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RECOMMENDATIONS FOR PREPARATION OF A DISTRIBUTED ENERGY RESOURCES ROADMAP

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Presentation Outline

- What are Distributed Energy Resources (DER)?
- Benefits of DERs
- Drivers of Increased DER Adoption
- Challenges from DER Adoption
- What is a DER Roadmap?
- Key Messages from Stakeholders in the US and Emerging Economies



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RECOMMENDATIONS FOR PREPARATION OF A DISTRIBUTED ENERGY RESOURCES PLAN OR ROADMAP

CLIMATE ECONOMIC ANALYSIS FOR
DEVELOPMENT, INVESTMENT, AND
RESILIENCE (CEADIR)



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What Are Distributed Energy Resources (DER)?

- There is no universally accepted definition of DER
- The North American Electric Reliability Corporation (2017) defined DER as:
 - *Any non-bulk electric system generating unit or multiple generating units at a single location owned and/or operated by the distribution utility or a merchant entity. They included distribution generation, behind-the-meter generation, energy storage, virtual DER aggregation, microgrids, cogeneration, and emergency, standby, or back-up generation”*
- In 2020, the Federal Energy Regulatory Commission (FERC), which regulates interstate transmission in the United States, defined DER as:
 - *“Any resource located on the distribution system, any subsystem, ... or behind a customer meter”*
- The Clean Power Hub highlights the common characteristics of DER:
 - *they are sited close to customers, can provide some or all of their power needs, and can be used by the power system to either reduce demand or provide supply to meet energy or ancillary service needs*

Main Types of Distributed Energy Resources

1. Distributed generation
2. Transmission and distribution grids
3. Stationary energy storage
4. Electric vehicles and charging infrastructure
5. Demand response
6. Energy efficiency

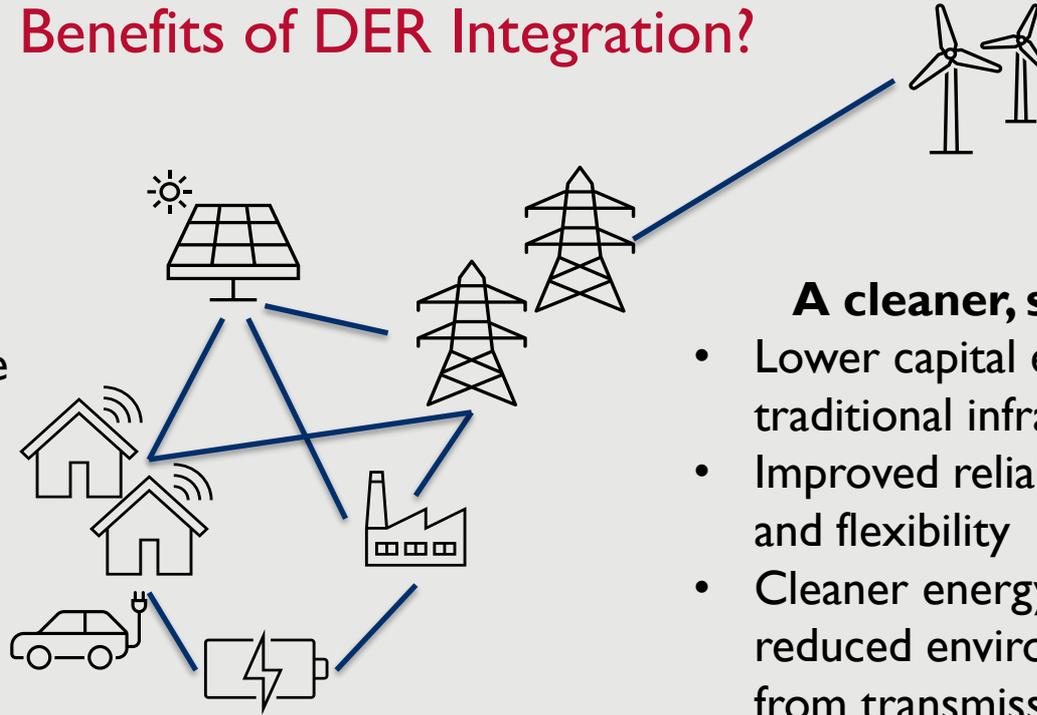


What are the Benefits of DER Integration?

Consumers pay lower electricity bills, have more choices, and more reliable services



Energy access in **remote geographic areas**



A cleaner, smarter grid

- Lower capital expenditure in traditional infrastructure
- Improved reliability, resilience and flexibility
- Cleaner energy sources and reduced environmental impacts from transmission and distribution infrastructure
- Greater domestic energy security

What Are the Key Drivers of DER Growth?



