Orlando’s Renewable Energy Future

The Path to 100 Percent Renewable Energy by 2050

Prepared for The First 50 Coalition

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EXECUTIVE SUMMARY

Of all U.S. states, Florida will feel the largest direct impacts from climate change. Given the City of Orlando's vulnerability to climate impacts—including increases in extreme heat, extreme weather, and climate migration—leadership by Mayor Buddy Dyer and the City on climate action is critical. Orlando has shown promise as a climate leader, joining climate action coalitions and signing onto multiple climate commitments. Specifically, Mayor Dyer and Orlando City Commissioners committed to 100 percent renewable energy by 2050, and joined Sierra Club's Ready for 100 Campaign, along with over 160 other cities that have committed to 100 percent renewable energy by 2050.[1] The City is also a member of the We Are Still in Coalition (a group opposing U.S. withdrawal from the Paris agreement), [2] the Climate Mayors group, [3] the City Energy Project (focused on energy efficiency deployment in cities), [4] and the Blomberg American Cities Climate challenge. [5]

However, Mayor Dyer and the City of Orlando are not currently on track to meet their climate commitments.

Orlando's electric utility, the Orlando Utilities Commission (OUC) currently relies almost entirely on fossil fuels[6] to supply the city's electricity. In 2019, 95 percent of OUC's capacity and 90 percent of total generation came from coal and gas.[7] OUC has only 9 megawatts of utility-scale solar PV on its system, which accounted for a mere 0.28 percent of total generation in 2019. The utility projects that solar will account for less than 10 percent of total generation by 2029.[8] OUC has no installed wind or battery storage, and it has no plans to build or acquire these resources in the next decade. OUC also ranks among the worst in the nation for energy efficiency investment, reporting savings of only 0.22 percent of retail sales in 2019 (compared to the national average of 1.03 percent, with leading utilities achieving as high as 3 percent savings).[9] This is particularly concerning because the American Council for an

[1] Sierra Club Ready for 100 webpage. Accessed May 8, 2020. Available at https://www.sierraclub.org/ready-for-100.

[2] We Are Still In, Orlando webpage. Accessed May 8, 2020. Available at https://www.wearestillin.com/organization/orlando-fl.

[3] Climate Majors webpage. Accessed May 8, 2020. Available at http://climatemayors.org/.

[4] City Energy Project webpage. Accessed May 8, 2020. Available at https://www.cityenergyproject.org/.

[5] Bloomberg Philanthropies. Jan 11, 2019. "Mike Bloomberg names Albuquerque, Austin, Denver, Orlando and San Antonio as Winners in Bloomberg American Cities Climate Challenge." Available at https://www.bloomberg.org/press/releases/mike-bloomberg-names-albuquerque-austin-denver-orlando-san-antonio-winners-bloomberg-american-cities-climate-challenge/.

[6] In this report, we will use the term "gas" to refer to the fossil and fracked gas. OUC and Siemens refer to fossil gas as Natural Gas in the Ten-Year Site Plan and modeling spreadsheets. We do not include Landfill Gas in this category and will refer to Landfill Gas separately by name.

[7] OUC TYSP, Schedule 6.2.

[8] OUC TYSP, Schedule 6.2.

[9] Relf, Grace, Emma Cooper, Rachel Gold, and Akanksha Goyal. 2020. *Utility Energy Efficiency Scorecard*, ACEEE. Page 26.

Energy-Efficient Economy (ACEEE) estimates that energy efficiency upgrades could cut energy use by 18 percent for homes and 23 percent for commercial buildings, thereby reducing greenhouse gas emissions and lowering system costs for ratepayers.[10]

OUC recently hired Siemens Energy Business Advisory to facilitate a full 20-year Electricity Integrated Resource Planning (EIRP) process that, among other things, evaluates conversion of Stanton Coal Units 1 and 2 to gas. To date, OUC's publicly available documents on the EIRP process show no evidence that the utility plans to pivot towards renewables or substantially increase energy efficiency and therefore, no evidence that OUC is planning to fulfill Mayor Dyer and City Commissioners' pledge.

In anticipation of OUC's EIRP, we evaluated three scenarios for OUC's system: a *Coal Continues* scenario where OUC continues to rely on coal at Stanton 1 and 2, a *Coal to Gas Conversion* scenario where OUC converts Stanton Units 1 and 2 to gas, and a *Renewable Energy* scenario where OUC transitions from coal to solar PV, battery storage, and demand-side management.

As shown in ES Table 1:, we find that transitioning to renewables is the lowest cost scenario while converting Stanton to gas is the costliest. Specifically, transitioning to renewables will save ratepayers $176 million over the next two decades relative to continuing to rely on coal and $543 million relative to converting Stanton to gas.

ES Table 1: Scenario net present value revenue requirement (NPVRR) 2020–2040

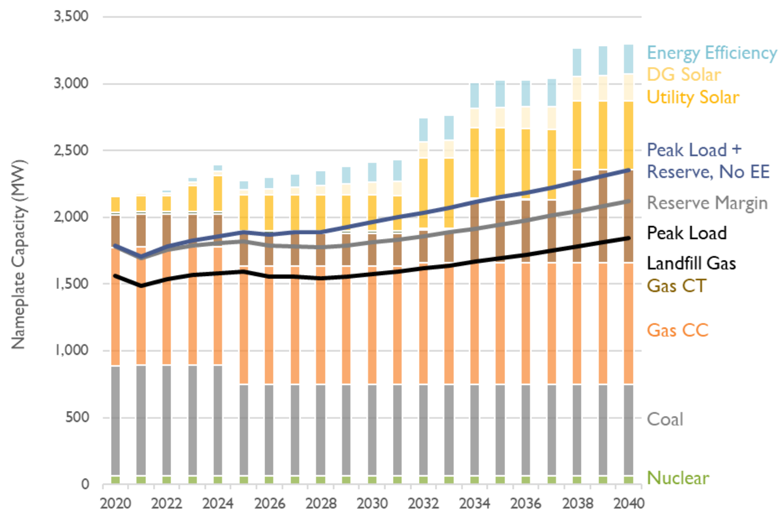
$2019 Million	**Coal Continues**	**Coal to Gas Conversion**	**Renewable Energy Scenario**
Portfolio Cost	$4,217	$4,584	$4,041
Difference from Coal Continues	-	$367	($176)
Difference from Renewable Energy	$176	$543	-

Note: Negative value = savings. Discount rate = OUC WACC of 6.3 percent. NPVRR does not include landfill gas costs, which were not available and do not differ across scenarios.

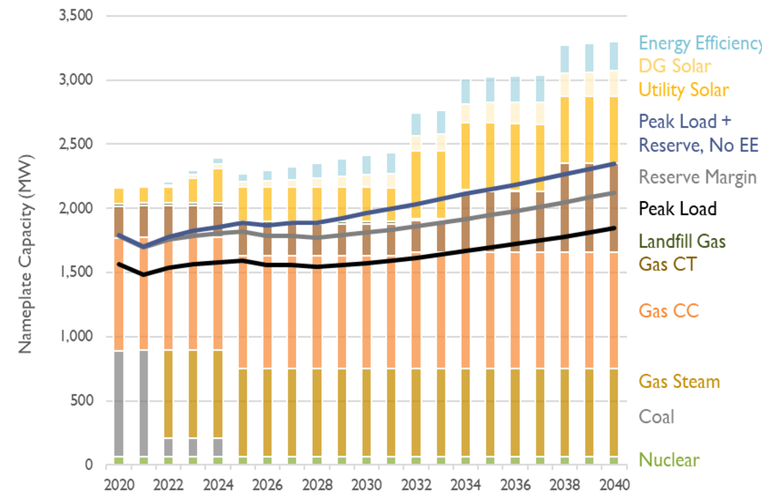
In the *Coal Continues* and the *Coal to Gas Conversion* scenarios, fossil fuels account for over 80 percent of OUC's capacity, as shown in ES Figure 1 and ES Figure 2. In contrast, in the *Renewable Energy* scenario, OUC transitions to rely on solar PV and battery storage in the summer and battery storage in the winter to meet its capacity needs as shown in ES Figure 3. Coal and gas together account for just 20 percent of total summer capacity and 35 percent of winter capacity in the *Renewable Energy* scenario. Critically, the *Renewable Energy* scenario relies on battery storage which is modular and therefore a lower risk investment for ratepayers than fossil resources. Specifically, battery storage can be better matched to the quantity and timing of system needs, and it can provide many of the grid services

[10] Nadel, S. and Ungar, L. 2019. *Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050*, ACEEE.

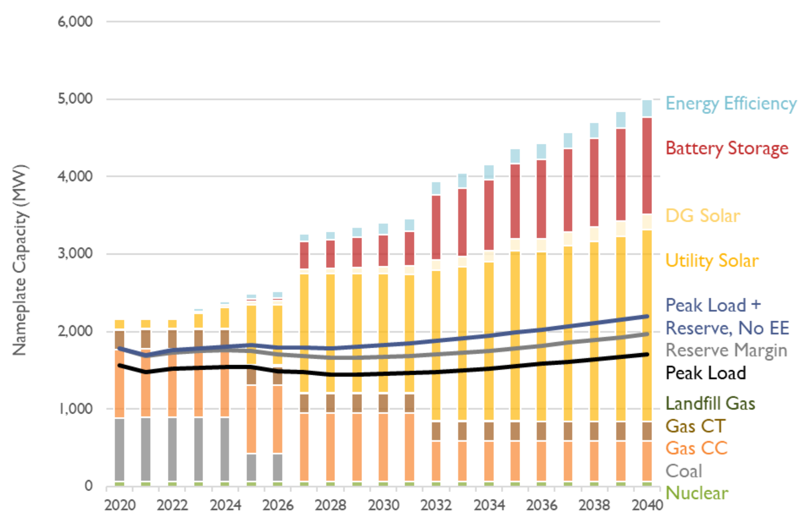
ES Figure 1: ***Coal Continues***—nameplate capacity



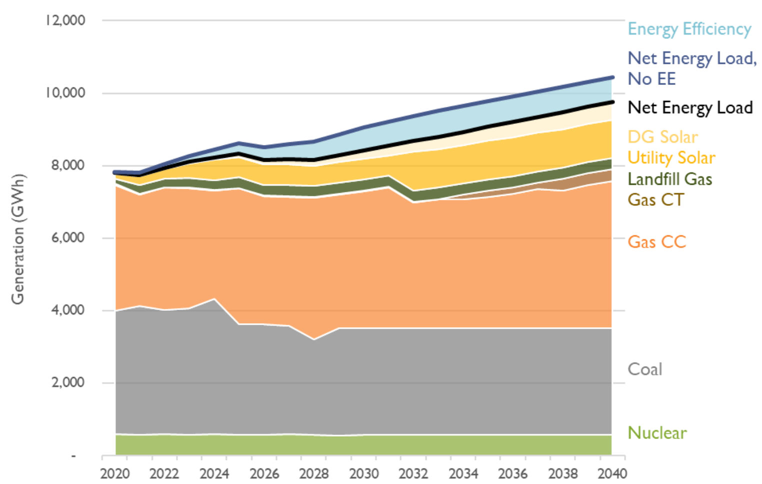
ES Figure 2: ***Coal to Gas Conversion***—nameplate capacity



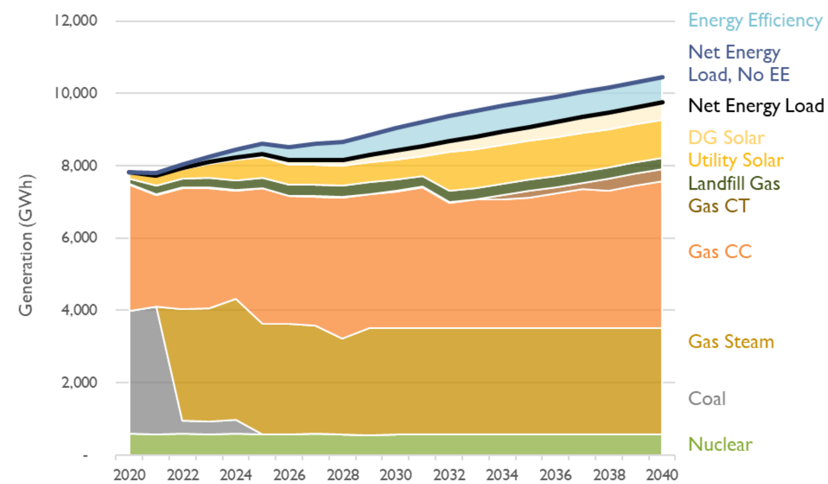
ES Figure 3: ***Renewable Energy*** —nameplate capacity



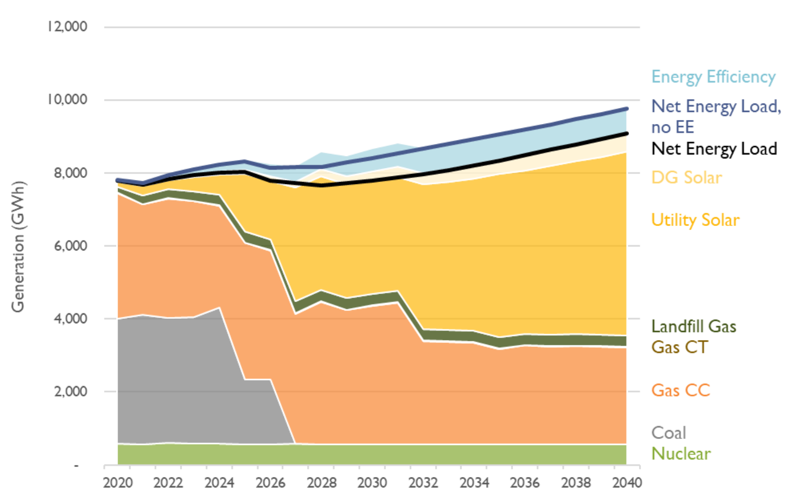
ES Figure 4: *Coal Continues*—generation



ES Figure 5: *Coal to Gas Conversion*—generation



ES Figure 6: *Renewable Energy*—generation

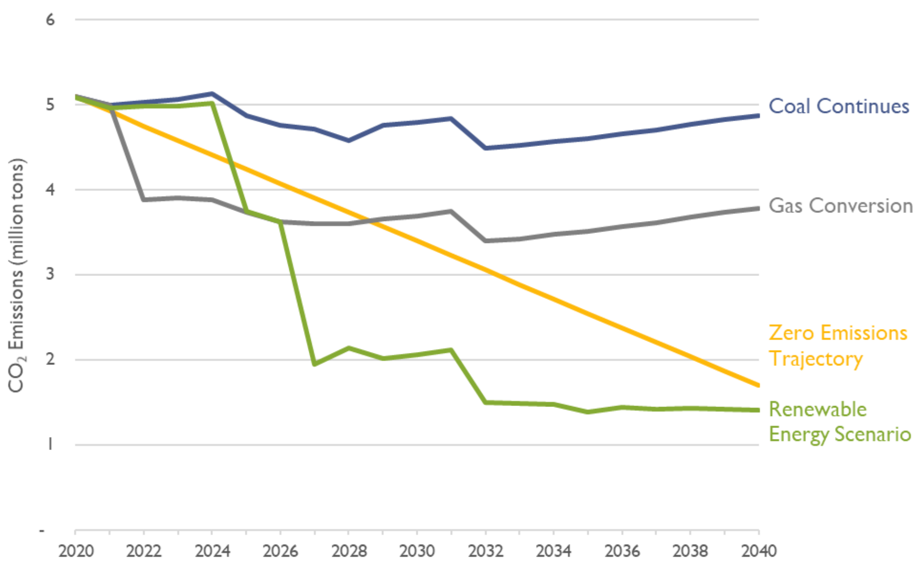


typically supplied by fossil resources. This saves ratepayers money and reduces risk relative to building a large fossil asset to meet projected future needs that may or may not materialize.

On an energy basis, fossil fuels dominate the generation mix in the *Coal Continues* and *Coal to Gas Conversion* scenarios, accounting for around 75 percent of OUC's total generation by 2040 as shown in ES Figure 4 and ES Figure 4. Solar PV accounts for only 16 percent of total generation by 2040. In the *Renewable Energy* scenario, solar PV accounts for over half of total generation, and fossil fuels account for less than 30 percent of total generation, as shown in ES Figure 6.

Neither the *Coal Continues* nor *Coal to Gas Conversion* scenarios put OUC on track to reach the Mayor and City's goal of 100 percent renewables or zero emissions by 2050. As shown in ES Figure 7, only in the *Renewable Energy* scenario will OUC be on track to reach its 100 percent commitment and zero emissions by 2050. Emissions levels in the *Coal Continues* scenario are three and a half times larger than levels in the *Renewable Energy* scenario by 2040 and approximately triple in the *Coal to Gas Conversion* scenario, also relative to the *Renewable Energy* scenario. Total emissions over the period 2020 through 2040 for the *Coal Continues* scenario amount to over 100 million tons of CO_2, which is nearly double the level seen in the *Renewable Energy* scenario. Total emissions over the period 2020 through 2040 for the *Coal to Gas Conversion* scenario amount to approximately 80 million tons of CO_2, which is just under one and a half times the level seen in the *Renewable Energy* scenario.

