



Reporting Item

BOARD OF DIRECTORS

February 15, 2022

ITEM

Pathways to Decarbonization Energy Portfolio and Customer Work Stream Summary


PURPOSE

To provide an overview on the objectives, methodology, findings and recommendations on the Pathways to Decarbonization Energy Portfolio and Customer work streams for February 2022.


FACTS

1. In November 2019, the Omaha Public Power District (“OPPDP”) Board of Directors approved an overall commitment for OPPDP to “Conduct all of its operations (including operations such as building services and transportation) in a manner that strives for the goal of net zero carbon production by 2050”. To identify various pathways to meet this goal, OPPDP has embarked upon a Strategic Initiative titled “Pathways to Decarbonization”. The strategic initiative is broken into four separate work streams: Energy Portfolio, Internal Operations, Customer, and Community. In February 2022, the Energy Portfolio and Customer work streams will present their findings and recommendations and in March of 2022, Community & Internal Operations will do the same.
2. The Energy Portfolio was a broad, and far looking study, evaluating many technologies and timelines over an extended horizon. The outcome of the study was actionable pathways to eliminate or significantly reduce greenhouse gas emissions from OPPDP’s energy portfolio, while ensuring system reliability. These pathways identified common solution across the various pathways which serve as a foundation for future decision making.
3. The Customer work stream identified programs and products to help OPPDP customers reduce their personal carbon footprint. In pursuit of program and product identification, OPPDP conducted market analysis, technology exploration, benchmarking and developed a repeatable product prioritization framework focusing on decarbonization.
4. This update communicates a summary of the objectives of the work streams, the methodology for executing the studies, key findings, recommendations, and next steps.

RECOMMENDED:

DocuSigned by:

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 Bradley R. Underwood
 Senior Director – Systems Transformation

APPROVED FOR REPORTING TO BOARD:

DocuSigned by:

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 L. Javier Fernandez
 President and Chief Executive Officer

BRU:rs

Strategic Initiative: Pathways to Decarbonization

BOD Update February 2022

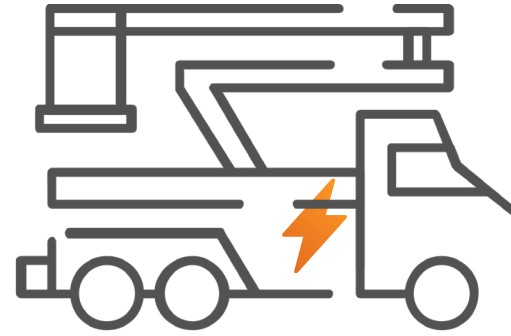
Colton Kennedy, Paul Fortney, Ryan Stigge
February 15, 2022

NET-ZERO CARBON
PRODUCTION
BY **2050**

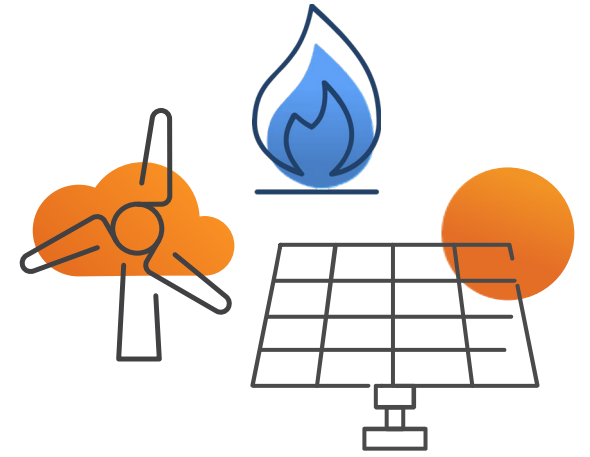


Agenda

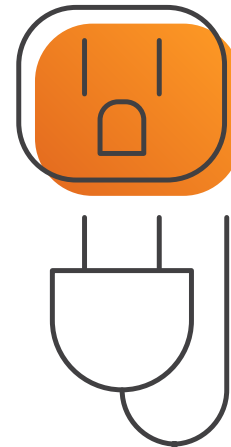
- Energy Portfolio Project Update
- Customer Project Update



Internal Operations



Energy Portfolio



Customer
Products & Services



Community Partner



Decarbonization: Energy Portfolio Project



Energy Portfolio

- The Energy Portfolio Project studied actionable pathways to eliminate or significantly reduce greenhouse gas (GHG) emissions from OPPD's energy portfolio, while balancing impacts on reliability, resiliency, and affordability
 - Developed and evaluated pathways to achieve decarbonization to set a foundation for future decision making including carbon reduction percentages and timelines
 - Identified and quantified the impact and risks of pathways on environmental impact, reliability, resiliency, financial stability, and affordability
 - Engaged the community and stakeholders to promote collaboration and education



Study Scope

- The Energy Portfolio Study is a broad, and far-looking study, evaluating many technologies and timelines over an extended horizon
- The study is intended to directionally inform OPPD stakeholders and decision makers
- Additional work is required to fully understand detailed impacts of pathways

The Energy Portfolio Project *IS*:

A study to develop a range of 'Pathways' that achieve Net Zero Carbon by 2050

An evaluation of existing and emerging energy technologies to effectively meet the Net Zero goal while meeting reliability needs and minimizing financial impact

