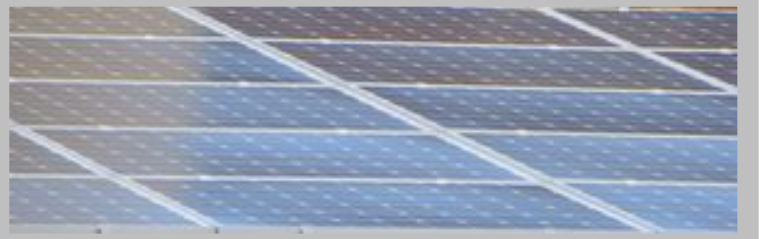

municipal sustainability

Welcome to

municipal sustainability & energy forum

hosted by Sierra Dall

Clean Coalition

Distribution Resources Planning

A foundational policy for modernizing the grid

John Bernhardt
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Agenda

- The need for Distribution Resources Planning (DRP)
- An overview of DRP
- The benefits of DRP
- California: a case study
- Pathways to initiate DRP in your state

Our vision

Clean Coalition

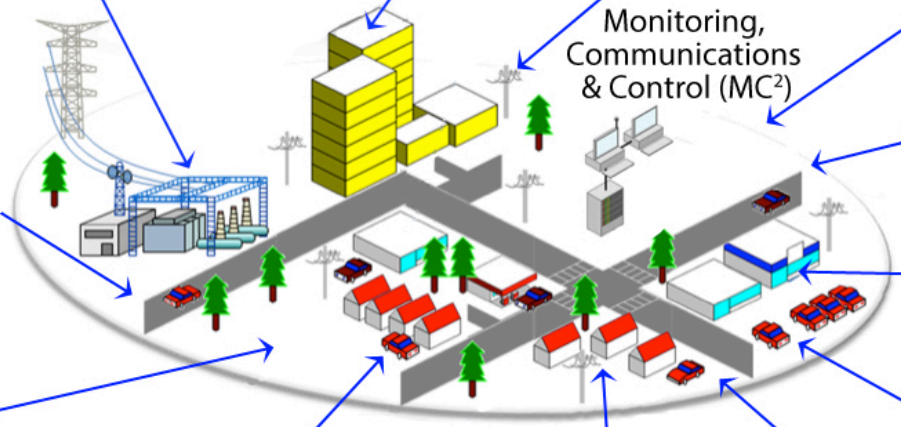
Grid Energy Storage

Distributed Generation

Switches & Power Electronics

Distributed Generation

Biopower Generation



Monitoring, Communications & Control (MC^2)

Energy Storage

Microturbine

Distributed Generation

Electric Vehicles (EV)

Home Energy System

Fuel Cells

Distributed Generation

Agenda

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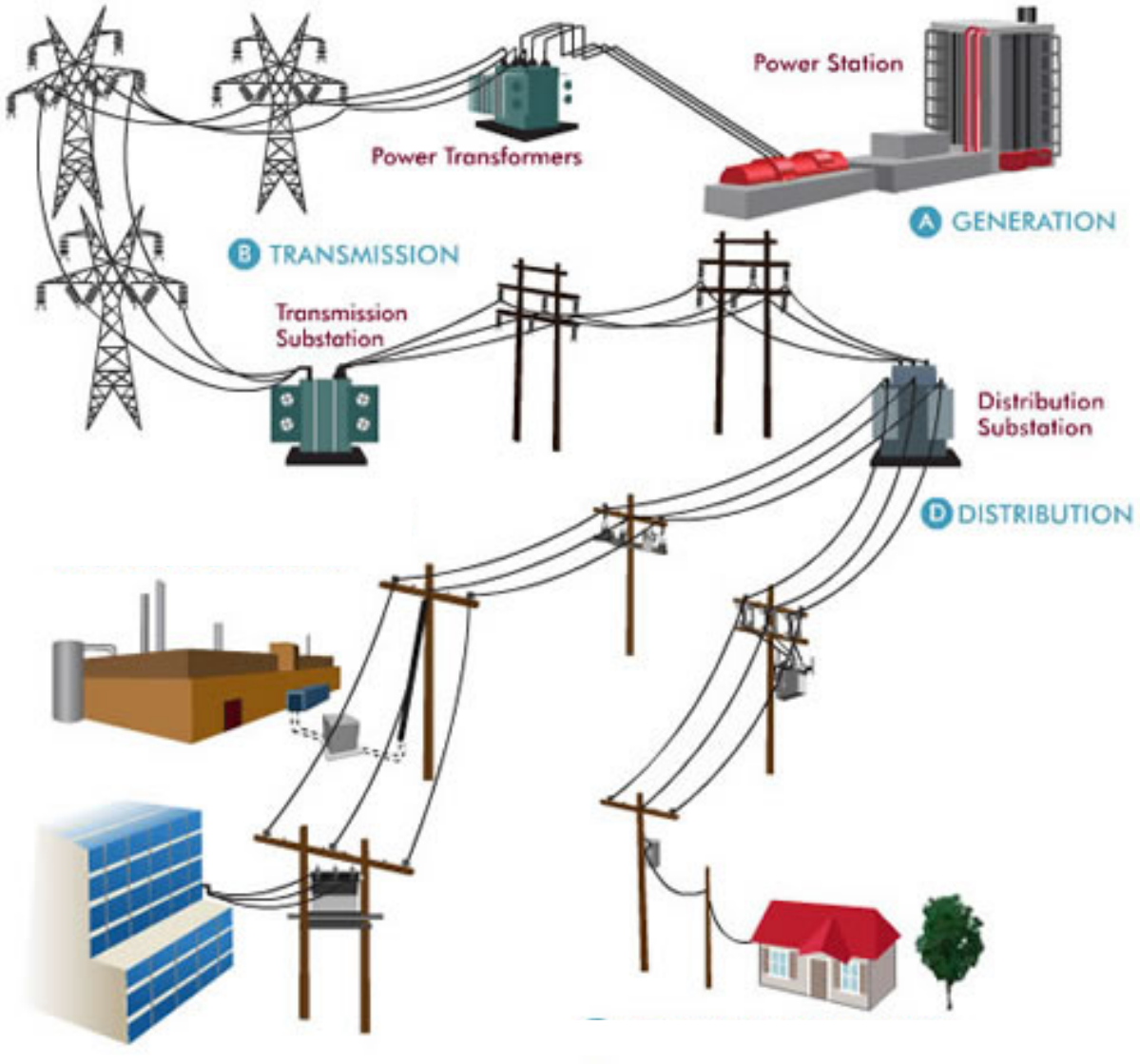
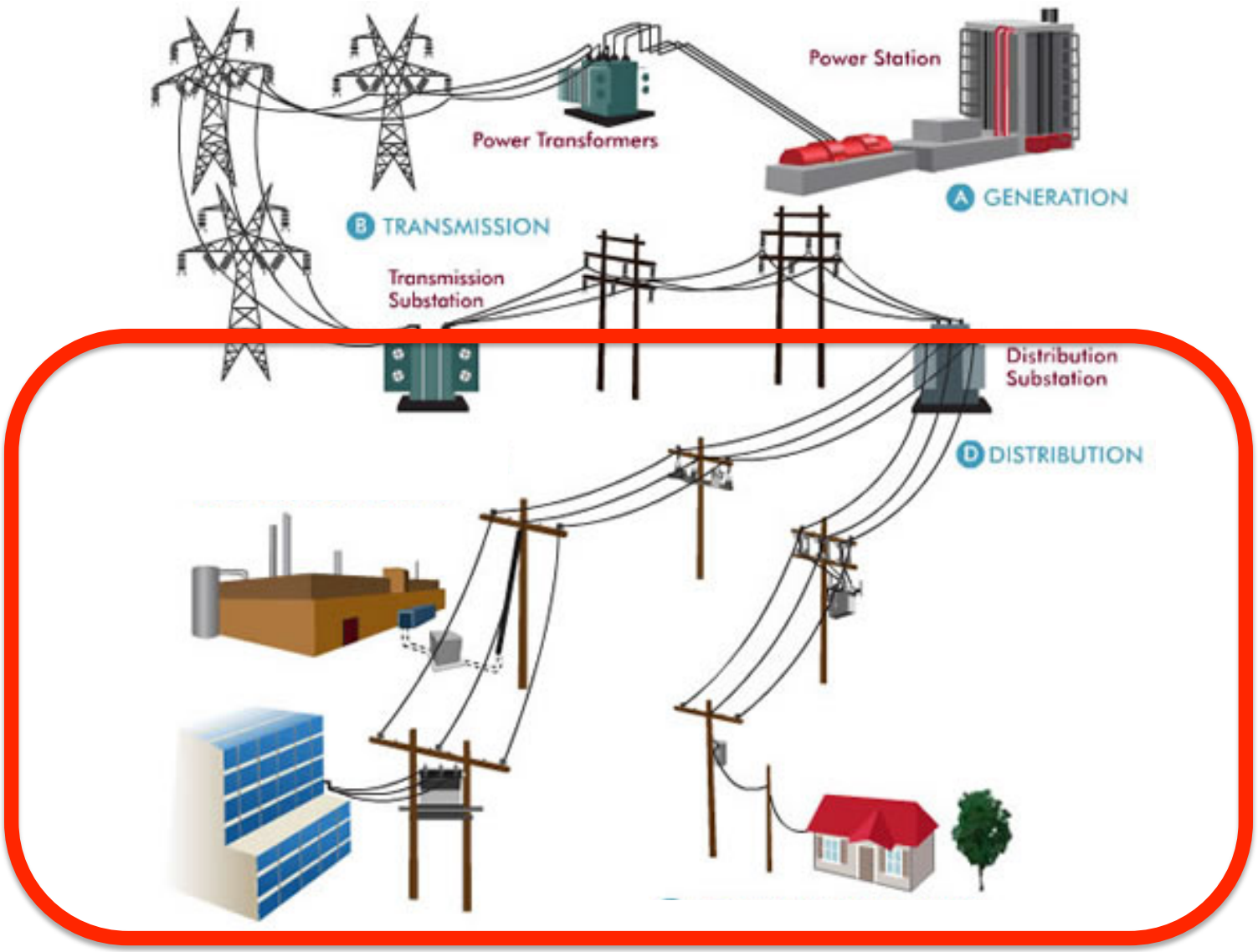
Anatomy of the power grid