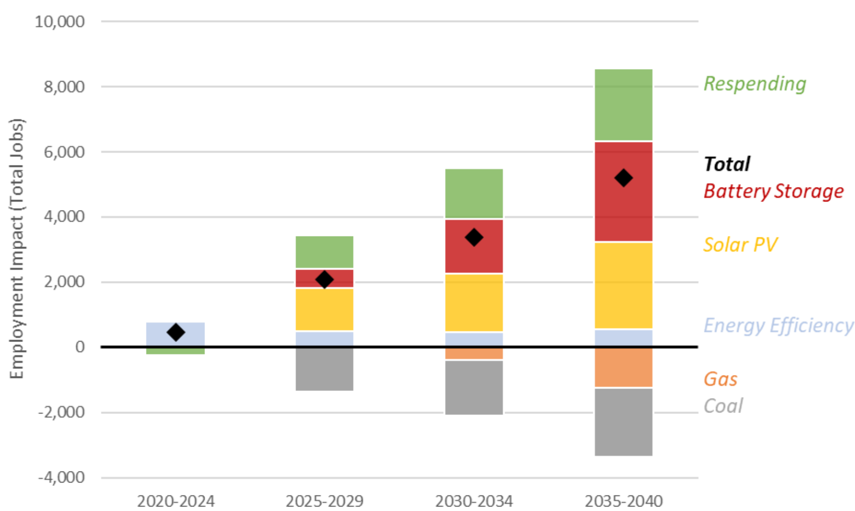
ES Figure 7: CO_2 emission trajectories of modeled scenarios



Further, continued reliance on fossil fuels subjects ratepayers to risks from regulatory uncertainty, stranded asset potential, and fuel price volatility, as well as health risks from air pollution (which exacerbates lung and heart conditions[11] and increases vulnerability to certain diseases, including COVID-19).[12]

We find that replacing Stanton's coal units with renewable energy resources, battery storage, and demand-side management solutions also increases local, high quality jobs in the region. Compared with investment in fossil fuels, renewables and energy efficiency create between two and three times as many jobs for the same quantity of spending.[13] Further, most expenditures on coal and gas do not benefit the Florida economy, as there are relatively few in-state jobs in these industries. We evaluated the employment impact of our scenario and find that the *Coal to Gas Conversion* scenario is expected to lose just over 2,000 net job-years while the *Renewable Energy* scenario is expected to create over 11,000 net job-years over the period 2020–2040 relative to the *Coal Continues* scenario. ES Figure 8 displays the average annual employment impacts of the *Renewable Energy* scenario compared to the *Coal Continues* scenario. Further, investment in energy efficiency, renewables, and energy storage creates high-paying jobs. In our *Renewable Energy* scenario, the weighted average income for the created jobs across all resources and all sectors is estimated to be $72,976 as compared to an economy-wide average of $62,977.

ES Figure 8: Total employment impacts of the *Renewable Energy* scenario relative to *Coal Continues*



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[11] Centers for Disease Control and Prevention, Air Quality webpage. Accessed June 4, 2020. Available at https://www.cdc.gov/air/air_health.htm.

[12] Wu, X., Nethery, R. C., Sabath, B. M., Braun, D., & Dominici, F. 2020. "Exposure to air pollution and COVID-19 mortality in the United States." medRxiv. April 27, 2020. Available at https://www.medrxiv.org/content/10.1101/2020.04.05.20054502v2.

[13] Garrett-Peltier, H., 2017. "Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model." *Economic Modelling*, *61*, pp.439-447.

Given the significant disconnect between Orlando Mayor Buddy Dyer's stated climate commitments and the action of its electric utility, the City must now act to align all plans and actions that impact climate and energy use with the City's stated goals. OUC must provide Mayor Dyer and the City of Orlando a clear plan on how it will transition from its current reliance on fossil fuels to a clean system that relies on solar PV, battery storage, and energy efficiency. A renewable portfolio will not only provide environmental benefits, but as we have shown in this report, will save the citizens of Orlando hundreds of millions of dollars directly, in addition to providing significant local jobs and economic stimulus, and protecting public health.

Our specific recommendations are as follows:

1. OUC must use the EIRP being prepared by Siemens to chart a path consistent with reaching 100 percent renewables by 2050. The plan should include a transparent evaluation of the economic retirement dates for OUC's coal plants at Stanton and all other fossil fuel resources; should include no new fossil fuel resources; and should replace all retired resources and meet any future load growth with solar PV, battery storage, and demand-side management solutions.

2. OUC needs to develop best-in-class energy efficiency programs to reduce load and target peak demand. It then needs to dramatically scale up investment in these programs to achieve incremental savings of at least one percent of retail sales per year.

3. OUC and the City of Orlando should evaluate the risk of any further investments in coal and gas plants being rendered uneconomic before the end of their useful life by policy changes and continued clean energy cost declines.

4. OUC and the City of Orlando should quantify the job and community impacts of its selected resource plan and ensure that OUC's resource plan yields local investment and local clean energy jobs. Especially now, as the City of Orlando battles a public health crisis and the resulting impact of job losses, OUC's has the ability to choose a path that can lead to cleaner air and create locally-based, high-quality jobs for Orlando residents.

1. ORLANDO'S RENEWABLE ENERGY COMMITMENTS REQUIRE AMBITIOUS ACTION FROM THE ORLANDO UTILITIES COMMISSION

1.1. The City of Orlando has committed to 100 percent renewable energy by 2050

Of all U.S. states, Florida will feel the largest direct impacts from climate change. Hurricanes, sea level rise, agriculture losses, extreme heat, and growing energy needs threaten the region and are likely to result in substantial economic losses. Orlando in particular is projected to be hard hit both physically and economically.[14] Given the City's vulnerability to climate impacts, leadership by the City on mitigation and adaptation is critical, both to protect the City, and to set an example for other cities and regions for mitigating their own climate impacts.

Orlando has shown promise as a climate leader, joining climate action coalitions and signing onto multiple climate commitments. Specifically, Orlando has committed to 100 percent renewable energy by 2050 and joined Sierra Club's Ready for 100 Campaign, along with over 160 other cities that have also committed to 100 percent renewable energy by 2050.[15] Orlando has joined the We Are Still In Coalition, a group of cities, states, tribes, businesses, universities, healthcare organizations, and faith groups that oppose the U.S. withdrawal from the Paris Agreement and commit to not retreating from responding to the climate crisis.[16] Orlando is part of the Climate Mayors group, a bi-partisan network of mayors committed to demonstrating climate leadership.[17] Orlando is also one of 10 cities selected to participate in the City Energy Project, a joint initiative of the Institute for Market Transformation and the Natural Resources Defense Council to explore bold practical ways to deploy energy efficiency at the city level.[18] And it is one of 25 cities nationwide chosen to participate in the Bloomberg American Cities Climate Challenge, receiving a $2.5 million dollar grant in 2019 to support climate action.[19]

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[14] Peters, Xander. 2019. "Florida will bear the brunt of climate change. Why do we keep voting for lawmakers without a plan?" *Orlando Weekly*. February 6. Available at https://www.orlandoweekly.com/orlando/so-why-do-so-many-of-its-residents-keep-voting-for-lawmakers-opposed-to-climate-policy/Content?oid=23804474.

[15] Sierra Club Ready for 100 webpage. Accessed May 8, 2020. Available at https://www.sierraclub.org/ready-for-100.

[16] We Are Still In, Orlando webpage. Accessed May 8, 2020. Available at https://www.wearestillin.com/organization/orlando-fl.

[17] Climate Majors webpage. Accessed May 8, 2020. Available at http://climatemayors.org/.

[18] City Energy Project webpage. Accessed May 8, 2020. Available at https://www.cityenergyproject.org/.

[19] Bloomberg Philanthropies. 2019. "Mike Bloomberg names Albuquerque, Austin, Denver, Orlando and San Antonio as Winners in Bloomberg American Cities Climate Challenge." Jan 11. Available at

While Orlando's climate commitments are to be applauded, the City must now act to align all plans and actions that impact climate and energy use with the City's stated goals. Commitments are voluntary and not self-enforcing. Without coordinated action across city departments, Orlando's climate commitments will amount to little more than rhetoric. One place where this is particularly important is Orlando's electricity system.

1.2. OUC relies predominantly on fossil fuels to supply electricity to the City's residents

The City of Orlando receives its electricity from the Orlando Utilities Commission (OUC),[20] a municipal utility that serves both Orlando, the nearby city of St. Cloud, and several neighboring cities through wholesale contracts. OUC is a member of the Florida Municipal Power Pool (FMPP), an electric power pool that centralizes dispatch of all pool members'[21] resources to meet total load in the most economical way. OUC serves as the dispatcher of FMPP and claims that participation in FMPP has provided significant savings to OUC, mainly by providing a market for OUC to sell excess generation.[22] OUC continues to rely heavily on fossil fuels.

Over 95 percent of OUC's generation capacity is fossil-based

Despite the City of Orlando's stated commitment to achieve 100 percent renewables by 2050, OUC relies almost entirely on coal and gas to supply the City's electricity. As shown in Table 1Table 3, in 2019 coal and gas accounted for over 90 percent of OUC's total generation, while solar only accounted for 0.28 percent.[23] Table 2 shows OUC's current winter and summer capacity mix, which is over 95 percent coal and gas, with a small amount of nuclear, landfill gas, and solar PV. OUC has only 9 megawatts (MW) of utility-scale solar PV on its system (nameplate), and no wind or battery storage installed.

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https://www.bloomberg.org/press/releases/mike-bloomberg-names-albuquerque-austin-denver-orlando-san-antonio-winners-bloomberg-american-cities-climate-challenge/.

[20] OUC is a statutory commission that was created by the legislature of the State of Florida as a separate part of City government.

[21] Lakeland Electric and the Florida Municipal Power Agency (FMPA) All-Requirements Project are also member of FMPP.

[22] OUC TYSP, page 1-1.

[23] OUC TYSP, Schedule 6.2.

Table 1: OUC's Energy mix by resource type for 2018 and 2019

Resource Type	2018		2019	
	GWh	%	GWh	%
Nuclear	470	5.88%	449	5.78%
Coal	4,204	52.57%	3,614	46.56%
Gas	3,138	39.24%	3,554	45.79%
Landfill Gas	157	1.96%	123	1.58%
Solar	28	0.35%	22	0.28%
Net Energy for Load	**7,997**	**100%**	**7,762**	**100%**

Source: Schedule 6-1 and 6-2 of OUC 2020 TYSP.

Table 2: Capacity (MW) owned and purchased by OUC by fuel type

PLANT NAME	WINTER CAPACITY					
	Coal	Nuclear	Gas/ Oil	PV	LFG	Total
Stanton	613		846			1,459
Indian River			213			213
C.D. McIntosh Jr.	136					136
St. Lucie		62				62
Other (MW)					18	18
Total (MW)	**749**	**62**	**1,059**		**18**	**1,888**
Total (%)	*39.70%*	*3.3%*	*56.1%*	*0.0%*	*1.0%*	*100.0%*
PLANT NAME	**SUMMER CAPACITY**					
	Coal	**Nuclear**	**Gas/ Oil**	**PV**	**LFG**	**Total**
Stanton	613		818	9		1,440
Indian River			197			197
C.D. McIntosh Jr.	133					133
St. Lucie		60				60
Other (MW)					18	18
Total (MW)	**746**	**60**	**1,015**	**9**	**18**	**1,848**
Total (%)	*40.4%*	*3.2%*	*54.9%*	*0.5%*	*1.0%*	*100.0%*

Source: Table 3-1, OUC 2020 TYSP.

Customer count and load have been increasing and may continue to do so over the next two decades

OUC serves just over 215,000 residential customers and nearly 26,000 commercial customers. The Metro Orlando area has been in the top tier of fastest growing metro areas (along with Tampa) based on U.S. Census figures for 2017–2018,[24] and OUC projects that that number of customers will grow at an average annual rate of 1.5 percent through at least 2029. This translates into an average annual increase

[24] Schneider, Mike. 2019. "Central Florida cities among fastest growing in US." *Associated Press*. April 18, 2019. Available at https://apnews.com/25fe6d1f5afd4024a8f3c1239bab63d0.

in retail sales of 1.6 percent between now and 2029.[25] OUC also supplies electricity through power sale contracts with Bartow, Lake Worth, Winter Park, Florida Power & Light, Mount Dora, and Chattahoochee.[26]

1.3. OUC has hired Siemens to conduct an EIRP process that will determine the City's long-term resource plan

OUC is required by Florida law to publish a Ten-year site plan (TYSP) every year. A TYSP does not involve a robust planning exercise; however, it is a useful guide for understanding the utility's near-term load forecast and resource plan. This year, in addition to producing its annual TYSP, OUC hired Siemens to run a full 20-year Electric Integrated Resource Planning (EIRP) process. The outcome of this EIRP process will play a strong role in determining OUC's resource plan for the next several decades.

Given Orlando's climate commitments, we would expect OUC's resource plans to be aligned with the goal of 100 percent renewable energy by 2050. However, there is no evidence in any of OUC's publicly available documents, including OUC's most recent TYSP from April 2020 and Siemens EIRP modeling files,[27] that the utility plans to pivot towards renewables and energy efficiency to meet its climate commitments.

OUC's 2020 TYSP includes minimal investment in renewables or efficiency

OUC's TYSP indicates plans to add only around 250 MW of solar PV over the next decade,[28] which OUC projects will account for less than 10 percent of OUC's generation by 2029. At this rate, renewable generation would account for only 16 percent of total generation (25 percent non-fossil generation including nuclear and landfill gas) by 2050, far below the level required to meet Orlando's 100 percent stated commitment. OUC's demand-side management goals approved by the Florida Public Service Commission (PSC) for the next decade are also disheartening, starting at 0.02 percent in 2020 and increasing to 0.18 percent savings as a percent of retail sales by 2029. These goals are even lower than OUC's current demand-side management investment at 0.22 percent.[29] This is particularly concerning because the American Council for an Energy-Efficient Economy (ACEEE) estimates that energy efficiency

[25] OUC TYSP, page 4-6.

[26] Bartow's and FP&L's contracts expire at the end of 2020, Lake Worth's at the end of 2025, and Winter Park's at the end of 2026. Mr. Dora and Chattahoochee contracts begin in 2021 and run through the end of 2027.

[27] Synapse reviewed Siemens modeling input files that were provided by OUC to Sierra Club in response to Serra Club's public records request.

[28] OUC TYSP, pages 2-6 – 2-9.

[29] OUC TYSP, page 5-2.

upgrades could cut energy use by 18 percent for homes and 23 percent for commercial buildings, thereby reducing greenhouse gas emissions and lowering system costs for ratepayers.[30]

OUC's now-postponed EIRP (being prepared by Siemens) is heavily focused on fossil fuel resources

Results of the OUC EIRP study being prepared by Siemens were originally scheduled for release in June 2019. However, on May 12, 2020 OUC announced a temporary pause in the process, citing the impacts of COVID-19.[31] Nonetheless, the utility has shared various documents on model inputs and assumptions. Like the TYSP, the EIRP documentation suggests that OUC plans to continue its reliance on fossil fuels and has no plans to pivot towards renewables and battery storage.

A central part of the EIRP analysis is an evaluation of what to do with Stanton Units 1 and 2: continue to operate on coal, convert the units from coal to gas, repower the units, or retire the units. Siemens also reviewed OUC's energy efficiency plans and developed a separate energy efficiency forecast for OUC based on its finding that 0.5 percent "is a reasonable expectation for [energy efficiency] load reduction."[32]

2. Replacing OUC's Expensive Stanton Coal Plant with Renewable Energy Can Save Customers over $175 Million over the Next Two Decades

Synapse created a spreadsheet model to evaluate the net present value of revenue requirements (NPVRR) of three scenarios: the first two scenarios continue OUC's status quo reliance on fossil fuels and the third scenario pivots to renewables, energy efficiency, and battery storage. Our analysis utilizes a spreadsheet model to compare these scenarios and determine the lowest cost resource plan. We found

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30 Nadel, S. and Ungar, L. *Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050*, ACEEE, September 2019.

31 Spear, Kevin. 2020. "OUC halts study on shuttering coal plants as coronavirus pinches revenue and public dialogue." *Orlando Sentinel*, May 12. Available at https://www.orlandosentinel.com/coronavirus/os-ne-ouc-delays-study-coal-plant-closings-20200512-thi5d7op6jempm4yi6knynd2e4-story.html.

32 Siemens spreadsheet model provided to Sierra Club in response to public record request. "EIRP Base Case Assumptions_Siemens_10.07.19_delivered."

that the *Coal Conversion to Gas* scenario will increase costs to ratepayers by approximately $370 million, while transitioning to renewables (the *Renewable Energy* scenario) will directly save ratepayers over $175 million over the next two decades. The full results are discussed in Section 2.2 below.

2.1. Modeled scenarios consider continued reliance on coal, conversion to gas, and a transition to renewables and clean energy

Fossil Fuel Scenarios

We modeled two fossil fuel scenarios: the *Coal Continues* scenario where OUC continues burning coal at Stanton Units 1 and 2, and the *Coal to Gas Conversion* scenario, where OUC converts Stanton Units 1 and 2 to gas. The two scenarios differ only in that in the *Coal Continues* scenario OUC continues to operate Stanton Units 1 and 2 on coal, and in the *Conversion to Gas* scenario OUC converts Stanton Unit 1 and Unit 2 to gas in 2022. Neither scenario put Orlando on track to reach 100 percent renewables by 2050.

- We rely on OUC's 2020 TYSP as well as Siemens EIRP model inputs for our resource addition and retirement information. CD McIntosh Unit 3, a 352 MW coal unit of which OUC's owns 140.8 MW, retires in the end of 2024, and the Stanton A power purchase agreement (gas combined cycle) expires in the end of 2031. We do not test or allow other retirements in the 2020 –2040 timeframe.

- OUC has no need for new capacity until 2032. We meet OUC's post-2032 capacity needs with a small amount of solar PV, assuming that OUC continues to deploy solar beyond 2029 at the rate currently planned for the next decade, and predominantly with new gas

A Renewable Energy Portfolio Can Meet System Needs

Solar PV can provide critical summer peak capacity at the times when system demand is highest. Further, when solar PV and battery storage are both deployed on a system, solar energy can be stored to meet system needs during non-daylight hours. This allows the utility to rely on solar energy to displace energy from higher variable-cost fossil fuels and save ratepayers money.