A scenario analysis to understand the impacts of implementation timelines

A report on findings and commonalities of successful portfolios

The Energy Portfolio Project *IS NOT*:

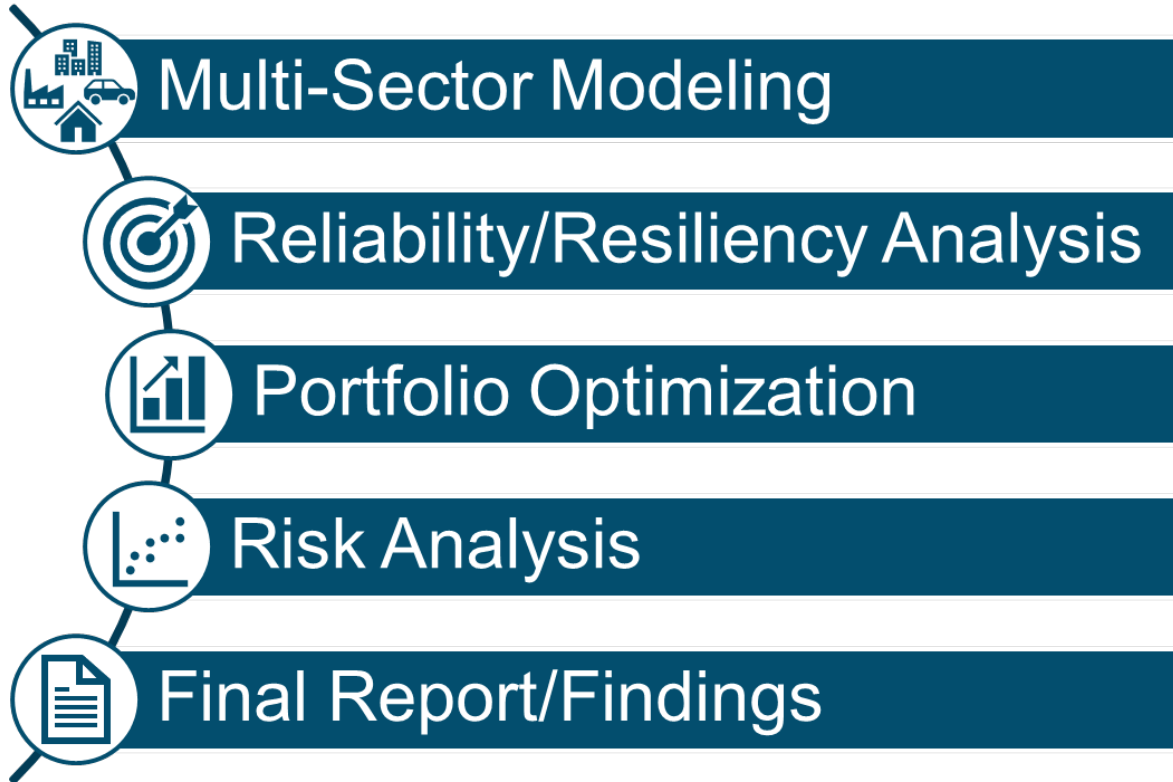
A recommendation for a singular future energy portfolio

A decision to add or retire specific assets

A siting study to determine where new assets will be located

A detailed transmission analysis required to understand full impacts of specific pathways

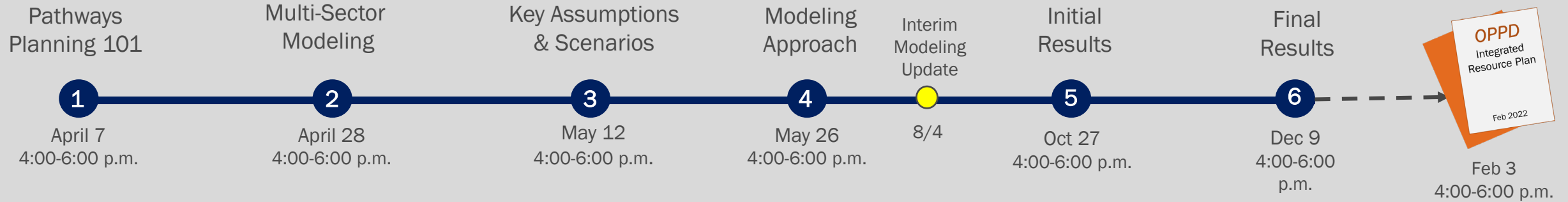
Overview



OPPD.....

- Worked with Energy and Environmental Economics (E3) to perform a multi-stage analysis
- Complemented development of electric technology pathways with economy-wide multi-sector analysis
- Developed multiple technology pathways to meet Net Zero Carbon goal while maintaining affordability, reliability, and resilience
- Included **reliability and resiliency** as an absolute requirement and key enabler of decarbonization. Reliability is the foundation of all pathway results.