Source: Oncor Electric Delivery Company

Distribution grids are centers of innovation



Source: Oncor Electric Delivery Company

DER technologies have become cost-effective

BRIEF

Minnesota solar project beats natural gas on price, gets authorization

Source: Utility Dive

DER technologies have become cost-effective

Clean Coalition

BRIEF

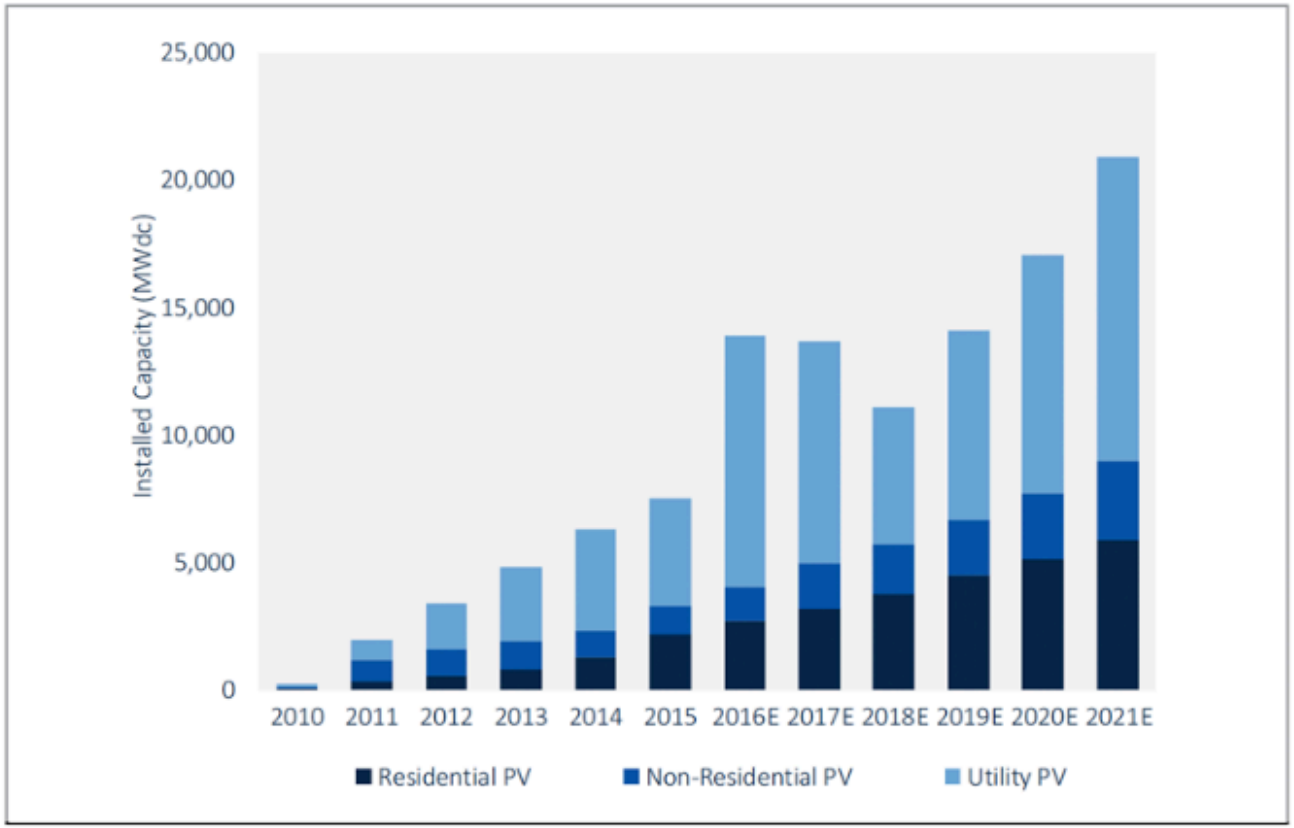
Hawaii co-op signs deal for solar+storage project at 11¢/kWh

