A Clean Energy Future for Tampa

Prepared for Sierra Club

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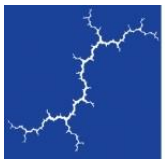

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EXECUTIVE SUMMARY

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. Tampa is one of the most vulnerable U.S. cities to climate change,[1] with a recent report indicating the city should expect up to 8 feet of sea level rise by 2100.[2] The most recent Project Phoenix Exercise found that the city could experience up to 42 feet of storm surge under category 5 hurricane conditions.[3] The Intergovernmental Panel on Climate Change (IPCC) recently confirmed that continued greenhouse gas emissions for fossil fuels will only continue to accelerate these impacts. Given the city's extreme vulnerability, phasing out thermal power plants located on the bay (which themselves are extremely vulnerable to the climate impacts they are driving) is a critical climate adaptation measure and will substantially increase the resilience of the city's electricity system.[4]

Tampa has elected prominent leaders on climate action at the federal and local level. In August 2021, Tampa's City Council passed an ambitious resolution to transition the city to 100 percent renewable energy by 2035. But Tampa's electric utility, the Tampa Electric Company ("TECO" or "the Company") currently relies almost entirely on fossil fuels to supply the city's electricity, invests only minimally in energy efficiency (EE), and has limited its investment in renewable generation by locking in large quantities of gas capacity. The Company's most recent Ten-Year Site Plan (TYSP) indicates that the TECO plans to continue its reliance on gas and invest only minimally in EE and renewable energy for the next decade and beyond.

We evaluated three main scenarios for TECO's system: a Business as Usual (BAU) Scenario where TECO continues to rely on its current fossil resources, and two clean energy scenarios where TECO retires its remaining coal unit and reduces its dependence on energy from its existing gas plants by building out solar PV and battery storage and increasing investment in demand-side management. One renewable energy scenario achieves a 50 percent renewable portfolio standard (RPS) for TECO by 2035, and the other achieves a more aggressive 80 percent RPS by 2035. Because the City of Tampa makes up only a

[1] Thompson, S., Y. Serkez. 2020. "Every Place Has Its Own Climate Risk. What is it Where You Live?" *New York Times.* September 18. Available at: https://www.nytimes.com/interactive/2020/09/18/opinion/wildfire-hurricane-climate.html.

[2] Figueroa, Daniel. 2021."Tampa study aims to prepare city for 8 feet of sea-level rise in 80 years." *WMNF*. January 12. Available at: https://www.wmnf.org/tampa-study-aims-to-prepare-city-for-8-feet-of-sea-level-rise-in-80-years/.

[3] Solomon, Josh. 2020. "Hurricane Phoenix is Tampa Bay's devastating worst-case scenario." *Tampa Bay Times*. August.- Available at https://www.tampabay.com/hurricane/2020/08/14/hurricane-phoenix-is-tampa-bays-devastating-worst-case-scenario/.

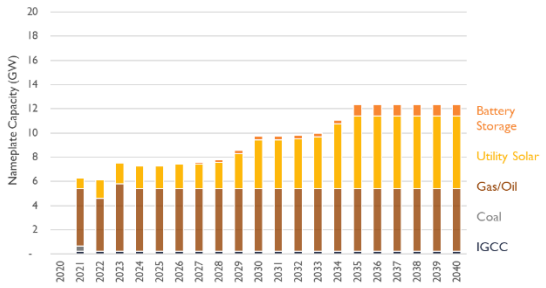
[4] Expert Report of Dr. Ranajit (Ron) Sahu on behalf of Sierra Club in DOAH Case No. 18-2124 (Feb 11, 2019).

portion of TECO's overall load, both renewable portfolios contain sufficient renewable resources to meet the City of Tampa's goal of 100 percent renewable energy by 2035.

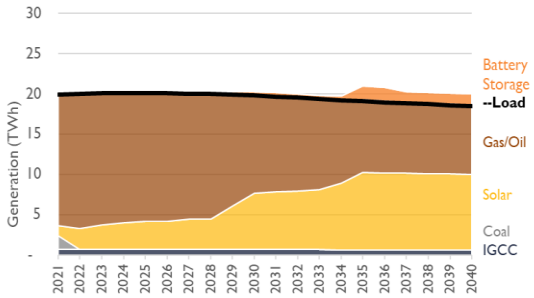
In the 50% Clean Energy Scenario, TECO builds out a significant quantity of Solar PV and relies on that solar to displace higher cost energy from TECO's existing fossil units (as shown in ES Figure 1a and ES Figure 1b). The Company also builds battery storage and increases investment in DSM to manage load growth.

In the 80% Clean Energy Scenario, the Company builds even more solar and battery storage to displace fossil generation (as shown in ES Figure 2a and 2b).