Energy Portfolio: Stakeholder Workshops



Workshop #1	Workshop #2	Workshop #3	Workshop #4	Workshop #5	Workshop #6	IRP Presentation
Pathways Planning 101	Multi-Sector Modeling	Key Assumptions & Scenarios	Modeling Approach	Initial Results	Final Results	Integrated Resource Plan
Duration: 2 hours IAP2 Level: Inform	Duration: 2 hours IAP2 Level: Inform/Consult	Duration: 2 hours IAP2 Level: Involve	Duration: 2 hours IAP2 Level: Consult	Duration: 2 hours IAP2 Level: Consult	Duration: 2 hours IAP2 Level: Inform	Duration: 2 hours IAP2 Level: Inform
Provides an overview of the Energy Portfolio study, its objectives, approach and stakeholder engagement plan.	Review of results for modeling Net Zero carbon across all energy uses in OPPD's service territory.	Review technologies, assumptions, and scenarios that will be used and analyzed in the Energy Portfolio modeling.	Review in-depth look at the technical modeling considerations and approach that will be used to develop pathways.	Review initial modeling results for Energy Portfolio decarbonization pathways.	Review final results of modeling with consideration of feedback received on initial results.	Review IRP filing and listen to stakeholder feedback.
<ul style="list-style-type: none"> Coordination with OPPD's 2021 IRP Introduce study team members 	<ul style="list-style-type: none"> Emissions across sectors Impact on future electric system demand 	<ul style="list-style-type: none"> Technology performance, fuel, and cost forecasts Scenarios for modeling 	<ul style="list-style-type: none"> Resource adequacy modeling Resource optimization modeling 	<ul style="list-style-type: none"> Initial energy portfolio pathways to achieve Net Zero Carbon by 2050 	<ul style="list-style-type: none"> Final energy portfolio pathways to achieve Net Zero Carbon by 2050. 	
<i>Recording Available Online</i>	<i>Recording Available Online</i>	<i>Recording Available Online</i>	<i>Recording Available Online</i>	<i>Recording Available Online</i>	<i>Recording Available Online</i>	





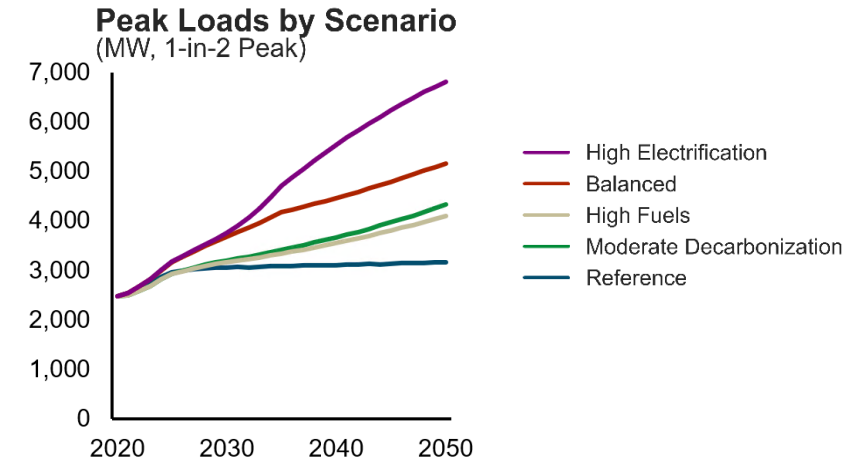
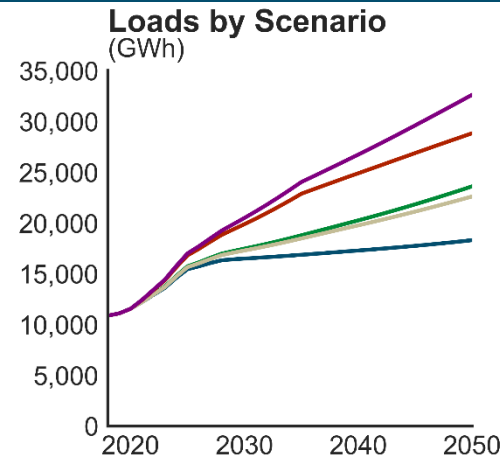
Electrification is Central to Economy-wide Decarbonization and Impacts Electric Resource Needs

+ All decarbonized economy-wide scenarios feature **significant OPPD electric load and peak demand growth from electrification**

+ This depends on:

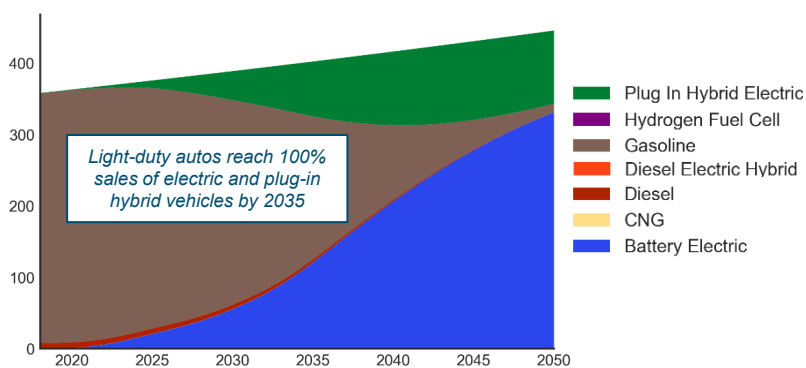
- Electric vehicle adoption across all vehicle types
- Adoption of electric heat pumps for space and water heating
- Fuel switching in industrial uses from gas to electricity and hydrogen

