



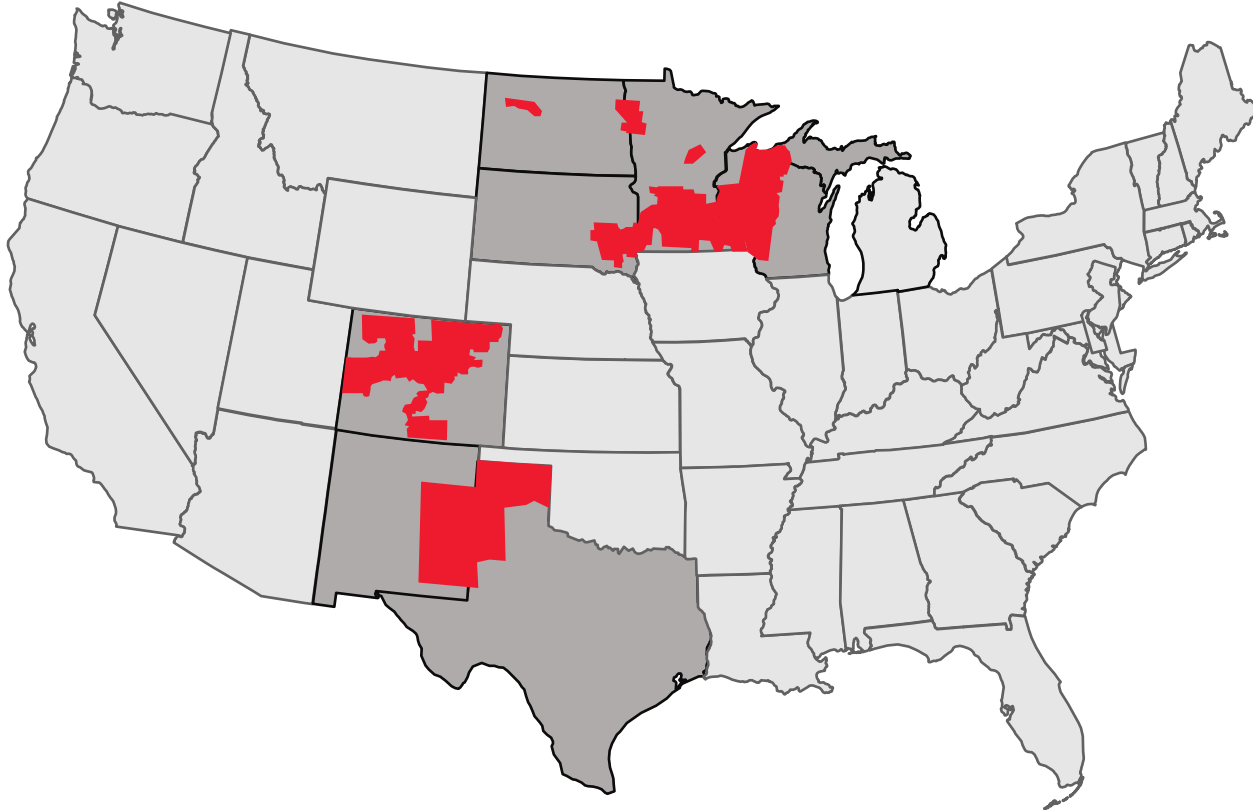
# FUTURE OF LOAD FLEXIBILITY

*Integrating Flexibility into the Grid of the Future*

Zach Pollock – Director of Grid Strategy & Emerging Technology

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# About Xcel Energy



## Serving eight states

**3.8** million electricity customers

**2.2** million natural gas customers

**2 GW** interconnected DER

**125,000** DER installations

## Nationally recognized leader:

- Wind energy
- Energy efficiency
- Carbon emissions reductions
- Innovative technology
- Storm restoration