U.S. residential electricity prices averaged 12.5 cents/kWh in Oct. 2016

Source: Utility Dive and U.S EIA

Continued growth of DER is projected

Figure 2.5 U.S. PV Installation Forecast, 2010-2021E



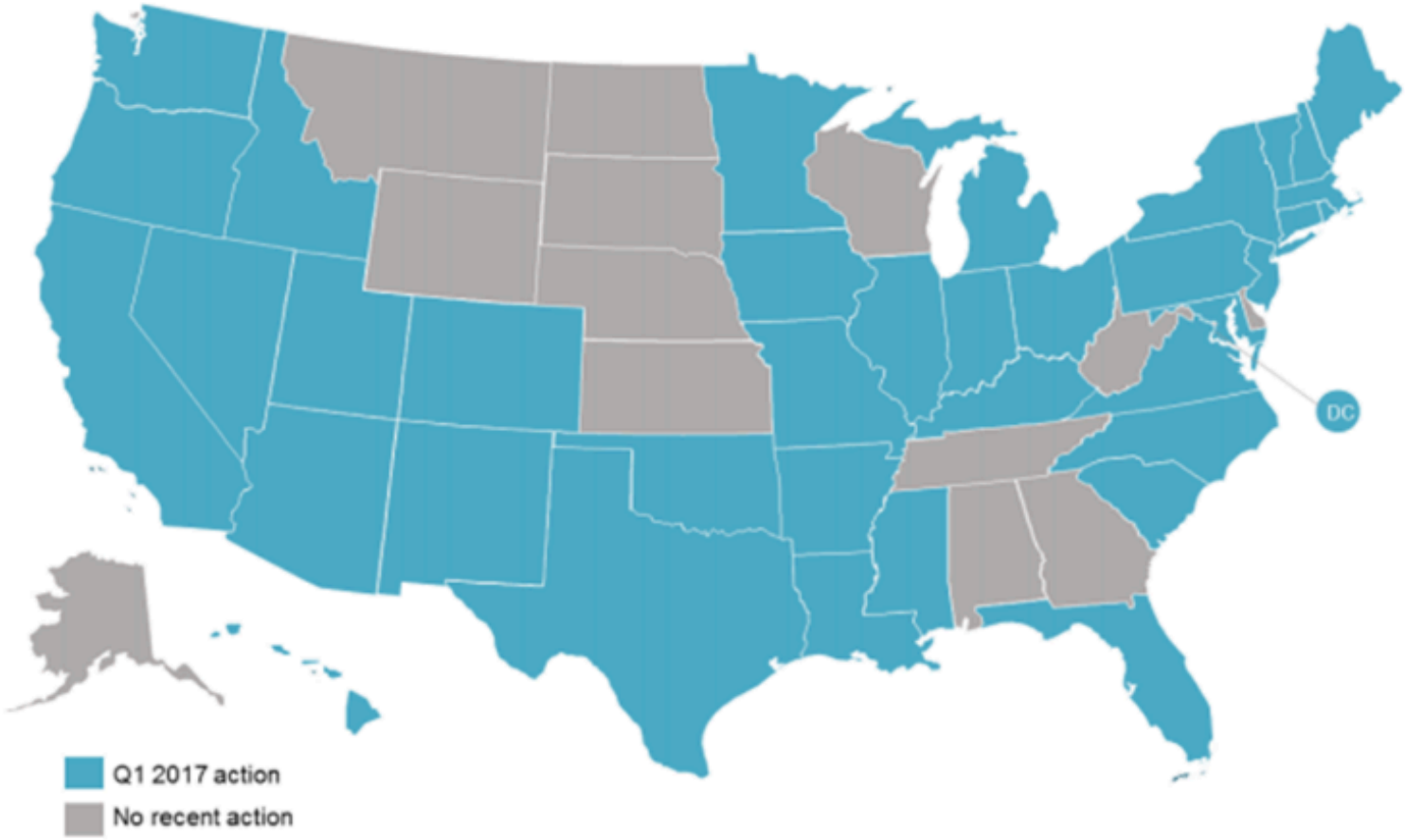
Industry experts predict continued growth of solar and distributed solar generation capacity to grow significantly in the coming years.

Source: GTM Research and SEIA

Energy policy is evolving

Clean Coalition

Figure 1. Legislative and Regulatory Action on Grid Modernization (Q1 2017)

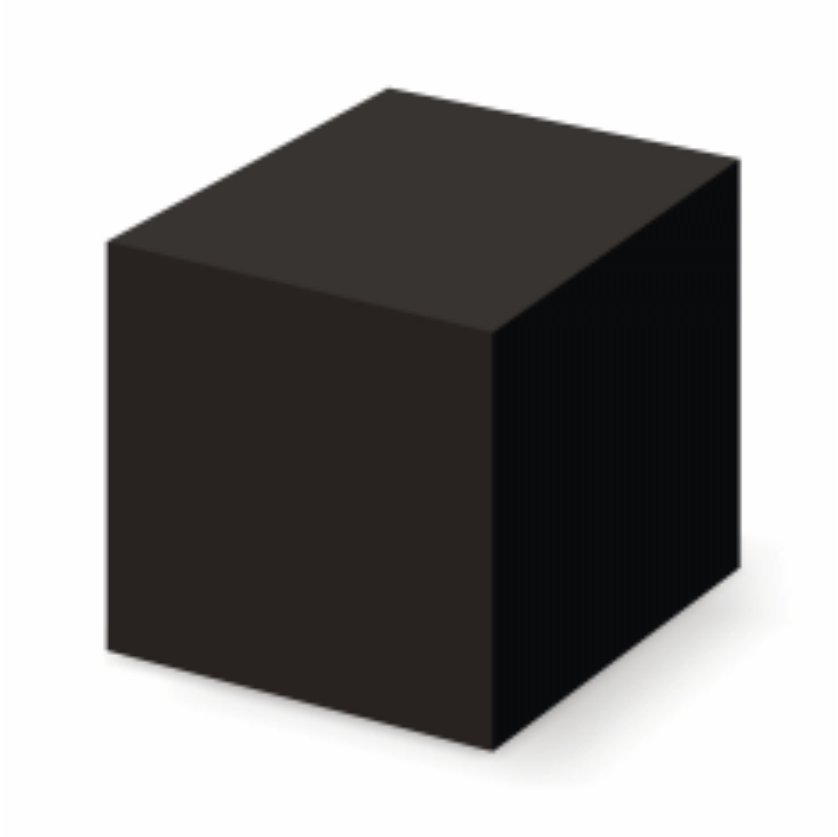


Source: NC Clean Energy Technology Center

DER open new business opportunities & models

- New ‘value-add’ services
  - Energy efficiency, demand response, enhanced reliability/power quality
- New asset ownership and capital investment opportunities
  - Utility-owned DER
  - Rate-basing: “utility pays” for smart distribution grid upgrades
- Evolving utility business models
  - Utility as an integrator – distribution system operator, distribution system platform provider, etc.