Increasing electricity demand and expansion of utility-scale renewable energy

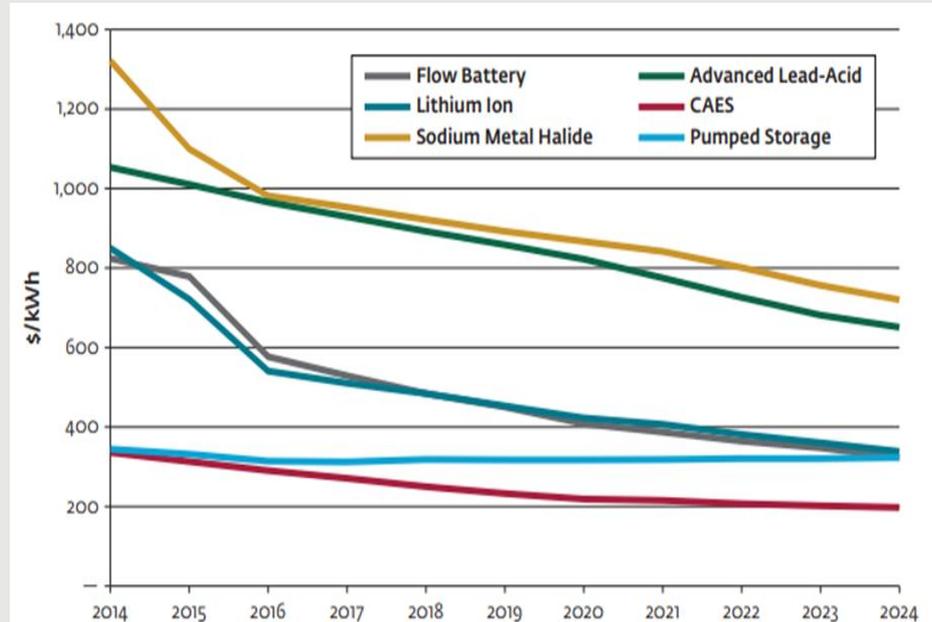


Policy and regulatory environment



Technology improvements and cost reductions

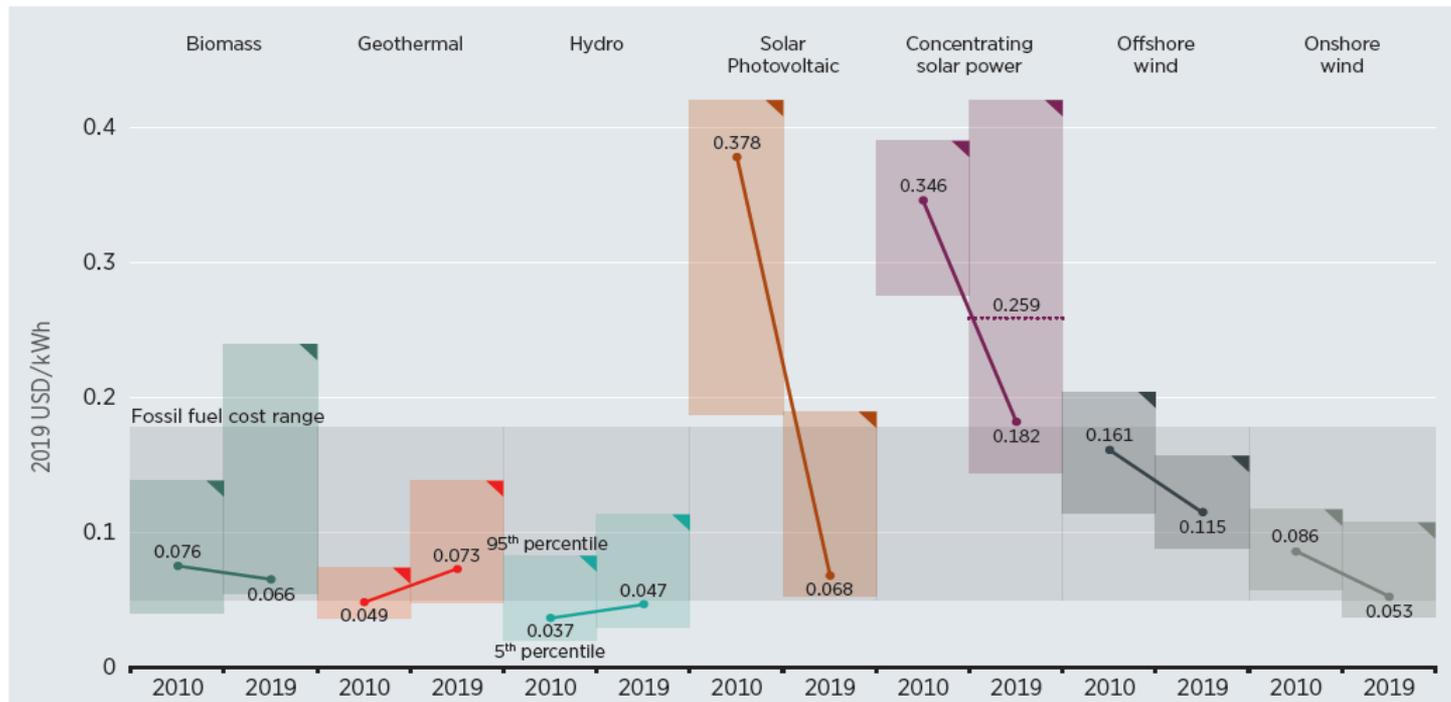
Actual and Projected Capital Costs of Six Energy Storage Technologies, 2014-2024



