SolarCity

Rate Design, Grid Services, and Distribution Planning

July 29th, 2016

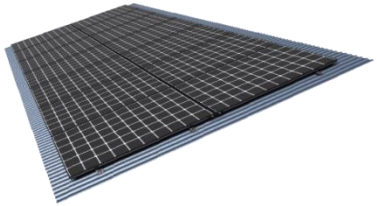
Agenda

NEM and Rate Design

Grid Services and Planning

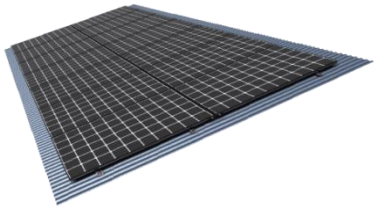
Distributed solar is still in its infancy, but steadily progressing towards dynamic, flexible, and controllable assets

Phase 2



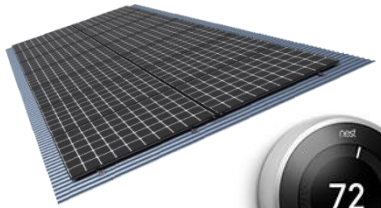
PV 1.0 → PV 2.0 → PV 3.0

Phase 1



No $ Down

Phase 3



New York Solar Progress Partnership

Joint NEM successor proposal by NY IOUs and solar parties

- First collaboration with solar industry and utilities to develop long-term solar policy to benefit ratepayers
- Keeps full-retail NEM for rooftop solar through 2020
- Acknowledges that solar DERs can benefit the grid and should receive corresponding compensation