Insufficient insight is a problem



Enhanced visibility and knowledge is key

Agenda

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- **An overview of DRP**
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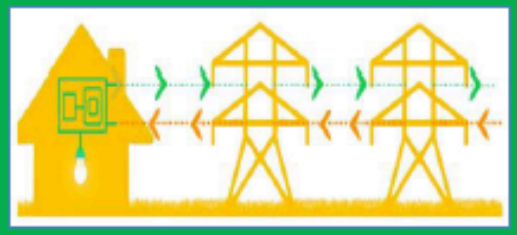
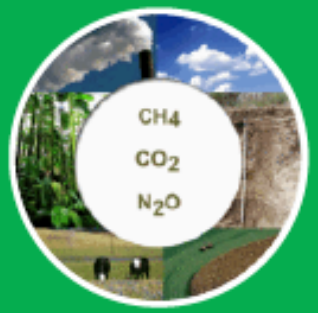
DRP supports the following goals



Modernize distribution system to accommodate expected DER growth through two-way power flow

Enable customer choice of new electric DER technologies and services



Identify and develop opportunities for DERs to realize grid benefits

Identify Optimal Locations for deployment of DERs

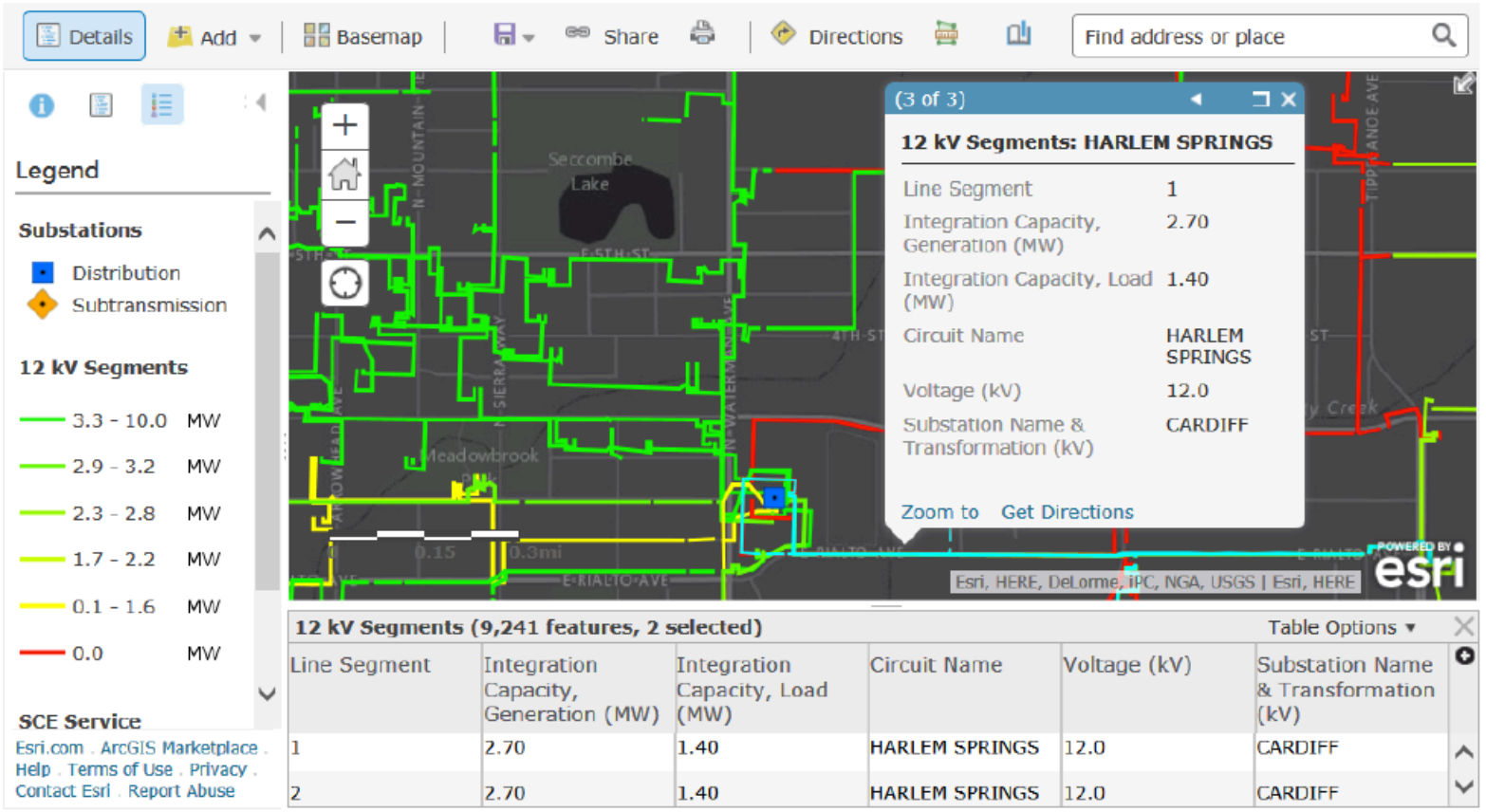
Source: Pacific Gas & Electric

Key components of DRP

- **Integration capacity analysis (ICA)**
  - Utilities determine the ability of existing grid to accommodate new DER within the distribution network. Grid maps, with details on available capacity down to the circuit level, will be made publicly available.
- **Methodology to value DER**
  - Utilities will propose, and regulators will approve, a methodology to value DER, which recognizes locational value.
- **Substation-level demonstration projects**
  - Pilot projects utilize DER to achieve ratepayer savings when compared to conventional approaches like centralized generation and transmission investments.
- **DER forecasts**
  - Project DER growth for the next ten years, with details on expected siting at the distribution substation level and potential impacts on distribution and transmission planning.

Integration capacity analysis (ICA)

- Aggregated, anonymous distribution data accessible online
  - Highlight grid locations best suited for new local generation, like solar
  - Identify grid constraints and opportunities for cost-effective DER



Source: Southern California Edison

Methodology to value DER

	Value Component	Definition
Distribution	Subtransmission, Substation & Feeder Capacity	Reduced need for local distribution system upgrades
	Distribution Losses	Value of energy due to losses between wholesale transaction and distribution points of delivery
	Distribution Power Quality + Reactive Power	Improved transient & steady-state voltage, reactive power optimization and harmonics
	Distribution Reliability + Resiliency+ Security	Reduced frequency and duration of individual outages & withstand and quickly recover from large external natural, physical and cyber threats
	Distribution Safety	Improved public safety and reduced potential for property damage
Customer, Societal & Environmental	Customer Choice	Customer & societal value from robust market for customer alternatives
	CO2 Emissions	Reductions in federal and/or state CO2 emissions based on cap-and-trade allowance revenue or cost savings or compliance costs
	Criteria Pollutants	Reduction in local emissions in specific census tracts
	Health Impacts	Reduction in societal health costs associated with GHG emissions
	Energy Security	Reduced risks derived from greater supply diversity
	Water Use	Synergies between DER and water management (electric-water nexus)
	Land Use	Environmental benefits & avoided property value decreases from DER deployment instead of large generation projects
	Economic Impact	State or local net economic impact (e.g., jobs, GDP, tax income)

Source: Newport Consulting Group

DRP pilot projects

- Prove the technical and economic feasibility of DER
- Capitalize on opportunities in which DER can save ratepayers money in comparison to traditional grid investments

Con Ed Looks to Batteries, Microgrids and Efficiency to Delay $1B Substation Build

A new demand-side program will be a training ground for future utility reforms in New York.