OPPD Electric Load Impacts

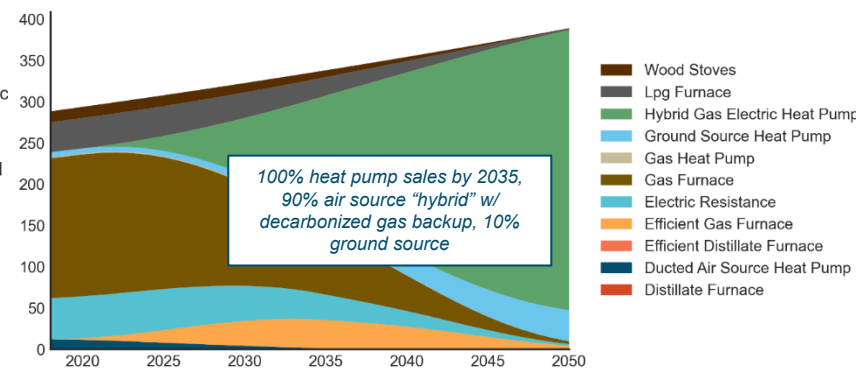


Transformation of Transportation, Building, and Industrial Energy Use

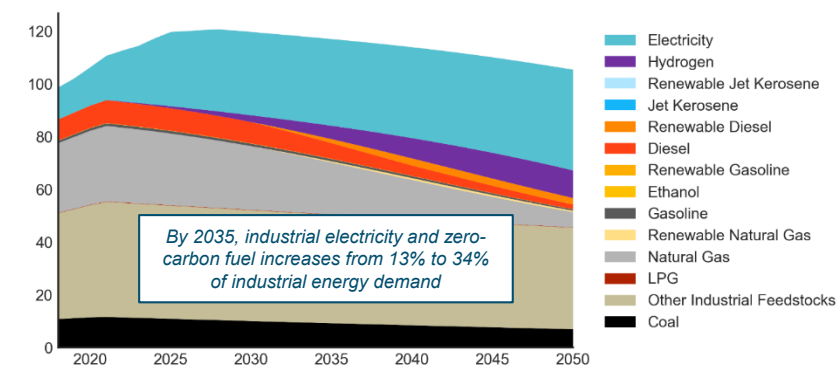
Light-Duty Auto Stocks in Balanced Scenario (Thousands)



Res. Single-Family Space Heating Stocks in Balanced Scenario (Thousands)



Industry Energy Demand in Balanced Scenario (Petajoules)

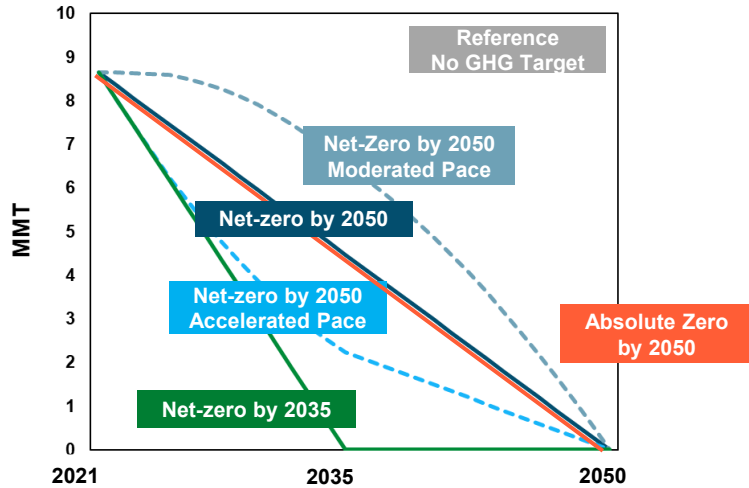




OPPD Energy Portfolio Scenarios

OPPD Framing Scenarios

Pace of Decarbonization



Technology Availability

Scenario	Technologies Available
Mature Only	Only mature (solar, wind, gas, li-ion, flow batteries, etc.)
Mature + H2	+ Hydrogen enabled gas
Mature + Emerging	+ Advanced nuclear, gas w/ carbon capture and storage, ultra-long duration seasonal storage
Mature + Emerging, No H2	- Hydrogen enabled gas

Framing scenarios consider various paces of decarbonization under multiple technology availability scenarios