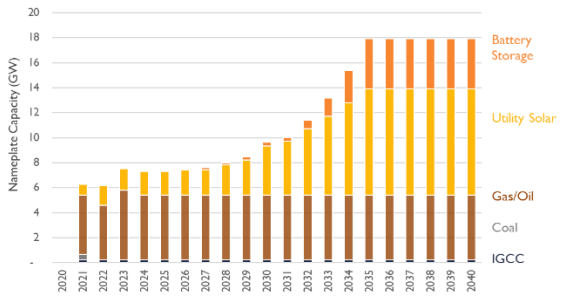
ES Figure 1a: Capacity mix for 50% Clean Energy Scenario



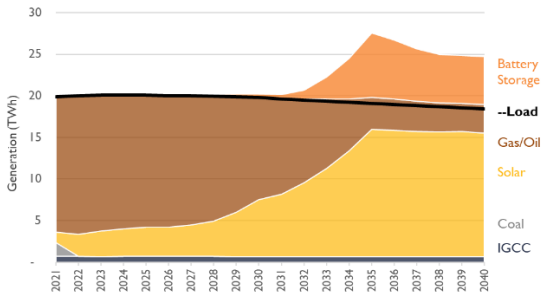
ES Figure 1b: Generation mix for 50% Clean Energy Scenario



ES Figure 2a: Capacity mix for 80% Clean Energy Scenario



ES Figure 2b: Generation mix for 80% Clean Energy Scenario



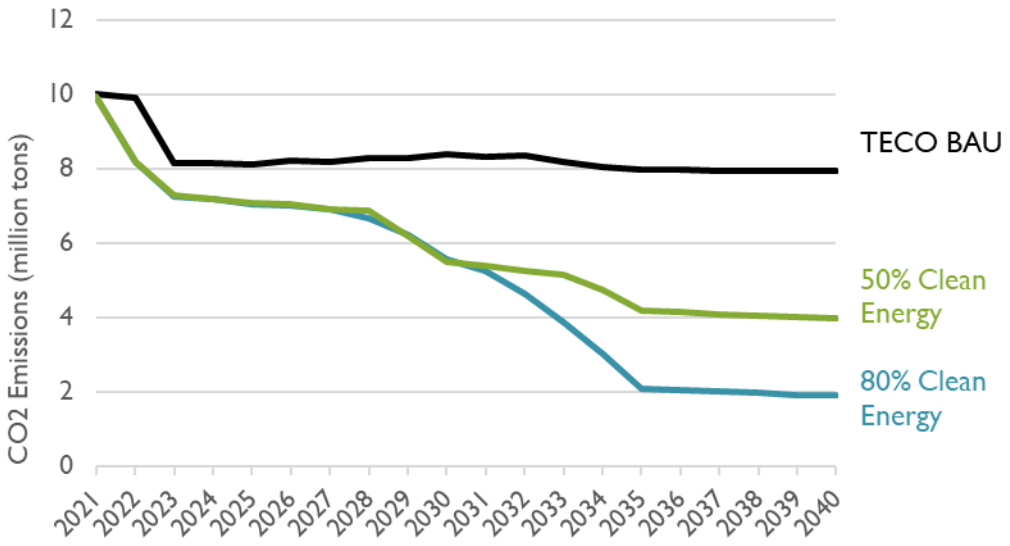
We find that transitioning to 50 percent renewables is the lowest cost resource option for Tampa ratepayers relative to continued reliance on fossil resources. As shown in ES Table 1, the 50% Clean Energy Scenario will save ratepayers between $400 million and $1.6 billion in net present value terms relative to the Company's current Fossil plan, depending on the gas and carbon pricing forecasts.

ES Table 1: Net present value of revenue requirement by scenario

Scenario	Total NPV ($Billion)	Delta From TECO BAU ($Billion)
TECO BAU	**$11.8**	
50% Clean Energy Scenario	$11.4	-$0.4
80% Clean Energy Scenario	$12.6	$0.8
TECO BAU Scenario, High Gas Price and Carbon Tax	**$14.8**	
50% Clean Energy Scenario, High Gas Price and Carbon Tax	$13.2	-$1.6
80% Clean Energy Scenario, High Gas Price and Carbon Tax	$14.0	-$0.8

The 50% Clean Energy Scenario will also reduce CO_2 emissions by 60 percent by 2040 (compared to 2021 levels) and prevents approximately 50 million tons of CO_2 from being emitted compared to the TECO BAU scenario, as shown in ES Figure 3. The 80% Clean Energy Scenario reduces CO_2 emissions over 80 percent by 2040 and prevents 66 million tons of CO_2 from being emitted.

ES Figure 3: CO_2 emissions by scenario



Further, continued reliance on fossil fuels will subject 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[5] and increases vulnerability to certain diseases, including COVID-19).[6]

We find that investing in DSM and building out solar PV to displace energy from TECO's existing fossil units 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.[7] 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 50% Clean Energy Scenario is expected to create over 13,250 net job-years[8] over the period 2021–2040 relative to the TECO BAU Scenario (that number rises to nearly 17,000 net job-years for the 80% Clean Energy Scenario). ES Figure 4 displays the average annual employment impacts of the switch to clean energy for the 50% Clean Energy Scenario. Further, investment in energy efficiency, renewables, and energy storage creates high-paying jobs. In our 50% Clean Energy Scenario, the weighted average income for the created jobs across all resources and all sectors is estimated to be over $73,000, as compared to an economy-wide average of $63,000.