by Katherine Tweed

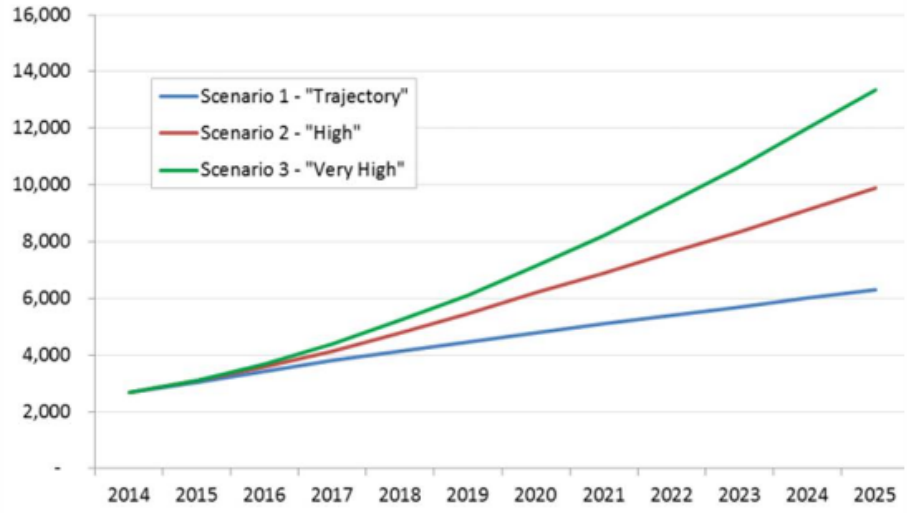
July 17, 2014

DER forecasts

- Establish method to project DER growth and potential impacts on the grid

SCE Territory Amounts of DER Deployment by 2025

Growth Type	Scenario 1	Scenario 2	Scenario 3
Base Load	27,019 MW	27,019 MW	27,019 MW
Solar PV (nameplate AC)	1,636 MW	1,905 MW	4,770 MW
AAEE (annual)	10,536 GWh	17,031 GWh	17,243 GWh
Demand Response	1,265 MW	2,087 MW	2,981 MW
CHP (annual)	6,350 GWh	8,576 GWh	13,612 GWh
EV (annual)	2,422 GWh	3,395 GWh	3,395 GWh
Storage (D&C)	270 MW	270 MW	637 MW
Storage (T)	310 MW	310 MW	731 MW



Sources: SCE and PG&E

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Benefits of implementing DRP

- **Streamline the interconnection process for DER**
  - Utilize online grid maps to guide siting of DER, like solar, to optimal locations on the grid – reducing costs of developing clean local energy projects
  - Save utilities time and money by improving interconnection review processes

Guiding DER siting saves ratepayers >50%

Clean Coalition

SCE Share of California's 12 GW Distributed Generation Goal

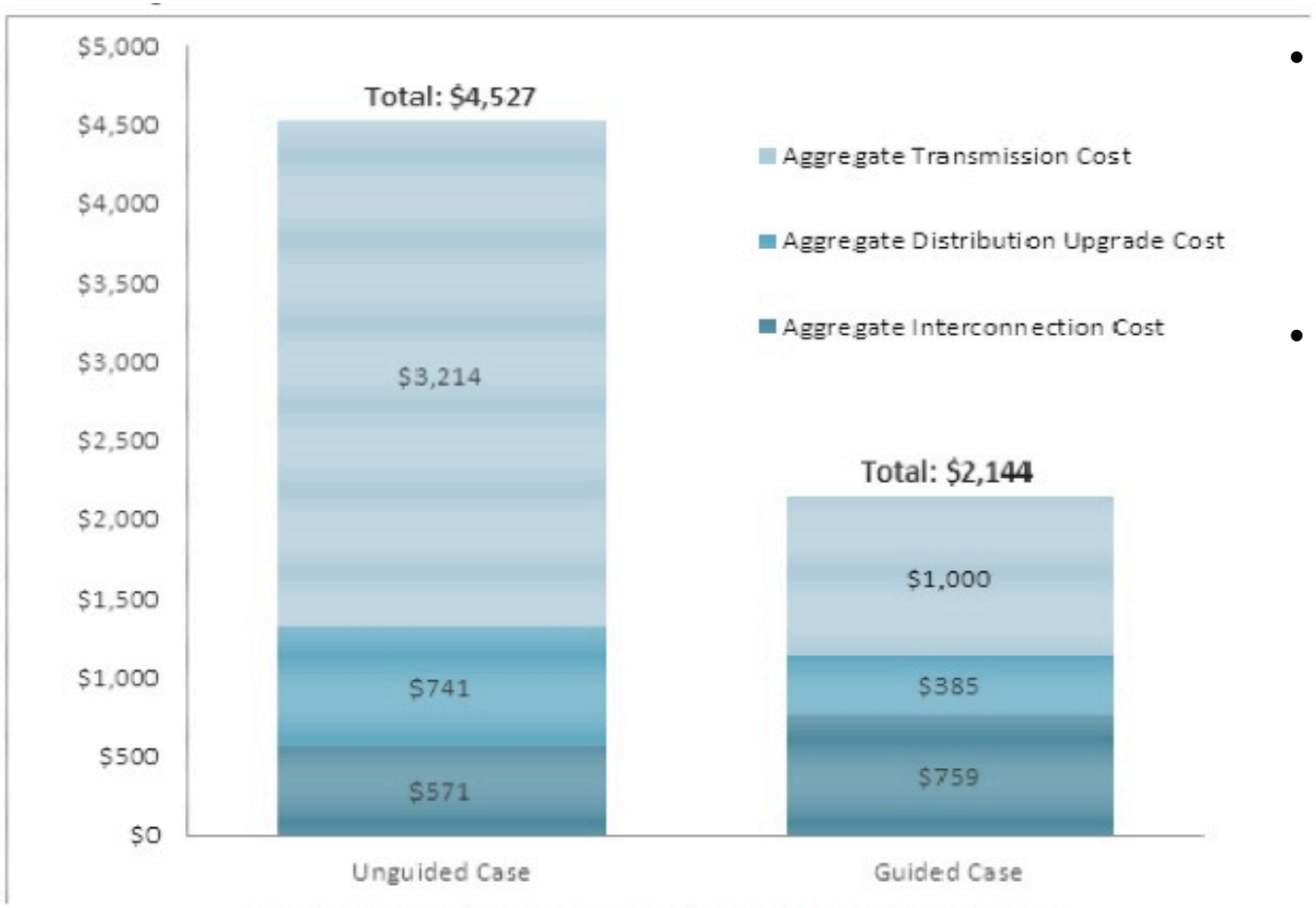


Figure 8: Total SCE System Costs of LER Proposal (Million USD)

- Locational value methodology should include transmission costs
- DRP should inform interconnection and compensation policies to guide DER deployment to optimal locations

Source: SCE Report May 2012

Benefits of implementing DRP

- **Guide smart investments into the distribution grid.**
  - Improve system planning processes by looking more holistically to identify the best solution

> “Instead of looking strictly at wires solutions, we started looking at DERs as non-wires solutions and at what the most cost-effective way of using them is to meet our reliability, safety, and affordability standards.”
>
> - *Mark Esguerra,* Principal Engineer and DRP filing lead at Pacific Gas and Electric

A planning framework to evaluate DER solutions

Clean Coalition

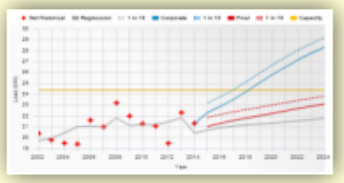
Integrated Distribution Planning Framework

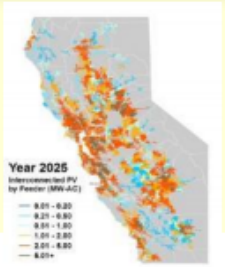
Distribution Resources Plan (DRP)

Integrated DER (IDER)

1 Assumptions, Scenarios & Scope

Develop forecasts, assumptions and planning scenarios.





