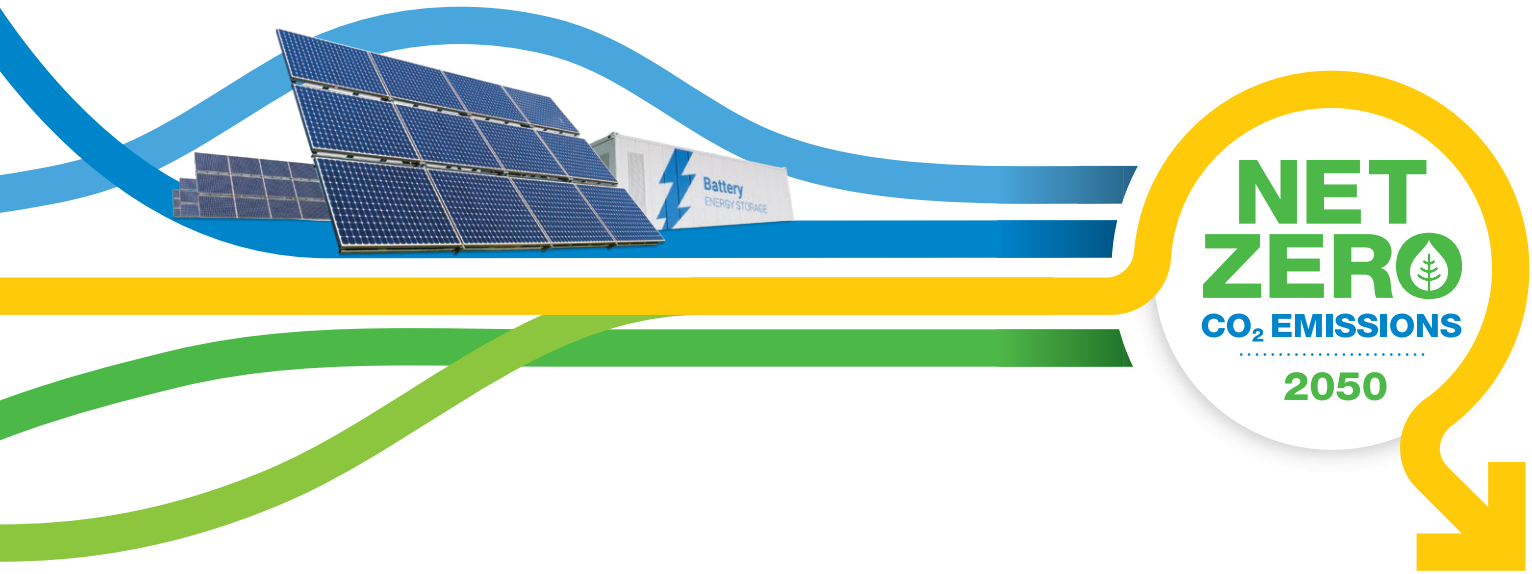
THE PATH FORWARD

Electric Integrated Resource Plan

Executive Summary: An OUC Management Clean Energy Roadmap Recommendation

October 14, 2020



OUC
The *Reliable* One®

ABOUT OUC

Orlando Utilities Commission (OUC) operates as a statutory commission created by the legislature of the State of Florida. Established in 1923, OUC – The *Reliable* One, Orlando's hometown utility, is the second largest municipal utility in Florida and 14th largest municipal in the country, providing electric, water, chilled water and lighting services to approximately 250,000 customers in Orlando, St. Cloud and parts of unincorporated Orange and Osceola counties. The OUC Commission consists of five members, including the Mayor of the City of Orlando, who is an ex-officio member. Members must be OUC customers and at least one member must reside outside the City of Orlando limits in the unincorporated area of Orange County.

OUC Sustainability Leadership at a Glance

2010-2020



- **#1** CITY IN FLORIDA for Clean Energy*
- **TOP** TIER COUNTY for EV Readiness***
- **14,000+** Energy Audits
- **200+** Installed EV Charging Station
- **$10.7** MILLION in Customer Energy Efficiency Savings
- **112,000+** Charging Sessions; **373,081 kg** of Avoided GHG Emissions
- **123** MW Utility-Scale Solar
- 2019 & 2020 **SACE** SUNRISER**
- **7.2** MW OUCollective & OUCommunity Solar

*American Council for Energy-Efficient Economy; 2020 City Clean Energy Scorecard

**Solar Alliance for Clean Energy; *Solar in the Southeast 2019 and 2020 Annual Reports.* This designation represents utilities that demonstrate the highest solar ambition as measured by forecasted solar growth on a watts-per-customer basis over a four year period, 2019 to 2023.

