

# SCE's Reimagining the Grid & Grid Mod Strategy

2<sup>nd</sup> Global DSO Event

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Vishal Patel

Principal Engineering Manager, Integrated System Analysis

Southern California Edison

Energy for What's Ahead<sup>SM</sup>



# SCE at a Glance

## One of three Investor Owned Utilities (IOUs) operated by the CAISO

### CAISO

50,300 MW peak demand

Over 30 million customers

CAISO oversees the operation of the bulk electric power system by managing the flow of electricity across transmission lines, serving 80 percent of California and a small part of Nevada (VEA)

### SCE

23,800 MW peak demand

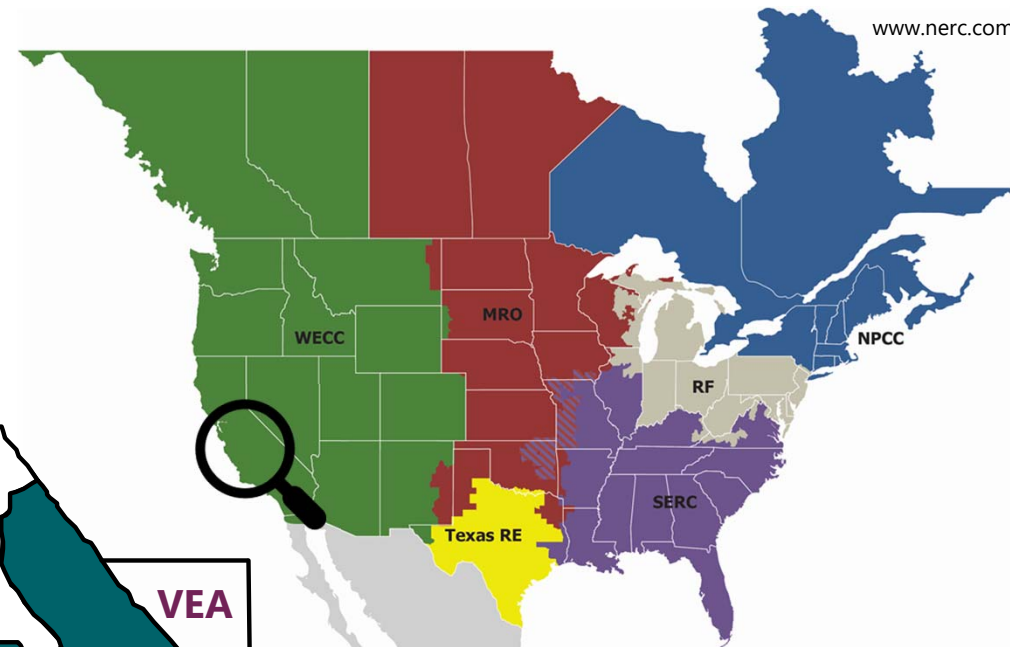
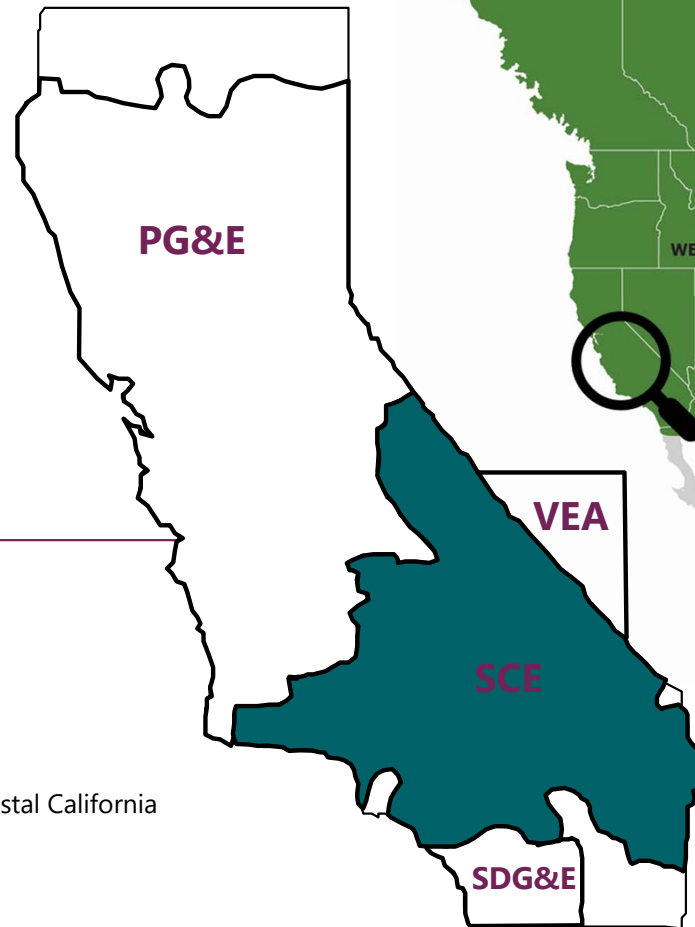
5 million customer accounts  
(serving 15 million residents)