Battery storage comes in smaller capacity increments than traditional fossil generation alternatives and can be constructed and deployed relatively quickly as capacity is needed. This saves ratepayers money and reduces the risk of overbuilding to meet uncertain future conditions. Battery storage also provides critical grid services that systems traditionally get from fossil fuel resources. Batteries are instantaneously responsive to changing system needs, and can, for example, quickly come offline as solar ramps up in the morning and come back online as it ramps down in the evening. Additionally, systems that rely on battery storage instead of large fossil fuel resources can actually lower their contingency requirements, as smaller resources require smaller levels of back-up reserves in case of a system failure. (Systems that rely on large, centralized fossil resources need large reserves to meet NERC requirements in case of an event where a single generator, transmission line, or other asset fails. As systems transition to rely on smaller, modular resources, such as battery storage, they will not have to plan for large, single resource outage contingencies.)

Demand-side management, including energy efficiency, can lower system energy use and system peak (through, for example, direct load control). Energy efficiency displaces high variable cost fossil fuels and should always be considered first in a resource plan.

combined cycle and combustion turbine resources. Firm imports will also be an option if there continues to be significant excess gas capacity in the region by this time.

- We use OUC's base load forecast from its 2020 TYSP which assumes an average annual growth rate for retail sales of 1.6 percent and a peak growth rate of 1.9 percent in summer and 2.3 percent in winter. We rely on the PSC's demand-side management goals for energy efficiency.
- We assume wholesale contracts that expire are not renewed.
- We rely on Siemens' and OUC's cost and operational information for current and planned resources. Where OUC-specific data is not available or is incomplete, we rely on the Horizons Energy National Database and other public industry-recognized sources.

Renewable Energy scenario

Our third scenario reflects a *Renewable Energy* scenario where Stanton Unit 1 and 2 are replaced by emission-free solar PV, incremental and dispatchable battery storage, and demand-side management. The *Renewable Energy* scenario puts OUC on the path to achieve 100 percent renewable energy by 2050.

- We retire Stanton 1 and 2 in 2024 and 2026 respectively, and meet capacity needs with solar PV and battery storage. We test a series of Stanton retirement dates in the near-term to identify the least-cost option.
- We rely on solar PV and incremental battery storage to meet capacity and energy needs that arise when the Stanton A power purchase agreement expires. We assume OUC's share of Stanton A and Stanton B would be retired and replaced beyond 2040.

Solar PV and Battery Storage Costs Have Dropped Dramatically in Recent Years

Solar PV Nationally, utility-scale PV and battery storage costs have dropped dramatically (50 percent over the past five years) and are projected to continue to do so for the foreseeable future. In Florida specifically, utility-scale solar PV costs dropped around 38 percent between 2015 and the end of 2019.

Despite this dramatic cost decline, there is only 3,690 MW of solar installed in the state, and in 2019, less than 2 percent of Florida's generation came from solar PV. In contrast, gas fueled around 70 percent of Florida's electricity generation in 2018. This is due in large part to the regulatory climate in the state. Florida lacks solar policies that have driven investment in solar elsewhere; specifically, Florida does not have a state renewable portfolio standard (RPS) and the state does not allow residential or commercial scale power purchase agreements.

Sources: *Lazard Levelized Cost of Energy Version 9.0, November 2015. Lazard Levelized Cost of Energy Version 13.0, November 2019. LCOE and capital cost of Crystalline Utility-Scale Solar PV.*

Fu, Ran, David J. Feldman, and Robert M. Margolis. US solar photovoltaic system cost benchmark: Q1 2018. No. NREL/TP-6A20-72399.

National Renewable Energy Laboratory (NREL), Golden, CO (United States), 2018.

Florida Solar (Data Current Through Q4 2019). Solar Energy Industries Association webpage, access May 26, 2020. Available at https://www.seia.org/state-solar-policy/florida-solar.

Solar Energy Industries Association (SEIA).

Florida State Profile and Energy Estimates, U.S. Energy Information Administration Website. Accessed May 26, 2020. Available at https://www.eia.gov/state/?sid=FL.

- We ramp up energy efficiency investment to national average levels by 2025 (annual savings representing 1.03 percent of retail sales).[33] We assume that energy efficiency does not change the load profile, but it reduces summer and winter peak loads proportionately to total annual savings.

- We assume excess energy can be sold as non-firm energy in FMPP or bilaterally to other regional entities.

- We rely on industry-recognized sources including ACEEE, National Renewable Energy Lab (NREL), Lazard, and U.S. Energy Information Administration (EIA) for cost and operational information for future renewables.

More information on topology, modeling structure, load, fuel prices, and other assumptions can be found in Appendix A.

2.2. Transitioning to renewables will save OUC ratepayers over $175 million over the next two decades

Based on our analysis of capital and operational costs (including initial and sustaining capital investments, fixed and variable operations and maintenance, fuel, and energy efficiency program investment), we find that the *Renewable Energy* scenario is the lowest cost resource option for Orlando ratepayers and the *Coal to Gas Conversion* scenario is the most expensive option. As shown in Table 3, the *Renewable Energy* scenario saves ratepayers over $175 million relative to the *Coal Continues* scenario and nearly $550 million relative to the *Coal to Gas Conversion* scenario.

Investments in Demand-Side Management Will Increase Energy Affordability for all, Especially ratepayers in Low-Income Neighborhoods

The national average for spending on energy as a percentage of income is 3.5 percent according to ACEEE, and 2 percent for Orlando specifically based on the U.S. Department of Energy's Low-Income Energy Affordability Data (LEAD) Tool. However, low-income Floridians face high energy burdens, meaning that an outsized portion of their income goes towards home energy bills. Specifically, the average energy burden among Orlando's low-income population is 7.2 percent, and with a quarter of the low-income population having an energy burden over 12 percent. Living in inefficient housing means low-income residents pay more per square foot for their utility bills, and these high energy burdens force families to face trade-offs between energy and other basic necessities, such as food and medicine.

While demand-side management programs can lower utility costs and therefore rates for all customers, targeted demand-side management programs can simultaneously focus on decreasing the electricity bills of low-income customers and therefore lower the energy burden they face.

Sources: *Drehobl, A. and Ross, L. Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities. ACEEE, April 2016.*

U.S. Department of Energy's Low-Income Energy Affordability Data (LEAD) Tool.

[33] Relf, Grace, Emma Cooper, Rachel Gold, and Akanksha Goyal. *2020 Utility Energy Efficiency Scorecard*, ACEEE. February 2020. Page 26.

Table 3: Scenario net present value revenue requirement (NPVRR) 2020–2040

$2019 Million	Coal Continues	Coal to Gas Conversion	Renewable Energy
Portfolio Cost	$4,217	$4,584	$4,041
Difference from Coal Continues	-	$367	($176)
Difference from Renewable Energy	$176	$543	-

Note: Negative value = savings. Discount rate = OUC WACC of 6.3 percent. NPVRR does not include landfill gas costs, which were not available and do not differ across scenarios.

Revenue requirement results

Figure 1 shows the total annual revenue requirement for the *Coal Continues* scenario. In the *Coal Continues* scenario, the majority of spending is focused on coal and gas resources over the next two decades. The picture looks very similar for the *Coal to Gas Conversion* scenario (not displayed here), except spending on coal decreases and spending on gas increases. In the *Renewable Energy* scenario there is a significant shift in spending by resources type, as shown in Figure 2. Specifically, spending on energy efficiency picks up in the early years, and by the mid 2020's spending on fossil resources (coal and gas) begins to steadily fall and is replaced by spending on solar PV and battery storage. Full revenue requirement results are included in Appendix B.

Figure 1: Annual revenue requirement for *Coal Continues* scenario

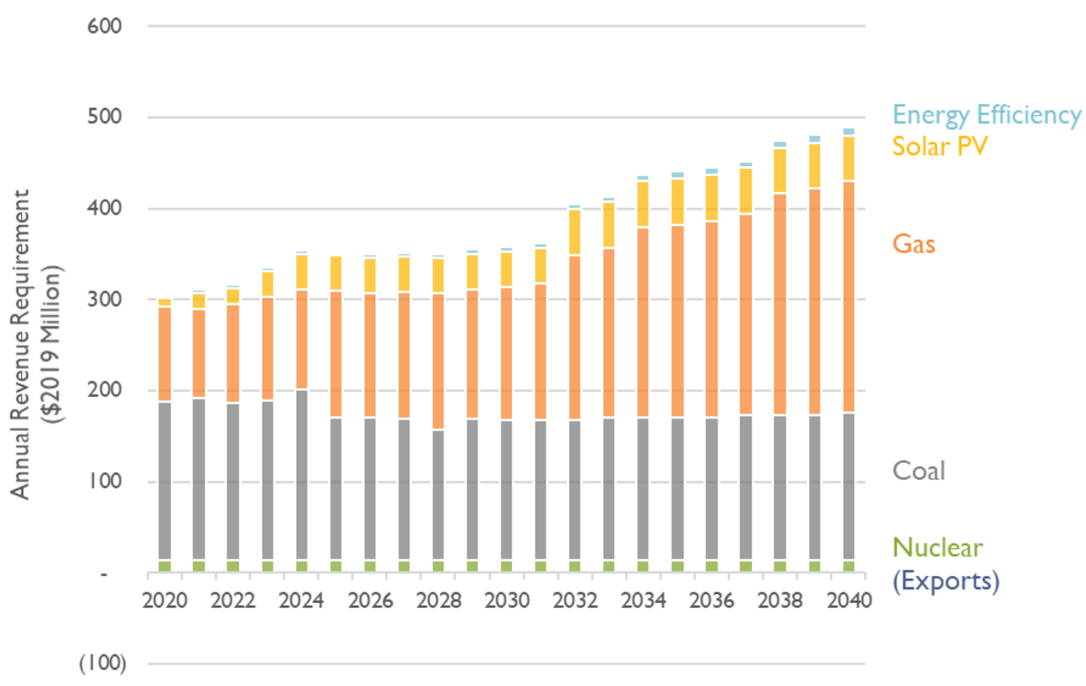
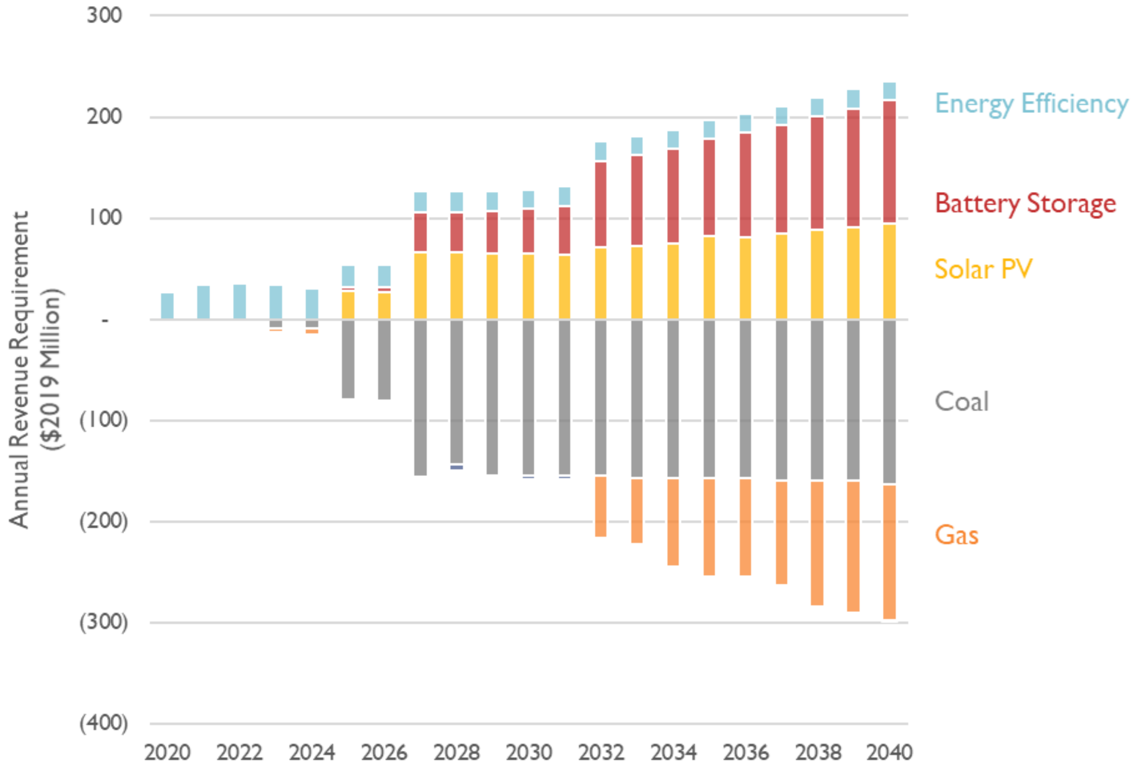


Figure 2: Difference in annual revenue requirement for *Renewable Energy* scenario relative to *Coal Continues* scenario



Capacity Results

As shown in Figure 3 and Figure 4, in the *Coal Continues* and *Coal to Gas Conversion* scenarios OUC continues to rely predominately on existing fossil fuel resources to meet system capacity needs while maintaining a 15 percent reserve margin. We assume that Stanton 1 and 2 do not retire in either scenario, and future capacity needs and load growth are met by a small amount of solar PV, and new gas capacity. Specifically, we build 260 MW of solar PV between 2030 and 2040 consistent with OUC's current installation trajectory for solar PV. When the Stanton A power purchase agreement expires in 2032, we build a new 385 MW combined cycle gas plant and then two additional 225 MW combustion turbines to meet OUC's projected continued load growth in 2035 and 2038. Fossil fuel resources account for around 80 percent of OUC's capacity in 2040 in these two scenarios (see Appendix B for winter and summer firm capacity results for all scenarios).