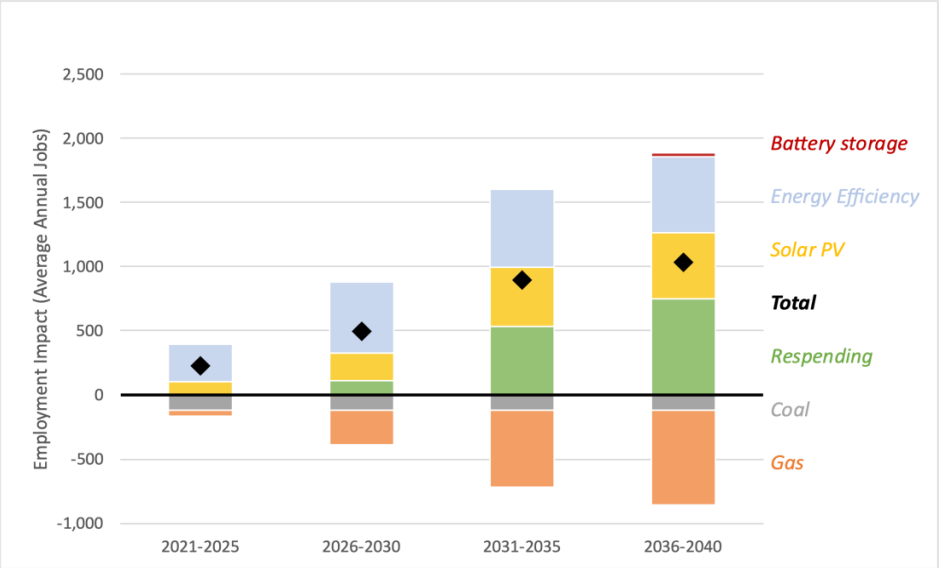
[5] Centers for Disease Control and Prevention. *Air Quality*. Accessed June 4, 2020. Available at: https://www.cdc.gov/air/air_health.htm.

[6] 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*. Available at: https://www.medrxiv.org/content/10.1101/2020.04.05.20054502v2.

[7] 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.

[8]. Each job-year represents a single full-time equivalent job for one year

ES Figure 4: Average annual employment impact by resource, 50% Clean Energy Scenario, 2020–2040 (FTE job-years)



Job impacts are shown relative to the TECO BAU scenario.

Given Tampa's vulnerability to the impacts of climate change, the city and utility must act now to both mitigate the climate impacts of its electricity system, but also adapt its electricity infrastructure to become more resilient. The city's 100 percent by 2035 resolution is a great step in the right direction. But, the Company's most recent planning document, the 2021 TYSP, indicate the Company's plan to continue its reliance on its fossil resources. TECO has an opportunity to take a leadership role and provide Tampa with a clear plan on how it will transition from its current reliance on fossil fuels to a clean system that complies with the new resolution by transitioning to more renewables and DSM. A renewable portfolio will not only provide environmental benefits, but as we have shown in this report, will save the citizens of Tampa hundreds of millions to even billions of dollars directly, in addition to providing significant local jobs and economic stimulus.

Our specific recommendations are as follows:

1. TECO should chart a path that is consistent with meeting the City of Tampa's ambitious goal of 100 percent renewable energy by 2035, rather than its current plan to rely heavily on fossil fuels.
2. TECO should not construct any new gas combined cycle or combustion turbine plants and should also accelerate the retirement of Big Bend 4. TECO should also evaluate the risk of any further investments in coal and gas plants being rendered uneconomic before the end of their useful lives by policy changes and continued declines in clean energy costs.

3. TECO should 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 that match regional average levels. TECO should prioritize education, energy audit, and implementation efforts for these programs in the neighborhoods with the highest energy burden in order to help households in frontline communities reduce the burden of high electricity bills.

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

1. TAMPA ELECTRIC AND THE CITY OF TAMPA HAVE AN OPPORTUNITY TO TAKE CLIMATE ACTION

1.1. Tampa is uniquely vulnerable to the impacts from climate change, and Tampa Electric has an opportunity to step up to address one of the main drivers of this threat.

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. Tampa in particular is one of the most vulnerable U.S. cities to climate change.[9] The city is expecting up to 8 feet of sea level rise by 2100 and is currently conducting a study to evaluate the impact of this expected rise on the city.[10] The most recent Project Phoenix exercise found that the city could experience up to 42 feet of storm surge under category 5 hurricane conditions.[11] The Intergovernmental Panel on Climate Change (IPCC) recently confirmed that continued greenhouse gas emissions for fossil fuels will only continue to accelerate these impacts. Given that the city is extremely vulnerability to sea level rise, phasing out thermal power plants located on the bay (which themselves are extremely vulnerable to the climate impacts they are driving) is a critical climate-adaptation measure and will substantially increase the resilience of the city's electricity system.[12]

Tampa has some prominent leaders on climate action at the federal and local level, and the city has a significant opportunity to increase its climate mitigation and adaptation measures. Congresswoman Kathy Castor, who represents the Tampa region, chairs the Select Committee on the Climate Crisis. In June 2020 she unvailed a climate plan called "Solving the Climate Crisis", which aims to set a goal of net-zero greenhouse gas emission by 2050.[13]

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[9] Thompson, S., Y. Serkez. 2020. "Every Place Has Its Own Climate Risk. What is it Where You Live?" *New York Times.* September 18. Available at: https://www.nytimes.com/interactive/2020/09/18/opinion/wildfire-hurricane-climate.html.

