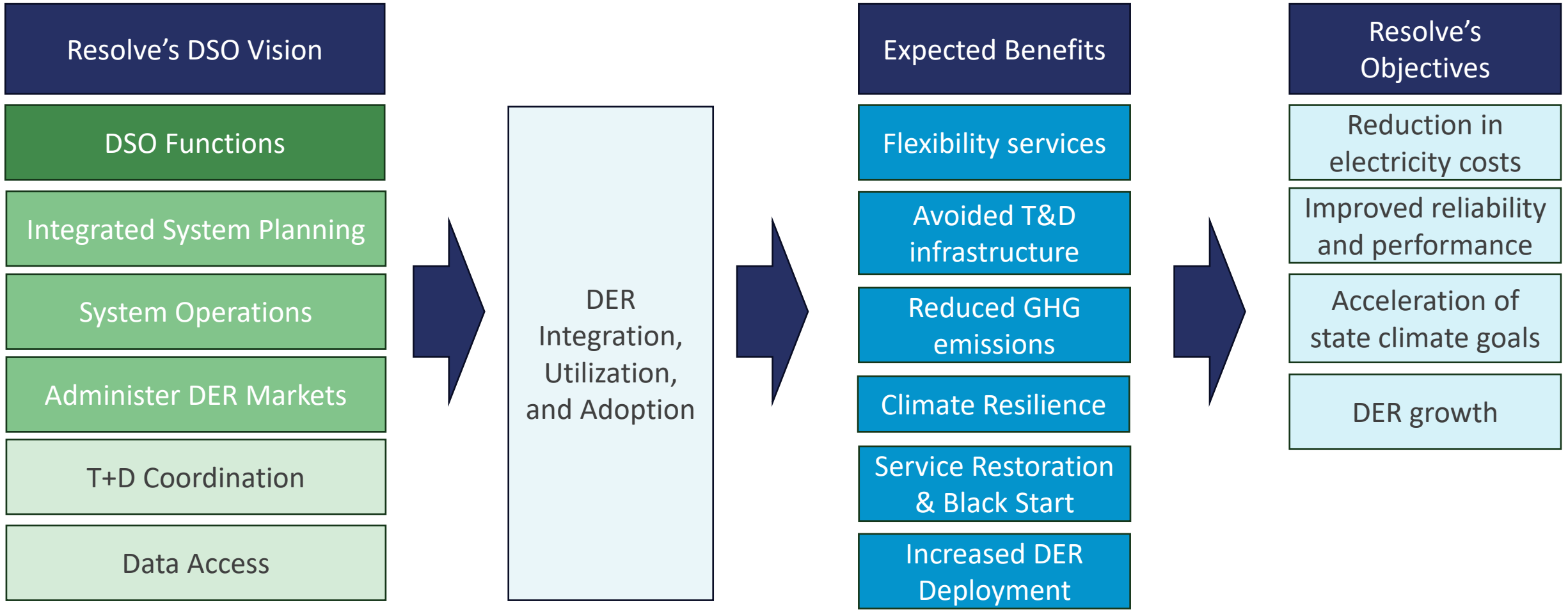
A DSO designed to perform the core DSO functions specified in the Resolve, as described in detail in the DSO initial study, would stimulate the growth of DERs and would maximize DER benefits for energy customers, for the electric system, for Maine's climate goals, and for individual DER owners.

Executive Summary – Findings and Recommendation

- The DSO initial study's conclusion is based on examining the following:
  - The requirements of the ongoing global power system transition to deploy renewable generating resources and energy storage and to displace fossil fuels
  - The rapid advances in distributed energy resource (DER) performance and cost-effectiveness and their benefits compared to transmission-connected resources
  - Interviews with Maine stakeholders and with external entities that are conducting DSO initiatives in other jurisdictions and their results to date
  - Current industry-wide practices of under-valuing and under-utilizing DERs in system operation and resource and infrastructure planning, which will inflate costs, slow the achievement of climate goals, and fall short on needed reliability and resilience improvements
- The DSO initial study develops in detail the core DSO functions *as they need to be updated to integrate and unlock the greatest benefits of growing DER participation*
- The DSO Study, Part 2, if authorized, would develop a DSO concept design proposal in accordance with Resolve Section 3, and would recommend next steps for Maine's DSO inquiry

Executive Summary – Findings and Recommendation

Enhanced distribution system functions, coordinated through a DSO, can help to optimize DERs and achieve energy system goals.