Source: Eller and Gantlett 2017

What are the Key Drivers of DER Growth?

Global Weighted Average Levelized Cost of Energy for Newly Commissioned Utility-Scale RE Generation Technologies, 2010-2019



Source: IRENA 2020

Illustrative DER Planning Challenges

- DER can be disruptive for vertically integrated utilities or power transmission and distribution utilities
- Utilities previously only had to manage unidirectional electricity flows from centralized generation to customers
- DER makes it necessary to consider multidirectional electricity flows from end users who are both consumers and generators
- DER changes net load profiles and may reduce utility revenues and require changes in business models
- DER can reduce utility capital, operating, maintenance, and replacement costs

What is a DER Roadmap?

Planning study, guidance document, or action plan

- Identifying national or subnational goals, targets, and milestones for DER
- Often used as synonym for a plan, but may be less prescriptive on timelines for achieving targets
- May address all types of DER technologies or a limited subset



Perspectives from Key Stakeholders

- Research on good practices for DER roadmaps and plans in the United States (U.S.)
- Interviews with U.S. utilities, government regulators, and regional grid market operators
 - California Independent System Operator
 - California Public Utilities Commission
 - Hawaiian Electric
 - PJM Interconnection (Eastern U.S.)
 - Sacramento Municipal Utility District
 - Southern California Edison
- Interviews with key informants on DER policies and planning in emerging economies
 - Colombia
 - Mexico
 - Vietnam

Drivers of DER Adoption in Colombia, Mexico, and Vietnam

Colombia	Mexico	Vietnam
<ul style="list-style-type: none">• Grid constraints• Vulnerability of hydropower to climate risks• High solar power potential	<ul style="list-style-type: none">• Power sector reforms• Subsidized electricity rates• Potential for increasing utility-scale renewable energy (RE) generation as costs declined• Policy goals to reduce electricity costs for users• Large potential for energy efficiency improvements• Need to develop ancillary service markets to improve electricity quality and reliability	<ul style="list-style-type: none">• Rapidly increasing electricity demand due to high economic growth and poverty reduction• Peak load supply constraints and costs• Plans to double electricity generation by 2030• Heavy reliance on hydropower and fossil fuel generation• Climate risks to hydropower• Air pollution from fossil fuel generation

DER Roadmap or Planning Process: Phase I



Obtain buy-in for participation and sponsorships



Stakeholder identification and mobilization



Scoping



Data collection and analysis



Communications

DER Roadmap or Planning Process: Phase 2



Build consensus on strategic directions



Prioritize DER technology options



Policy and regulatory changes



Market structure or operations



Legal, financing, and investment support structures



Procurement rules



Milestones, goals, targets and indicators of progress



Monitoring and evaluation system



Draft roadmap or plan



Public comments



Final roadmap or plan



Communication materials

DER Roadmap or Planning Process: Phase 3



Action plan and implementation schedule



Budget frameworks for public sector and utility investments



Monitoring and reporting on milestones, goals, targets, and indicators



Periodically updating

Key Messages from Interviewed Stakeholders



DER Roadmaps:

- Help government planners and regulators, utilities, grid operators, and market operators make **improved decisions on DER investments and use**
- Help utilities **develop consensus** on objectives, targets, technologies, and location-specific priorities, and plans for procurement, financing, and implementation of investments and programs
- Represent **interests of diverse stakeholders** in planning stage which can reduce regulatory delays and increase public and private investment and consensus for implementation

Additional Information

Report available at:

https://pdf.usaid.gov/pdf_docs/PA00X3MI.pdf

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