Sensitivity Scenarios

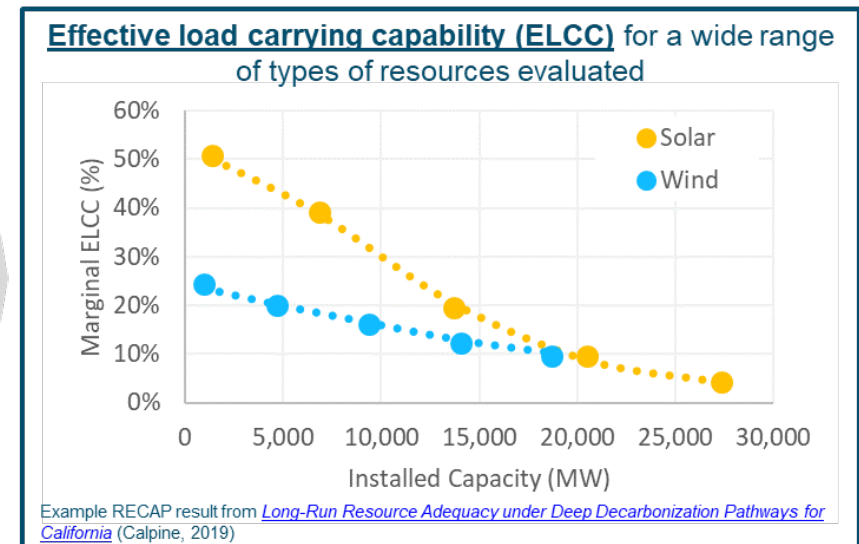
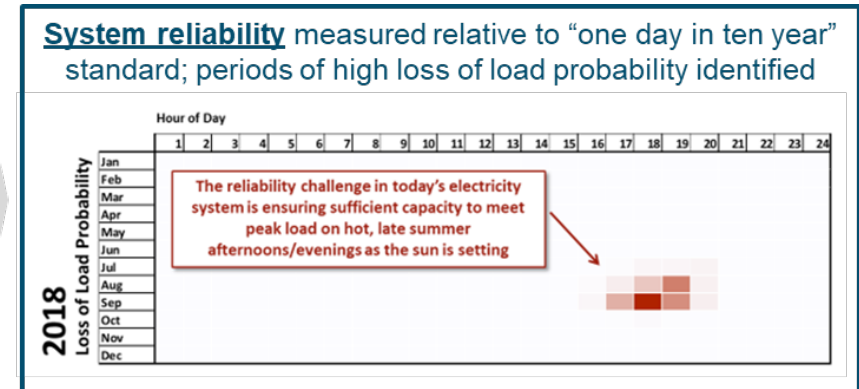
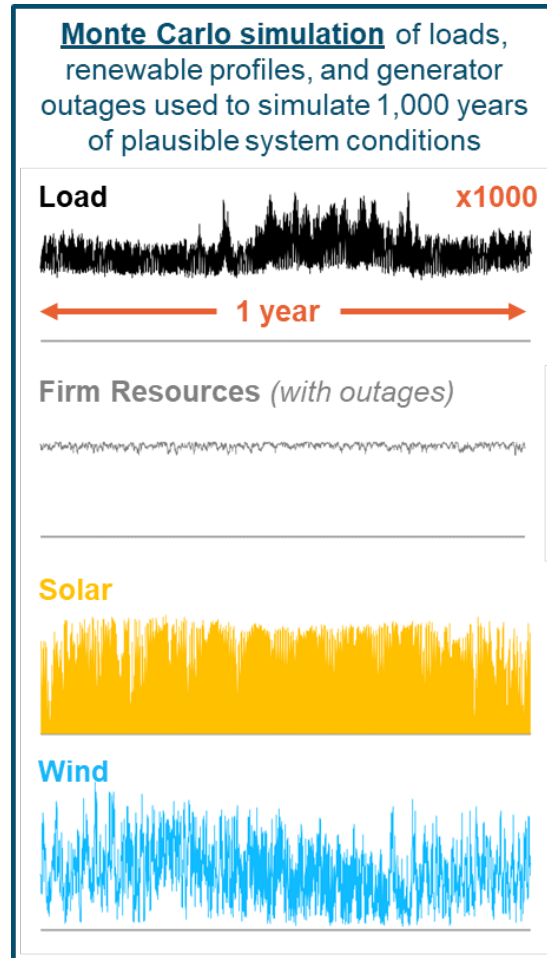
Assumption	Sensitivities
Multi-Sector Electrification Loads	High Electrification, Moderate Decarbonization, Reference
SPP Resource Mix	Reference
Carbon pricing	Carbon price
Technology costs	Breakthrough costs
Flexible Loads	High

Sensitivities consider additional scenarios for load, cost, technology, and policy



ELCC Modeling Approach

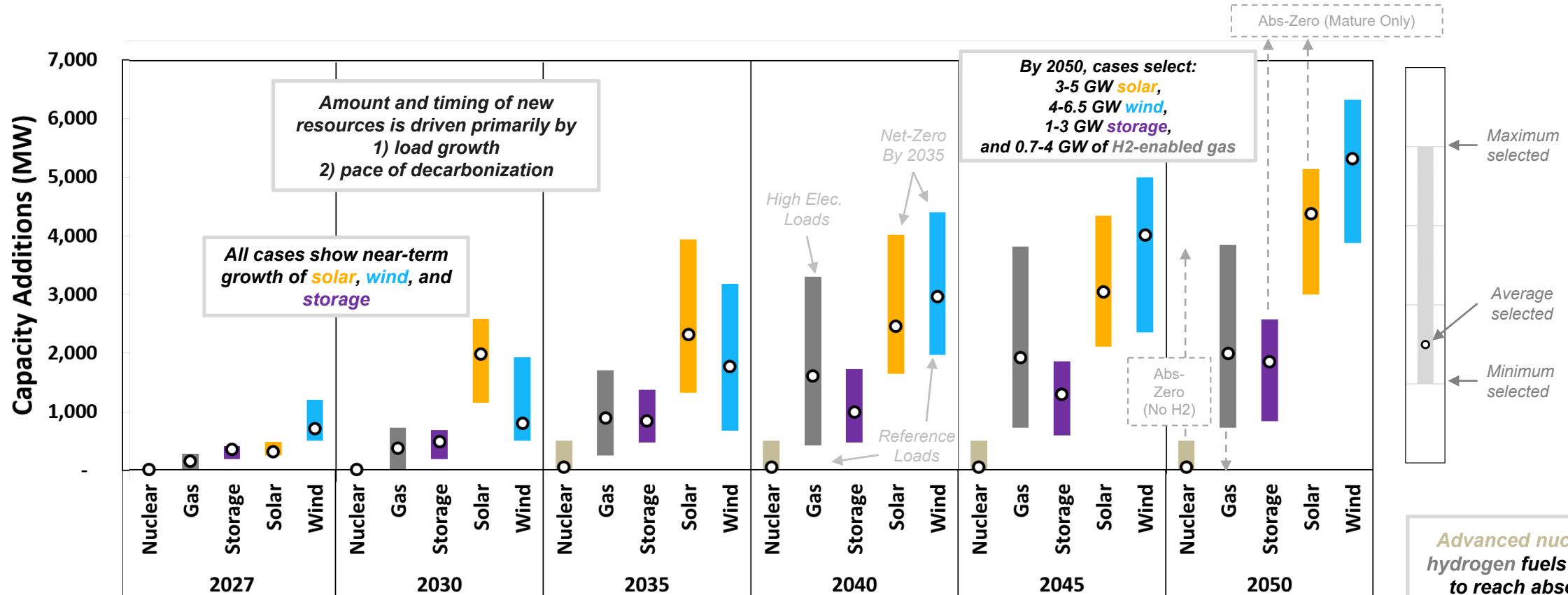
- + E3 used the RECAP model to develop estimates of wind and solar ELCC values for OPPD
- + RECAP is a monte carlo-based model that uses historical weather, load, wind, and solar conditions to evaluate the OPPD system over thousands of simulated years
 - Captures correlations between wind, solar, and load
- + Key outputs for portfolio optimization include:
 - Total capacity requirement (MW) to meet 1-day-in-10-year standard
 - ELCC values of wind, solar, battery storage, and demand response