Figure 3: Nameplate installed capacity for *Coal Continues* scenario

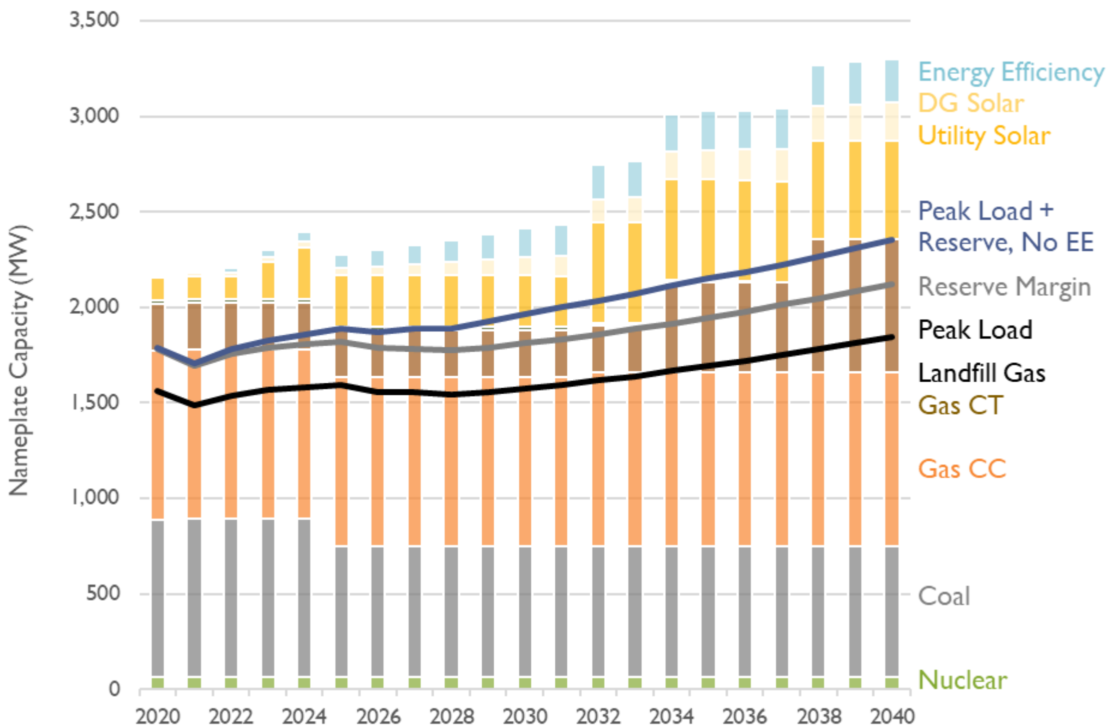
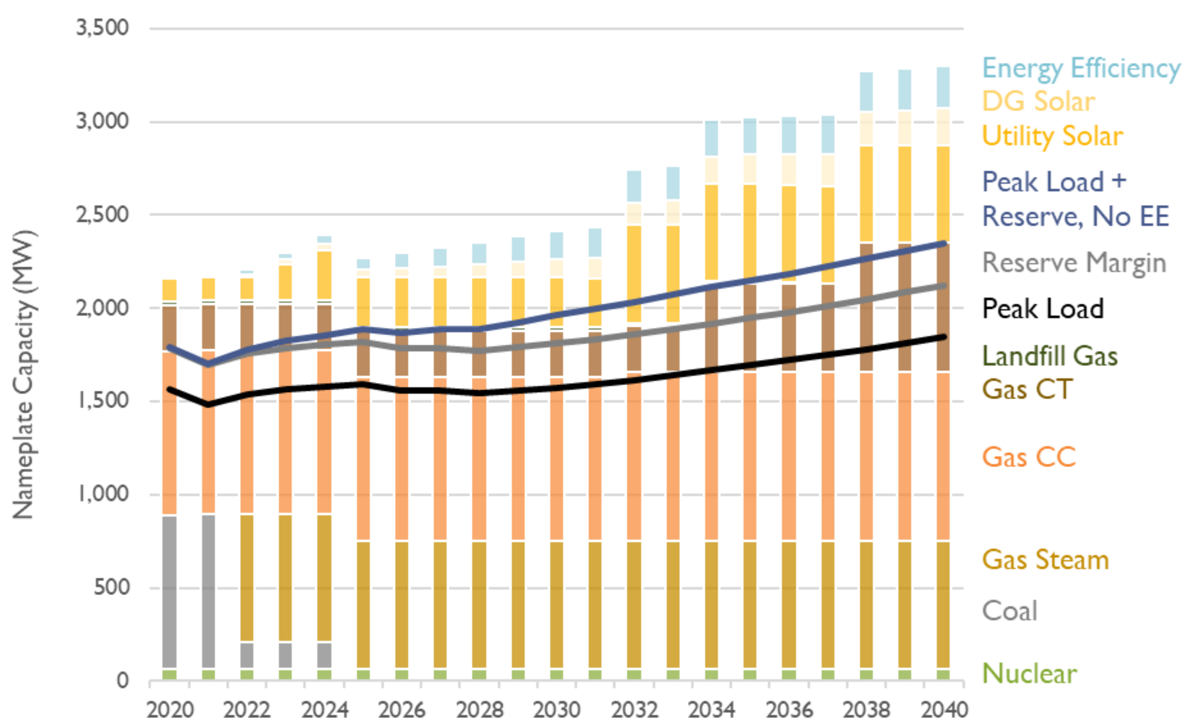
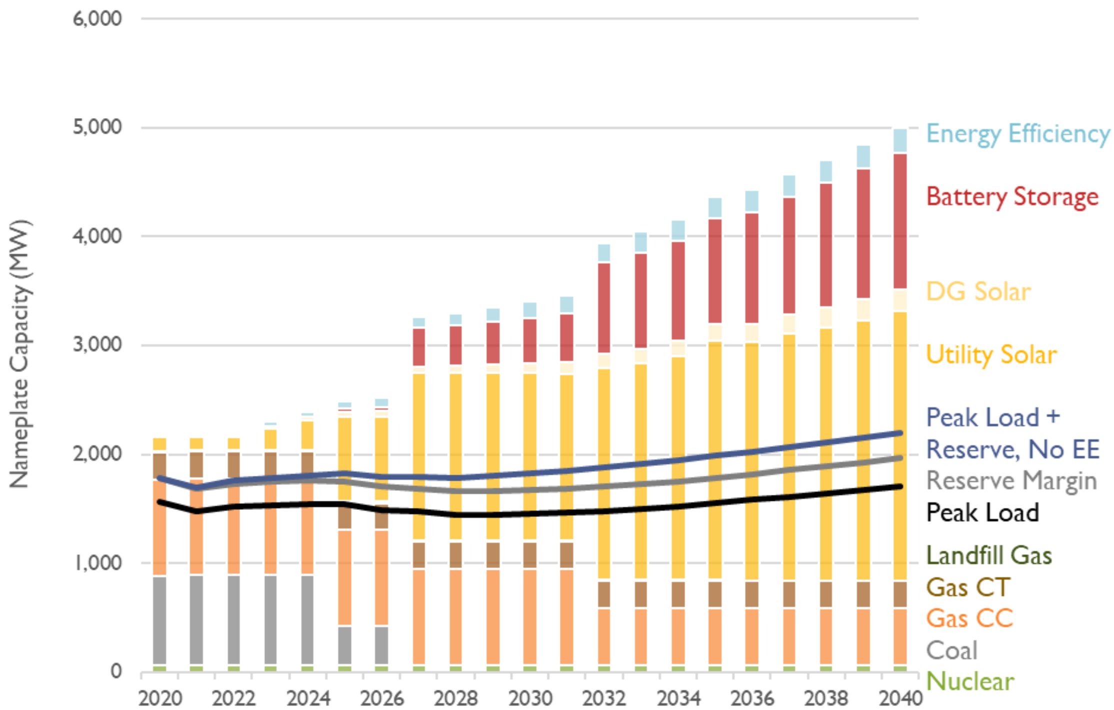


Figure 4: Nameplate installed capacity for *Coal to Gas Conversion* scenario



In contrast with the fossil fuel scenarios, in the *Renewable Energy* scenario we build out over 2 GW of solar, 1.2 GW battery storage, and increase investment in energy efficiency over the next two decades to meet firm peak demand while maintaining a 15 percent reserve margin (**Error! Not a valid bookmark self-reference.**). We assume Stanton 1 retires at the end of 2024 and Stanton 2 at the end of 2026. This creates a small capacity need starting in 2025, which can be met with less than 40 MW of battery storage (or firm imports), and a larger capacity need starting in 2027 that can be met by a little over 300 MW of battery storage. By 2040, fossil fuel capacity accounts for only 20 percent of summer and 35 percent of winter firm capacity.

Figure 5: Nameplate installed capacity for *Renewable Energy* scenario



We meet energy needs through the deployment of 510 MW of solar PV in 2025 and another 750 MW in 2027. Some of OUC's energy need could also be met by ramping up existing fossil fuels or buying non-firm imports. However, based on the power purchase agreement prices provided by Siemens, after 2025, solar from power purchase agreements is cheaper than the variable cost of most, if not all, of OUC's other resources. We meet subsequent energy and capacity needs beyond 2027 that result from the expiration of the Stanton A power purchase agreement and projected regional load growth through additional incremental deployments of solar and battery storage. The modular nature of battery storage makes it particularly well-suited to meet OUC's incremental future capacity needs. Unlike fossil resources which are constructed in large blocks, battery storage can be deployed in the size needed at the time needed. This saves ratepayers money and reduces the risk associated with building a large asset to meet projected future needs that may or may not materialize.

It is important to note that although summer peak is higher than winter peak on OUC's system, we conservatively assign solar a firm capacity contribution of zero percent in the winter and 50 percent in the summer. Therefore, the system is built to meet OUC's winter peaking needs and there is excess capacity in the summer.

Energy results

In both the *Coal Continues* and *Coal to Gas Conversion* scenarios, OUC's fuel mix gradually expands between 2020 and 2040. Despite this small shift, OUC continues to rely on coal and gas for 75 percent of its generation, as shown in Figure 6 and Figure 7, and is not on track to reach its renewable energy goal in either scenario. In contrast, in the *Renewable Energy* scenario, OUC's fuel mix shifts dramatically over the study period, transitioning from majority fossil fuels in 2020 to majority renewable energy by 2040. OUC relies on non-fossil resources for nearly 70 percent of its generation by 2040 and is on track to meet its renewable energy goal of 100 percent renewables by 2050, as shown in Figure 8.

Figure 6: *Coal Continues*—generation results

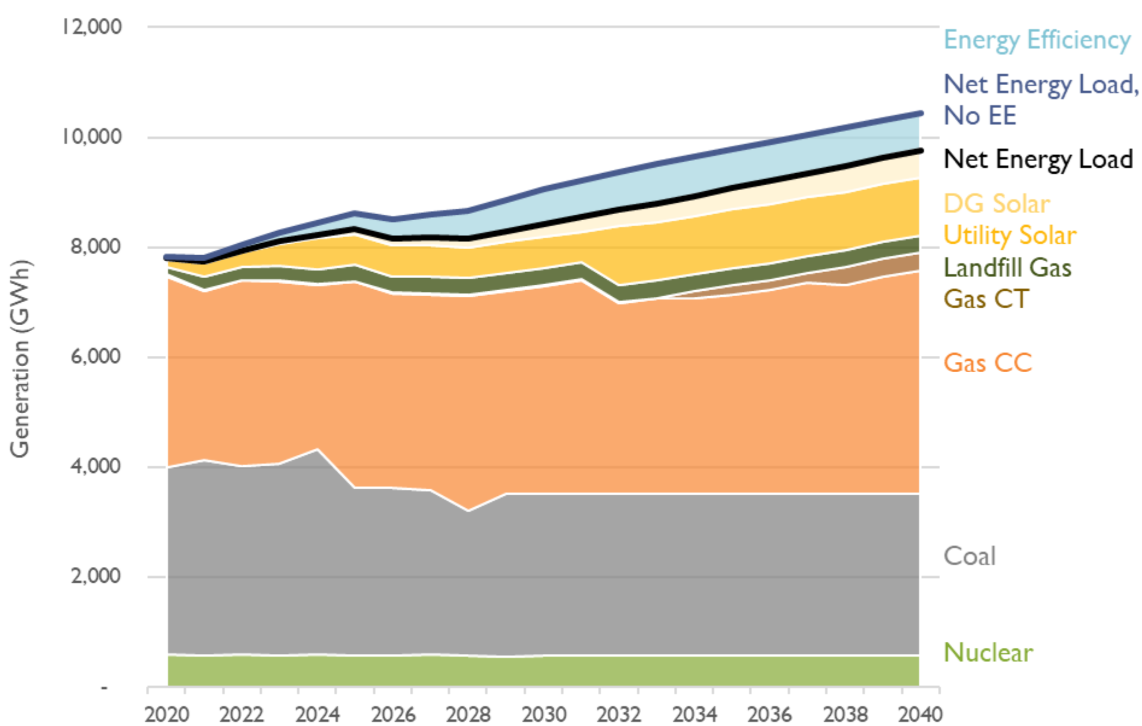


Figure 7: ***Coal to Gas Conversion*****—generation**

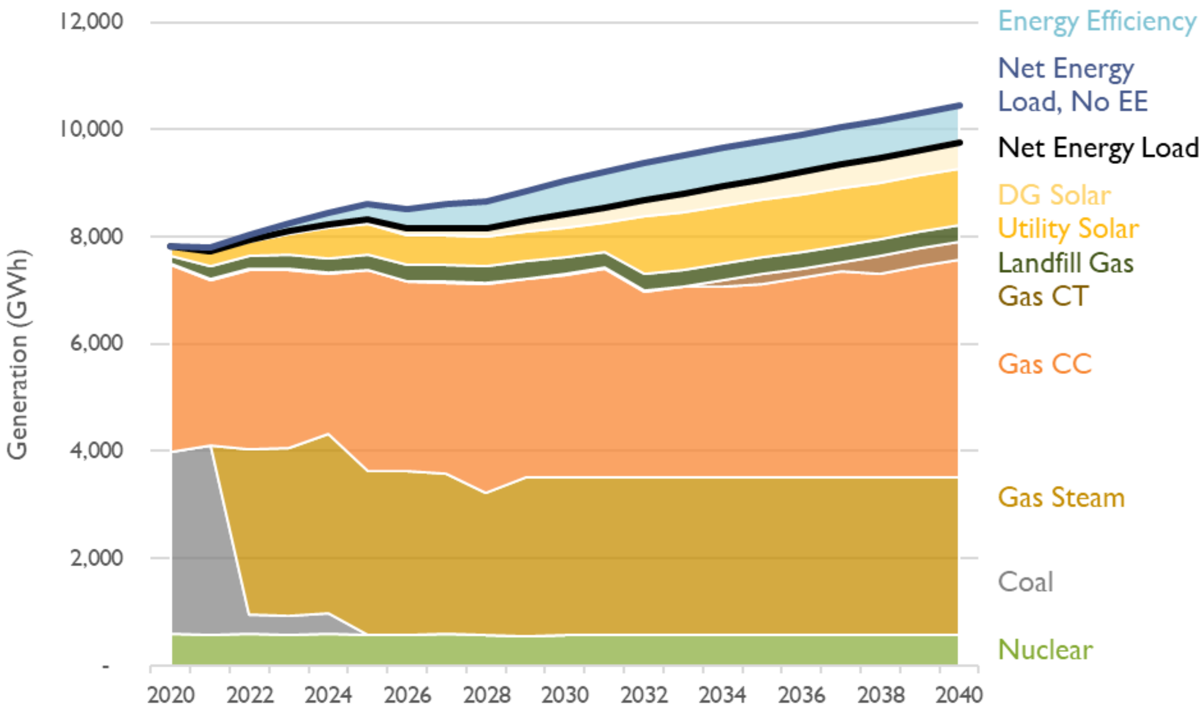
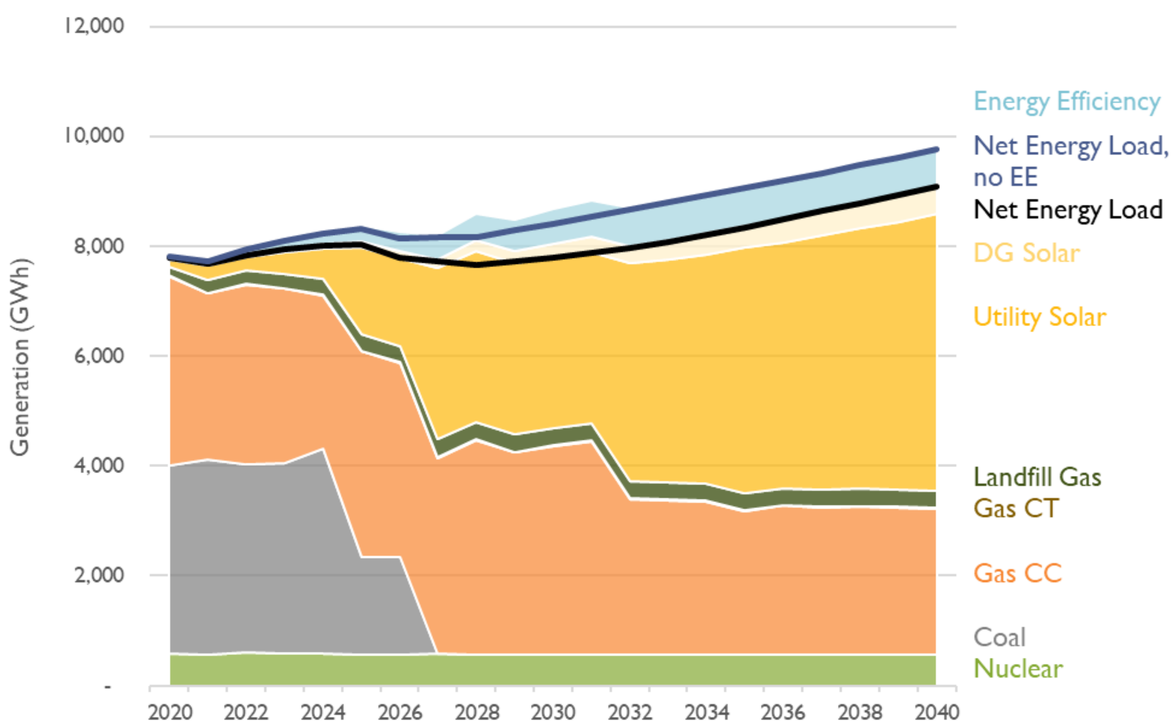


Figure 8: ***Renewable Energy*****—generation**



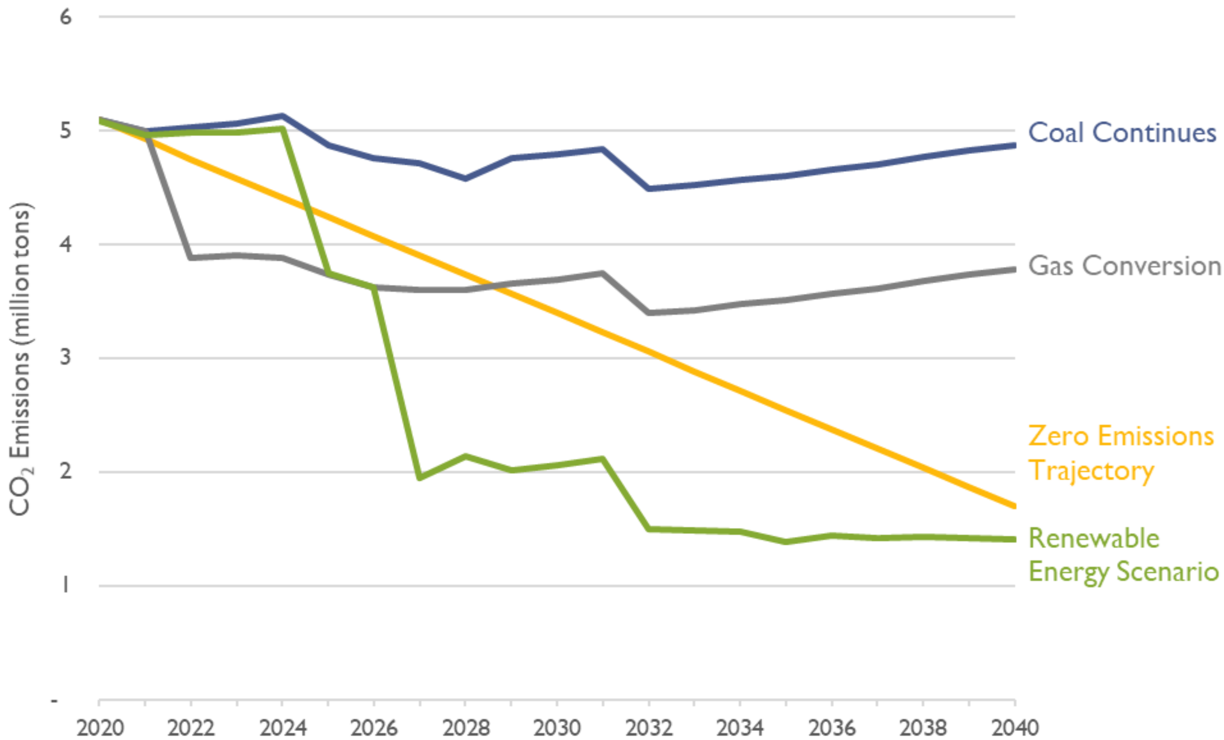
3. Continued Operation of Stanton 1 and 2 on Coal or Conversion to Gas Is Not Consistent with Orlando's Climate Goals and Subjects Ratepayers to Unnecessary Risks

3.1. OUC must retire Stanton and transition to renewables to reach its climate goals

For the City of Orlando to reach its goal of 100 percent renewable energy by 2050, OUC must begin taking action to steadily reduce its CO_2 emissions. The *Renewable Energy* scenario shows a cost-effective resource portfolio that will put OUC on track to reach 100 percent renewable energy and zero emissions by 2050. In fact, the *Renewable Energy* scenario puts OUC's emissions levels 20 percent below the level required for a zero-emission trajectory by 2040.