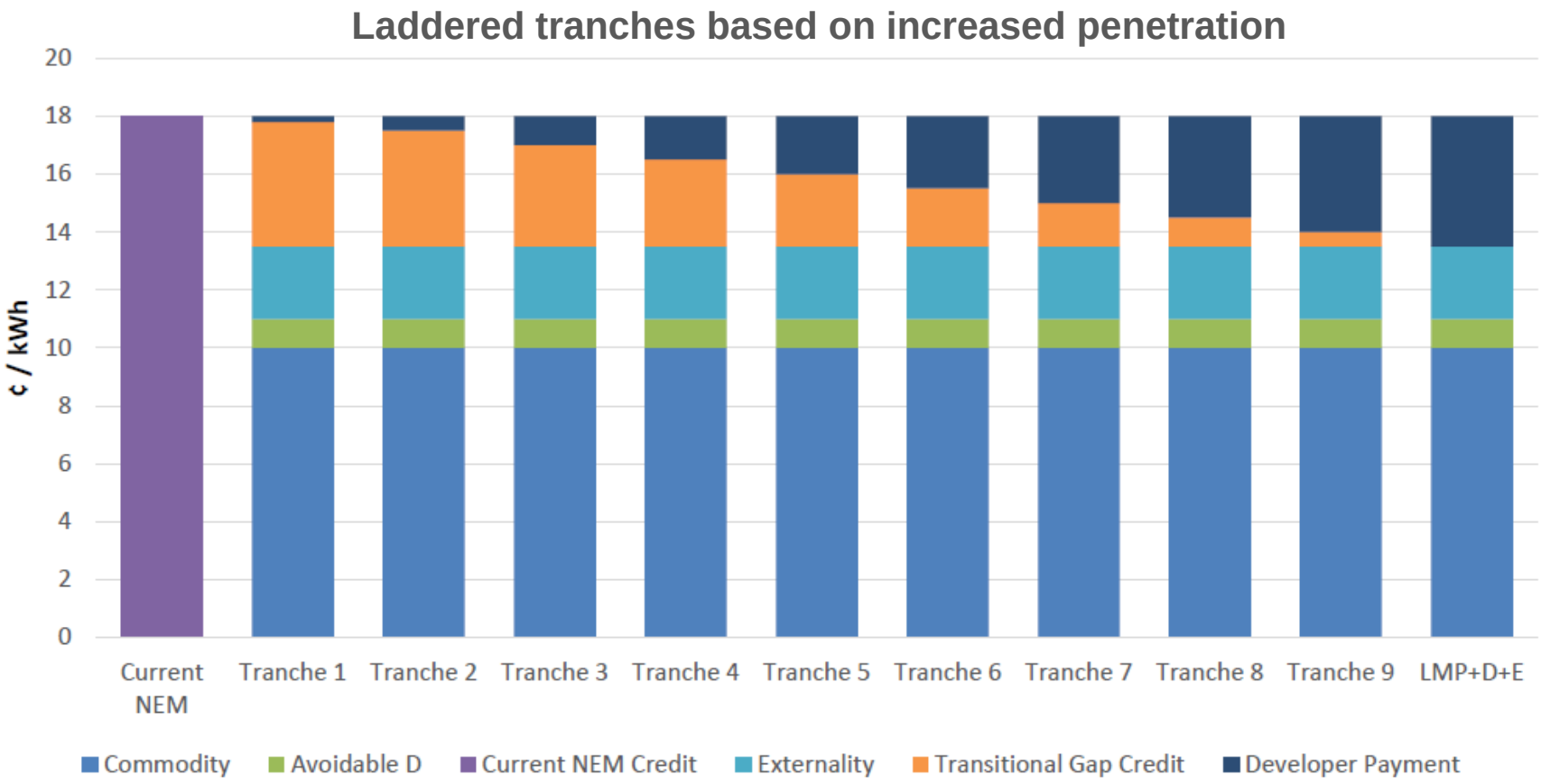
Rooftop solar

- NEM until 2020 as default transition date
- Projects grandfathered for 15-25 year term, to be decided by PSC
- Transition to a locational value tariff after 2020, to be defined later

Community solar

- Customers keep NEM over time while community system assumes locational value + a transitional gap credit
- Developer to pay difference between retail rate and LMP+D+E
- Projects awarded value for energy production for term of 15-25 years
- Priority in the interconnection queue based on location

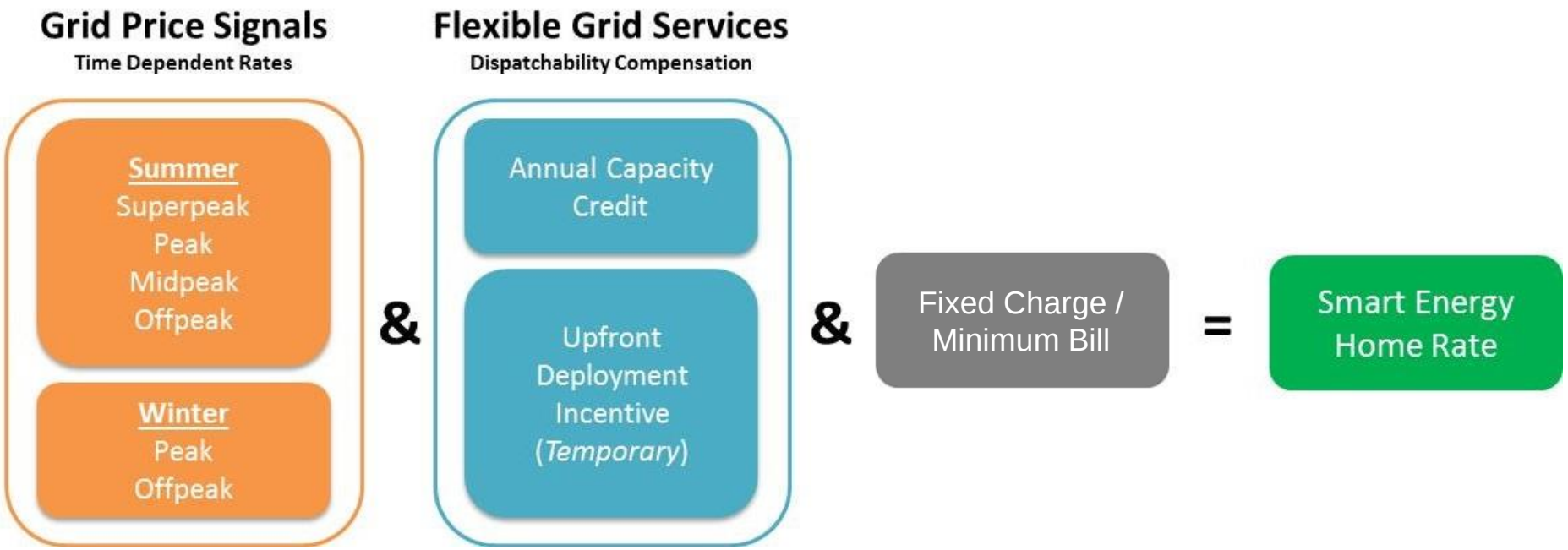
NY: Maintain NEM through 2020 for rooftop solar, while transitioning *Community Solar* to LMP+D+E



Source: Solar Progress Partnership Comments on an Interim Successor to Net Energy Metering