[10] Figueroa, Daniel. 2021."Tampa study aims to prepare city for 8 feet of sea-level rise in 80 years." *WMNF*. January 12. Available at: https://www.wmnf.org/tampa-study-aims-to-prepare-city-for-8-feet-of-sea-level-rise-in-80-years/.

[11] Solomon, Josh. "Hurricane Phoenix is Tampa Bay's devastating worst-case scenario." *Tampa Bay Times*. August, 2020. Available at https://www.tampabay.com/hurricane/2020/08/14/hurricane-phoenix-is-tampa-bays-devastating-worst-case-scenario/.

[12] Expert Report of Dr. Ranajit (Ron) Sahu on behalf of Sierra Club in DOAH Case No. 18-2124 (Feb 11, 2019).

[13] Kinane, Sean. 2020. "Kathy Castor announces "Solving the Climate Crisis" plan." *88.5 WMNF*. Available at: https://www.wmnf.org/kathy-castor-announces-solving-the-climate-crisis-plan/.

Tampa Mayor Jane Castor committed to climate action during her campaign by including in her campaign platform a sustainability and resiliency plan with a goal of 100% renewable energy by 2045.[14] After taking off, she followed-through on advancing action on climate change. In December 2019, she Joined Climate Majors' Steering Committee. In May 2020, she named Whit Remer as Tampa's sustainability officer—he was the first official tasked with adapting Florida's third largest city to the challenges of climate change.[15] Then in December 2020, Mayor Castor gathered a group of environmentalists and political heavy hitters to advise her on ways to help Tampa Bay's largest city adapt to a changing climate.[16] On August 6, 2021, the Tampa City Council voted 6-1 to adopt a renewable energy resolution in support of transitioning to 100 percent clean, renewable energy sources community-wide by 2035.

The city still has a long way to go to map out how it will achieve this goal and then implement the necessary measures across the economy. But it is critical that the Tampa Electric Company ("TECO" or "the Company"), as the supplier of electricity to the city and the region, acts to phase out fossil resources from its electricity system. Doing so is essential for the City of Tampa to meet its climate goal and will both mitigate the emissions that drive climate change and make the city and the entire region more resilient to adapt to the impacts of climate change that are happening.

1.2. TECO has traditionally relied on fossil fuels to supply electricity to the residents of Hillsborough County, but can now pivot to renewables, battery storage and DSM.

As of the end of 2020, TECO served 698,493 rural and residential customers, including 76,709 commercial customers and 1,408 industrial customers in Hillsborough County, Florida.[17] The population in Hillsborough County has been growing at around 1.8 percent annually (compound annual growth rate or "CAGR") over the past decade. TECO projects a continued annual growth rate of 1.5 percent over the next decade. Population is a key driver of retail demand.

The city has historically relied on fossil fuels to supply electricity and plans to continue to do so in the near-term. Approximately 87 percent of TECO's generation in 2021 is projected to come from fossil resources—specifically 82.6 percent of load is projected to be met by natural gas and 4.6 percent by

[14] Taylor, Janelle Irwin. 2019. "Jane Castor wants Tampa to go 100% clean energy by 2045." *FLAPOL.* Available at: https://floridapolitics.com/archives/289040-jane-castor-wants-tampa-to-go-100-clean-energy-by-2045.

[15] Frago, Charlie. 2020. "Whit Remer named Tampa's sustainability officer." *Tampa Bay Times.* May. Available at https://www.tampabay.com/news/tampa/2020/05/12/whit-remer-named-tampas-sustainability-officer/.

[16] Frago, Charlie. 2020. "Tampa Mayor Jane Castor announces environmental advisory group." Tampa Bay Times. December. Available at: https://www.tampabay.com/news/tampa/2020/12/09/tampa-mayor-jane-castor-announces-environmental-advisory-group/.

[17] TECO 2021 TYSP, Schedules 2.1 and 2.2, History and Forecast of Energy Consumption and Number of Customers by Customer Class, Base Case.

coal. Comparatively, only 7.8 percent of generation is projected to be met by solar.[18] Only 595 MW of solar PV is currently installed,[19] and zero firm peak contribution is assigned to solar in the winter (due to morning winter peak).[20]

The Company has historically invested minimally in demand side management (DSM) and energy efficiency (EE) measures. Between 2015 and 2019, annual EE savings as a percent of retail sales was between 0.23 percent and 0.28 percent.[21] This is incredibly low compared to the average savings, which was 1.03 percent among the largest U.S. utilities in 2018.[22]

In the past, the Company has experienced minimal load growth, with only a 1.01 percent CAGR between 2015 and 2019.[23] TECO has also historically had a summer peaking system. But in the winter of 2017/2018 the region experienced a polar vortex and winter peak surpassed summer peak. Peak dropped back down for the winter of 2018/2019 and TECO is expected to continue to have a summer peaking system.

1.3. TECO's 2021 ten-year site plan doubles down on fossil fuels, when the company needs to rapidly accelerate the buildout of solar, energy storage, and demand-side management.