Executive Summary – DER and DSO advances elsewhere (1 of 2)

- European countries and Australia are pursuing DSO structures, while some US states and utilities are piloting new distribution system functions
- Experiences remain nascent but results point to significant cost savings and DER growth
- The most advanced DSOs are operating in the United Kingdom since 2023, where estimated customer savings of **£14.1bn/year by 2040 are available from** household flexibility
- Investment deferrals from flexible connections and new DER grid services are the primary means of reducing distribution system costs in UK and Netherlands

Executive Summary – DER and DSO advances elsewhere (2 of 2)

European countries and Australia are pursuing DSO structures, with early results pointing to significant cost savings and DER growth

United Kingdom

UK Power Networks:

- Flexible Connections: **£106m cost avoidance**
- DER Grid Services: **£91m** , >1.5 GW flexibility contracted and 7.8 GWH flexibility dispatched

SP Energy Networks

- DER Grid Services: **£328.4m** and 759 MW flexibility contracted

National Grid UK

- DER Grid Services: **£80m** and 17 GWh flexibility contracted with 19,000 dispatch events

Australia

Estimated system benefits from DER integration with flexibility

- Combined net present value (NPV) of more than **$19 billion** by 2040
  - **$11 billion** in distribution and transmission network avoided costs and benefits
  - **$8 billion** in generation and storage cost reductions

Estimates based on DSO market design studies and pilots

Other

Netherlands

- DER Grid Services: **136 MWh** flexibility procured across both distribution utilities

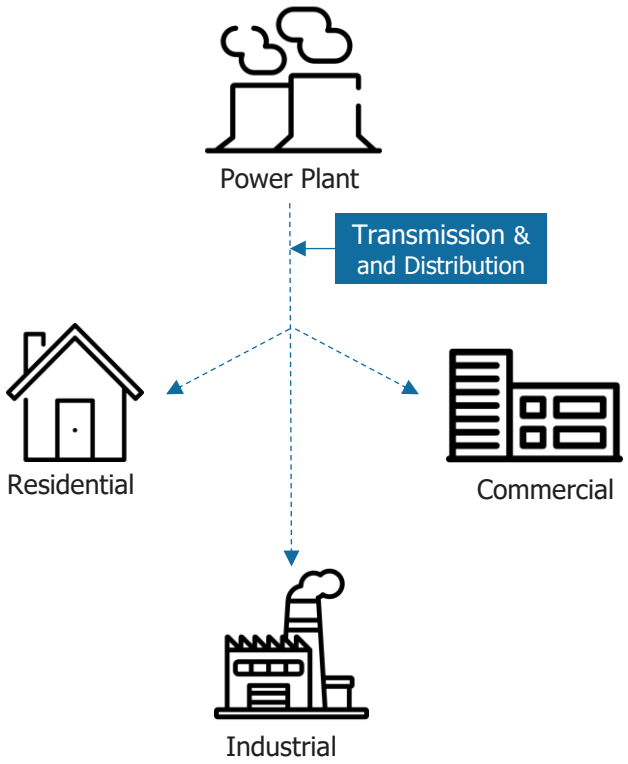
ComEd (Illinois)

- Expect **240MW** of additional front-of-meter DER capacity from expanded DERMS active management to community solar constrained areas