***League of Women Voters of Florida, Summer 2020 EV Report Card

OUC's long history of sustainability was reinforced in February 2020 when the utility adopted a new strategic plan. As part of its strategic commitments, OUC will continue to make significant investments in energy innovation – particularly in solar, energy storage, electric vehicles (EVs), efficiency and conservation through 2030.

- OUC has committed $420 million to solar technology. Further commitments include investing an additional $90 million in energy storage. As part of these investments, OUC has already committed to providing 270 megawatts of solar energy to our customers.
- $45 million has been committed to innovative electrification programs including support for e-buses, dealership programs, and additional EV charging stations, bringing OUC's total installed charging stations from 200 currently to nearly 300 by Spring 2021 – maintaining Orlando's position as one of the Top 10 most-EV ready cities in the nation[1].
- A state leader in energy efficiency programs, OUC will meet its strategic commitment to achieve 1% of savings of retail sales in 2020. Additionally, OUC has a $30 million investment planned in efficiency and conservation efforts by 2030, including enhancements to low-income programs and technology solutions.

OUC's Connected 2025 Strategic CO_2 Reduction Commitments

FY 2020-2030

Solar Power

$420 Million
committed to solar technology



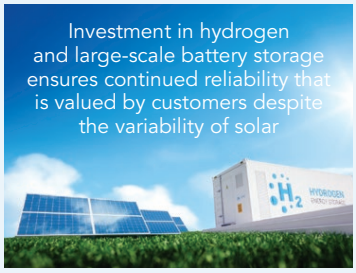


Includes utility scale, distributed solar, floating solar, weather stations & more

Energy Storage



$90 Million
planned to be invested in energy storage



NET ZERO
CO_2 EMISSIONS
2050

Electrification of Transportation



OUC has committed **$45 Million** to innovative EV programs



Includes charging infrastructure, transmission upgrades, charging hubs and customer education

Energy Efficiency





$30 Million planned investment in efficiency and conservation efforts by 2030, including enhancements to low-income programs and technology solutions

[1] In 2012, Orlando was named one of the Top 10 Most EV-Ready Cities in the U.S. by PlugShare, a mobile app that helps EV owners find charging stations. In summer 2020, Orange County was recognized in a report presented by the League of Women Voters in Florida as one of five "top tier" counties for EV readiness. Rankings were based on four measures, including percent of EV sales compared to total registered cars and trucks, charging and fast-charging infrastructure, and policy.

OUC Management recommends significantly reducing coal-fired generation no later than 2025 and eliminating it no later than 2027, using coal-to-gas conversion as a technology bridge, positioning solar as the main source of new energy, investing in energy storage, and leveraging other future clean technologies. The resulting recommendation balances the key attributes of Affordability, Reliability, Resiliency and Sustainability.

SITUATION

To prepare for a clean energy future, OUC has taken another critical step toward finalizing the Electric Integrated Resource Plan (EIRP).

The EIRP Process

The EIRP is an energy roadmap that guides how OUC generates and supplies electricity in a way that balances Affordability, Reliability, Resiliency and Sustainability through 2050. Currently, OUC relies on a diverse fuel mix of coal, natural gas, nuclear, solar and landfill gas. As confirmed by the OUC Board in February 2020's public strategy workshop, and in furthering OUC's decades-long commitment to sustainability, the utility pledged to achieve Net Zero CO_2 Emissions by 2050, as well as interim targets of 50% CO_2 emissions reduction by 2030 and 75% by 2040 compared to 2005 levels[2]. OUC's Net Zero CO_2 by 2050 commitment directionally aligns with City of Orlando Mayor Buddy Dyer's 2017 aspirational proclamation to achieve 100% renewable energy generation for Orlando by 2050.

EIRPs are standard, responsible, due-diligence practices for utilities that typically look across a 20-year horizon, as driving forces in the energy industry change. However, OUC extended the time horizon to 30 years to explore the feasibility of 100% renewable generation. With stakeholder engagement at its core, the EIRP process considers factors affecting power generation and transmission – from individual customer needs to broader issues such as the utilization of existing assets and resources, advances in renewable energy technologies, and potential events that could impact energy supply and demand (e.g., government regulations, hurricanes, etc.).