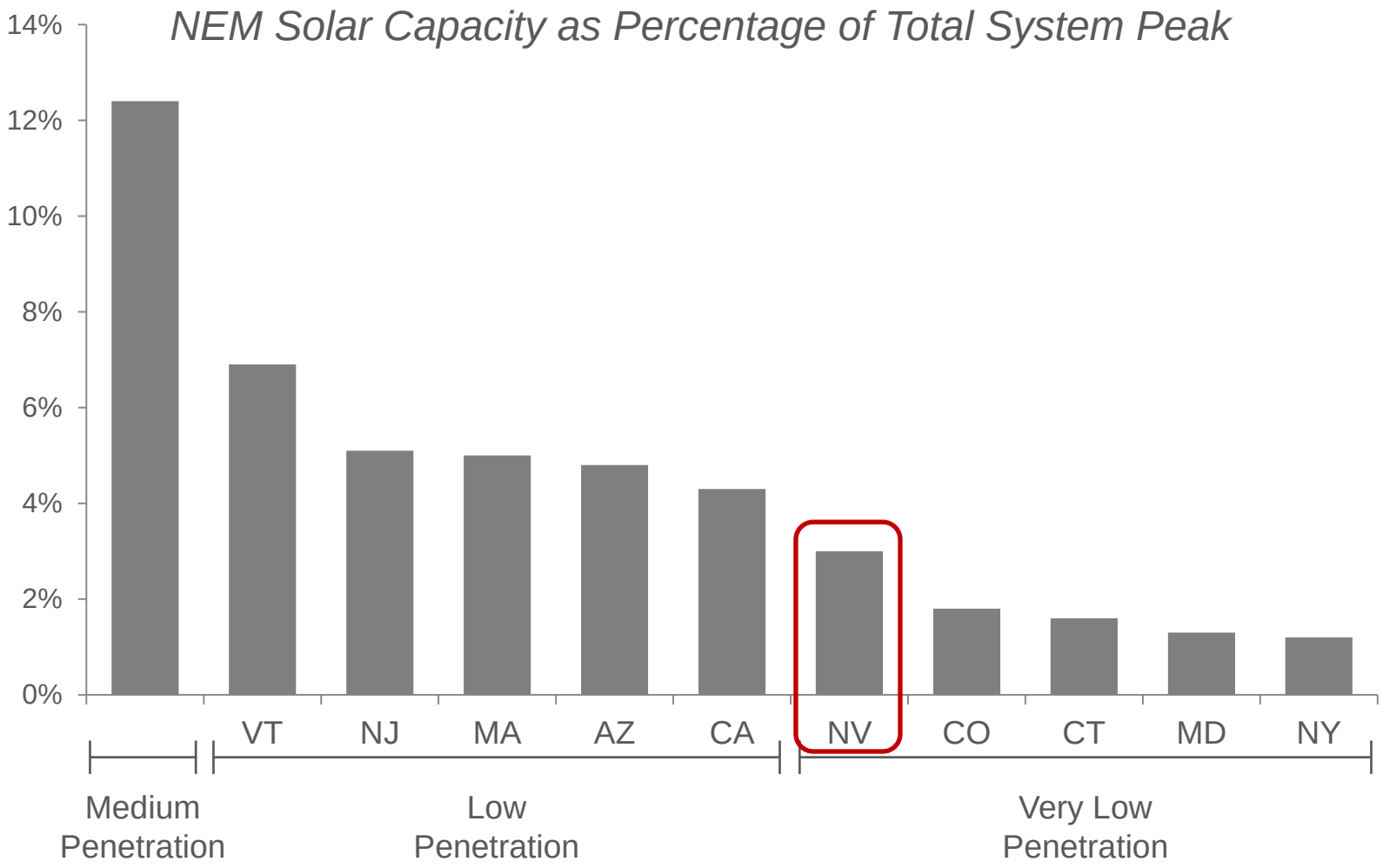
Optional Smart Energy Home Rate

EFCA Smart Energy Home Rate Proposal in New York



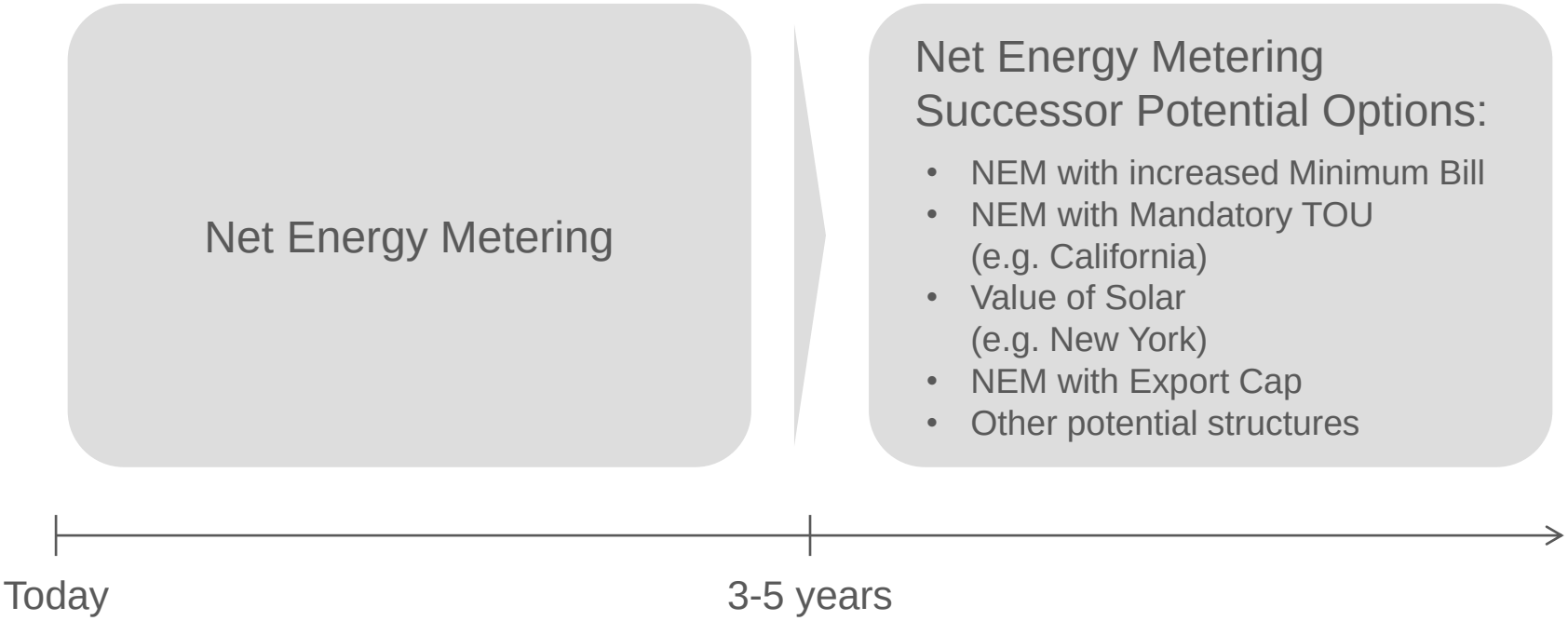
Source: "Initial Comments of the Energy Freedom Coalition of America in Response to the Commission's Notice Soliciting Comments and Proposals on An Interim Successor to Net Energy Metering", NY Public Service Commission Case, April 2016

NEM penetration in Nevada is still very low



Source: U.S. Energy Information Agency (EIA), July 2015 preliminary data.

Revitalize distributed solar market, then evaluate NEM successor options as penetration increases