# Our Goal to be a Net Zero Energy Provider by 2050



**Electricity\***  
(from 2005 levels)



**Natural Gas Service\*\***  
(from 2020 levels)



**Transportation\*\*\***  
(from 2020 levels)

2030

**80%**  
lower carbon  
emissions



**25%**  
lower  
greenhouse gases



**1 in 5**  
vehicles are EVs  
in our states



2050

**ZERO**  
carbon  
emissions



**NET-ZERO**  
gas service

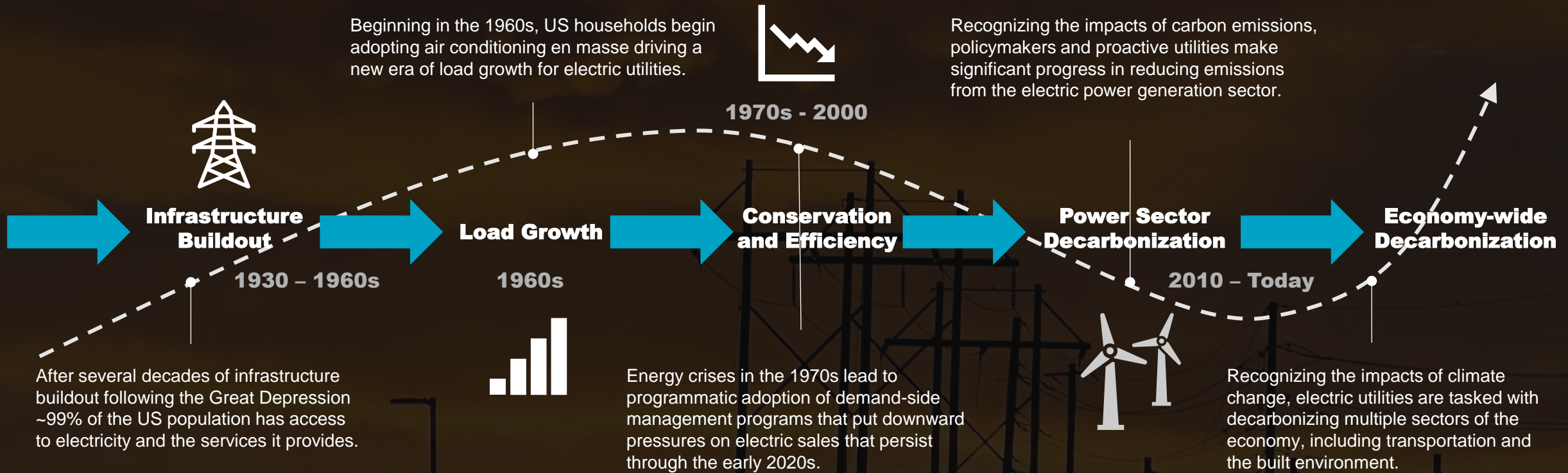


**ZERO-CARBON FUEL**  
accessible within  
1 mile



# A Brief History of the Electric System in the United States

The electric grid has been built out over the last century in tranches in response to various drivers of load growth and public policy objectives – a strategy that has worked well historically.



# THE GRID IS UNDERGOING A MASSIVE TRANSFORMATION

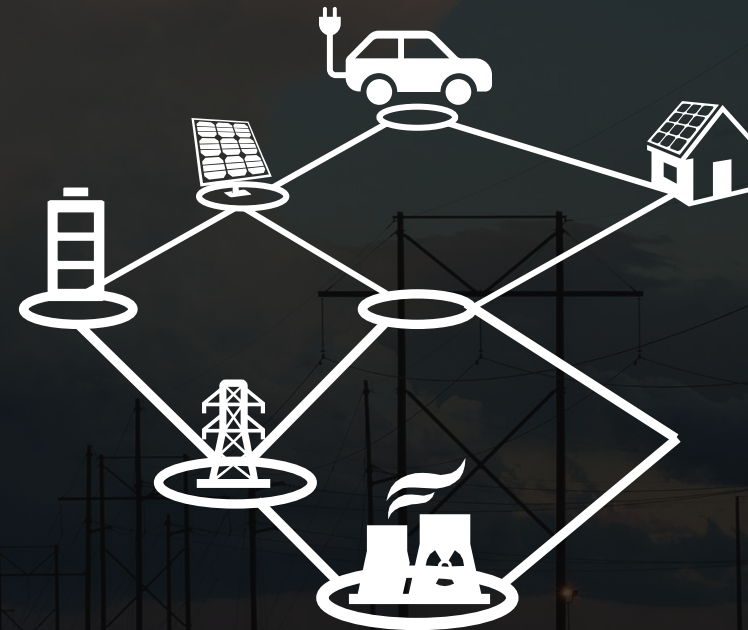
## THE GRID OF THE PAST



Customers received electricity via central generation, transmission, and distribution



## TODAY



More load and DERs at the grid edge, requiring a modernized approach to distribution system planning and operations.

# Foundational Principles for Planning the Grid of the Future

Planning for the energy system of the future requires an integrated approach to achieving multiple objectives.

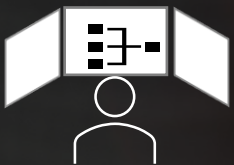


Investment in additional infrastructure based on our system design principles, aiming for lower system loading levels than can meet a diverse and evolving set of customer needs.



Maximize the use of existing and new infrastructure through asset health and reliability programs.