However, as discussed above and shown in Figure 9 below, OUC's current resource plan does not put the utility on track to reach zero emissions. In fact, under its current plan, its emissions are likely to go up relative to current emissions levels. OUC's resource mix as expressed in its 2020 TYSP produces emissions levels in 2029 that are 30 percent above the level required for a zero-emission trajectory, and our modeling of the *Coal Continues* scenario finds that, if OUC continues on its current path, emission levels in 2040 will be nearly three times the level needed for a zero-emission trajectory. Emissions in the *Coal Continues* scenario are 2.5 times levels seen in the *Renewable Energy* scenario by 2029, and 3.5 times larger than levels in the *Renewable Energy* scenario by 2040. Total emissions over the period 2020 through 2040 for the *Coal Continues* scenario amount to over 100 million tons of CO_2, which is nearly double the level seen in the *Renewable Energy* scenario.

Figure 9: CO_2 emission trajectories of modeled scenarios



If OUC converts Stanton to gas but does not ramp up investment in renewables and energy efficiency, its direct emissions will decrease in the near term, but then slowly increase as it builds more gas to meet future demand. The *Coal to Gas Conversion* scenario produces double the level of emissions by 2040 required for OUC to be on a zero emissions path. Emissions for the *Coal to Gas Conversion* scenario are 1.8 times larger than the *Renewable Energy* scenario by 2029, and 2.7 times larger by 2040. Total emissions over the period 2020 through 2040 for the *Coal to Gas Conversion* scenario amount to just under 80 million tons of $CO_{2,}$ which is just under 1.5 times the level seen in the *Renewable Energy* scenario.

These large differences in total emissions will have a significant climate impact, and this is without even considering the contribution of upstream methane leakage associated with gas extraction, processing, and transportation. Methane is a significantly more potent greenhouse gas than carbon dioxide, so even small amounts of methane leakage can have a big impact on the climate. While there is disagreement around the level of methane leakage involved in gas extraction, processing, and transportation, there is well established research showing leakage rates of 2-3% of fuel produced. These findings, from a 2018 study published in the journal Science[34] place the emissions leakage rate at 60 percent higher than the

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[34] Alvarez, R. et al. *Assessment of methane emission from the U.S. oil and gas supply chain.* Science, 361 (6398), 186-188. June 21, 2018. Available at https://science.sciencemag.org/content/361/6398/186.

current leak rate of 1.4 percent used by U.S. EPA.[35] A more recent study published in April 2020 evaluated methane leaks from the Permian Basin located in New Mexico and Texas and found that 3.7 percent of gas produced in this basin is leaked into the atmosphere. This means that the emissions associated with all fossil scenarios is understated in our results.[36]

3.2. Continued reliance on fossil fuels resources exposes ratepayers to significant economic and health risks

There are many risks associated with reliance on fossil fuel resources that we have not factored into our analysis. We have omitted them here due to either the level of uncertainty associated with if and how they will materialize or the challenge with monetizing the risks to incorporate into analysis. However, these risks do not exist to the same extent if OUC transitions toward renewables, battery storage, and demand-side management. Therefore, OUC should consider and incorporate these risks into its analysis and decision-making processes.

First, future environmental regulations could require OUC to invest in capital upgrades to existing fossil infrastructure to comply, or otherwise increase the costs of operating existing fossil fuel units. This could take the form of an emissions or pollutant limitation, or implementation of a CO_2 price at the state or federal level. Further, reliance on resources that require fossil fuels to operate (gas especially) present the risk of fuel price volatility.

Investment in the coal to gas conversion at Stanton Energy Center, or in any future gas assets, presents a stranded asset risk as well. Declining renewable energy and storage costs, state or federal policy, future gas price increases, or other future plant costs may make it uneconomic to continue operating gas plants long before OUC's investment in the plant is depreciated. If it is no longer legal or economic for OUC to operate a specific asset, either the OUC ratepayers or the citizens of Orlando will be stuck paying the bill for an asset that is no longer providing any value.

Further, continued reliance on fossil fuels subjects community members (ratepayers) to health risks from air pollution. This exposure exacerbates lung and heart conditions[37] and increases vulnerability to certain diseases, including COVID-19.[38]

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[35] U.S. EPA, *Inventory of U.S. Greenhouse Emission and Sinks, 1990 – 2016.* April 12, 2018. Available at https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf.

[36] Zhang, Yuzhong, Ritesh Gautam, et al. *Quantifying methane emissions from the largest oil-producing basin in the United States from space.* Science Advances, Vol 6, No. 17. 22 April 2020. Available at https://advances.sciencemag.org/content/6/17/eaaz5120.

[37] Centers for Disease Control and Prevention, Air Quality webpage. Accessed June 4, 2020. Available at https://www.cdc.gov/air/air_health.htm.

[38] Wu, X., Nethery, R. C., Sabath, B. M., Braun, D., & Dominici, F. 2020. "Exposure to air pollution and COVID-19 mortality in the United States." *medRxiv*. April 27, 2020. Available at https://www.medrxiv.org/content/10.1101/2020.04.05.20054502v2.

4. Replacing Stanton's Coal Units with Renewable Energy Resources Creates High Quality Local Jobs

Synapse conducted an analysis of the economic benefits of OUC investing in renewable energy, battery storage, and energy efficiency. This evaluation focuses on the change in jobs that would result from a transition in the utility's electricity supply- and demand-side resources. The core of the analysis compares current spending on existing resources in the *Coal Continue*s scenario to a future in which OUC pursues one of the two alternative scenarios described in Section 2: *Coal to Gas Conversion*, or *Renewable Energy*. We find that the *Coal to Gas Conversion* scenario is expected to lose around 2,000 net job-years while the *Renewable Energy* scenario is expected to create around 11,000 net job-years over the period 2020–2040 relative to the *Coal Continues* scenario. Full results are discussed in Section 4.2 below.

OUC should respond to the current economic crisis by shifting investment from fossil resources to job-inducing energy efficiency and renewables

In May, OUC announced a temporary pause in the EIRP process, citing "plummeting revenues and the inability to effectively communicate with the public because of the coronavirus outbreak". Sierra Club welcomed this decision, citing the importance of delaying the process until the public can be fully engaged.

With this delay, OUC has an opportunity to re-focus its resource plan on solutions that both meet its electricity system needs and provide regional economic benefits.

A report on economic recovery from COVID published in June by the International Energy Administration found that, globally, a sustainable recovery plan would both spur economic development, create jobs, and put emissions into structural decline. The report also found that the largest areas for new job development were in retrofitting buildings and installing other measures to improve efficiency. These findings support the results of our Orlando-specific economic and jobs analysis (discussed in this section) and highlight the importance of OUC evaluating and quantifying local economic impacts of its resource plans as part of its EIRP process.

Source: *Spear, Kevin. 2020. "OUC halts study on shuttering coal plants as coronavirus pinches revenue and public dialogue." Orlando Sentinel, May 12. Available at https://www.orlandosentinel.com/coronavirus/os-ne-ouc-delays-study-coal-plant-closings-20200512-thi5d7op6jempm4yi6knynd2e4-story.html*

Sustainable Recovery, a World Energy Outlook Special Report. International Energy Agency. June 2020. Available at https://webstore.iea.org/download/direct/3008.

4.1. Investment in renewable energy delivers more local benefits than continued reliance on fossil fuels

Investments in energy efficiency, solar power, wind power, and batteries can strengthen local and state economies while saving ratepayers money. Together, there are nearly three million U.S. jobs dedicated to these energy resources.[39] Over half of

[39] National Association of State Energy Officials and Energy Futures Initiative. The 2019 U.S. Energy & Employment Report. 2019.

those jobs are in the construction sector,[40] which support the economies where these energy resources are installed. Additionally, energy efficiency investments save ratepayers money by reducing utility bills, which can create new jobs when the savings are re-spent in the economy.[41]

Transitioning away from fossil-fuel-based electricity generation can create a net increase in jobs associated with low-carbon energy supply and energy efficiency. Compared with investment in fossil fuels, renewables and energy efficiency create between two and three times as many jobs for the same quantity of spending.[42] Further, a large portion of expenditures on coal and gas leave the Florida economy, as there are relatively few in-state jobs in these industries. The mining and extraction jobs sector represented 0.18 percent of all Florida jobs in 2018, which is one-quarter of the national share for this sector.[43] Reduced spending on coal and gas generation will result in job loss in these sectors. However, this should be considered alongside the increase in renewable and energy efficiency jobs to understand the overall net impact. Thoughtful consideration should be given to how to transition any workers who lose jobs.

4.2. In Orlando, transitioning to renewables will create over 11,000 net job-years over the next two decades

Synapse created an economic input/output model to evaluate the number of jobs that would be created under the *Coal to Gas Conversion* and *Renewable Energy* scenarios. Our model converts changes in OUC spending by energy resource into job impact outcomes. We consider job losses associated with declining investment in fossil fuel generation. Additionally, we quantify the jobs that would be created by ratepayer re-spending of (1) utility savings from energy efficiency and (2) rate reductions resulting from lower cost energy resources. A description of the model, our methodology, and the economic parameters we use are included in Appendix C.

We estimate job creation in units of “net job-years.” Each job-year represents a single full-time equivalent job for a single year. Some jobs are temporary, such as construction jobs for one-time projects. Others are longer term and involve ongoing operation and maintenance or program implementation (e.g. a weatherization program that is funded for numerous years). Therefore, defining the job creation in terms of “job-years” is a way to equally account for both temporary and long-term jobs. Our results are “net” because they represent (1) the increase in jobs due to new investment in

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[40] Id.

[41] See, for example: Camp, E., J. Hall, P. Knight, C. Odom. 2020. *Investing in Public Infrastructure in Massachusetts: Impacts of Investment in Clean Energy, Water, and Transportation*. Synapse Energy Economics for Labor Network for Sustainability.

[42] Garrett-Peltier, H., 2017. “Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model.” *Economic Modelling*, *61*, pp.439-447.

[43] Bureau of Economic Analysis. 2019. Regional Data, Total Full-Time and Part-Time Employment by NAICS Industry. Available at https://www.bea.gov/data/employment/employment-by-state.

renewables and energy efficiency and (2) the decrease in jobs due to reduced spending for fossil-fuel-based generation.

Spending by resource type

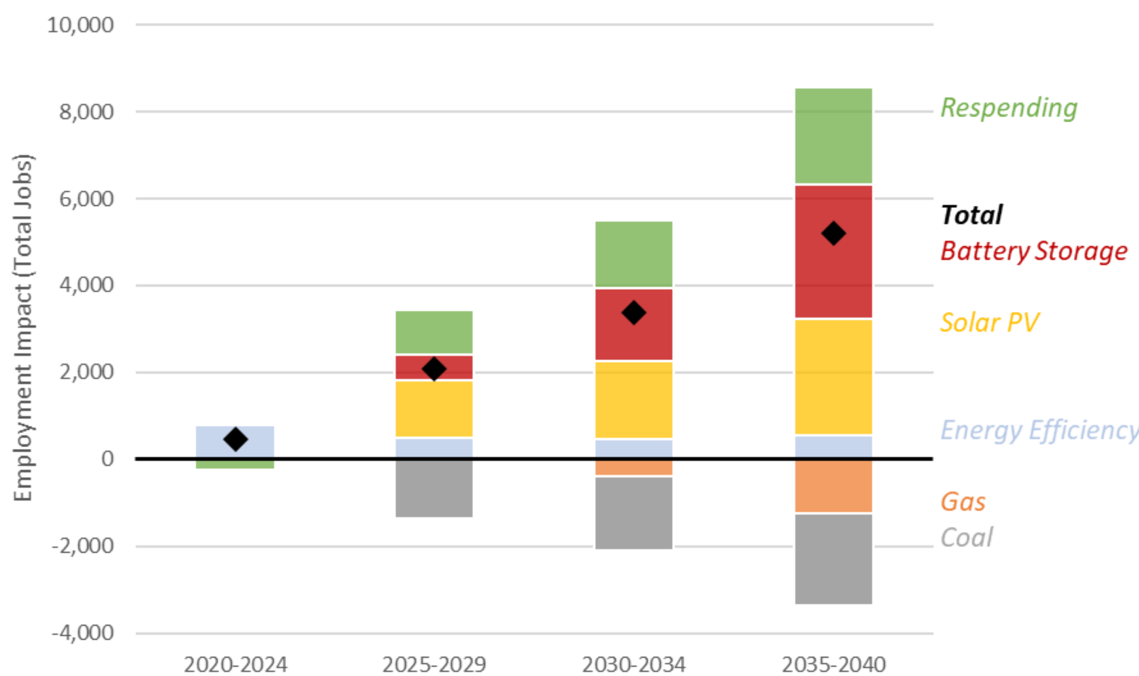
The *Coal to Gas Conversion* scenario is expected to lose around 2,100 net job-years over the period 2020–2040 as shown in Table 4. This result is equivalent to a loss of 100 jobs on average over the 21-year study period. This magnitude of job loss is expected from OUC transition from coal to gas, as the gas industry is less job-intensive per unit of energy (as measured by total spending) than the coal industry. Induced jobs from re-spending is also expected to go down by nearly 2,300 job-years as utility costs go up, and with that, customer spending on utility bills.

Table 4: Change in full-time equivalent job years by resource, 2020–2040 (FTE job-years)

	Renewable Energy Scenario		Conversion to Gas	
	Annual Average	**Total**	**Annual Average**	**Total**
Re-spending	217	4,548	(112)	(2,349)
Solar Power	276	5,799	0	0
Energy Efficiency	109	2,286	0	0
Battery Storage	256	5,382	0	0
Coal	(248)	(5,204)	(312)	(6,552)
Gas	(79)	(1,664)	324	6,795
Total	**531**	**11,147**	**(100)**	**(2,107)**

In contrast with the *Coal to Gas Conversion* scenario, the *Renewable Energy* scenario is expected to create over 11,000 net job-years over the period 2020 through 2040 (see Table 4) as OUC transitions away from fossil fuels resources and towards 100 percent renewable energy. This result is equivalent to over 500 jobs on average over the 21-year period. A large share of the job creation will occur in the years 2027 and 2032, associated with construction of solar PV and battery storage to replace Stanton 1 and 2 and the Stanton A power purchase agreement. Figure 10 displays the total employment impacts of the *Renewable Energy* scenario relative to the *Coal Continues* scenario for four periods. We find significant and increasing positive impacts from the *Renewable Energy* scenario, with direct spending on renewables battery storage, efficiency, and re-spending outstripping decreased investment in coal and gas during all periods.

Figure 10: Total employment impacts of the *Renewable Energy* scenario relative to *Coal Continues*



Solar PV accounts for the largest economic impact at nearly 5,800 job-years, followed by Battery Storage at around 5,400 job-years. Energy efficiency also has a strong economic impact of around 2,300 job-years. Induced jobs from customer re-spending of utility savings accounts for 2,800 job-years based on efficiency savings, and an additional 1,000 job-years based on other decreased utility spending (and therefore lower customer spending). See Appendix C for discussion of induced jobs. Job losses in coal and gas are expected to be 5,200 and 1,700 job-years, respectively. However, as discussed above, a large portion of these jobs are expected to be based outside of the state of Florida.

Job impacts by sector

Investment in energy efficiency, renewables, and energy storage creates high-quality jobs. The average worker income for the new jobs will vary by resource and sector. At the low end, jobs in the "other services" sector (non-professional and non-business services) will earn an average income of $53,865. At the high end, solar power manufacturing jobs will earn $149,149 on average. In our *Renewable Energy* scenario, the weighted average income for the created jobs across all resources and all sectors is estimated to be $72,976 as compared to an economy-wide average of $62,977.

Many of the jobs created by investment in energy efficiency, renewable energy, and batteries would be local. As shown in Table 5, nearly 70 percent of these new jobs would occur in the construction sector, which we expect would be in the OUC service territory and surrounding area where the new resources would be installed. Additionally, new local jobs will be created to the extent that ratepayers reinvest utility savings back into the local economy. Transitioning away from fossil-fuel-based generation will result in loss of local fossil-related jobs. However, the sector most impacted by this change in investment would be mining and extraction, which we estimate will lose around 100 jobs a year for a total loss of around 2,100 job-years over the study period. However, as discussed above, relatively few of these jobs are likely to be located in state.

Table 5: Change in full-time equivalent job-years (FTE job-years) relative to base scenario by sector, 2020–2040

	Renewable Energy Scenario		**Coal to Gas Conversion**	
Sector	**Annual Average**	**Total**	**Annual Average**	**Total**
All sector re-spending jobs	217	4,548	(112)	(2,349)
Mining and extraction	(108)	(2,269)	26	542
Utilities	(30)	(620)	22	453
Construction	358	7,508	0	0
Manufacturing	48	1,008	0	0
Wholesale trade	10	210	(5)	(113)
Professional and business services	(17)	(359)	(31)	(647)
Other services	53	1,121	0	7
Total	**531**	**11,147**	**(100)**	**(2,107)**

5. Recommendations

The City of Orlando has asserted a strong commitment to climate and sustainability through its Community Action Plan[44] and membership in various climate coalitions. However, the actions of OUC are not aligned with the City's stated goal. OUC's most recent planning document, the 2020 TYSP, indicated plans to build out only a small amount of Solar PV over the next 10 years, no plans to build any battery storage, and very minimal investment in additional demand-side management programs. Further, Siemen's now-paused EIRP process focused on Stanton coal Units 1 and 2, assumed minimal investment in incremental demand-side management and efficiency, and was unclear on the role renewables would play in Orlando's future.