50,000+ square miles  
service area across southern, central and coastal California

118,000 miles  
of SCE distribution and transmission lines

43% carbon-free power in 2020

SCE's estimated delivered power mix from owned gen and third-party power procurements



#### Eastern Interconnection

**MRO** – Midwest Reliability Organization  
**NPCC** – Northeast Power Coordinating Council  
**RF** – Reliability First  
**SERC** – SERC Reliability Corporation

#### Western Interconnection

**WECC** – Western Electricity Coordinating Council

#### ERCOT Interconnection

**TRE** – Texas Reliability Entity

# SCE's Perspectives to Achieve CA State Policy & Decarbonization Goals

California's climate-change goals include a 40% reduction in absolute greenhouse gas (GHG) emissions from 1990 levels by 2030, and 80% by 2050, as well as net-zero GHG emissions economy-wide by 2045



SCE is required by law to meet the following retail sales requirements for the power it delivers to customers:

- ✓ By 2020 – **33%** of power from Renewables Portfolio Standard (RPS)-eligible resources (*requirement met*)
- ❑ By 2030 – **60%** of power from RPS-eligible resources
- ❑ By 2045 – **100%** carbon-free power

**Weblinks are provided below**, which outline SCE's perspectives to transform the industry towards a clean energy future and achieve decarbonization goals:

## [2020 Sustainability Report](#)

### [Clean Power and Electrification Pathway](#)

An integrated blueprint for California to reduce GHG emissions and air pollutants by 2030.

### [Pathway 2045](#)

A data-driven analysis of the steps that California must take to meet 2045 goals, which identified 5 key actions for affordably achieving carbon neutrality.

### [Reimagining the Grid](#)

An assessment of the grid changes needed to support GHG reduction goals, while adapting to evolving customer and climate-change driven needs.

### [Mind the Gap](#)

An assessment of policy changes and additions needed to ensure California meets its GHG emissions reductions targets by 2030 in anticipation of its goal to decarbonize by 2045.

## SCE'S PATHWAY 2045 OUTLINES FIVE ACTIONS CALIFORNIA CAN TAKE TO AFFORDABLY ACHIEVE ECONOMYWIDE CARBON NEUTRALITY



### **Decarbonize Electricity**

100% of retail sales powered with carbon-free electricity



### **Electrify Transportation**

Including three-quarters of light-duty vehicles, two-thirds of medium-duty vehicles and one-third of heavy-duty vehicles



### **Electrify Buildings**

70% of space and water heating electrified in the built environment



### **Low-Carbon Fuels**

Applications that are not viable for electrification to use low-carbon fuels



### **Carbon Sinks**

Remaining carbon to be sequestered to reach carbon neutrality



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The future grid is becoming more complex with challenges that are changing the way we plan and operate the system

CUSTOMER



- Supporting **large adoption of DERs<sup>1</sup>** on distribution systems
- **Higher usage and load density** largely due to electrification
- **More end-uses that are sensitive to power quality** (e.g., power electronics)
- Overall, **increased reliance on electricity**

SUPPLY



- **Integrating very high levels of renewables** (intermittent and far from load centers)
- **Ensuring Resource Adequacy** with an evolving mix of resources
- Maintaining grid stability and resilience under **lower levels of inertia** with conventional generation retirements