As is the case with all regulated Florida utilities, TECO has no formal Integrated Resource Planning (IRP) process. Instead, the Company prepares a Ten-Year Site Plan (TYSP) every year and files it with the state's Public Service Commission. Synapse's modeling utilized data from the TYSP released in 2020. Since then, TECO has published the 2021 Site Plan. While we conducted most of our analysis based on the 2020 Site Plan, we updated our modeling to reflect the change in generation resource additions outlined in the 2021 Site Plan.

The Company is currently undergoing a project to modernize Big Bend Unit 1, which involves retiring existing coal capacity and adding new gas capacity. This project will add a sizable amount of new energy and capacity to TECO's system. As part of the modernization plan, TECO will retire Big Bend Unit 2 in December 2021.[24] The Company also announced Big Bend retirement dates for Unit 3 (2023) and 4

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[18] *Id*. Page 59.

[19] *Id.* Schedule 1, Existing Generating Facilities.

[20] This means that solar PV is assumed not to help meet TECO's peak winter capacity need.

[21] Calculated based on data from EIA Form 861 and Schedule 3.3, History and Forecast of Annual Net Energy for Load (GWh)–Base Case, TECO 2020 TYSP.

[22] Relf G., Cooper E., Gold R., Goyal A, Waters. C. 2020. *ACEEE 2020 Utility Scorecard.* American Council for an Energy-Efficient Economy (ACEEE). Available at: https://www.aceee.org/research-report/u2004.

[23] Calculated based on data from Schedule 3.3, History and Forecast of Annual Net Energy for Load (GWh) – Base Case, TECO 2020 TYSP; and EIA form 861.

[24] TECO 2021 TYSP. Schedule 1, Existing Generating Facilities.

(2045) in a depreciation study released in December 2020.[25] While the retirement of coal is a positive step, the Company's continued reliance on fossil-based gas is concerning.

We are also concerned that TECO is planning for a dual/winter peaking system, building to meet a 20 percent reserve margin, and investing only minimally in DSM. The Company should be cautious with this approach, as it will likely result in an overbuilt system at the expense of Tampa residents. The winter peak forecast drives future capacity needs but is based on technically unsupported assumptions. The weather-normalization methodology used by TECO results in a significant jump between historical load and first-year forecast that drives capacity need.[26] In prior analysis, we found that various assumptions used in the company's forecasting methodology were unsubstantiated and unexplained. There is no evidence that the Company's methodology has changed.[27]

Assumed dual peaking system

According to the 2021 TYSP, TECO forecasts that winter peak will be higher than summer peak by between 235 MW and 310 MW between 2021 and 2030.[28] The summer peak has historically been between 360 MW and 1,008 MW higher than the winter peak in every year except 2010-2011 and 2017-2018 (See Figure 1).[29] Even during the polar vortex, winter peak only surpassed summer peak by 85 MW and the utility still had surplus capacity.[30] These types of abnormal polar vortex events should not be considered when forecasting normal load, especially given that historical weather-normalized summer and winter peak demand has been roughly flat to declining. TECO's use of a winter peak severely under-credits solar, which gets zero firm capacity credit without battery storage.[31] Despite this lack of winter capacity credit, TECO still plans to build over 600 MW of solar over the next decade, recognizing that solar has value to its system and results in savings to ratepayers.

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[25] Petition of Tampa Electric Company for approval of its 2020 Depreciation and Dismantlement Study and Capital Recovery Schedules. December 30, 2020.

[26] TECO 2020 TYSP: Schedule 3.1, History and Forecast of Summer Peak Demand (MW), Base Case; and Schedule 3.2 History and Forecast of Winter Peak Demand (MW), Base Case.

[27] Glick, D., Fagan, B., Frost, J. White, D. 2019. *Big Bend Analysis: Cleaner, Lower-Cost Alternatives to TECO's Billion-Dollar Gas Project.* Synapse Energy Economics, Inc., prepared for Sierra Club. Available at: https://www.synapse-energy.com/sites/default/files/Big-Bend-Analysis-18-118.pdf.

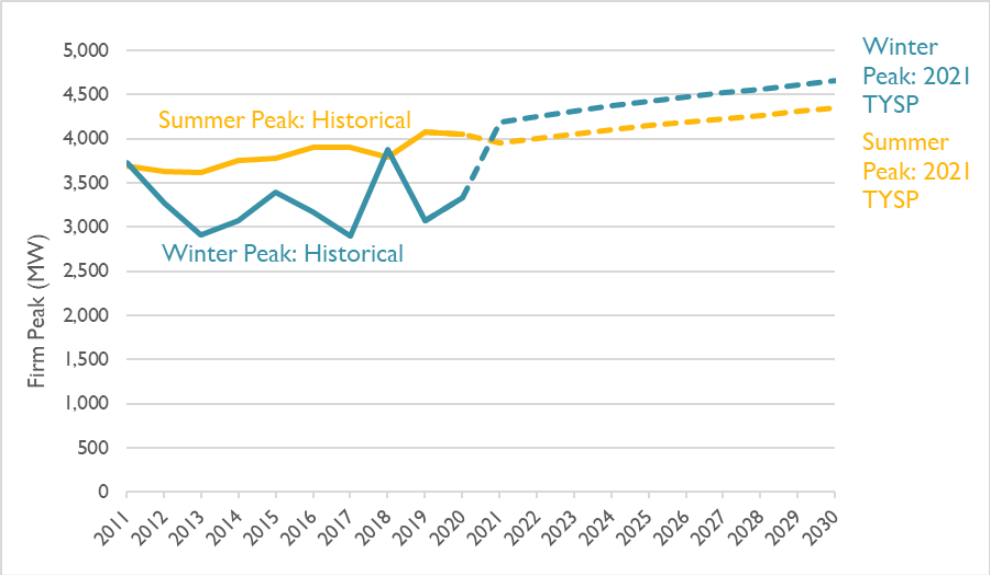
[28] TECO 2021 TYSP: Schedule 3.1, History and Forecast of Summer Peak Demand (MW), Base Case; and Schedule 3.2 History and Forecast of Winter Peak Demand (MW), Base Case.