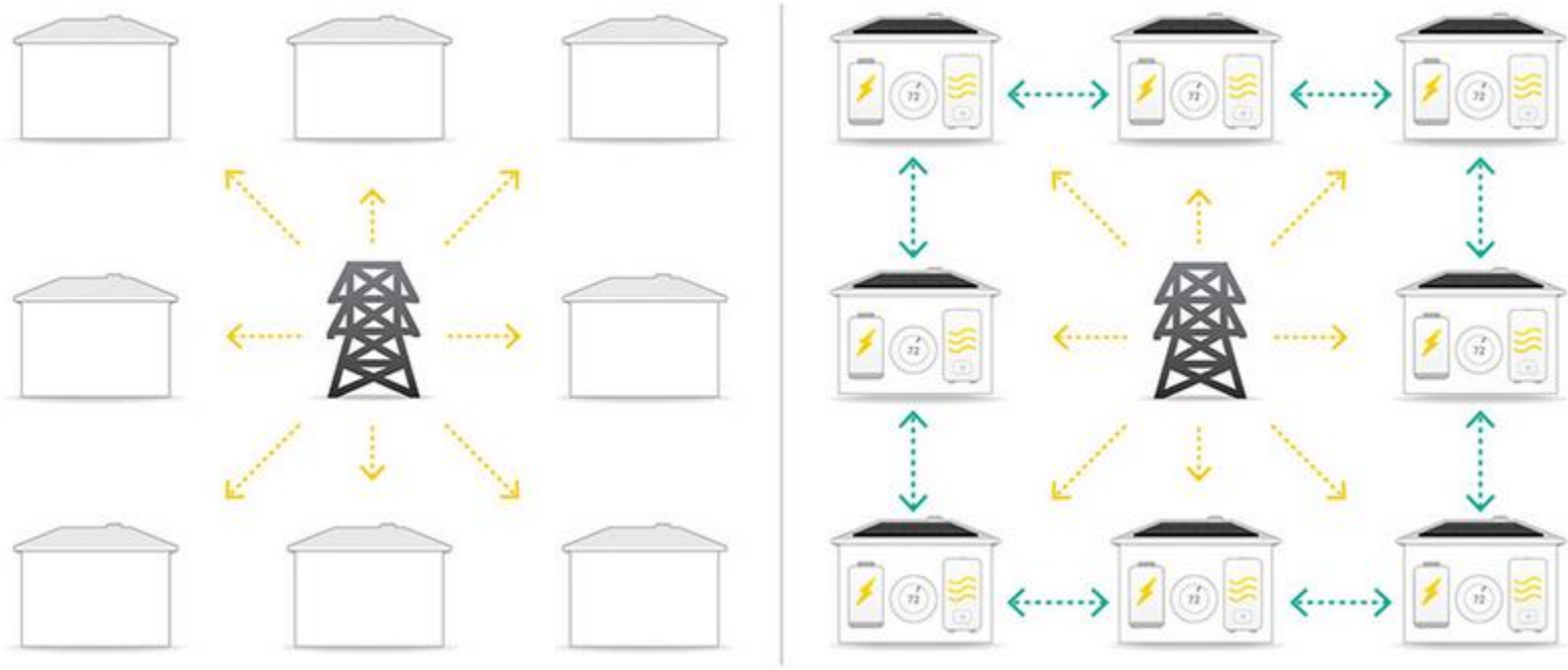


Agenda

NEM and Rate Design

Grid Services and Planning

What Should the 21st Century Grid Look Like?



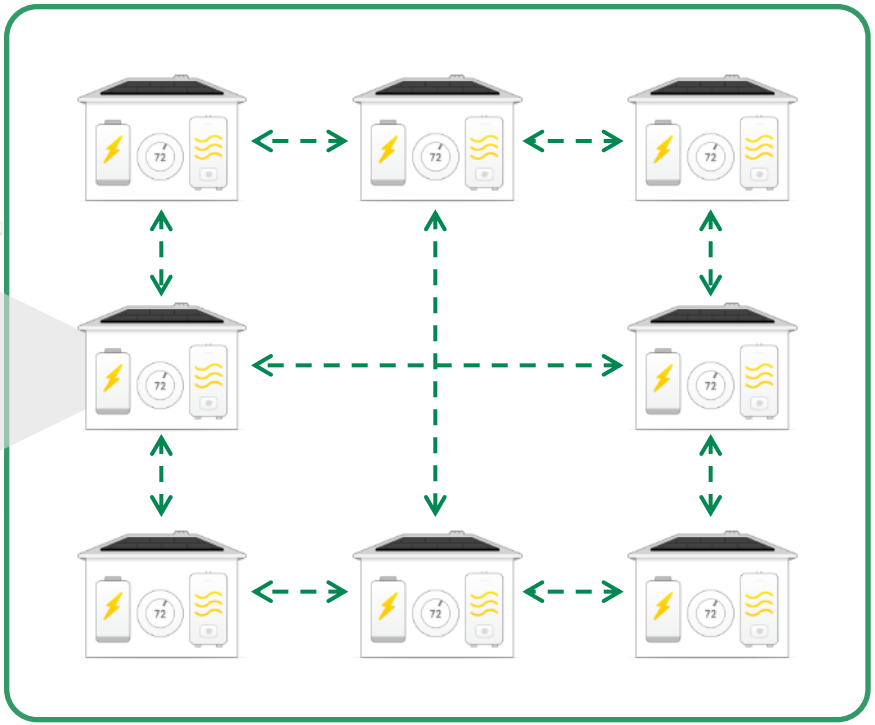
Today **Future**

Distributed Energy Resource Aggregation

Utilize portfolios of distributed energy resources to provide grid services

Distributed Energy Resources (DERs)

Aggregated DER Portfolios



Grid Services

- Demand Response / Dynamic Capacity
- Ramping / Ancillary Services
- Voltage & Reactive Power
- Contingency Support

Engaged consumers are increasingly able to manage their own energy and provide grid services

Solar

Universal Gateway

Smart Thermostat

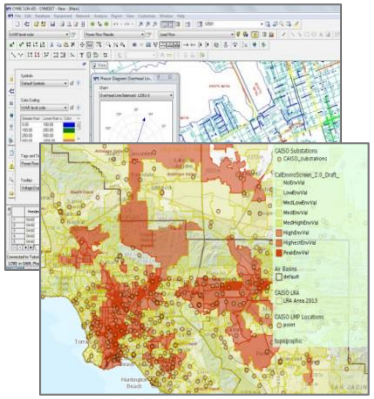
Battery

Real-time Monitoring

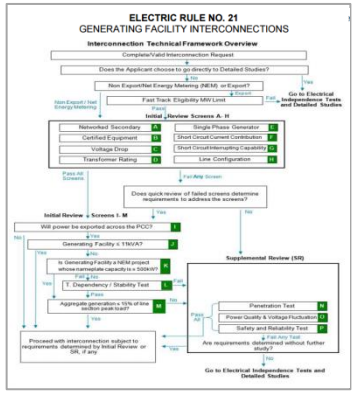
Smart Water Heaters

However, distribution planning must be modernized in order to capture DER benefits