2 Distribution Planning Assessment

Distribution Grid Studies

- Thermal
- Voltage
- Protection
- Safety and Reliability

3 Distribution Grid Needs

Distribution Grid Needs

- Load Serving Capacity
- DER Hosting Capacity
- DER Aggregator Requirements
- Coordination with Transmission Planning

4 Evaluate Options

Prioritize Grid Needs

Deferral framework Analysis (technical feasibility and indicative cost screens)

Implement "wires" solutions for locations deemed infeasible for DERs

5 Sourcing

Sourcing Process to satisfy needs identified in IDPP

Implement "Wires" Solution

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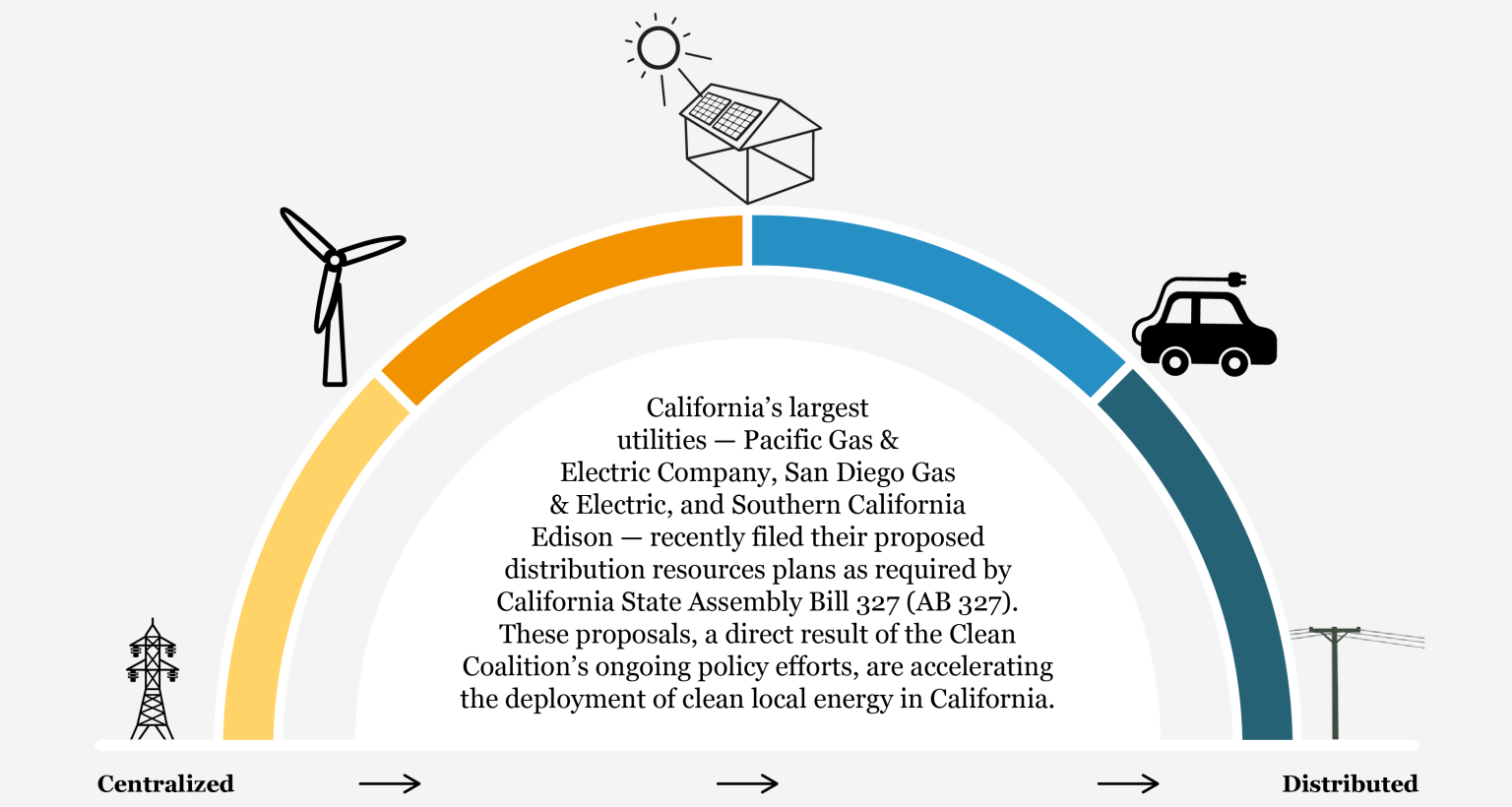
Initiating CA's DRP took time



2009-2010

The Clean Coalition is founded and begins advocating for local renewables, in front of the California Public Utilities Commission (CPUC) and the Federal Energy Regulatory Commission, as an alternative to centralized, fossil fuel generation.

2011-2012

The California Energy Commission includes many Clean Coalition recommendations in their Integrated Energy Policy Report. The Clean Coalition introduces multiple bills in California mandating proactive distribution grid planning.

2013-2014

AB 327 becomes law in California requiring the largest utilities to proactively plan for the rise of distributed renewable energy. The CPUC adopts numerous Clean Coalition recommendations as they implement the law, including the Community Microgrid Initiative methodology.

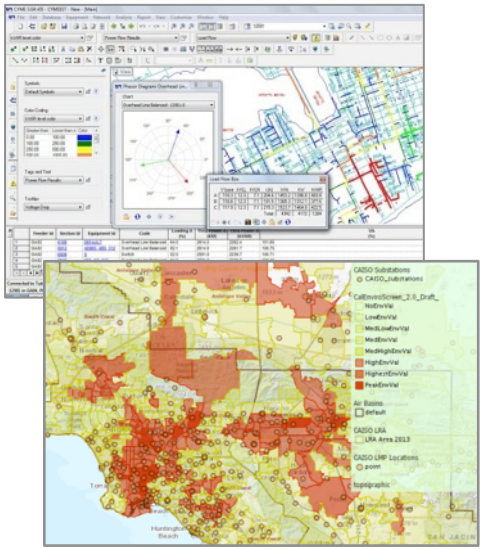
2015

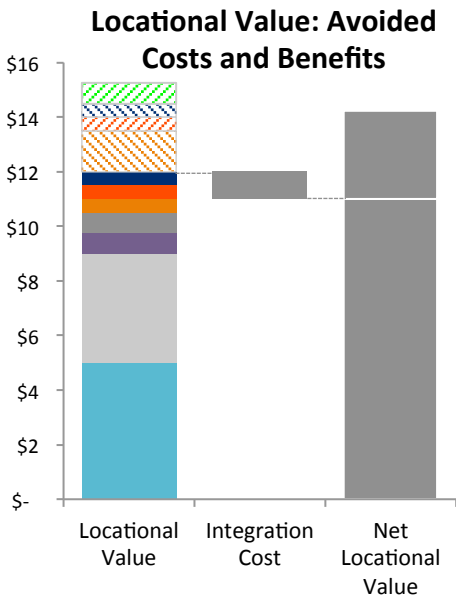
On July 1, utilities submitted their distribution resources plans, signaling a major step forward in establishing a cleaner, more reliable, and more efficient grid, while setting a model for the rest of the United States.