Considerations

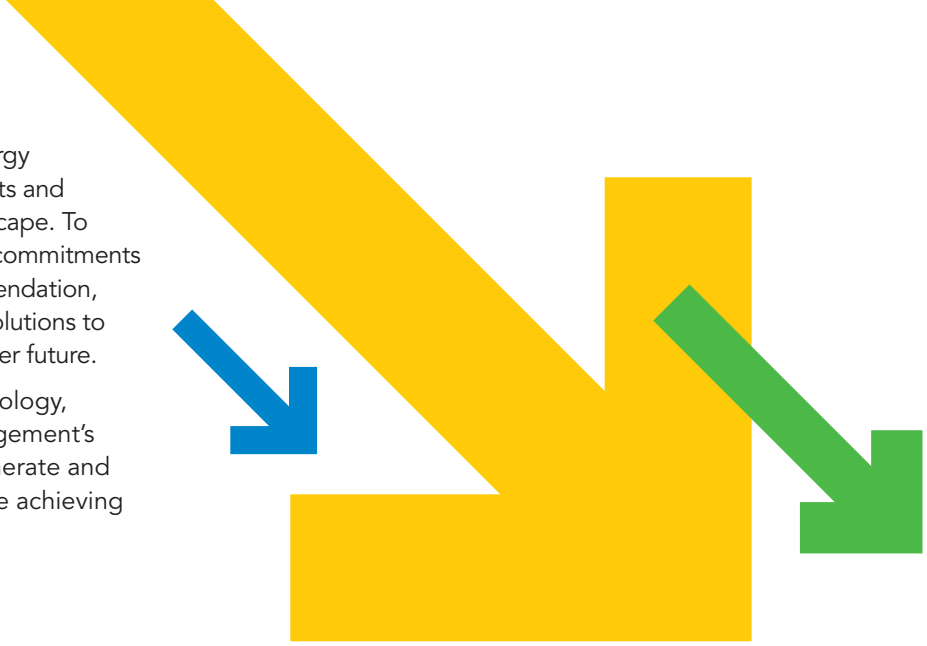
Florida-specific factors were taken into consideration because renewable resources are limited relative to other regions in the country. Currently, wind, hydroelectric and geothermal are not economically and/or technically viable in Florida – and biomass and landfill gas, while possible resources, are available only in small quantities[3]. That leaves the state's utilities with one feasible renewable asset: sunshine – which poses its own challenges. With solar power, electricity is not produced at night or at scale on cloudy days. With an average of 277 partly cloudy days[4] per year in Orlando – nearly 76% of the year – intermittency is a concern, and backup resources are necessary to ensure that power is always available.

Transmission infrastructure, which facilitates the transfer of high-voltage energy between Florida and the rest of the country, is a major component when considering resiliency of the system. Largely due to Florida being a peninsula, Florida can import energy only from its northern border. Unlike many of the other states where there are multiple paths to receive high-voltage energy, Florida has a lower overall import capacity. Compared to California, which has physical capacity to import 20% of its power, Florida has a lower overall transmission import capacity of approximately 6% of total forecast summer peak load in 2020[5].

[2] Data from 2005 is a widely used baseline, including in the 2018 Paris Agreement.
[3] U.S. Energy Information Administration, Florida: State Profile and Energy Estimates – Analysis
[4] National Oceanic and Atmospheric Administration – Cloudy and Sunny Days Analysis
[5] Various studies and reports presented at the Florida Reliability Coordinating Council (FRCC) regarding the Florida/Southern 500kV Interconnection and FRCC regional load forecasts

These realities restrict Florida's renewable energy portfolio until further technology advancements and additional transmission access alters the landscape. To combat this, as shown in the utility's strategic commitments in the prior section and the following recommendation, OUC is investing in a balance of sustainable solutions to propel Central Florida toward a cleaner, greener future.

This document summarizes the EIRP methodology, process, and findings that led to OUC Management's recommended clean energy roadmap to generate and supply electric power to our community while achieving the goal of Net Zero CO_2 Emissions by 2050.



FUTURE CHALLENGES AND OPPORTUNITIES

The transition from a fossil-based generating portfolio to a clean portfolio introduces both challenges and opportunities:

- ***Intermittency:*** As intermittent energy resources, such as solar, expand their viability as primary energy generation sources, OUC must take steps to ensure energy sufficiency by adding more energy storage and portfolio diversity.
- ***Rate Competitiveness:*** The cost, maturity and availability of technology advancements and supporting infrastructure must be balanced to ensure affordability is maintained.
- ***Limited Energy Diversity:*** Unlike other parts of the country, Florida's only viable renewable option is solar energy[6] – although wind-by-wire generation may become more widely available in the future. OUC will continue to evaluate and monitor emerging clean technologies, such as hydrogen, offshore wind and small modular nuclear power plants.
- ***Transmission:*** OUC will have greater reliance on transmission infrastructure. As a result, greater geographical diversity of renewable energy will be required to minimize the risk of extreme weather, and generation diversity will need to remain part of the OUC strategy.

EIRP CONSULTANTS

OUC engaged Siemens PTI to support the development of the EIRP and to evaluate a list of energy portfolio "candidates" for the utility to consider. Siemens PTI developed and analyzed seven possible *Candidate Portfolios* designed to provide sufficient energy to meet OUC demand under expected conditions – and to also achieve multiple sustainability goals by 2050. To determine the best resource mix for OUC, these portfolios were evaluated on the basis of four key attributes: ***Affordability, Reliability, Resiliency and Sustainability.***

To facilitate the critical stakeholder engagement process for the EIRP, which was used to rank the four key attributes, OUC also engaged Essence Partners, an independent, national marketing firm specializing in the energy sector.