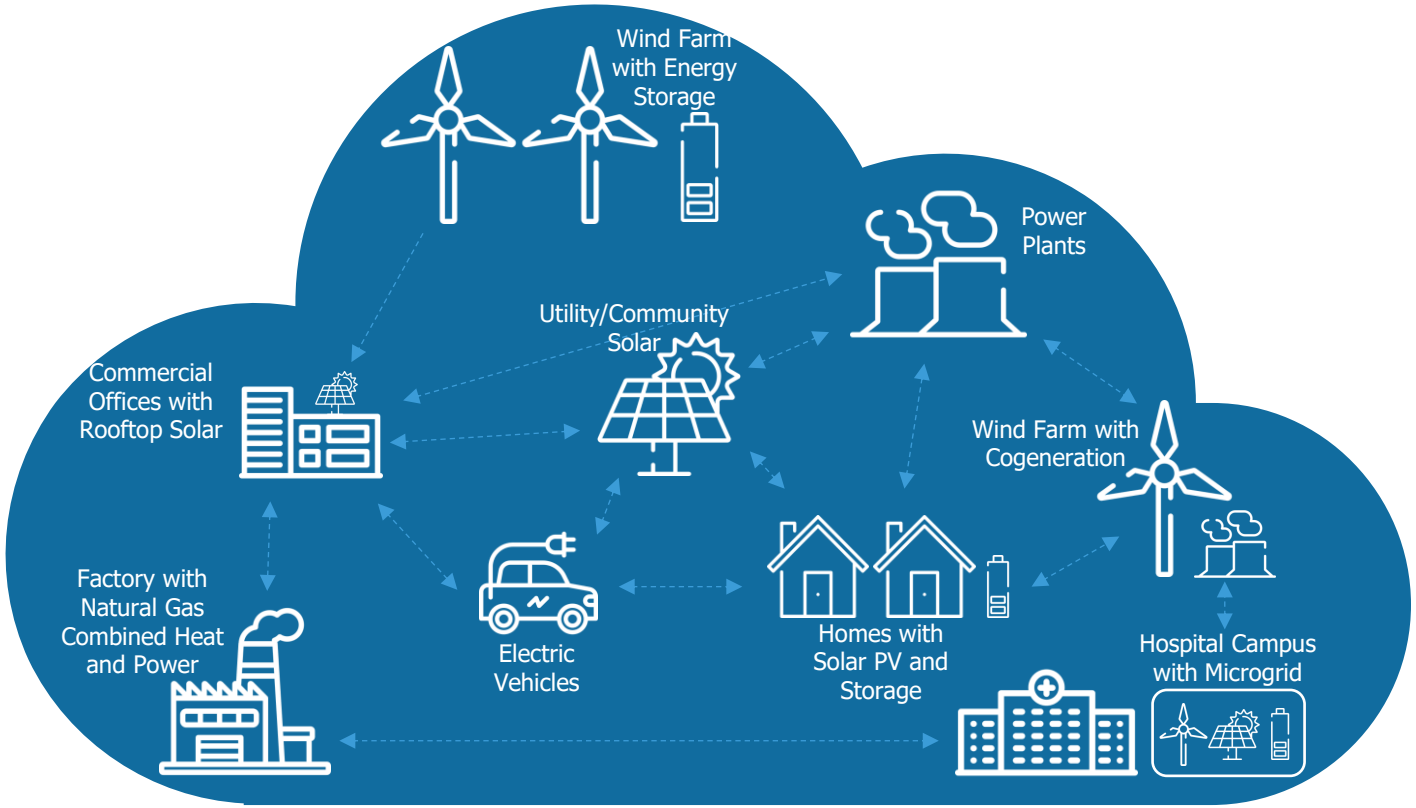
Introduction

Introduction: An Evolving Electricity System

PAST: Traditional Power Grid
Central, One-Way Power System

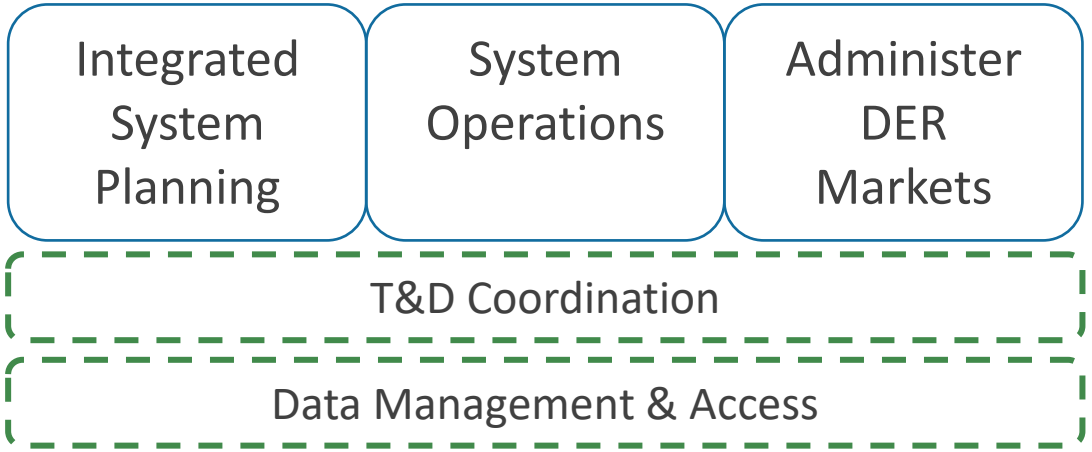


TODAY: The Energy Transition
Distributed, Cleaner, Two-Way Power Flows



DSO Functions

- In addition to the three core functions specified in the Resolve, two additional functions are essential to realize the most benefits from DERs:
  - **Transmission & Distribution (T&D) Coordination:** Maximizing DER benefits for optimal whole-system outcomes requires DSO coordination with the bulk system in operations, markets and planning
  - **Data Management & Access:** Accurate & timely information exchange among DSO, DER owners/operators & the bulk system operator is required for DER operating & market participation decisions to align DER investment & performance with system needs & state policy goals



Study Approach

Study Approach: Assumptions

- This approach is informed by the Resolve's language and international precedent
- This Resolve's language is focused on DERs:
  - Identifies the growth of DERs as a key objective
  - Identifies administration of an open and transparent DER market as a core DSO function
  - Part 2 guidance on design characteristics focuses on DER integration and orchestration
- This DSO investigation focuses on DER integration and participation, consistent with approaches around the globe (UK, Europe, Australia)
- The Study examines whether the Resolve-specified DSO functions, if well-implemented and without assuming any specific DSO structure, could facilitate cost-effective DER integration and stimulate further DER growth in a manner that meets the Resolve's stated objectives.

Study Approach: DSO Grid Functions Evaluation Approach

- Part 1 assesses the extent to which successful implementation of DSO Grid Functions could better enable DER integration and proliferation and examines the various categories of benefits that could be realized as a result.
- Part 1 conducts this assessment along three lines of inquiry:
  - **Functional Analysis**: Describes in some detail the enhancements needed to today's distribution utility functions for the three core DSO functions to facilitate DER integration and unlock the greatest benefits of DERs for the Resolve's objectives.
  - **Literature Review Benefits Assessment:** Summarizes evidence from DSO initiatives in other jurisdictions on the benefits of these DSO functions for achieving the Resolve's objectives.
  - **Maine Comparative Analysis:** Describes how Maine's current grid functions compare to the DSO functions needed to meet the Resolve and the advanced grid functions implemented in other DSO initiatives globally. Seeks to identify potential gaps in the effectiveness of today's grid functions in Maine for maximizing DER value, and how these gaps might impact the achievement of the Resolve's objectives.

Study Approach: Discovery & Stakeholder Engagement (D&SE)

- The Strategen team's D&SE approach focused on three categories of stakeholders:
  - Maine and ISO-NE territory (12 interviews)
  - International (15 interviews across 4 regions)
  - Strategen leveraged its experience working across the United States and internationally to apply insights from industry trends to the functional analysis

Maine & ISO-NE
- CMP
- Versant Power
- EMEC
- Fox Islands
- EMT
- OPA
- NMISA
- Coalition for Community Solar Access
- Advanced Energy United
- Rep. Runte
- ISO-NE

United Kingdom
- Ofgem
- UK Power Networks
- Scottish & Southern Energy Networks
- Energy Networks Association
- Baringa Consulting

European Union
- E.ON
- Alliander
- EU DSO Entity
- ECCO International
- Danish Technical University

Australia
- South Australia Power Networks (SAPN)
- AusNet Services
- Australian Energy Market Operator

Canada
- E.ON
- Ontario Independent Electricity System Operator (IESO)

The Strategen Team is grateful for the time and input provided by individuals from the organizations above. Still, all content included in these materials and the report solely reflects the views and opinions of the authors. Any errors or omissions remain ours alone.