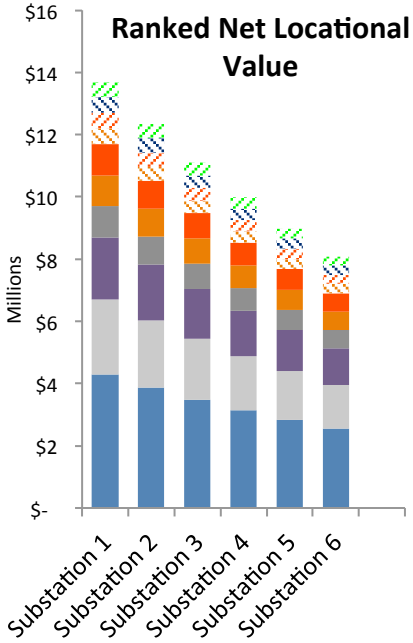
DRP analysis process

Clean Coalition

Identify DPAs Substations & circuits → **Perform Planning Analyses** → **Calculate Locational Need & Net Value** → **Invest or incent by Locational Net Value**

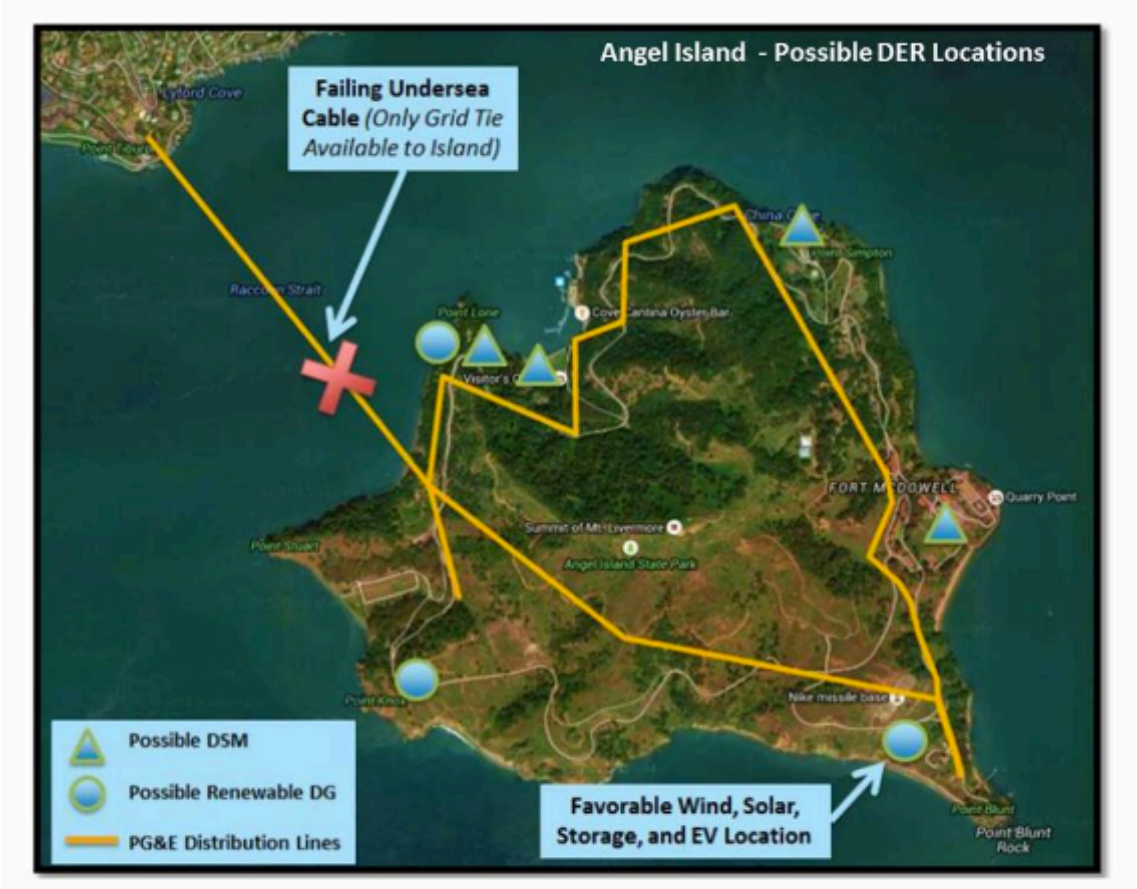






DRP pilot projects

- Prove out the technical and economic feasibility of DER
- Pilot projects identified by the methodologies developed for the integration capacity and optimal location benefit analyses



Source: Pacific Gas & Electric

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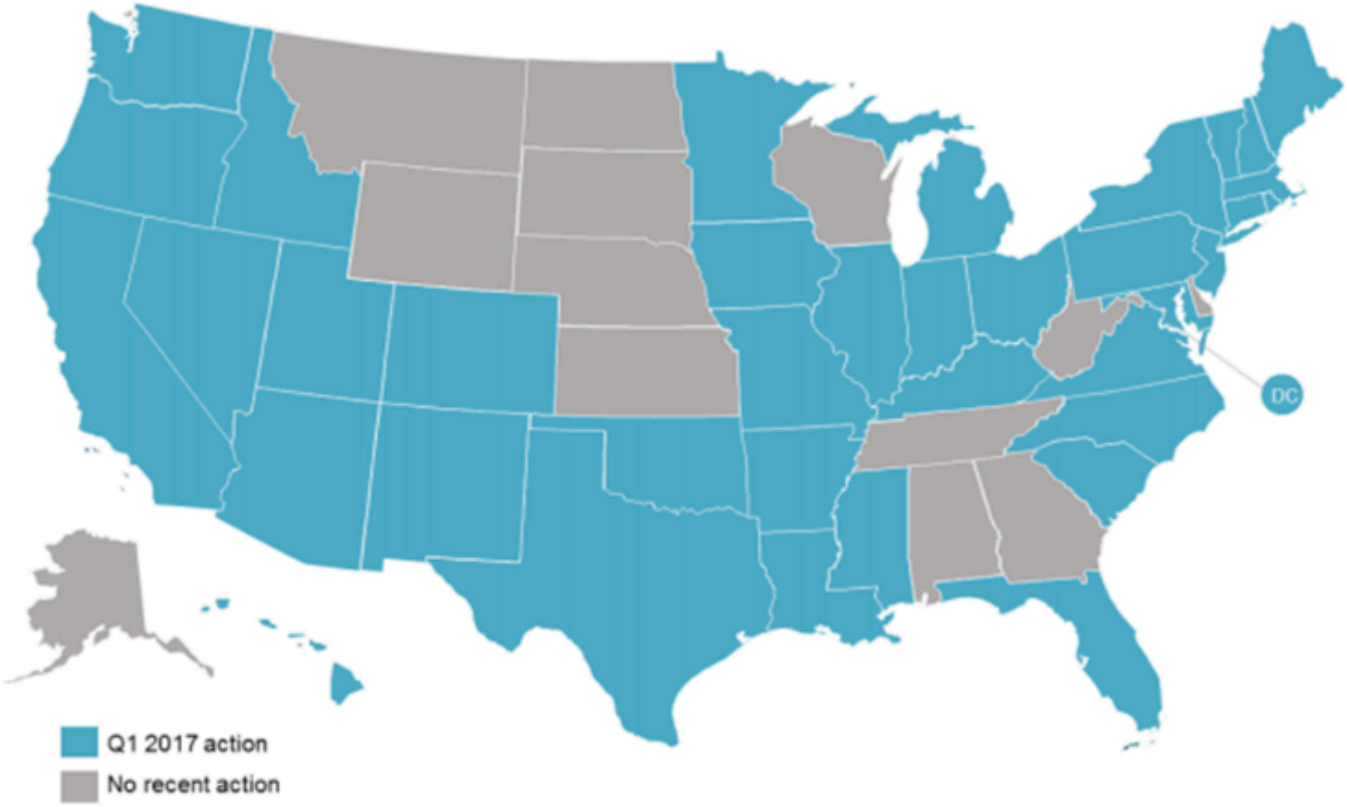
3 pathways to initiative a DRP process