[6] "Florida has few other renewable energy assets. The state has no significant wind resources and no installed utility-scale wind power generating capacity, although some wind power components are manufactured in Florida. Potential for a small amount of additional hydroelectric generation exists in the northern part of the state that is not close to sea level." (Source: U.S. Energy Information Administration)

STAKEHOLDER ENGAGEMENT

KEY POINTS:

- Community engagement included a wide variety of options for the community to provide feedback.
- A 12-member, independent Advisory Council met multiple times, and after analyzing community input, determined how key attributes should be weighted: *Reliability* at 35%, *Affordability* at 24%, *Sustainability* at 22% and *Resiliency* at 19%.

Stakeholder engagement is the foundation of the EIRP process. To ensure that OUC captured a comprehensive vision for the community's energy future, the EIRP included input from stakeholders in Orlando, Orange County and St. Cloud. Stakeholders were represented through a 12-member, independent Advisory Council nominated by elected officials and staff from Orange County, the City of Orlando and the City of St. Cloud. Members represented a cross-section of the community, composed of residential and commercial customers, including community partners, environmental groups, OUC program participants, and Orange and Osceola County residents. The Advisory Council met in November 2019, January 2020, and virtually in March 2020.

An online survey received input from 1,377 participants. To increase community engagement, five in-person community forums were held, generating additional feedback from 306 community members. Commercial customers were also engaged in a forum and interviews. All forums offered education on the EIRP to provide participants with a basic level of understanding and an opportunity to vote on the key attributes. Essence Partners conducted all forums and gathered and analyzed all voting data.

After gathering input from stakeholders, Essence Partners provided the voting data to the Advisory Council and facilitated the group's ranking of the key attributes which determined how they would be weighted when scoring the *Candidate Portfolios*. ***The Advisory Council rankings were: Reliability, with the most weight at 35%, Affordability at 24%, Sustainability at 22% and Resiliency at 19%.***

Definitions of Key Attributes

- ***Reliability***: An electric system's ability to effectively produce and deliver the energy required by customers with minimal interruptions and consistent quality while maintaining compliance.
- ***Affordability***: An electric system's ability to produce and deliver energy at an affordable cost with minimal price fluctuations.
- ***Sustainability***: An electric system's ability to produce energy in a way that proactively reduces pollution and impacts on the surrounding ecosystem.
- ***Resiliency***: An electric system's ability to adapt to uncontrollable events (such as weather extremes like hurricanes, major storms, heat waves, cloud cover, and other severe weather events), maintain physical and cyber security, and quickly bounce back following an interruption.

Key Attributes

Advisory Council Final Ranking



Ranking totals are based on points distributed by the Advisory Council for each attribute.

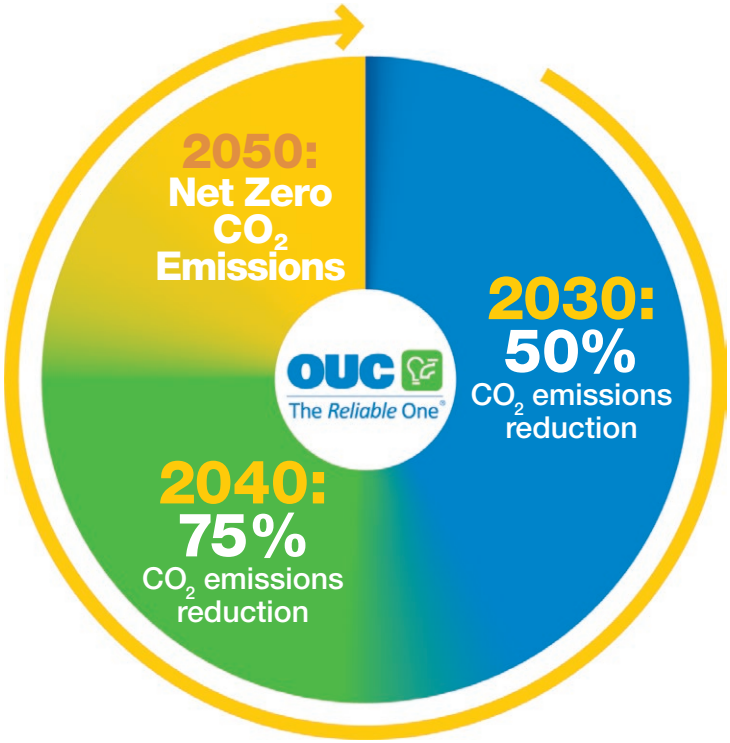
OBJECTIVES AND CRITERIA

KEY POINTS:

- All *Candidate Portfolios* were analyzed for their ability to meet key attributes of *Reliability, Affordability, Sustainability and Resiliency*.
- OUC reviewed seven *Candidate Portfolios*.
- *The Leading Portfolio* meets OUC's goal of Net Zero CO_2 Emissions by 2050, as well as interim targets of 50% CO_2 emissions reduction by 2030 and 75% by 2040.