Traditional Planning



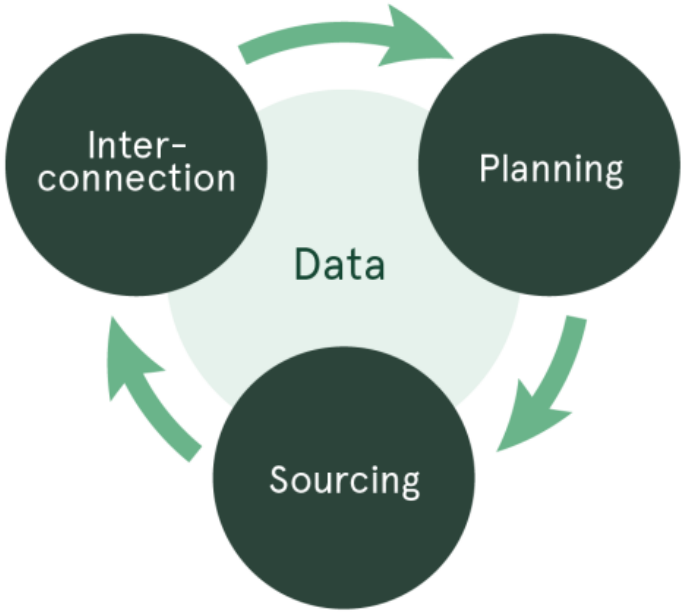
Planning



Interconnection

Image Sources: CYME, Kevala, PG&E

Integrated Distribution Planning

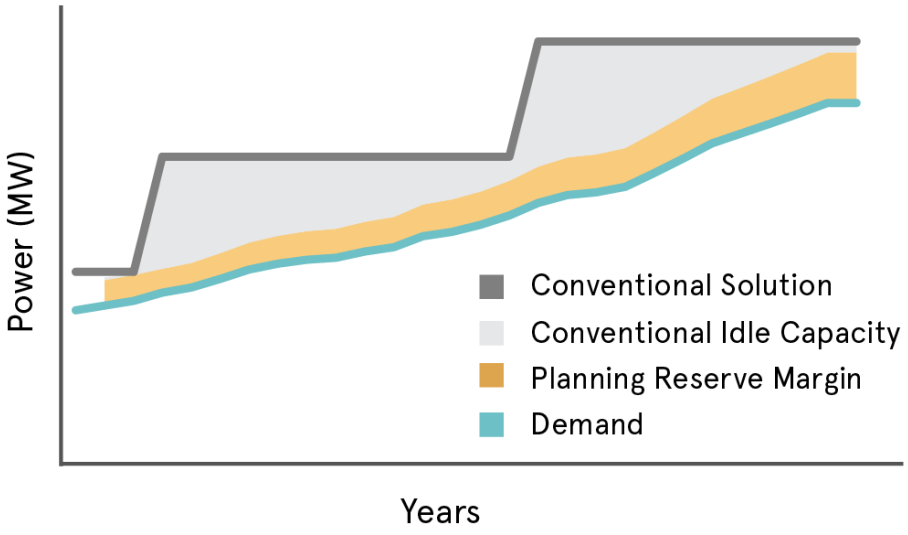


A holistic approach to meeting grid needs and expanding customer choice by unlocking the benefits of distributed energy resources

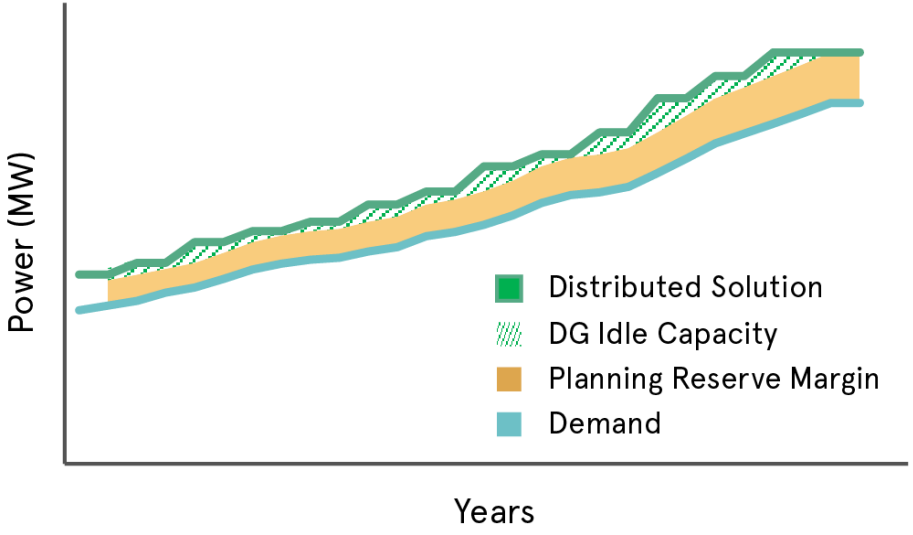
Benefits of *Integrated Distribution Planning*