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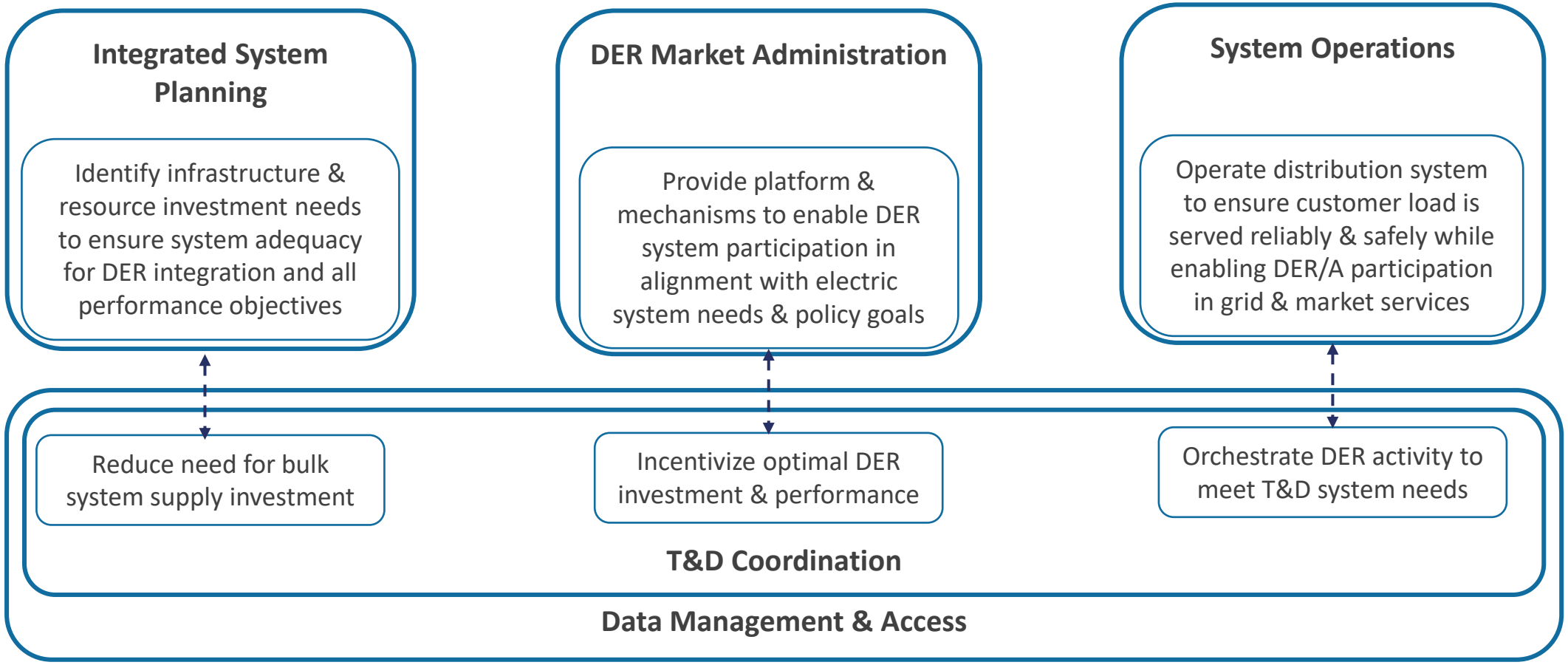
Functional Analysis