CLIMATE

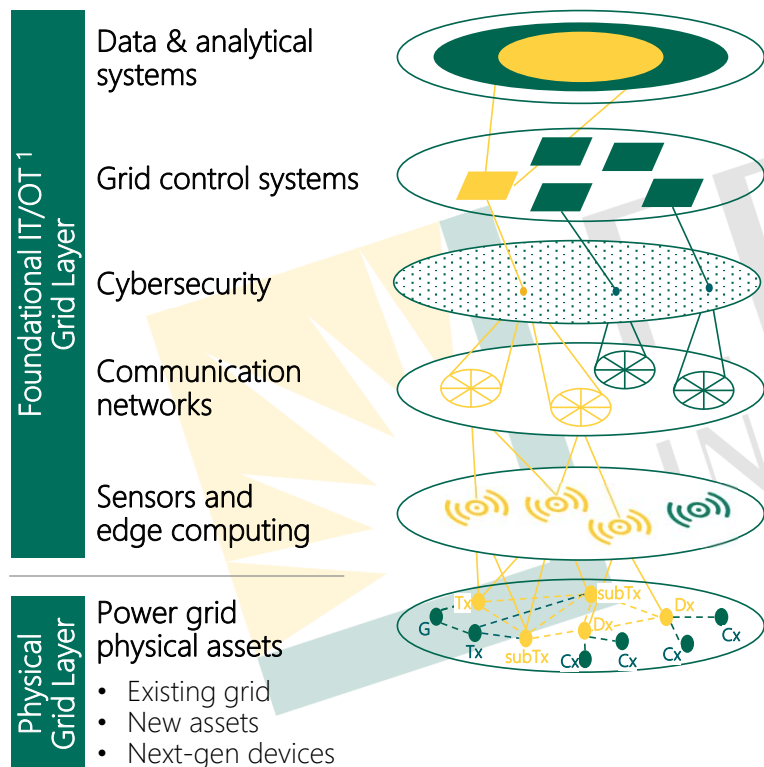


- Direct impacts to **performance of grid assets** from climate risks such as extreme temperatures, wildfires, and floods
- Climate-driven changes in **customer needs and electric service continuity**

1. Distributed Energy Resources.

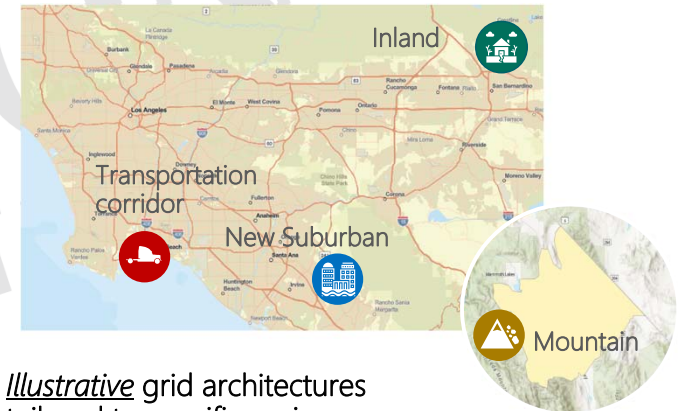
# The reimagined grid will be designed with region-specific architectures that will bundle new technologies together

Foundational & situational technology layers are bundled together...



...to develop solutions for specific needs across the grid

Sample of SCE "representative communities" with distinct local needs and characteristics:



*Illustrative* grid architectures tailored to specific regions:

- : Self-isolating grid (mini/micro-grid)
- : Distributed control grid (autonomous/edge)
- : High density/demand urban grid (incl. DC<sup>2</sup>)
- : Hybrid grid (combined architecture)