[44] The City of Orlando's 2018 Community Action Plan, Green Works Orlando. Available at https://www.orlando.gov/files/sharedassets/public/departments/sustainability/2018_orlando_communityactionplan.pdf.

Given the significant disconnect between Orlando's stated climate commitments and the action of its electric utility, the City must now act to align all plans and actions that impact climate and energy use with the City's stated goals. OUC must provide Orlando a clear plan on how it will transition from its current reliance on fossil fuels to a clean system that relies on solar PV, battery storage, and energy efficiency. A renewable portfolio will not only provide environmental benefits, but as we have shown in this report, will save the citizens of Orlando hundreds of millions of dollars directly, in addition to providing significant local jobs and economic stimulus, and protecting public health.

Our specific recommendations are as follows:

1. OUC must use the EIRP being prepared by Siemens to chart a path to 100 percent renewables by 2050. The plan should include a transparent evaluation of the economic retirement dates for OUC's coal plants at Stanton and all other fossil fuel resources; should include no new fossil fuel resources; and should replace all retired resources and meet any future load growth with solar PV, battery storage, and demand-side management solutions.

2. OUC needs to develop best-in-class energy efficiency programs to reduce load and target peak demand, and dramatically scale up investment in these programs to achieve incremental savings of at least one percent of retail sales per year.

3. OUC and the City of Orlando should evaluate the risk of any further investments in coal and gas plants being rendered uneconomic before the end of their useful life by policy changes and continued clean energy cost declines.

4. OUC and the City of Orlando should quantify the job and community impacts of its selected resource plan and ensure that OUC's resource plan yields local investment and local clean energy jobs. Especially now, as the City of Orlando battles a public health crisis and the resulting impact of job losses, OUC's has the ability to choose a path that can lead to cleaner air and create locally-based, high-quality jobs for Orlando residents.

Appendix A. Resource Plan Methodology and Inputs

Model description

Synapse designed a spreadsheet model to evaluate the NPVRR of three scenarios. Our analysis compares a series of capacity expansion scenarios to determine the lowest cost resource plan. We do not perform optimized capacity expansion and production cost modeling; rather we screen several likely scenarios. We evaluate energy balance and capacity needs for the summer and winter season of each year.

Peak load and annual energy

For peak load and annual energy, Synapse relied on OUC's 2020 TYSP for the period 2020–2029. For the years 2030–2040, Synapse applied the compound annual growth rate (CAGR) from the period 2025–2029 to the OUC's project 2029 values. We did not make any changes to OUC's embedded electric vehicle load assumptions.

We matched generation values between 2020 and 2029 to the energy balance by resource type as displayed in Schedule 6.1 of OUC's TYSP for the *Coal Continues* scenario. We adjusted Stanton B up and down as needed to calibrate the model. We assumed that going forward, system energy needs would be met if each existing resource continues to operate at the approximate capacity factor observed during the period 2025–2029.

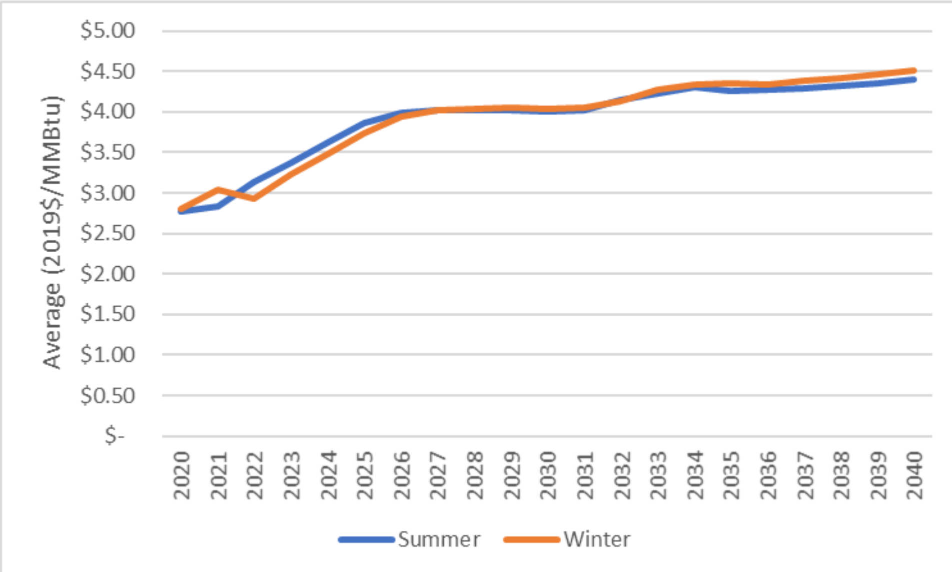
We designed all portfolios to meet a 15 percent reserve margin in both the summer and winter.

Fuel prices

Synapse relied on the coal price forecast that Siemens prepared for OUC with local delivery charges calculated. We are not including the specifics of the forecast here due to confidentiality concerns.

Synapse relied on our own internal gas price forecast for Henry Hub base prices and applied Siemens FGT Citygate basis for the local delivery adder (Figure A-1). Our Henry Hub gas price forecast relies on NYMEX futures for monthly prices through December 2021. Starting in January 2025, we use the annual average prices projected in the U.S. Energy Information Administration's Annual Energy Outlook (AEO) 2020. For 2022–2024, we linearly interpolate the annual price from the NYMEX (2021) value to the AEO (2025) value. We then apply a monthly shape for 2022–2024 prices that is based on the average monthly prices from 2017 to 2020. We apply trends in average monthly prices observed in the NYMEX futures to the longer-term gas price to develop long-term monthly trends.

Figure A-1: Synapse average seasonal natural gas forecast with Siemens Citygate adder



Existing and planned resources – TYSP and EIRP

Synapse relied on the EIRP that Siemens is preparing for OUC for current resource operational information, supplemented by public information when unit-specific information was not available. Specifically, for operations and maintenance costs at Stanton Units 1 and 2, OUC provided the input assumptions that Siemens is relying on. OUC did not provide operational or sustaining capital costs assumptions for all other existing plants; therefore, we relied on the Horizon Energy's generic assumption (calculated based on FERC Form 1 data) for operations and maintenance costs and AEO for sustaining capital expenditure costs. We also relied on EIA data on historical generator performance to validate the operational assumption Siemens planned to model for OUC. In the case of Stanton Units 1 and 2, we found that historical heat rates as reported by the EIA were significantly higher than the average levels Siemens planned to model; therefore, we used an average observed over the years 2017–2019. We relied on public information available on existing solar power purchase agreement prices. We assigned all existing and future solar PV a 50 percent firm capacity contribution in the summer and 0 percent in the winter.

For new resources, OUC projected no new resource needs between 2020 and 2029. Beyond 2029, OUC provided input assumptions that Siemens planned to model around resource retirements and power purchase agreement expiration. We assumed that OUC would continue to deploy solar PV at the rate projected for the next decade, and that it would fill all remaining capacity needs with new gas capacity. Based on the incremental energy and peak capacity needs, we assumed OUC would deploy a combination of combined cycle and combustion turbine gas resources. We relied on the capital cost and operational assumption for new gas capacity and the solar power purchase agreement price projection for Solar PV that Siemens prepared for OUC. We also relied on the Distributed Generation forecast that Siemens prepared for OUC. For the Coal to Gas conversion project cost, we relied on the project cost information that Siemens prepared for OUC.

Renewable Energy scenario projects

Synapse developed our own energy efficiency forecast for the *Renewable Energy* scenario. We ramped up investment in energy efficiency between now and 2025 to reach the national average of 1.03 percent annual incremental savings from energy efficiency as a percent of total retail sales. We relied on data from the U.S. EIA and ACEEE 2020 Utility Energy Efficiency report card for average program performance metrics.

We estimated energy efficiency program costs by comparing OUC's energy efficiency program performance to those of other Florida utilities. We made the conservative assumption that energy efficiency program costs in the early years will mirror those of other Florida utilities with poor energy efficiency performance (Florida Power and Light) and will decline as energy efficiency programs ramp up to more closely approximate those of other Florida utilities with more average energy efficiency performance (Duke Energy Florida). We relied on data from the U.S. EIA and ACEEE 2020 Utility Energy Efficiency report card for cost and performance data.

We relied on the cost data that Siemens provided to OUC for solar power purchase agreement costs, and Annual Technology Baseline (ATB) from NREL for utility-owned solar PV and battery storage cost assumptions. We assumed that solar contributes 50 percent firm capacity in the summer and 0 percent firm capacity in the winter based on OUC's current modeling assumption.

Appendix B. Detailed Resource Plan Scenario Results

In this section we provide additional results to supplement the results provided in the report and executive summary. Specifically, we provide:

Annual revenue requirement for each scenario broken down by resource type:

- Figure B-1, Figure B-2, Figure B-3
- Annual revenue requirement for each scenario broken down by expense category: Figure B-4, Figure B-5, Figure B-6
- Summer Firm Capacity (MW) by scenario: Figure B-7, Figure B-9, Figure B-11
- Winter Firm Capacity (MW) by scenario: Figure B-8, **Error! Reference source not found.**, Figure B-12

Figure B-1: Annual revenue requirement by resource type for *Coal Continues* scenario

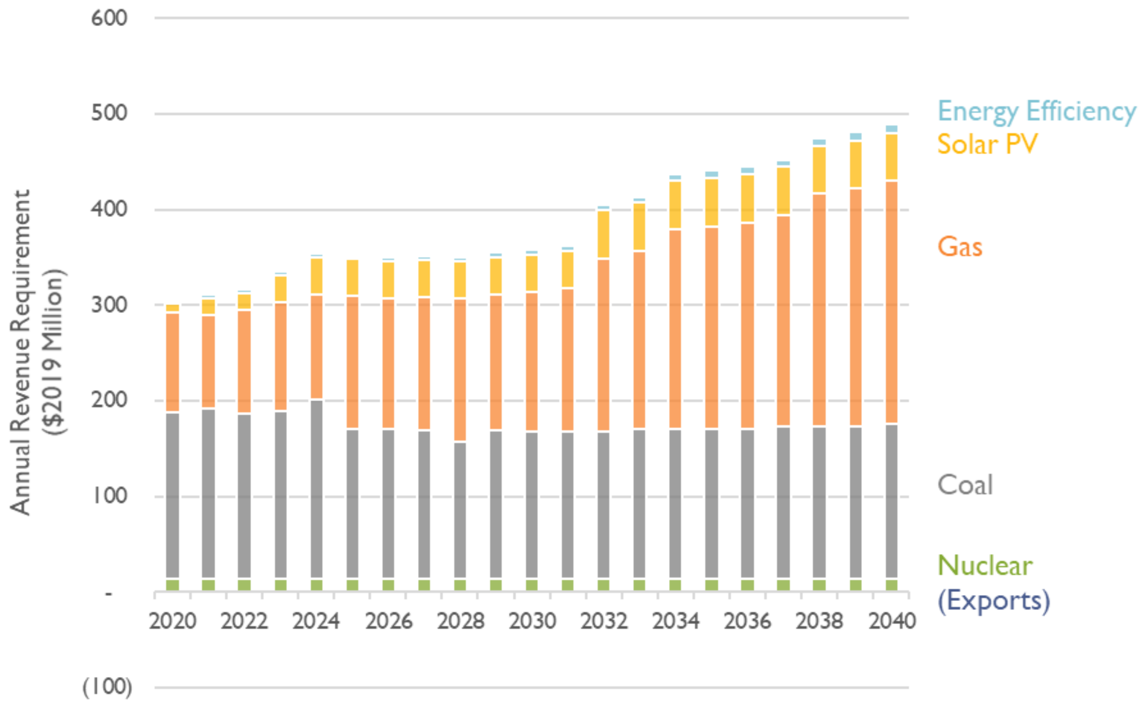


Figure B-2: Annual revenue requirement by resource type for *Coal to Gas Conversion* scenario

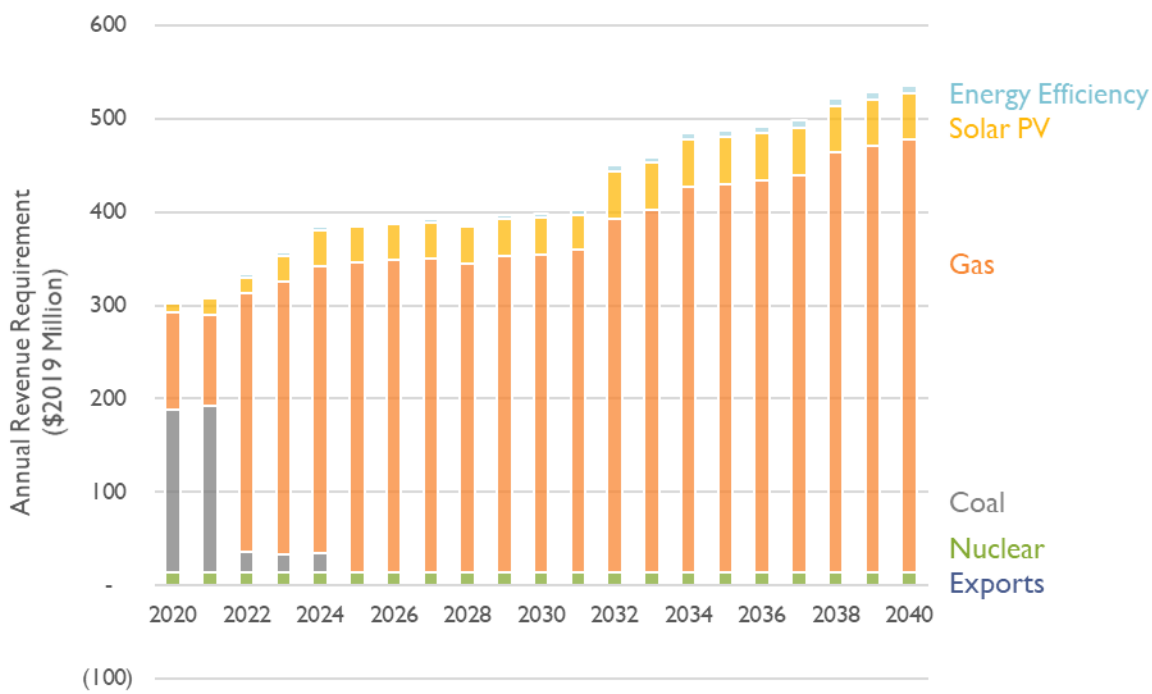


Figure B-3: Annual revenue requirement by resource type for *Renewable Energy* scenario

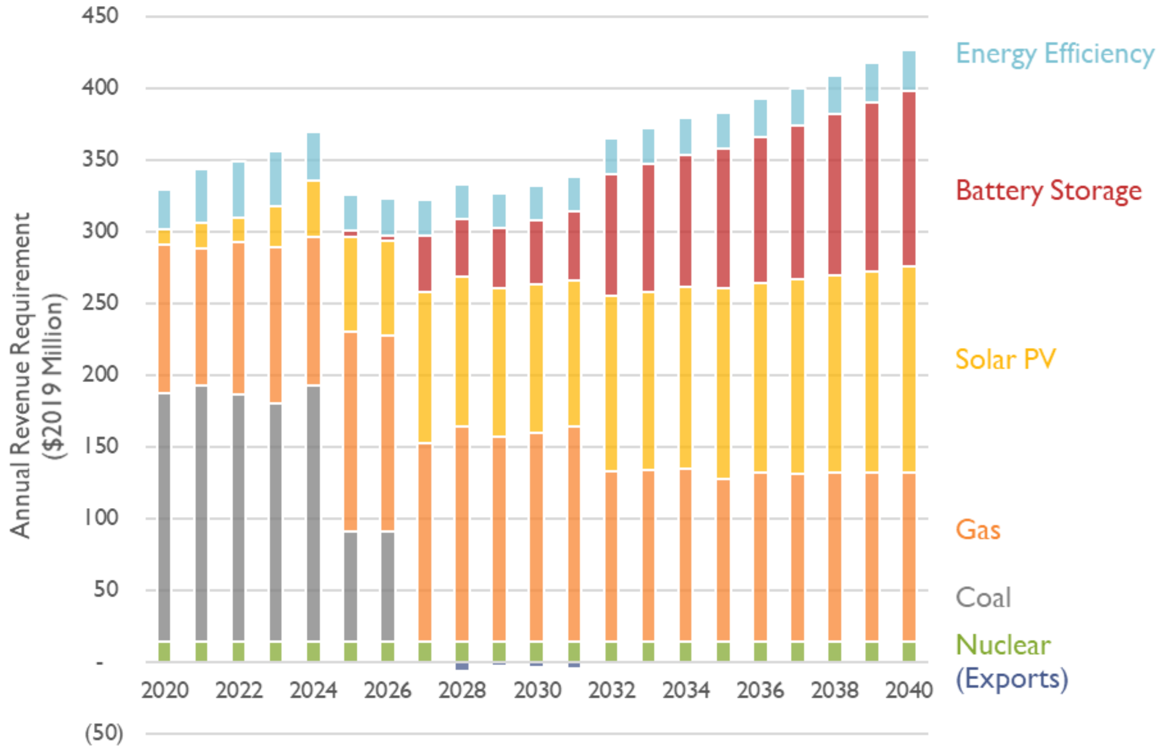


Figure B-4: Annual revenue requirement by expense type for *Coal Continues* scenario