The main EIRP objectives were to develop a portfolio strategy that: 1) achieved the best performance relative to the attributes of *Reliability, Affordability, Sustainability and Resiliency* required to meet our community's future energy needs and 2) met OUC's strategic Net Zero CO_2 Emissions by 2050 goal, as well as interim targets of 50% CO_2 emissions reduction by 2030 and 75% by 2040.

Net Zero CO_2 Emissions Targets[1]



[1] These reduction targets are based on OUC's 2005 emission levels

Candidate Portfolios were developed using several different pathways and mathematical optimization techniques to achieve these objectives. Siemens PTI then used these objectives as guiding principles to develop, define and subsequently measure the performance of the following seven *Candidate Portfolios* using stochastic simulations.

1. **Net Zero CO_2 2050 Portfolio** – designed to test a portfolio that achieves Net Zero CO_2 Emissions by 2050.
2. **100% Renewable by 2050 Portfolio** – designed to test the performance of a 100% renewable OUC generation fleet by 2050.
3. **Coal Retirement 2022/2026 Portfolio** – designed to test retiring a Stanton coal unit in 2022 and the other in 2026, replacing that capacity with renewables and energy storage only, based on the Synapse Energy Economics Report (August 2018) – a review of the U.S. electric system completed by Synapse Energy Economics.
4. **Gas Conversion 2026/2029 Portfolio** – designed to test converting a Stanton coal unit to natural gas in 2026 and the other in 2029.
5. **Gas Conversion 2036/2040 Portfolio** – designed to test converting a Stanton coal unit to natural gas in 2036 and the other in 2040.
6. **Wind-by-Wire Portfolio** – designed to test the impact of out-of-state wind capacity late in the forecast horizon.
7. **The Modular Nuclear Portfolio** – designed to test the impact of adding modular nuclear capacity.

In addition to the Net Zero CO_2 Emissions reduction by 2050 goal, each candidate portfolio was evaluated and ranked based on the four key attributes using specific metrics for each:

- ***Reliability***: Each *Candidate Portfolio* was designed to meet or exceed the *Reliability* requirement of 100% energy sufficiency under expected conditions without reliance on neighboring utilities. Additionally, Siemens PTI measured this attribute using metrics related to the first year of energy shortages which occur when customer demand exceeds available supply resources (due to significant cloud cover during highest demand week occurring in August). The second metric is the technology diversity of the portfolio at the end of the forecast horizon.
- ***Affordability***: To measure each *Candidate Portfolio* for Affordability, Siemens PTI used metrics related to the portfolio costs of generation and transmission, including fixed cost recovery, and the uncertainty of those costs over the 30-year planning horizon.
- ***Sustainability***: Siemens PTI measured this attribute by determining the probability of meeting the Net Zero CO_2 Emissions reduction by 2050 goal and interim targets, as well as the percentage of clean (non-CO_2 emitting technologies) energy generation in 2050.
- ***Resiliency***: To measure each *Candidate Portfolio* for Resiliency, Siemens PTI used scenario analysis that simulated system shocks such as hurricanes and gas pipeline disruptions, as well as metrics related to energy shortages.

The performance of the portfolios across all metrics is summarized in the Balanced Scorecard (**Exhibit 1**). Numerical scores indicate how each portfolio was ranked (where 1 is the best, and 8 is the worst) relative to other portfolios on a given metric. The final score is the weighted average ranking using the weights provided by the Advisory Council (*Reliability*, 35%; *Affordability*, 24%; *Sustainability*, 22%; *Resiliency*, 19%).