New Resource Needs

Range of Resources Added in Net-Zero Carbon Scenarios



- Graph shows the range (and average) of resources selected by RESOLVE across all decarbonized scenarios
- These additions are on top of planned Power with Purpose solar and gas additions
- Gas includes both new H2-enabled gas and NC coal-to-gas repowering
- Near-term buildout subject to execution feasibility (SPP interconnection, permitting, supply chain, etc.)

Key Findings

- **OPPD can achieve Net Zero while balancing affordability and reliability**

Net-zero is achievable with projected generation and transmission cost impacts of approximately 8-22% over time by 2050 while maintaining resource adequacy levels.

- **All scenarios cease coal generation and reduce use of fossil fuels**

Generation from fossil resources is reduced in all Net Zero scenarios as it is increasingly displaced by low-carbon resources. All scenarios ultimately repower or retire OPPD's coal generation by 2045 and maintain firm resources with minimum capacity factors.

- **The goal requires a mix of renewable energy, energy storage, and community-wide energy efficiency**

Large quantities of low carbon resources are required to displace fossil generation and reduce emissions across OPPD's system.

Key Findings

- **Firm Generation is needed to maintain resource adequacy**

Wind, solar, energy storage, and demand-side resources support reliability but have limitations, especially during certain extreme weather events. Firm resources are required to support the system during these critical periods.
- **Resources are consistent across a variety of pathways**

A core set of resources are common across a variety of scenarios. Pace of Decarbonization scenarios sets the speed of resource decisions. The solution scales proportionally with total load.
- **Achieving Absolute Zero is more costly and is dependent on future technology development**

Achieving Absolute Zero with current technology requires impractically high levels of new resources at significantly higher cost. However, emerging technologies such as hydrogen, long-duration storage, and small modular reactors have the potential to make this more feasible.

Key Findings

Accelerating decarbonization reduces cumulative emissions at a relatively low incremental cost, but poses implementation and integration challenges

Accelerating Net Zero decarbonization pathways results in relatively low incremental cost, but requires integrating higher levels of resources in the near-term, which may pose supply chain, financial, grid interconnection, and operational risks.

The changing resource mix will pose new resiliency challenges that must be evaluated, understood, and mitigated

Critical resource adequacy periods are expected to change from peak summer conditions to periods of extreme cold or extended periods of low renewable generation. Grid resiliency will depend on how utilities anticipate and prepare for these extreme events as the grid continues to evolve.

Outcome

- The Energy Portfolio Project identified actionable pathways to eliminate or significantly reduce greenhouse gas (GHG) emissions from OPPD's energy portfolio, while balancing impacts on reliability, resiliency, and affordability
- The results of the study are incorporated into the long-term horizon of OPPD's draft 2021 IRP
- The study, which surpasses all prior OPPD work to understand the directional changes required for OPPD to achieve Net Zero Carbon by 2050, is informing OPPD's leadership and board of directors to support future decision making

Advanced Feasibility Studies

While the Energy Portfolio provides the long-term directional **WHAT**, advanced technical studies are required to understand the **HOW** and to answer additional detailed questions:

- Advanced Supply-Side Resource Feasibility Study
 - Existing resource transition planning, specifically Nebraska City Station (*energy assurance, operational impacts*)
 - Future resource approach (*hybrid vs. standalone, interconnection*)
- Advanced Demand-Side Resource Feasibility Study
 - Distributed resource potential and planning (*energy efficiency, load flexibility, distributed energy resources*)
 - Distribution system impacts (*electrification impacts*)
- Detailed scoping of these studies will occur in early 2022 and will inform organization resource requirements and timelines.