Value of Small & Targeted Infrastructure Solutions

Option 1: Bulky Deployment

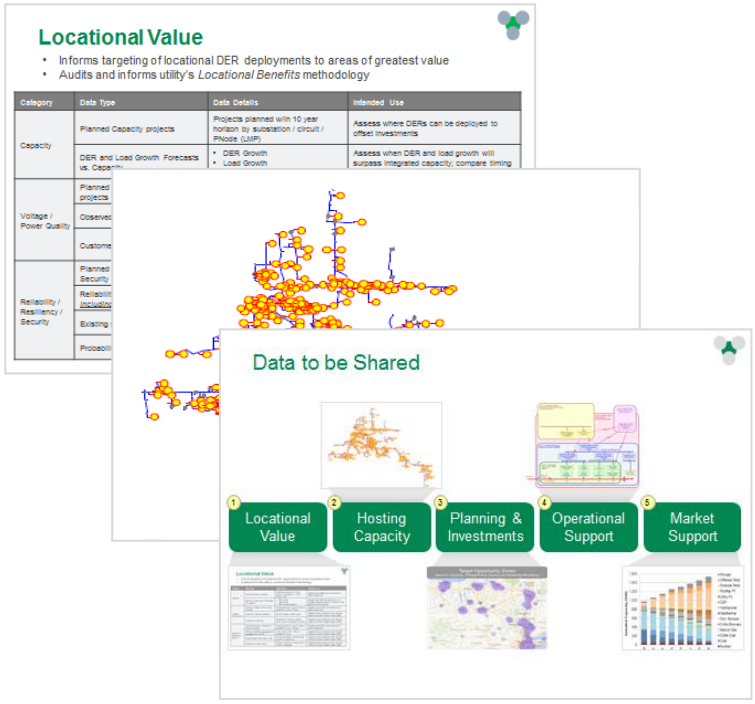


Option 2: Targeted Deployment

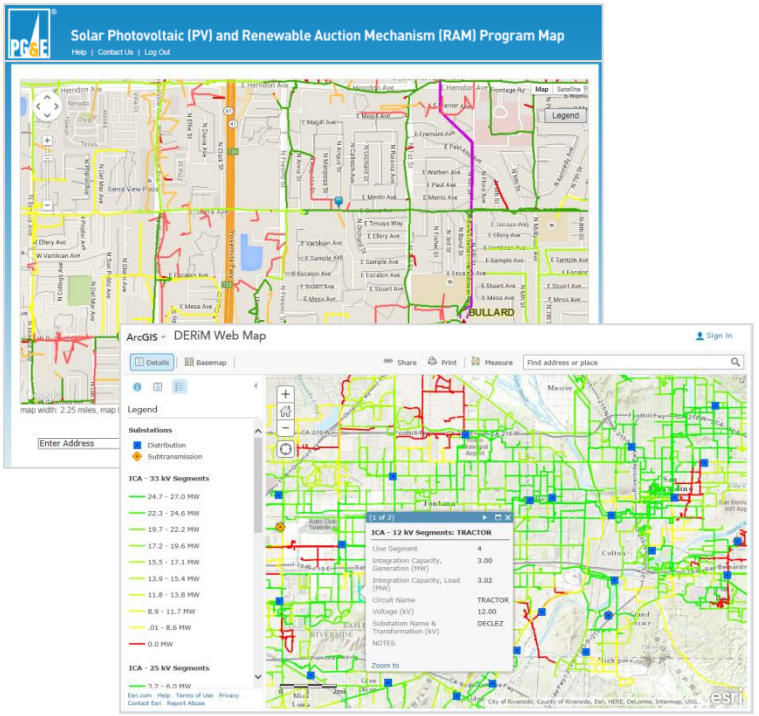


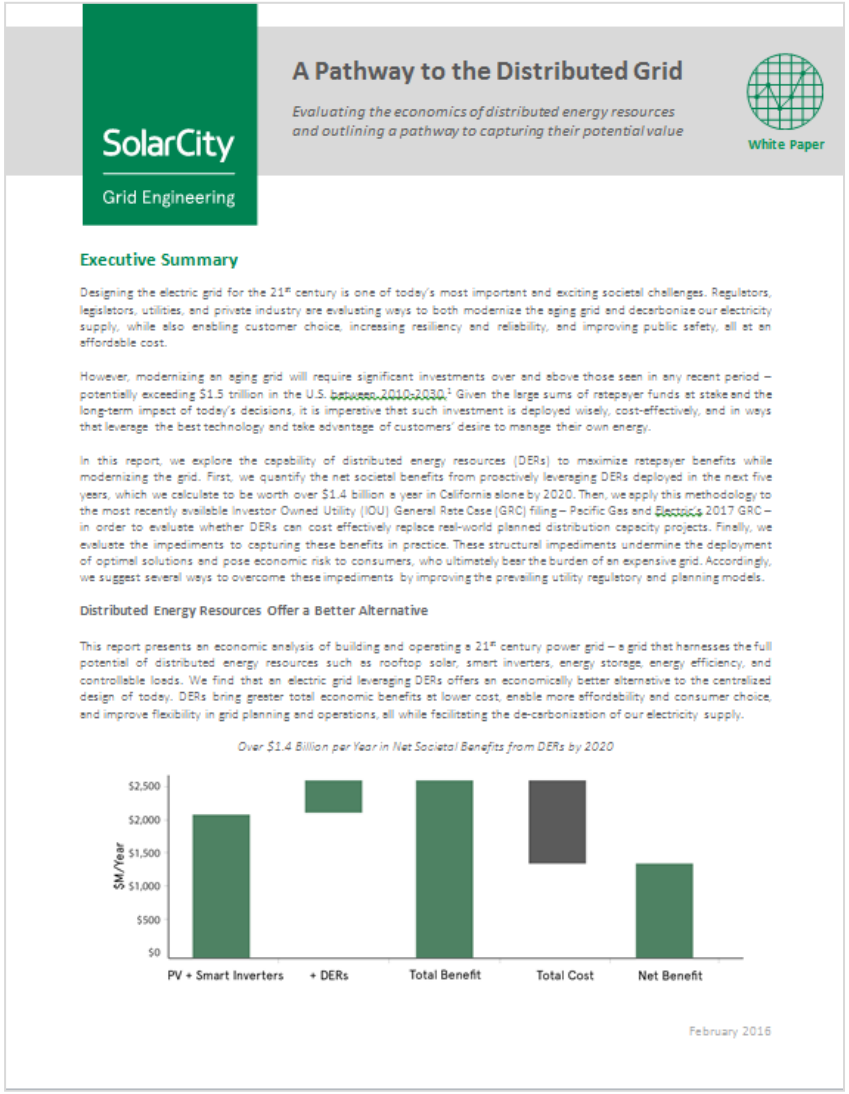
Grid planning data must be transparent and accessible to enable industry innovation

Data Transparency



Data Access





SolarCity

Grid Engineering

A Pathway to the Distributed Grid

Evaluating the economics of distributed energy resources and outlining a pathway to capturing their potential value

White Paper

Executive Summary

Designing the electric grid for the 21st century is one of today's most important and exciting societal challenges. Regulators, legislators, utilities, and private industry are evaluating ways to both modernize the aging grid and decarbonize our electricity supply, while also enabling customer choice, increasing resiliency and reliability, and improving public safety, all at an affordable cost.

However, modernizing an aging grid will require significant investments over and above those seen in any recent period – potentially exceeding $1.5 trillion in the U.S. between 2010-2030.[1] Given the large sums of ratepayer funds at stake and the long-term impact of today's decisions, it is imperative that such investment is deployed wisely, cost-effectively, and in ways that leverage the best technology and take advantage of customers' desire to manage their own energy.

In this report, we explore the capability of distributed energy resources (DERs) to maximize ratepayer benefits while modernizing the grid. First, we quantify the net societal benefits from proactively leveraging DERs deployed in the next five years, which we calculate to be