## FOCUS OF TODAY'S DISCUSSION



Pursuit of cost-effective infrastructure alternatives (e.g. DERs, Load Flexibility, NWAs) when and where feasible (with the right market signals), while also deploying grid technologies to help improve how we plan and operate the grid.

**TODAY**  
**<60%**

**OF THE GRID IS UTILIZED TO ITS FULL  
CAPABILITIES**



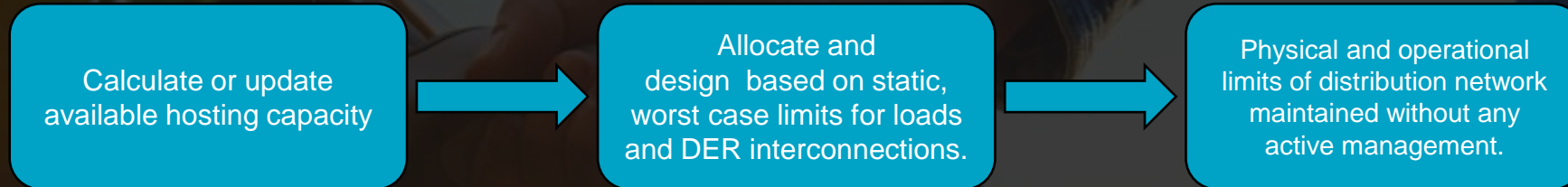
**PEAK DEMAND** only occurs a few days each year, for a few hours on each day – but is still the primary driver of investment

**Planning and operating to a single, maximum peak value means most assets are not utilized to their full potential**

# Today versus Tomorrow: Planning & Operations Functions

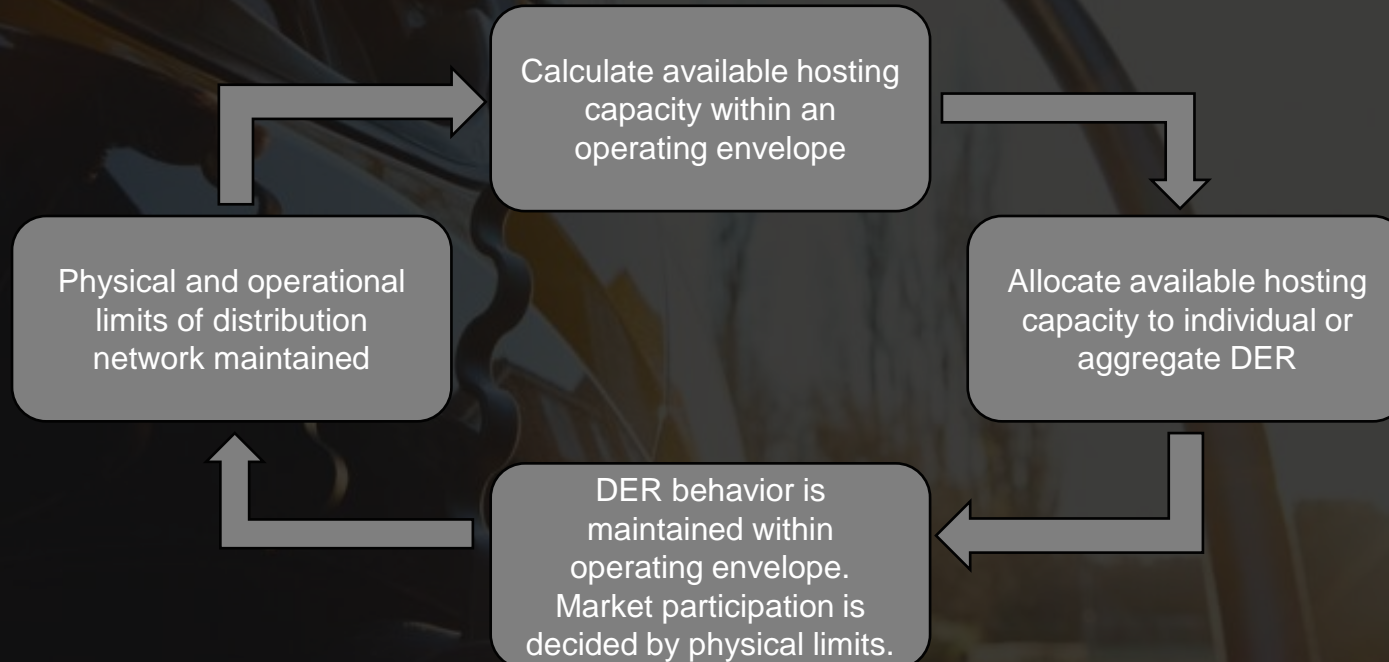
## Static vs Dynamic Distribution Grid Planning and Operation

**Today:**



PERFORMED PERIODICALLY (YEARS)

**Tomorrow:**



PERFORMED EVERY SECOND/ MINUTE/ HOUR



FLEXIBILITY allows us to better utilize our assets relative to their static limits

WHAT IF  
**20%**

OF OUR LOAD WAS FLEXIBLE IN EVERY  
HOUR OF EVERY DAY?