While the Balanced Scorecard ranked Gas Conversion 2026/2029, Gas Conversion 2036/2040 and Modular Nuclear as the most favorable *Candidate Portfolios* across the four attributes, ***only Gas Conversion 2026/2029 accomplishes the Sustainability attribute of achieving the Net Zero CO_2 Emissions by 2050 goal, as well as interim targets of 50% CO_2 emissions reduction by 2030 and 75% by 2040.***

As a result, it became the "*The Leading Portfolio.*"

Exhibit 1

Balanced Scorecard

Candidate Portfolios

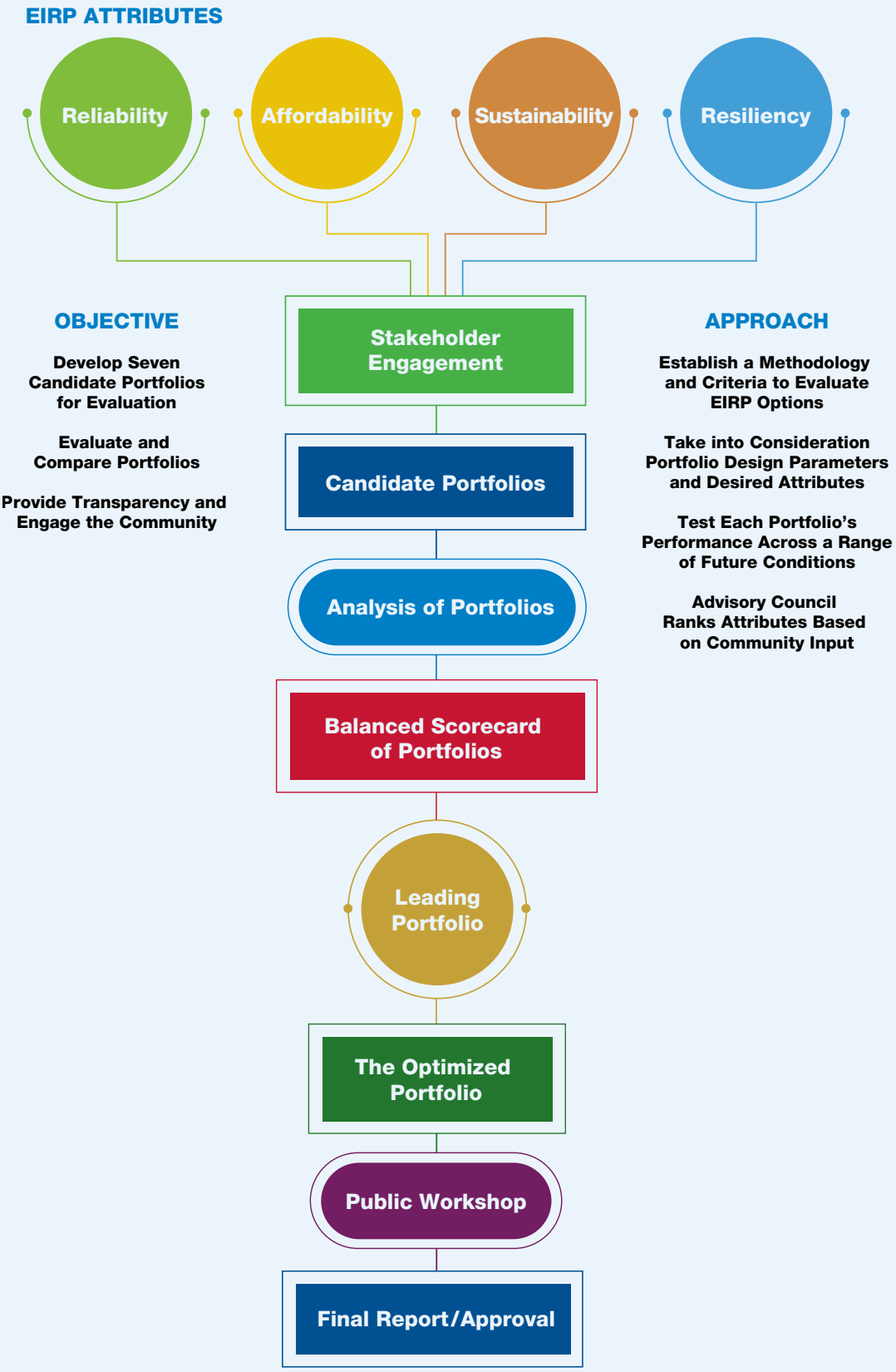
Attributes	Weight	Net Zero CO_2 2050	100% Renewable by 2050	Coal Retirement 2022/2026*	Gas Conversion 2026/2029*	Gas Conversion 2036/2040	Wind-by-Wire	The Modular Nuclear
Reliability	35%	3.5	3.0	4.0	2.0	2.0	3.0	1.5
Affordability	24%	5.2	6.2	5.8	5.1	4.7	5.5	4.4
Sustainability	22%	1.5	1.5	1.0	1.0	2.0	1.8	1.5
Resiliency	19%	3.0	4.3	8.0	4.3	4.0	5.0	4.0
Total	**100%**	**3.4**	**3.7**	**4.5**	**3.0**	**3.0**	**3.7**	**2.7**

*These Portfolios meet all of the Interim Emission Targets
Scores: 1 is the best, and 8 is the worst

Source: Siemens PTI

Exhibit 2

The EIRP Process



OUC MANAGEMENT CLEAN ENERGY ROADMAP RECOMMENDATION: *THE OPTIMIZED PORTFOLIO*

KEY POINTS:

- *The Leading Portfolio* was further refined into *The Optimized Portfolio.*
- This refinement meets OUC's sustainability goals at the best value and increases levels of Reliability and Resiliency by limiting investments in new gas-fired generation and avoiding stranded costs.