worth over $1.4 billion a year in California alone by 2020. Then, we apply this methodology to the most recently available Investor Owned Utility (IOU) General Rate Case (GRC) filing – Pacific Gas and Electric's 2017 GRC – in order to evaluate whether DERs can cost effectively replace real-world planned distribution capacity projects. Finally, we evaluate the impediments to capturing these benefits in practice. These structural impediments undermine the deployment of optimal solutions and pose economic risk to consumers, who ultimately bear the burden of an expensive grid. Accordingly, we suggest several ways to overcome these impediments by improving the prevailing utility regulatory and planning models.

Distributed Energy Resources Offer a Better Alternative

This report presents an economic analysis of building and operating a 21st century power grid – a grid that harnesses the full potential of distributed energy resources such as rooftop solar, smart inverters, energy storage, energy efficiency, and controllable loads. We find that an electric grid leveraging DERs offers an economically better alternative to the centralized design of today. DERs bring greater total economic benefits at lower cost, enable more affordability and consumer choice, and improve flexibility in grid planning and operations, all while facilitating the de-carbonization of our electricity supply.

Over $1.4 Billion per Year in Net Societal Benefits from DERs by 2020

February 2016

Find out more:

A Pathway to the Distributed Grid

Evaluating the economics of distributed energy resources and outlining a pathway to capturing their value

solarcity.com/gridx

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Thank you