Decarbonization: Customer Project



Objective

Identify programs and products to help OPPD customers reduce their personal carbon footprint.

- Conduct market analysis, technology exploration, and industry and non-industry benchmarking
- Review OPPD product prioritization framework to ensure the value of decarbonization is recognized and included in prioritization
- Develop a repeatable product evaluation framework focusing on decarbonization

Key Deliverables:

- Decarb-focused product strategy
- Prioritized decarb product roadmap (3 - 5 year focus)
 - Other programs have separate roadmaps which roll-up and are prioritized by the Product Development and Marketing department
 - Initial focus is helping customers begin the journey to reducing their carbon footprint through energy efficiency. The focus will move over time to beneficial electrification and shifting usage to help OPPD with reliability and affordability
- Acceleration plan

Overview

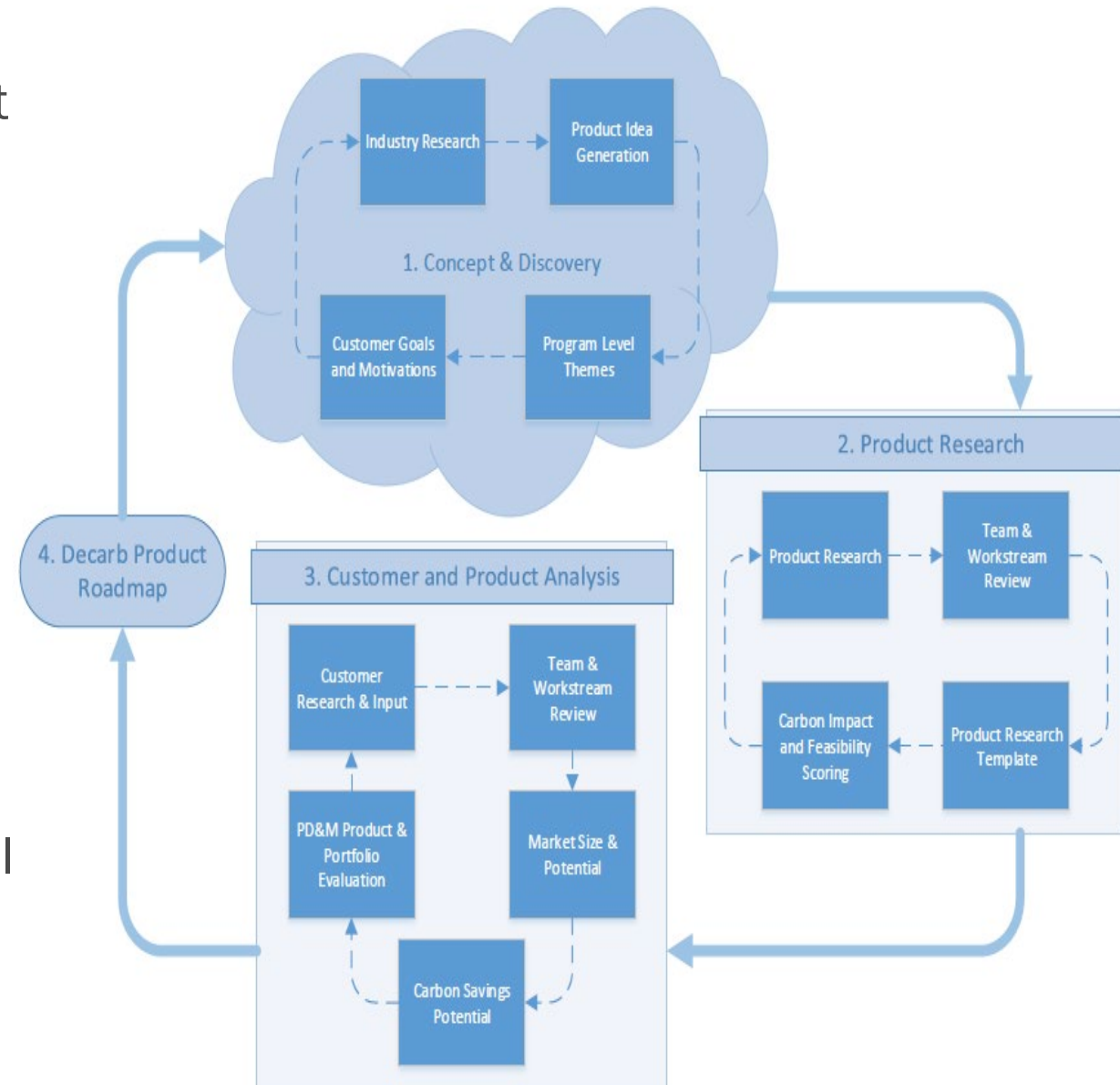
Developed and piloted a repeatable product evaluation framework which included:

- Industry research and benchmarking
- 2 rounds of product concept research, benchmarking and scoring
- High level product designs, budgets, YOY growth expectations

Phase I included analysis of 228 concepts covering all aspects of decarbonization

Phase II featured a more detailed analysis on the top 26 scoring concepts from phase I

Completed customer research, including prioritization surveys and stakeholder workshops



Key Findings

Customer Motivations

- **Residential:**

- Customers want to positively impact the environment, improve reliability and save money, but lack the education and information to take action
- Customers believe they can make an impact and in many cases would be willing pay a little more to do so
- Customers prefer to do business with companies demonstrating environmental leadership
- Only 4% of OPPD customers feel their utility is most responsible for improving the environment; they view utility as a trusted source for information for what they can do personally.
- Customers surveyed agreed OPPD should work towards better educating the community on ways they can lower their carbon footprint and incentivize those who actively take steps in doing so.