Building upon the strengths of the *Leading Portfolio*, the *Optimized Portfolio* delivers on several key objectives including earlier coal retirement dates, accomplishment of interim Net Zero CO_2 Emissions, avoidance of stranded costs and long-term enhanced generation diversity.

The Balanced Scorecard was used as a guide for determining *The Optimized Portfolio* by including strategies that scored well and the insights that were gained in the analysis of the *Candidate Portfolios*.

The elements of the strategy, along with the insights and validating metrics ***allow OUC to achieve Net Zero CO_2 Emissions by 2050 goal, as well as interim targets of 50% CO_2 emissions reduction by 2030 and 75% by 2040, in directional alignment with the City of Orlando goals, while striking a balance of the four key attributes – Reliability, Affordability, Sustainability and Resiliency.***

Specifically:

- ***Significantly reducing coal-fired generation no later than 2025 and eliminating it no later than 2027.*** The C.D. McIntosh Unit 3, a 340-megawatt, primarily coal-fired unit in Lakeland, Florida, is expected to shutter by the end of 2024[7]. Both Stanton coal-fired units will be converted from coal to natural gas. The natural gas conversion units would be retired no later than 2040 to achieve greater sustainability and avoid stranded costs.
- ***Accelerating solar and energy storage as primary strategies.*** Energy storage technologies will be used to provide energy during non-solar energy production periods.
- ***Leveraging future clean technologies to ensure diversity for reliability.*** According to the EIRP analysis, the addition of wind-by-wire generation would greatly reduce the amount of solar and energy storage required to achieve energy sufficiency. Like solar, wind is an intermittent resource, but is highly complementary to solar generation. Generally, energy from wind resources is available at different times of day, which is important for Reliability and Resiliency. While wind energy is currently not available for import into OUC's service territory due to transmission constraints, it is anticipated to be an option as access to transmission lines from the Midwest expand. OUC will continue to monitor its availability, along with other emerging clean resources such as hydrogen, offshore wind and small modular nuclear power plants.

	Gas Conversion 2026/2029 "Leading Portfolio"	Optimized Portfolio
Conversion Builds	2026, 2029	2025, 2027
Conversion Retirement	After 2050	By 2040
Primary New Energy Resources	Solar and Energy Storage	Solar, Energy Storage and Wind-by-Wire Generation
Non-FL Wind Generation	None	Contingent upon transmission access

[7]OUC owns a 40% share of this unit, which came online in 1982 and is operated by Lakeland Electric.