[29] *Id.*

[30] *Id.*

[31] *Id.* Schedule 1: Existing Generating Facilities as of December 31, 2020.

Figure 1: Historical and projected system peak by season



Another factor that could result in an overbuilt system is TECO's use of a 20 percent reserve margin,[32] even though the North American Electricity Reliability Corporation (NERC) reference reserve margin for the Florida Reliability Coordinating Council (FRCC) region is only 15 percent. Electric utilities use a reserve margin, in part, to account for differences between an average year and demand conditions that are likely to be experienced once every 10 years or less. But TECO applies its inflated reserve margin to its peak load forecasts, which already account for infrequent extreme weather events. The result is an overbuilt system.

In the 2020 TYSP, TECO assumed a load growth rate (CAGR) for the next decade (2020–2029) of 1.1 percent. But the utility did acknowledge that COVID impacts may result in lower than projected overall sales in 2020 and 2021. [33] In 2020, the Company observed a decrease in commercial load of 10 percent and an increase in residential load of 4 percent, driving a net decline of 2.4 percent.[34]

[32] *Id*, page 28.

[33] TECO response to Staff's data request in the Undocketed Review of TECO's 2020 TYSP's. Fifth Supplemental Set, Request No 1(b).

[34] TECO response to Staff's data request in the Undocketed Review of TECO's 2020 TYSP's. Fifth Supplemental Set, Request No 1(a).

TECO also includes minimal amounts of DSM in its TYSP. Planned EE will achieve savings of between 0.29 percent and 0.32 percent of retail sales.[35] This is significantly below the national average saving as a percent of retail sales, and well below what TECO can easily achieve.[36]

The combination of a high reserve margin, high winter peak (unsupported by historic performance), and low DSM investment drives the need for peaking capacity on TECO's system. For this reason, TECO plans to build out 37 MW of new peaking capacity in the form of Reciprocating Internal Combustion Engine (RICE) units in 2025.[37] This is down from the 185 MW of RICE units that TECO had planned in the prior year (2020) TYSP.[38]

2. A TRANSITION AWAY FROM COAL AND GAS TO RENEWABLES, BATTERY STORAGE, AND ENERGY EFFICIENCY CAN SAVE TECO CUSTOMERS BETWEEN $400 MILLION AND $1.6 BILLION THROUGH 2040

For this analysis, Synapse utilized the EnCompass capacity optimization and dispatch model, developed by Anchor Power Solutions, to simulate resource choice impacts in TECO's service territory between 2021 and 2040. The net present value of revenue requirements was then compared across three scenarios and three sensitivities. The first scenario, TECO Business as Usual (BAU), continues TECO's status quo reliance on fossil fuel resources, while the second scenario, 50% Clean Energy Scenario, pivots to renewables, energy efficiency, and battery storage. A third scenario models TECO reaching 80% Clean Energy by 2035. The sensitivities demonstrate the financial impacts of a future with higher natural gas prices and a carbon tax on all scenarios.

[35] Calculated based on data from Schedule 3.3, History and Forecast of Annual Net Energy for Load (GWh)–Base Case, TECO 2020 TYSP; and EIA form 861.

[36] Relf G., Cooper E., Gold R., Goyal A, Waters. C. 2020. *ACEEE 2020 Utility Scorecard.* American Council for an Energy-Efficient Economy (ACEEE). Available at: https://www.aceee.org/research-report/u2004.

[37] TECO 2021 TYSP: Schedule 8.1 Planned and Prospective Generation Facility Additions and Changes

[38] TECO 2020 TYSP: Revised Schedule 8.1 Planned and Prospective Generating Facility Additions and Changes.

2.1. Modeled scenarios consider TECO's planned reliance on fossil fuels, and a transition to renewables and clean energy

TECO Business as Usual (BAU)

The TECO BAU Scenario relies on the builds detailed in the *2021 Ten Year Site Plan* published by TECO in April 2021. This scenario is characterized by continued reliance on fossil resources, with a small buildout of solar and battery storage. In this case, Big Bend 2 retires in December 2021, Big Bend 3 retires in 2023, and Big Bend 4 stays online for the entire period. The rest of TECO's fossil fleet is also kept online. The 445 MW Big Bend Modernization project comes online at the end of 2022 and 37 MW of new reciprocating engine peaking gas capacity is built out according to the schedule detailed in the 2021 TYSP. TECO also states its intention to invest additional money into the existing Bayside CC plant to expand its generating capacity between 2022 and 2023.[39]