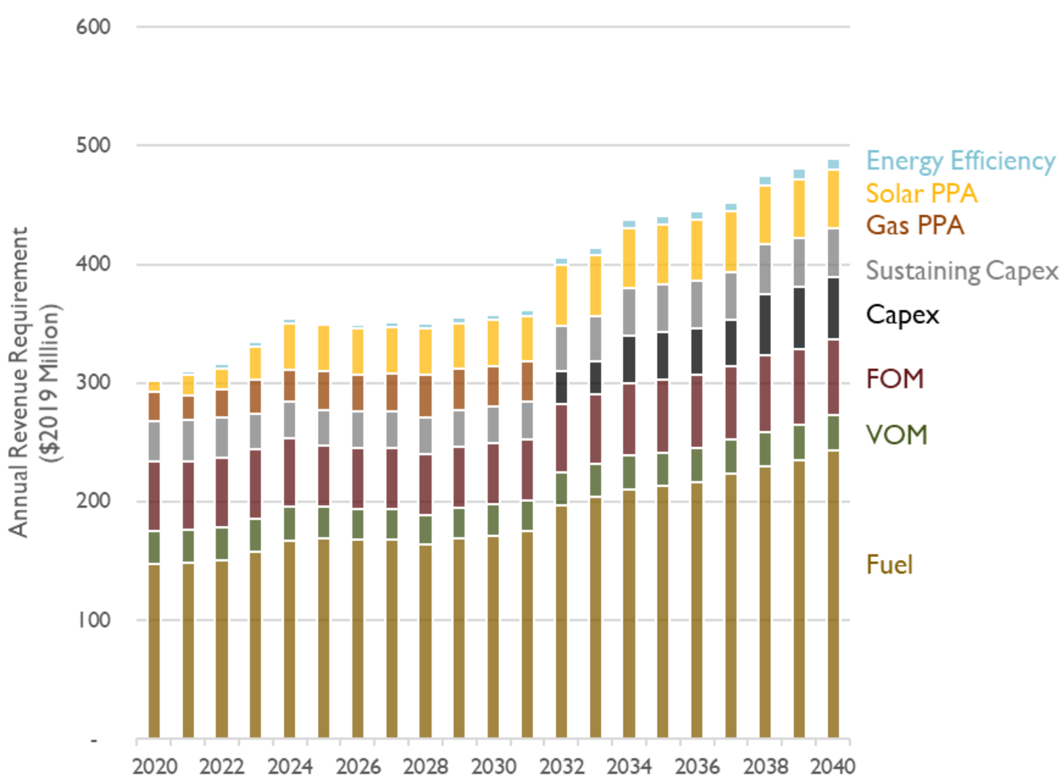


Figure B-5: Annual revenue requirement by expense type for *Coal to Gas Conversion* scenario

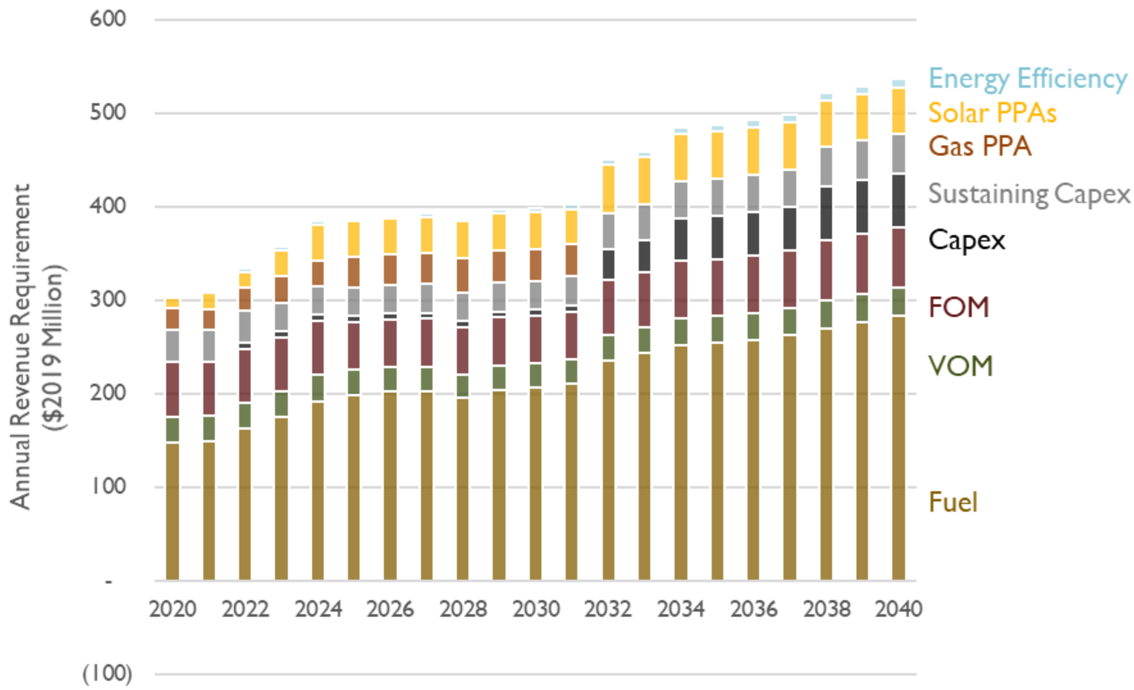


Figure B-6: Annual revenue requirement by expense type for *Renewable Energy* scenario