Functional Analysis

- Maine's distribution utilities are all conducting some version of the functions described in the resolve to *meet their current obligations*
- A key premise of a DSO is the need for significantly enhanced and intentionally designed functions to integrate DER growth & participation to better meet the objectives stated in the Resolve
- The functional analysis is based on domestic and international precedent as well as the market experiences of the Strategen Team (including California, Hawaii, Australia)

DSO Functional Analysis



Comparative Analysis

Expected Gaps between Resolve Vision and Current State

- The enhanced functions described in the Initial Report reflect major advances over current distribution-level operating, planning and market practices
- The current structure and performance mandates in Maine are not explicitly targeted to the Resolve vision for growth in DER deployment and participation, and thus there will be gaps between DSO functions and the current state
- Many factors drive the gaps between Resolve vision and current state, including:
  - Enhanced direction and resources to implement key Advanced Grid Functions to support DSO objectives (i.e., enabling the growth of DERs, administering DER markets, integrated system planning, etc.)
  - Need to consider new business models, incentive structures and functional reforms to the distribution utility regulatory framework
  - External factors outside Maine's control (FERC rulings, ISO-NE processes, etc.)

DSO Study Part 2 Approach

Addressing the requirements of Resolve Sec. 3

Considerations for Next Steps

- The DSO development process in several countries (UK, AU, etc.) has been a multi-year, iterative process with significant stakeholder engagement and is still ongoing in several countries
- Initial Study did not address all the elements required by Resolve Section 3 (Part 2)
- Recommended next steps include a more granular description of DSO core function implementation and development of DSO conceptual design structures along with attendant regulatory considerations
  - **DSO structure** is about the roles and responsibilities of the DSO in the context of the whole electric system, including its interfaces with other key system actors: DER owners; transmission and distribution asset owners; balancing authority and wholesale markets; state agencies
  - **DSO regulatory framework** addresses governance and oversight, performance incentives, performance measurement, DSO revenue model

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Q&A Session

Appendix

Additional detail from Literature Review

Accelerated Achievement of Policy Goals + Increase in DERs

- Flexible Connection was the primary means for increasing DER deployment in UK, Australia and US
- UK (Since March 2023)
  - UKPN: **4GW** interconnected
  - Northern Power Grid: **500MW** interconnected
  - National Grid UK: 10GW capacity identified and **4.68GW** interconnected/signed
- Australia
  - SA Power Networks: Made flexible connections the default option for DG customers which was modeled to **double exports** for residential rooftop customers
- US
  - ComEd Illinois: Committed to scale DERMS active management to community solar constrained areas and expecting **240MW** of additional FTM DER capacity

Reduced Electricity Costs: Distribution System

- Deferrals from Flexible Connections and DER grid services was the primary means reducing distribution system costs in UK and Netherlands
- UK (Since March 2023)
  - UKPN:
    - Flexible Connections: **£106m cost avoidance**
    - DER Grid Services: **£91m** , >1.5 GW flexibility contracted and 7.8 GWH flexibility dispatched
  - SP Energy Networks
    - DER Grid Services: **£328.4m** and 759 MW flexibility contracted
  - National Grid UK
    - DER Grid Services: **£80m** and 17 GWh flexibility contracted with 19,000 dispatch events
- Netherlands
  - DER Grid Services: 136 MWh flexibility procured across both distribution utilities

Reduced Electricity Costs: Bulk Power System

- Real world benefits are still being modeled but studies point to significant savings
- Australia
  - DER integration could deliver a combined net present value (NPV) of more than **$19 billion** by 2040
    - **$11 billion** in distribution and transmission network avoided costs and benefits of DER integration.
    - **$8 billion** in generation and storage cost reductions resulting from high levels of DER with high flexibility
- UK
  - Household flexibility could deliver an annual saving for GB consumers and the energy system of **£14.1bn/year** in 2040
    - Lower wholesale electricity prices account for **£12.3bn** in savings
    - Lower peak demand reduces the need to build additional power stations, delivering a saving of around **£1.2bn**
    - Lower peak demand reduces the need to build additional network assets, a saving of around **£0.5bn**
- US
  - Virtual Power plants could reduce **$10b/annual** in grid costs

Scalable Success: UK Power Networks