TECO also plans to build approximately 700 MW of new contracted solar capacity and 600 MW of generic future solar. This planned solar generation will account for less than 18 percent of TECO's total generation by 2030.[40] The Company also plans to build 300 MW of new battery storage capacity over the period covered by the TYSP. TECO acknowledges the declining cost of solar and battery storage[41], as well as the role that battery storage can play in its portfolio in balancing the system and integrating increasing penetration of renewables.[42] Despite this acknowledgement, the capital costs used for future solar and battery projects in the TYSP stay relatively flat in nominal dollars over the course of the study period. TECO's solar costs only drop by 1 percent between projects installed in 2024 and 2030,[43] whereas the National Renewable Energy Laboratory (NREL) projects a price drop of 30% over the same period in its *2021 Annual Technology Baseline* (ATB).[44] We see the same issue with battery storage costs.

The TYSP assumes that DSM investments in TECO will achieve an annual savings as a percent of sales rate of between 0.29 and 0.32 percent.[45] Relative to the rest of the nation, Florida lags far behind in EE investment.

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[39] TECO 2021 TYSP. Page 1.

[40] TECO 2021 TYSP. Schedule 6.2. History and Forecast of Net Energy for Load by Fuel Source, Base Case Forecast Basis.

[41] TECO response to Staff's data request in the Undocketed Review of TECO's 2020 TYSP's. Supplemental Set, Requests No 47.

[42] *Id.* Supplemental Set, Requests No 47 and No 53.

[43] TECO 2021 TYSP. Schedule 9. Status Report and Specifications of Proposed Generating Facilities.

[44] National Renewable Energy Laboratory, 2021 Annual Technology Baseline. Available at https://atb.nrel.gov/.

[45] Calculations based on TECO 2020 TYSP, Schedule 3.3, History and Forecast of Annual Net Energy for Load (GWh) –Base Case.

50% Clean Energy Scenario

We also modeled an alternative to the Reference Case that meets a 50 percent RPS by 2035. This scenario retires TECO's coal units, focuses on increased DSM, and builds more solar and battery storage as opposed to new gas resources. Given that the Big Bend modernization project and the Bayside enhancement project are already approved and slated to come online in the next 2 years, these upgrades were included in this scenario. However, the additional RICE unit that TECO has coming online in 2024 was not assumed to be part of the system.

Solar resources were offered to the model on an energy basis at a cost of approximately $27/MWh based on recently approved PPA bids.[46] This allowed the model to build solar PV for energy if it was lower cost than operating existing units, even if the system did not need new capacity. Battery resources (standalone and paired with solar) were also offered to the model using cost assumptions from NREL's 2020 Annual Technology Baseline.

The load forecast assumptions used in this scenario are similar to those used in the TECO BAU Scenario. The main difference is the addition of incremental energy efficiency savings compared to what TECO plans to achieve. To develop our assumptions, we increased TECO's EE savings as a percent of sales to meet the average of the top 10 utilities in the Southeast by 2025 (1.47 percent). We then continued to improve the forecasted savings trajectory through 2030 at half the implicit rate from 2021-2025. We assume that energy efficiency does not change the load profile, but it reduces summer and winter peak loads proportionately to total annual savings.

The model was allowed to retire Big Bend 4 at any point in the analysis period depending on whether or not it was found to be economic. The model chose a retirement year of 2022 for this unit, resulting in zero coal generation for the rest of the analysis.

80% Clean Energy Scenario

Our third scenario utilized the same set of inputs as the 50% Clean Energy Scenario, while also building additional solar and storage resources to allow TECO to serve an even higher percentage of load with renewable energy. Ultimately, this scenario meets 80 percent of load with renewables by 2035.

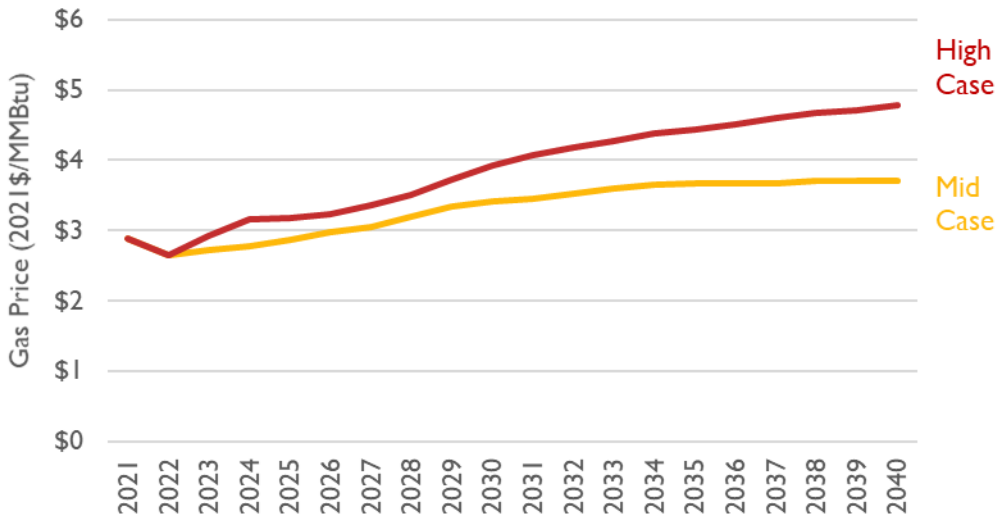
High Gas Price and Carbon Tax Sensitivity