Exhibit 3

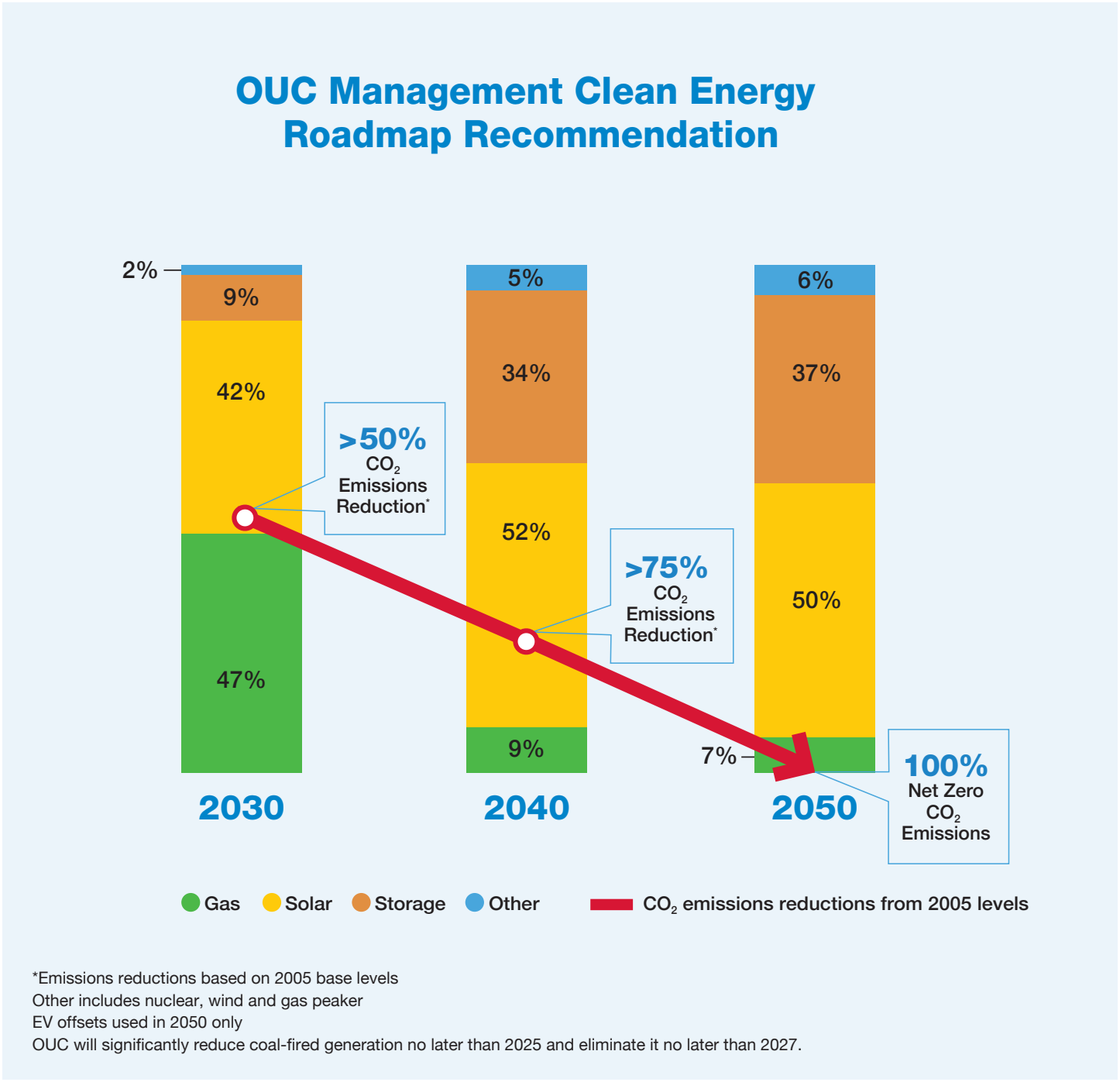


Exhibit 3 shows the resource mix by technology for OUC's optimized portfolio strategy for the forecast horizon.

- ***Striving to maintain competitive rates while achieving strategic goals.*** Advancements of this magnitude require significant investments. However, *The Optimized Portfolio delivers the best value*. Gas conversion capital costs are 5-10% of the cost of a new combined cycle gas plant, allowing for OUC to retire converted gas-fired units by 2040.

OUC will continue to monitor performance developments and technology enhancements for new and existing clean technologies, such as hydrogen and small modular reactors, to ensure the highest performance relative to the key attributes.

NEXT STEPS

KEY POINTS:

- *The Optimized Portfolio* is not final until Board approval.
- The public is invited to join an in-person workshop on November 17, 2020, at 2 p.m.
- More information is available at OUCRoadmap.com.

OUC remains committed to public feedback throughout the process of sharing the EIRP results. The public is invited to join an in-person workshop on November 17, 2020, at 2 p.m. to further discuss this process and results. For a list of locations and to RSVP for this workshop, visit OUCRoadmap.com.

The results of the EIRP will be approved by the Board at a later date. In the future, EIRPs will be considered every five years.



This OUC EIRP incorporates scientific and technical assumptions that have been applied for modeling and analysis. While practicable from a technical perspective, recommendations and subsequent actions are impacted by factors including but not limited to customer demand, technology advancements and partnerships, economic factors, energy efficiency, policy and regulatory changes, and the integration of renewable options.

A Bold, Balanced Strategy for Orlando's Energy Future

The OUC Management Clean Energy Roadmap Recommendation based on our recent EIRP study – paired with our Strategic Commitments from February 2020 – will allow OUC to achieve Net Zero CO_2 Emissions by 2050 goals, as well as interim goals of 50% CO_2 emissions reduction by 2030 and 75% by 2040.

OUC MANAGEMENT CLEAN ENERGY ROADMAP RECOMMENDATION

Significantly reduces coal-fired generation no later than 2025 and eliminates it no later than 2027





Accelerates solar and energy storage as primary strategies to ensure energy during non-solar energy production periods

Leverages future clean technologies to ensure diversity for reliability





Strives to maintain competitive rates for customers while achieving strategic goals

THE PATH FORWARD

NET ZERO CO_2 EMISSIONS 2050

STRATEGIC COMMITMENTS

Solar Power

$420 Million committed to solar technology by 2030



Energy Storage



$90 Million planned investment in energy storage by 2030

Electrification of Transportation



Committed **$45 Million** to innovative EV programs by 2030



Energy Efficiency



$30 Million planned investment in efficiency and conservation efforts by 2030



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