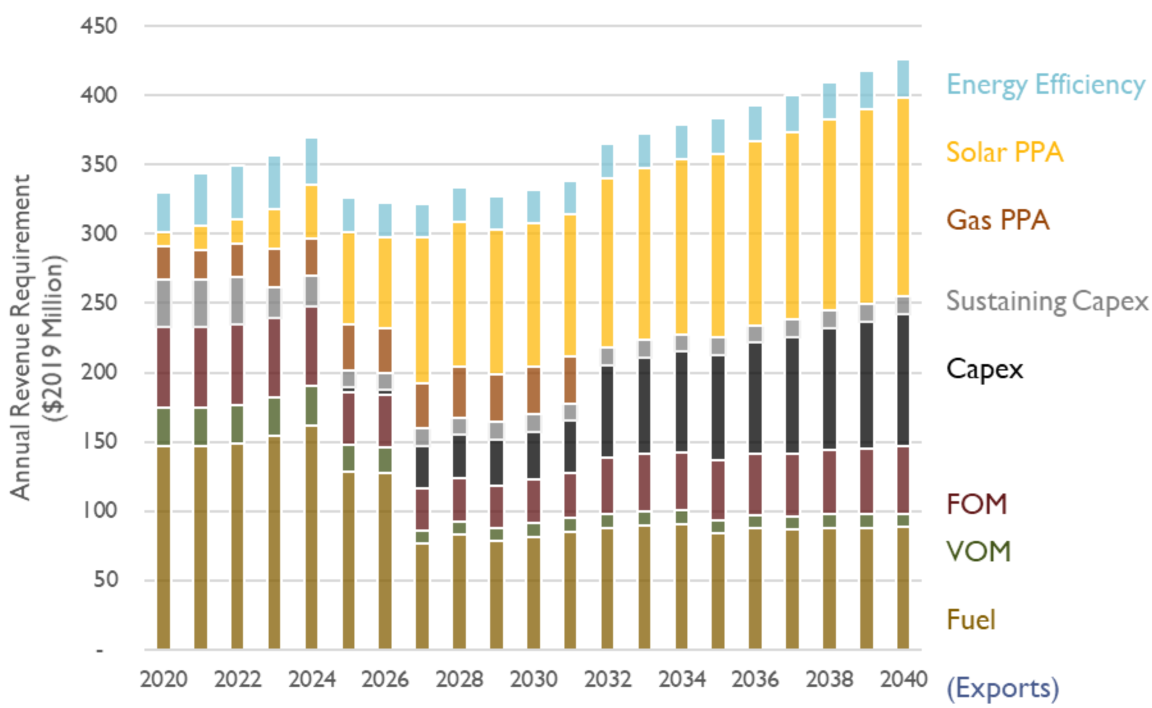


Figure B-7: Winter firm capacity—*Coal Continues* scenario

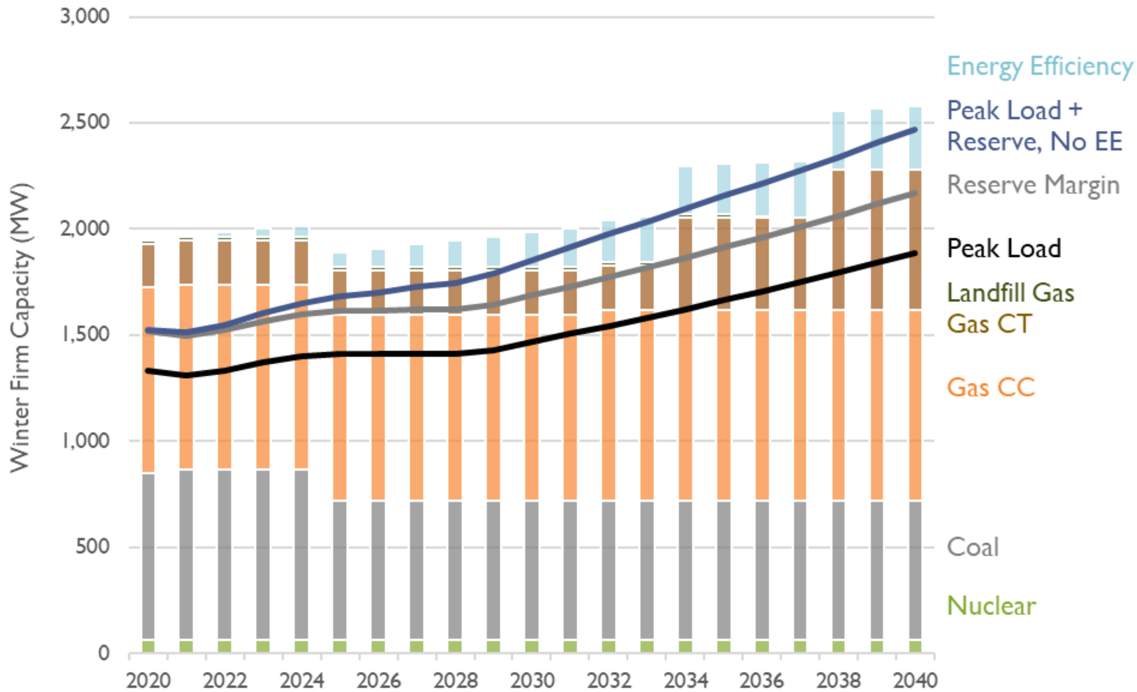


Figure B-8: Summer firm capacity—*Coal Continues* scenario

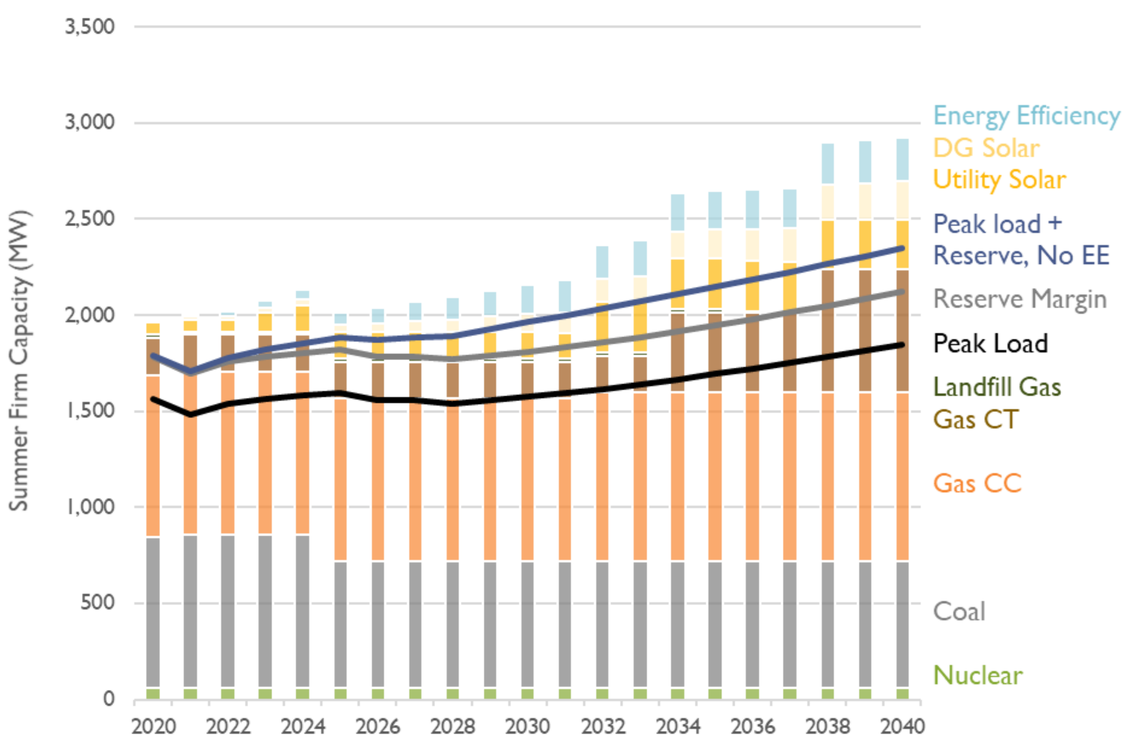


Figure B-9: Winter firm capacity—*Coal to Gas Conversion* scenario

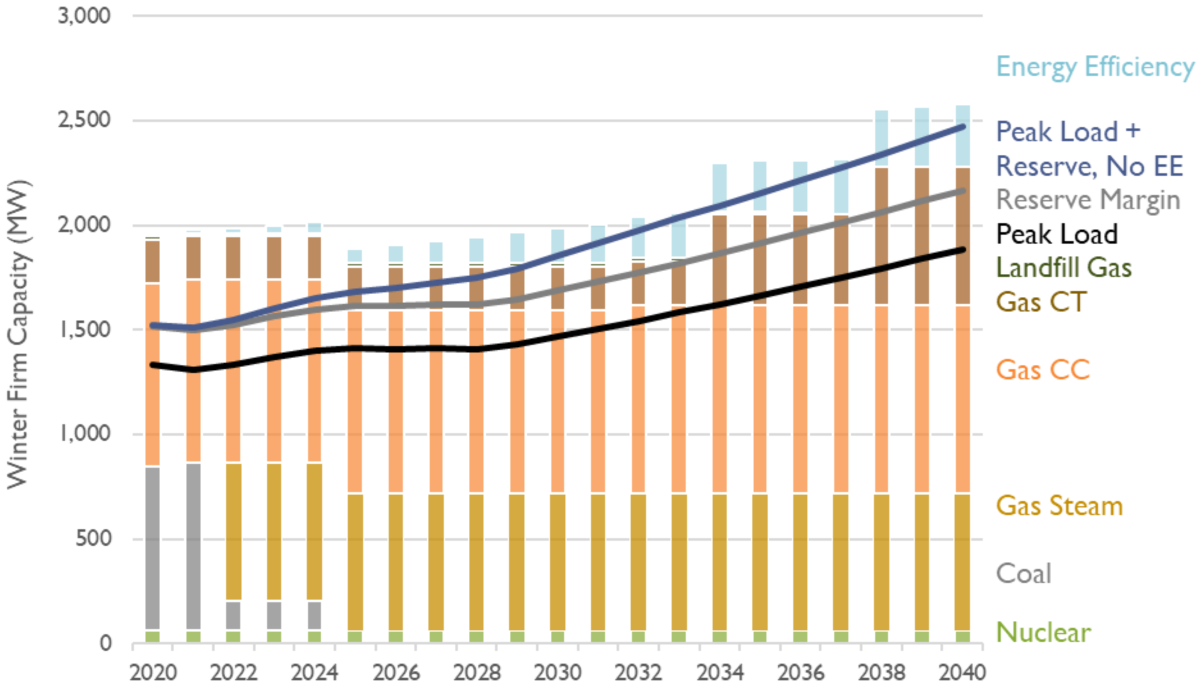


Figure B- 10: Summer firm capacity—Coal to Gas Conversion scenario

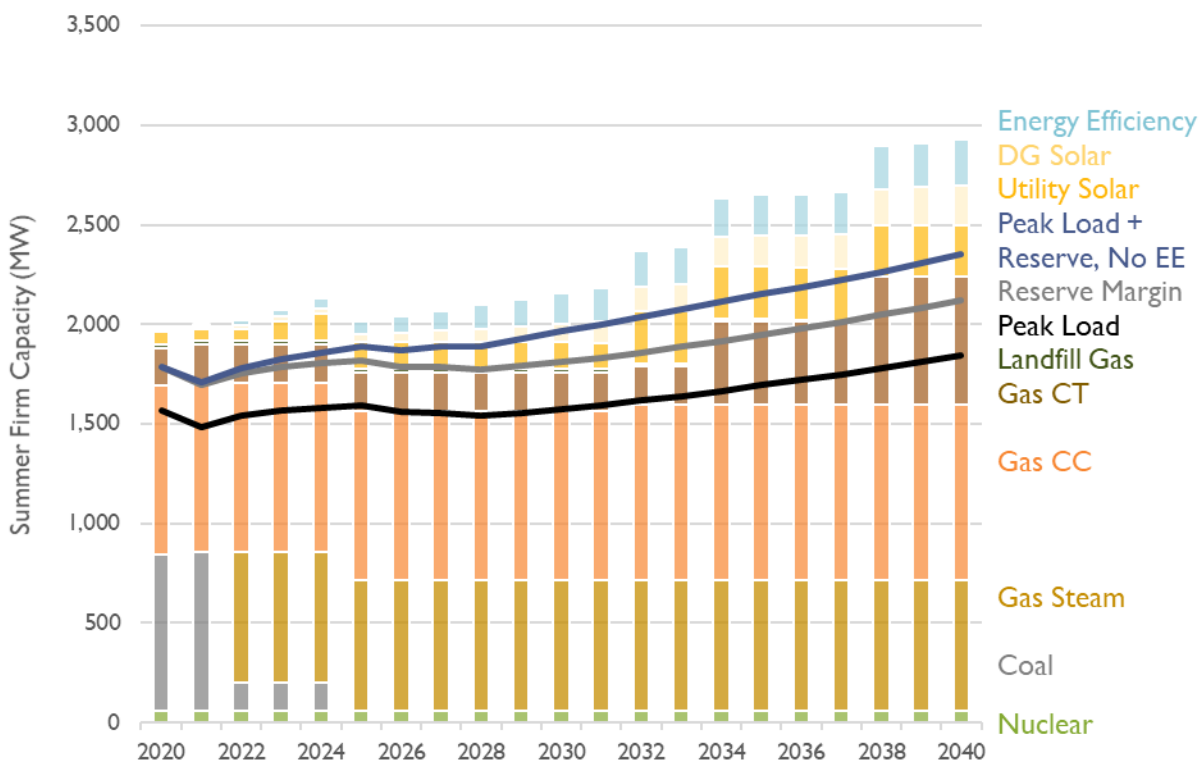


Figure B-11: Winter firm capacity—*Renewable Energy* scenario

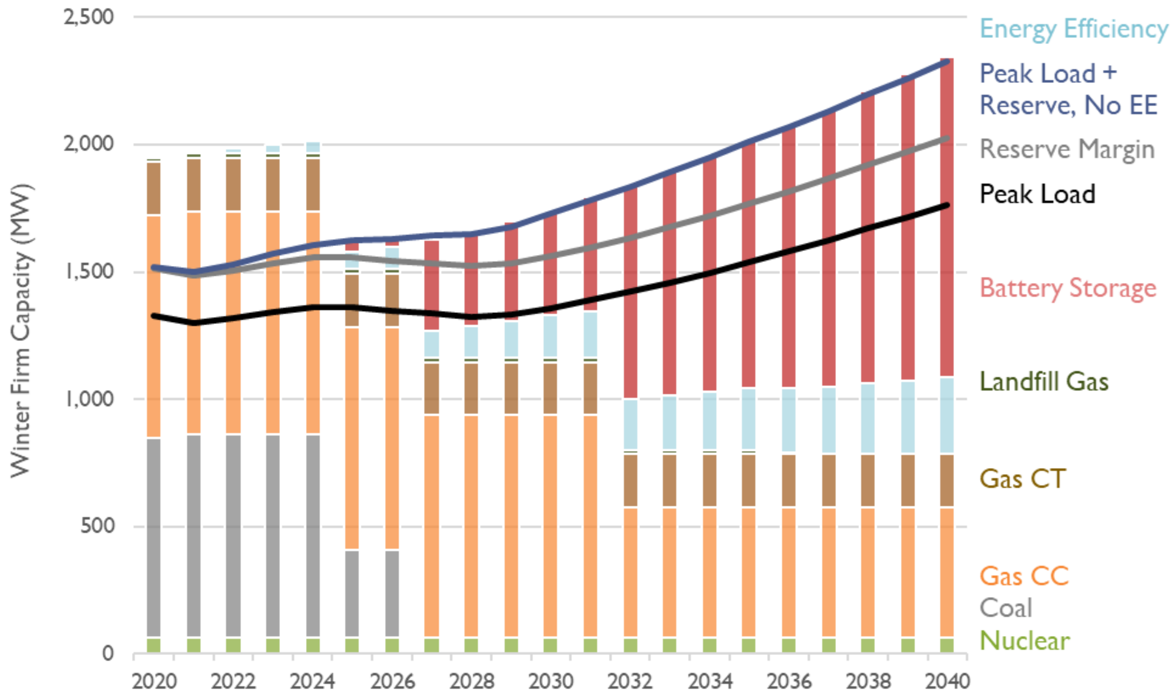
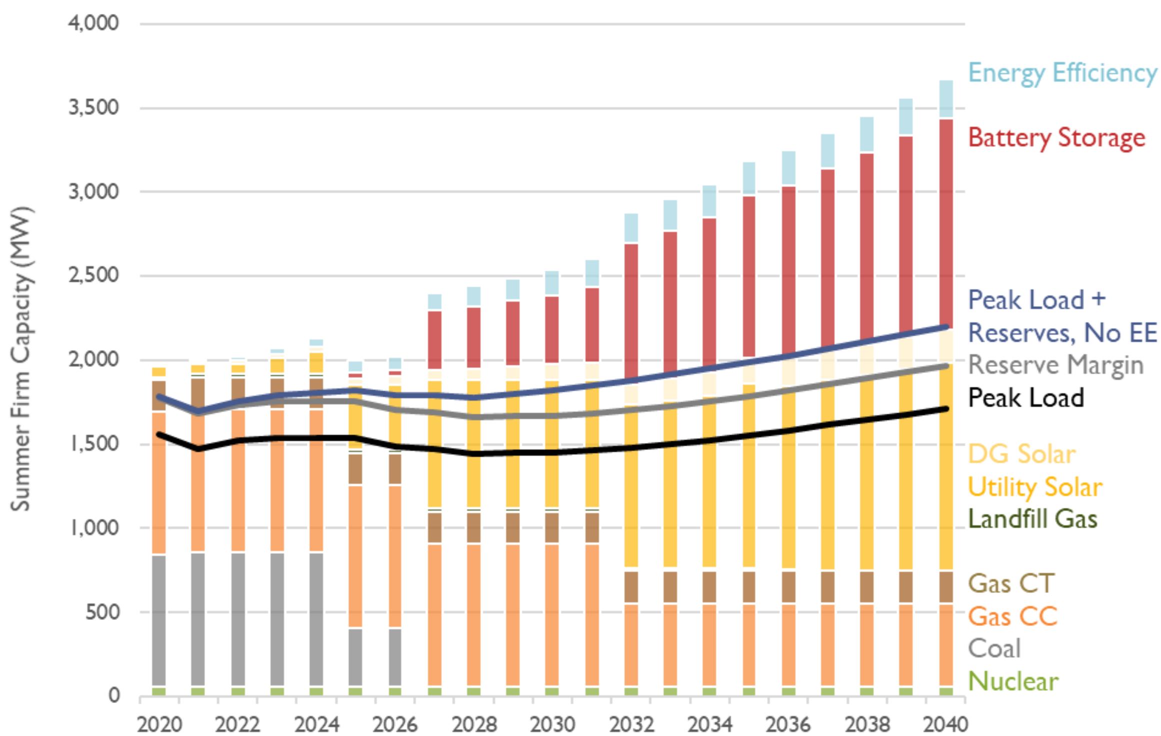


Figure B-12: Summer firm capacity—*Renewable Energy* scenario



Appendix C. JOBS AND ECONOMIC IMPACTS ANALYSIS METHODOLOGY AND INPUTS

Synapse developed an input/output model to quantify the jobs that would be created by changes in OUC investment across a range of energy resources. Figure C-1 provides an overview of this model. Our analysis uses three sets of economic parameters to estimate the employment impact of investment in an energy resource:

1. **Total U.S. jobs,** where one job is a full-time equivalent employment opportunity for one person
2. **Labor expenditure share**, the fraction of total resource expenditures that is used to pay worker wages
3. **Average labor wage**, the annual income earned by a full-time worker

We identify U.S. employment levels through economic literature specific to the energy sector.[45] For labor expenditure share and average labor wage, we use data from an industry-standard economic impact model, IMPLAN.[46] Our data are differentiated by resource and sector for each set of economic parameters:

Energy resources:

- Wind Power
- Solar Power
- Energy Efficiency
- Battery Storage
- Coal
- Natural Gas

Sectors:

- Mining and extraction
- Utilities
- Construction
- Manufacturing
- Wholesale trade
- Professional and business services
- Other services

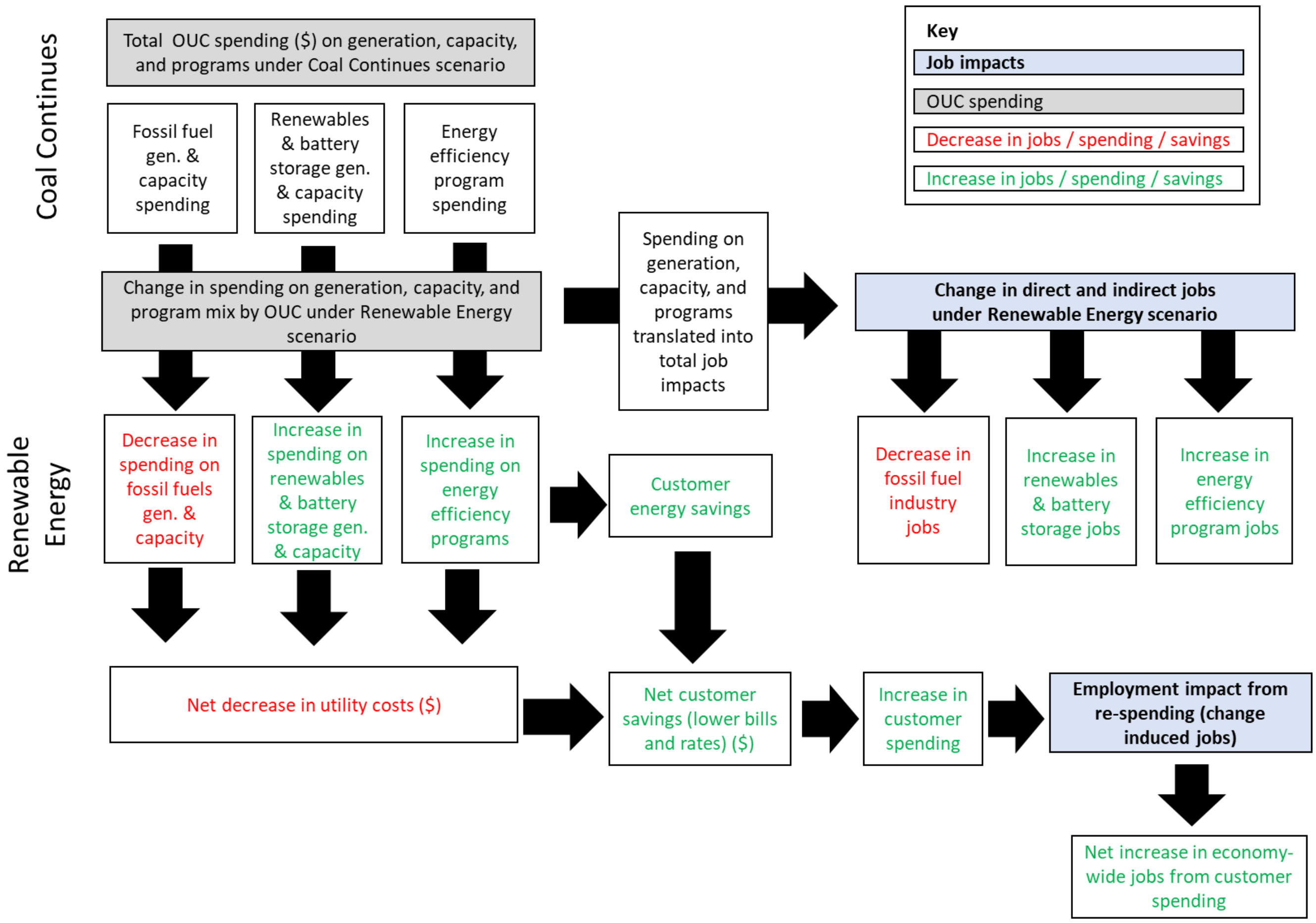
We compute direct, indirect, and induced jobs for each resource. **Direct jobs** include contractors and construction workers (among others) working on the construction or operation of the resource. Solar panel installers and energy efficiency auditors are examples of direct jobs. **Indirect jobs** are created at the supplier level, which produces parts, tools, and other inputs to support the construction and operation of the resource. For instance, an investment in a wind power plant not only creates direct jobs at the plant site, but also indirect jobs up the supply chain for structural, mechanical, and other

[45] National Association of State Energy Officials and Energy Futures Initiative. The 2019 U.S. Energy & Employment Report. 2019.

[46] IMPLAN is a commercial model that evaluates job creation and re-spending associated with a set of costs. It is developed by IMPLAN Group LLC. Information on IMPLAN is available at: http://implan.com/.

component manufacturers. **Induced jobs** result from utility customers spending more money in the economy. In this analysis, we estimate these induced impacts from both energy efficiency savings and changes in overall utility spending, which we assume will affect the rates that utility customers pay.

Figure C- 1: Synapse's economic model for OUC energy investment



Appendix D. Detailed Job Impacts Results

Table D-1: Job impact by resource and sector for the *Renewable Energy* scenario relative to *Coal Continues* (FTE job-years)

Resource *Sector*	**Total**	**Annual Average**	**2020-2024**	**2025-2029**	**2030-2034**	**2035-2040**
Re-spending (all sectors)	**4,548**	**217**	**(240)**	**1,013**	**1,546**	**2,228**
Energy efficiency customer savings	2,849	136	153	594	946	1,155
Utility spending change → change in customer spending	1,699	81	(393)	419	600	1,073
Solar Power	**5,799**	**276**	**-**	**1,304**	**1,800**	**2,695**
Mining and extraction	-	-	-	-	-	-
Utilities	36	2	-	8	11	17
Construction	3,233	154	-	727	1,003	1,503
Manufacturing	267	13	-	60	83	124
Wholesale trade	214	10	-	48	66	100
Professional and business services	1,027	49	-	231	319	477
Other services	1,022	49	-	230	317	475
Energy Efficiency	**2,286**	**109**	**779**	**507**	**458**	**542**
Mining and extraction	-	-	-	-	-	-
Utilities	-	-	-	-	-	-
Construction	1,277	61	435	283	256	303
Manufacturing	193	9	66	43	39	46
Wholesale trade	108	5	37	24	22	26
Professional and business services	628	30	214	139	126	149
Other services	80	4	27	18	16	19
Battery Storage	**5,382**	**256**	**-**	**611**	**1,685**	**3,087**
Mining and extraction	-	-	-	-	-	-
Utilities	-	-	-	-	-	-
Construction	2,998	143	-	340	939	1,719
Manufacturing	548	26	-	62	172	315
Wholesale trade	334	16	-	38	104	191
Professional and business services	1,315	63	-	149	412	754
Other services	187	9	-	21	59	107
Coal	**(5,204)**	**(248)**	**(39)**	**(1,350)**	**(1,710)**	**(2,105)**
Mining and extraction	(1,633)	(78)	(12)	(424)	(537)	(660)
Utilities	(416)	(20)	(3)	(108)	(137)	(168)
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	(362)	(17)	(3)	(94)	(119)	(147)
Professional and business services	(2,666)	(127)	(20)	(692)	(876)	(1,078)
Other services	(127)	(6)	(1)	(33)	(42)	(51)
Gas	**(1,664)**	**(79)**	**(26)**	**-**	**(389)**	**(1,249)**
Mining and extraction	(636)	(30)	(10)	-	(149)	(478)
Utilities	(239)	(11)	(4)	-	(56)	(180)
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	(84)	(4)	(1)	-	(20)	(63)
Professional and business services	(664)	(32)	(11)	-	(155)	(498)
Other services	(41)	(2)	(1)	-	(10)	(31)

Table D-2: Job impact by resource and sector for the *Coal to Gas Conversion* scenario relative to *Coal Continues* (FTE job-years)

Resource *Sector*	Total	Annual Average	2020-2024	2025-2029	2030-2034	2035-2040
Re-spending (all sectors)	**-2,349**	**(112)**	**(217)**	**(603)**	**(670)**	**(859)**
Energy efficiency customer savings	0	0	0	0	0	0
Utility spending change → change in customer spending	(2,349)	(112)	(217)	(603)	(670)	(859)
Solar Power	**-**	**-**	**-**	**-**	**-**	**-**
Mining and extraction	-	-	-	-	-	-
Utilities	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	-	-	-	-	-	-
Professional and business services	-	-	-	-	-	-
Other services	-	-	-	-	-	-
Energy Efficiency	**-**	**-**	**-**	**-**	**-**	**-**
Mining and extraction	-	-	-	-	-	-
Utilities	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	-	-	-	-	-	-
Professional and business services	-	-	-	-	-	-
Other services	-	-	-	-	-	-
Battery Storage	**-**	**-**	**-**	**-**	**-**	**-**
Mining and extraction	-	-	-	-	-	-
Utilities	-	-	-	-	-	-
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	-	-	-	-	-	-
Professional and business services	-	-	-	-	-	-
Other services	-	-	-	-	-	-
Coal	**(6,552)**	**(312)**	**(1,045)**	**(1,691)**	**(1,710)**	**(2,105)**
Mining and extraction	(2,056)	(98)	(328)	(531)	(537)	(660)
Utilities	(524)	(25)	(84)	(135)	(137)	(168)
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	(456)	(22)	(73)	(118)	(119)	(147)
Professional and business services	(3,356)	(160)	(536)	(866)	(876)	(1,078)
Other services	(160)	(8)	(25)	(41)	(42)	(51)
Gas	**6,795**	**324**	**990**	**1,752**	**1,808**	**2,245**
Mining and extraction	2,598	124	379	670	691	858
Utilities	978	47	142	252	260	323
Construction	-	-	-	-	-	-
Manufacturing	-	-	-	-	-	-
Wholesale trade	343	16	50	88	91	113
Professional and business services	2,710	129	395	699	721	895
Other services	166	8	24	43	44	55