- 1) Legislative process
- 2) Regulatory process
- 3) Voluntary utility adoption

3 pathways to initiative a DRP process

- There may be opportunities to bring DRP into existing policy activity underway in your state

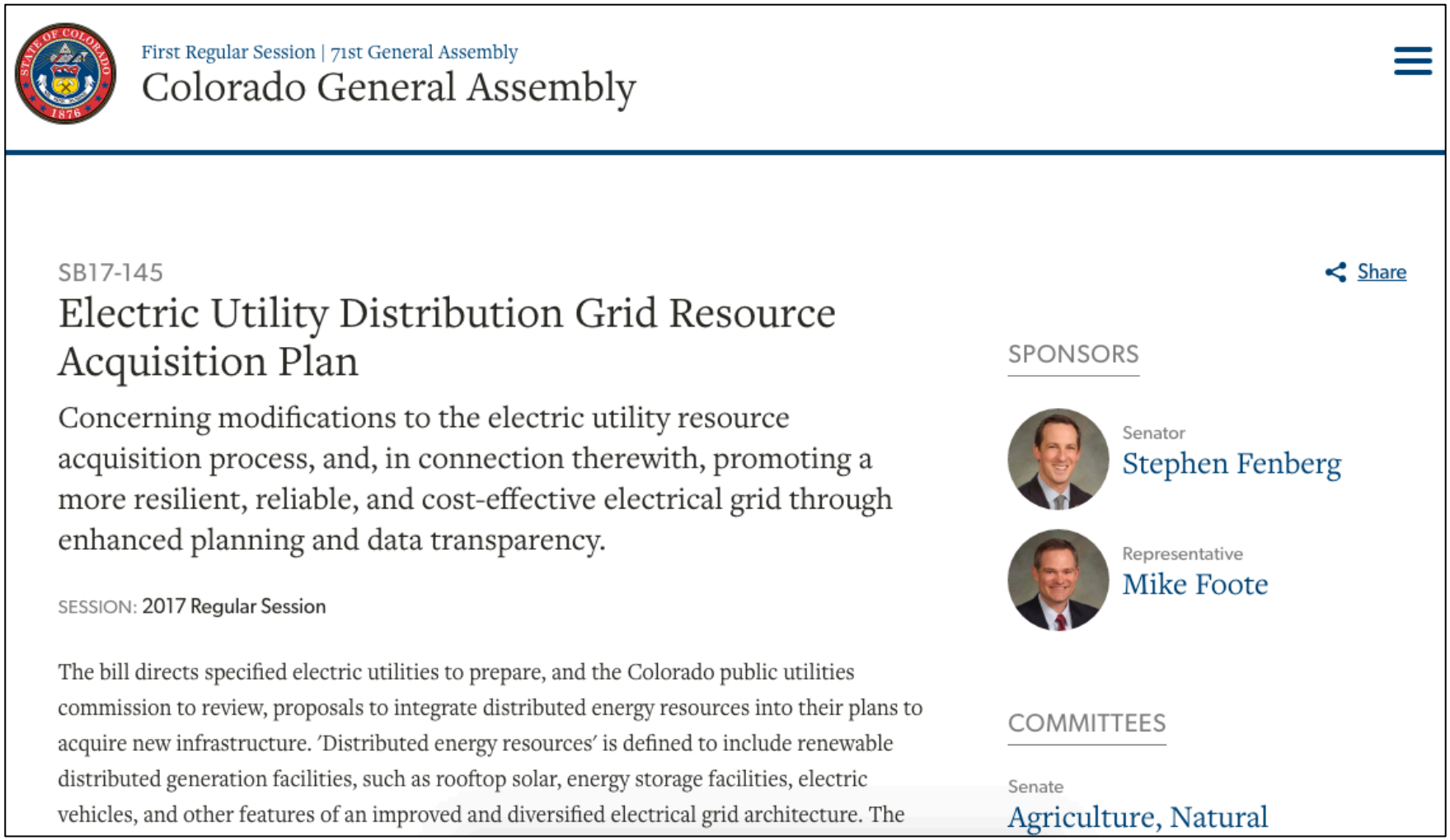
Figure 1. Legislative and Regulatory Action on Grid Modernization (Q1 2017)



Source: NC Clean Energy Technology Center

The Clean Coalition can help

- Facilitated the introduction of Senate Bill 145 in Colorado in Spring 2017



First Regular Session | 71st General Assembly
Colorado General Assembly

SB17-145

Electric Utility Distribution Grid Resource Acquisition Plan

Concerning modifications to the electric utility resource acquisition process, and, in connection therewith, promoting a more resilient, reliable, and cost-effective electrical grid through enhanced planning and data transparency.

SESSION: 2017 Regular Session

The bill directs specified electric utilities to prepare, and the Colorado public utilities commission to review, proposals to integrate distributed energy resources into their plans to acquire new infrastructure. 'Distributed energy resources' is defined to include renewable distributed generation facilities, such as rooftop solar, energy storage facilities, electric vehicles, and other features of an improved and diversified electrical grid architecture. The

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The end result

- Making a quicker, cheaper, and easier to build local renewables

Source: EcoPlexus

Thank you. Any questions?

- *"By failing to prepare, you are preparing to fail."* – Ben Franklin

- Modernizing the grid in a smart, cost-effective manner requires Distribution Resources Planning (DRP)

- <u>For questions and assistance, contact:</u>

John Bernhardt
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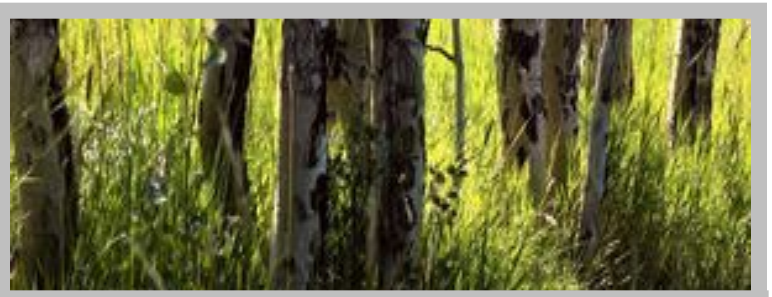

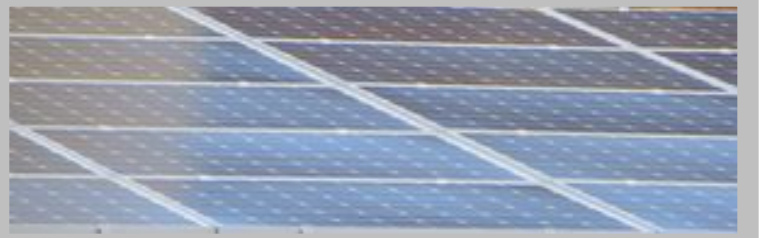

municipal sustainability & energy forum

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