- **Commercial and Industrial:**

- Solutions seem big, intimidating and there is a desire for more education
- Sustainability is almost a requirement
- Customers look at utilities to help and partner with to make an impact (more so than residential).
- Businesses agree that OPPD should better educate them on ways they can lower their carbon footprint and incentivize business customers that are actively taking steps to lower their carbon footprint.

Sources: OPPD Power Panel Survey Decarbonization Surveys, DSM Potential Study, What Does Green Mean to You Workshop, JD Power Results, Cogent Results, Green Power Redesign Phase I, Other Utilities Decarb Strategies (Austin Power, Duke Energy, etc...)

Key Findings

Decarb Product Roadmap

Program Type	Product Concept	Target Market
Energy Efficiency	Energy Star Appliance Rebate	Residential
Electrification	Electric Yard Equipment Program/Rebate	Residential/Commercial
Energy Efficiency	Commercial Outdoor Lighting (and controls) Rebate	Commercial
Energy Efficiency	Commercial Food Service Equipment Rebate	Commercial
Energy Efficiency	Residential LED Lighting Rebate	Residential
Environmental	Community Solar Program Expansion	Residential
Distributed Energy Resources	Residential Weatherization Program and Rebate	Residential
Electrification	Commercial Fleet Electrical Vehicle Incentives and education	Commercial
Distributed Energy Resources	Commercial Customer Community Solar	Commercial
Environmental	Residential Shade Tree Program and Rebate	Residential
Energy Efficiency	Heat Pump Water Heater Rebate	Residential/Commercial
Energy Efficiency	Free Commercial Energy Rating Assessment	Commercial
Energy Efficiency	Small Business Lighting Rebate	Commercial
Energy Efficiency	HVAC Tune-ups Rebate	Residential
Demand Response	Business/Commercial Customer Peak Load Reduction Incentives	Commercial
Energy Efficiency	Residential Large Appliance Recycling	Residential
Electrification	Electric Vehicle Charger Station Network throughout the OPPD Service Territory	Residential/Commercial
Energy Efficiency	Mass Marketing Energy Efficiency Education (all channels and medium)	Residential/Commercial
Electrification	Electric Vehicle Education Program	Residential/Commercial
Energy Efficiency	Commercial Building Construction using Net Zero and Energy Efficiency Standards	Commercial
Energy Efficiency	Business/Commercial Customer Energy Efficiency Audits with OPPD Installing Upgrades	Commercial
Energy Efficiency	Comparison of Monthly Energy Usage to Peers	Residential
Customer Owned Generation	OPPD Residential Solar Installation and Discount	Residential
Energy Efficiency	Energy Efficiency Smart Thermostat Rebate	Residential
Electrification	Heat Pump Clothes Dryer Rebate	Residential
Energy Efficiency	Home Energy Efficiency Audit and Assessment	Residential

Next Steps

Operationalize repeatable decarb product evaluation framework, and assign an internal champion

Establish short, intermediate and long-term targets in tandem with System Transformation and align the roadmap

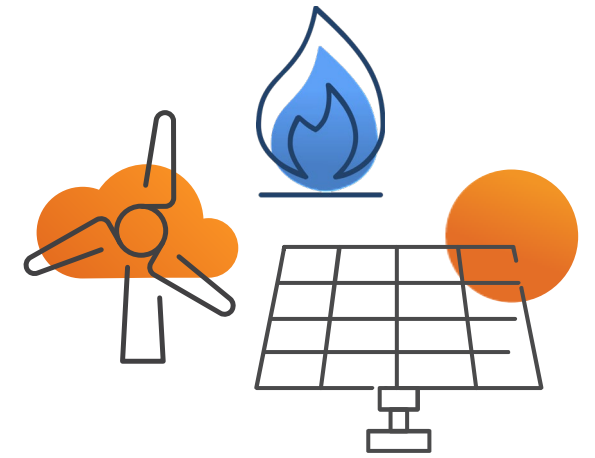
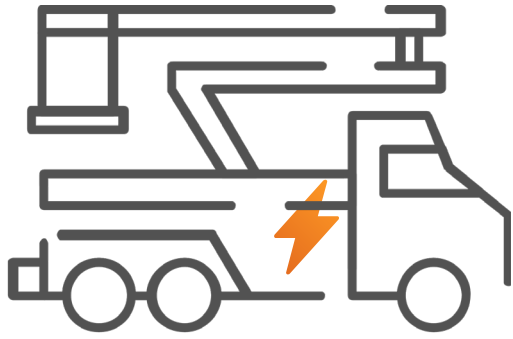
- Collaborate on Advanced Feasibility Studies to inform and develop intermediate- and long-term product planning

Ensure the programs above have incremental resources (both financial and people) identified to achieve the plan

- Large resource investments may be required in order to accelerate energy efficiency and carbon reduction

Track and report carbon savings both internally and externally

Use community workstream output and product offerings to fuel community-driven initiatives and market transformation



Questions, Discussion