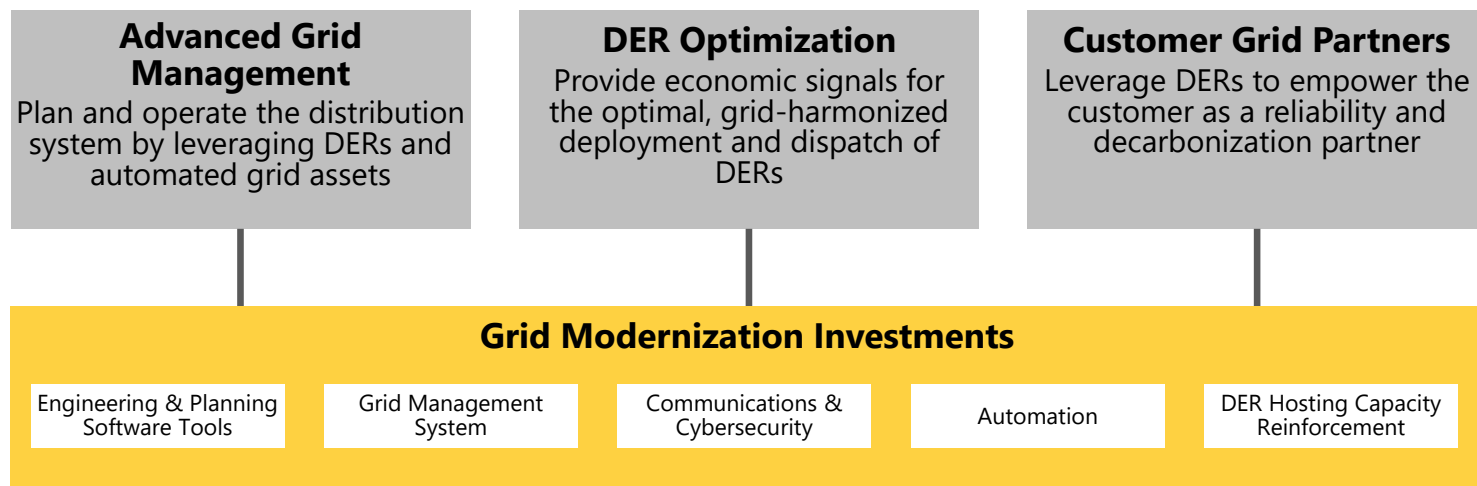
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1. Information Technology/Operational Technology  
2. Direct Current (DC) grid technologies, including medium-voltage DC breakers, DC links (converters + battery), etc.

SCE is modernizing the grid to address market, policy, and technology drivers

### Grid Modernization Vision

SCE's long-term vision is to transform its distribution grid into a secure, flexible, networked platform that optimizes DER value through advanced grid management and empowers customers with options to be reliability partners



# Five investment types comprise the Grid Modernization program



## **Engineering & Planning Software Tools**

Planning tools will modernize the distribution planning process to meet new DRP requirements.



## **Grid Management System**

Advanced distribution management systems in concert with field devices will improve safety, operational efficiency, and DER integration.



## **Communications & Cybersecurity**

Modern communication system will replace legacy technology with low latency, high bandwidth to support modern capabilities.



## **Automation**

Field devices such as advanced switches and line sensors will provide situational awareness, improve safety and reliability, and increase flexibility.



## **DER Hosting Capacity Reinforcement**

DERs that exceed thermal, protection, and power quality limits will require upgrades.



# Grid Evolution and Implications

Grid **planning, design, and operations** will need to shift from a focus on systemwide standards to one that meets multiple objectives based on localized needs. Changes in practice include:

- Strengthening our forecasting certainty & “forward radar”
- Moving from a deterministic planning approach to a risk-based, multi-scenario, and adaptive approach
- Greater integration of generation, transmission, distribution, and customer resources to optimize planning and operating decisions
- Recognizing the heterogeneity of different regional needs, moving from uniform grid architectures to region-specific, “modular” designs supported by foundational & select situational capabilities/technologies
- Incorporating flexibility and greater resiliency into future grid architectures with technologies that can rapidly reconfigure and isolate portions of the grid while utilizing storage, DERs, and demand-side solutions

## Reimagined Grid

*to enable Pathway 2045 vision and meet location-specific needs*

- Heterogenous and integrated T and D architectures
- Grid decisions more autonomous, flexible, and software/network-centric
- Common IT/OT platform deployed across the grid with advanced cybersecurity
- Tailored grid architectures with existing and next-gen technologies deployed for different regions



# Thank you

**Vishal Patel**

Principal Engineering Manager

Integrated System Analysis

Southern California Edison

Phone: 626-302-7704

[Vishal.Patel@sce.com](mailto:Vishal.Patel@sce.com)