# Foundational Principles of Flexibility



**IMPROVE  
VISIBILITY**



**LEVERAGE DERS AS  
AN ASSET**



**STANDARDIZED  
COMMUNICATIONS**



**OPERATIONAL  
CHANGE  
MANAGEMENT**

# What are we doing to more dynamically plan and operate the grid today?



## IMPROVING VISIBILITY / ACCESS TO MORE DATA

- More monitoring and communications to the Grid Edge (e.g., leveraging AMI data)



## INCREASING SOPHISTICATION OF ANALYSIS

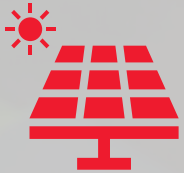
- Moving from planning based on deterministic annual “peaks” to hourly analysis (i.e. 8760)
- Shifting from deterministic to stochastic/probabilistic modeling



## INTEGRATING FLEXIBILITY IN PLANNING AND OPERATIONS

- Challenging static planning limits via “Flexible Interconnection” and Load Connections
- Embracing new operational technologies (e.g. DERMS)

# Alignment of Dynamic Planning and Operations to Xcel's Strategic Initiatives



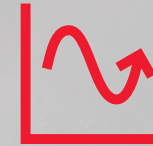
Make DERs an asset to our system.



Mitigate potential operational and planning impacts as penetration levels increase.



Provide bridge solutions for load and generation customers (e.g., flexible interconnection and load)



Reduce overall system costs by planning and managing the distribution system more dynamically



Reduce risk of cost shift from DER upgrades

**LEAD THE CLEAN ENERGY TRANSITION**

**ENHANCE THE CUSTOMER EXPERIENCE**

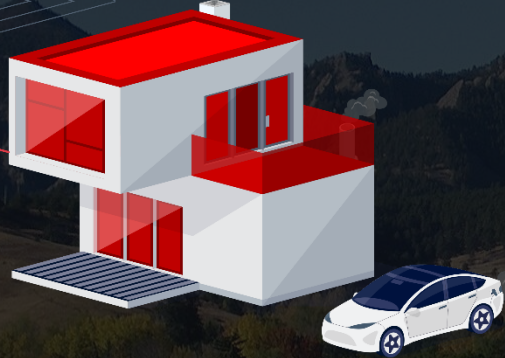
**KEEP CUSTOMER BILLS LOW**

# Prime Time VPP Project Overview | Case Study

Planned project, received \$12.7M federal funding via IIJA

**TODAY**

**Peak Load – 38 MW**



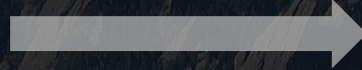
**Solar** 11.2 MW

**Batteries** 0.18 MW

**EVs** 0.036 MW

**Heating/Cooling** 1.8 MW

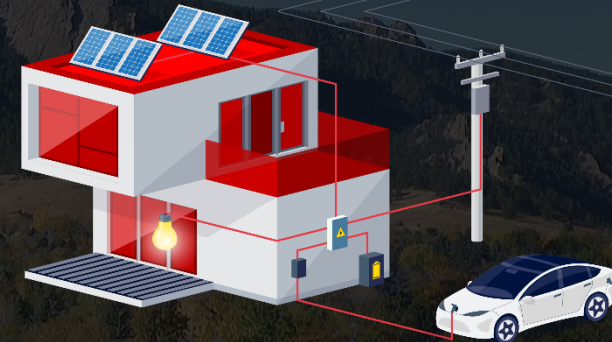
**VPP**



**Over the next 8 years:**  
31% Peak Load Growth  
61% DER Growth

**FUTURE**

**Peak Load 50 - MW**



**Solar** 19 MW

**Batteries** 2.4 MW

**EVs** 2.3 MW

**Heating/Cooling** 2.9 MW

## Technology Stack

- Dispatching DR via Separate Platforms
- Scheduling via Legacy Systems
- Notifications sent from several third-party systems

- Dispatching and Scheduling via Single Integrated Platform
- Serving as an Integration Hub for 3rd Party DERs
- Centralized Automatic Notifications

## Operating Model

- Limited visibility/control
- More deterministic planning and operating model
- Focus on Bulk System Benefits
- Static Incentive Programs

- Enhanced visibility/control
- More dynamic planning and operations
- Both Distribution and Bulk System Benefits
- Performance/service-based incentives