To assess the potential financial impacts of a federal or statewide carbon tax and higher natural gas prices, we conducted a sensitivity analysis. Under the high gas price and CO_2 price sensitivity, Synapse used a gas price projection (shown in Figure 2) derived from EIA's 2021 Annual Energy Outlook (AEO) Henry Hub high gas price forecast as opposed to the mid case. Gas price volatility is already

[46] Harlow, J. "MI Power Grid Phase II." Presentation at the Advanced Planning Evaluator and All-Source Meeting, February 2021. Available at: https://www.michigan.gov/documents/mpsc/Feb_18_Competative_Procurement_Presentation__716684_7.pdf.

observable—as of August 2021, Henry Hub futures prices for January 2022 had risen above $4/MMBtu.[47]

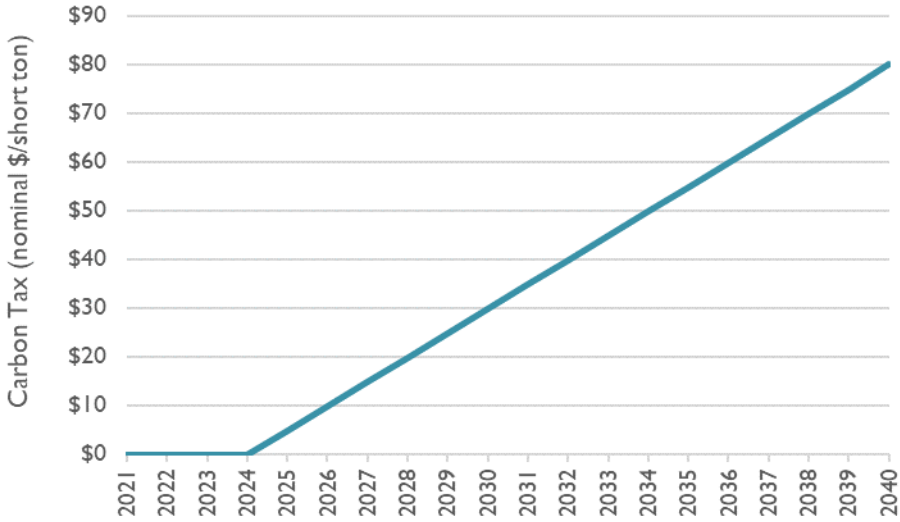
Figure 2: Natural gas price forecast comparison between high and mid case



For the carbon tax, Synapse applied a $5 per short ton carbon tax beginning in 2025, escalating at a rate of $5 per year in nominal dollars. This is on the low end of CO2 price trajectories used by other Southeastern utilities in planning analysis and is far below the social cost of carbon adopted by the federal government. Figure 3 shows our Carbon Tax Forecast.

[47] CME Group, Henry Hub Natural Gas Futures – Settlements. Last updated September 3, 2021. Available at: https://www.cmegroup.com/markets/energy/natural-gas/natural-gas.settlements.html.

Figure 3: Carbon Tax Forecast



2.2. Transitioning to renewables will save TECO ratepayers between $400 million and $1.6 billion between now and 2040.

The results of our modeling analysis show that the 50% Clean Energy Scenario is the lowest cost resource option for Tampa ratepayers. It will save ratepayers between $400 million and $1.6 billion in net present value terms relative to the Company's current plan that relies more heavily on fossil resources. It also results in a 60 percent reduction in CO_2 emissions by 2040 (compared to 2021 levels) and prevents approximately 50 million tons of CO_2 from being emitted compared to the TECO BAU Scenario.

Capacity Results

In the TECO BAU Scenario, TECO continues to operate Big Bend 4 on coal through 2040 and brings online 37 MW of RICE units at the end of 2024. We allowed the model to choose solar as an energy resource starting in 2031 (the first year after the 2021 TYSP ended) and it built out 1,580 MW of additional solar by 2040. Figure 4 shows the capacity buildout for the TECO BAU Scenario.

In both the 50% and 80% Clean Energy scenarios, the model chose to retire the Big Bend 4 coal plant immediately in 2022. No new capacity was needed on TECO's system, but the model did choose to build an additional 480 to 500 MW of solar PV in 2022, in the 50% and 80% Clean Energy scenarios respectively. By 2040, the 50% Clean Energy Scenario has over 6,000 MW of solar PV and almost 1,000 MW of battery storage. The 80% Clean Energy Scenario has over 8,500 MW of solar PV and 4,000 MW of storage. Figure 5 shows the generation capacity buildout for the 50% Clean Energy Scenario.

The High Gas Price and Carbon Tax Sensitivity was applied to the TECO BAU Scenario and both clean energy scenarios. For these sensitivities, the model was set up such that it relied on the builds from the original scenarios and did not re-optimize. This setup produces revenue requirement results that

quantify the potential risks associated with TECO's existing and proposed resource mix relative to the 50% Clean Energy Scenario's resource portfolio if a carbon price is implemented. For this reason, the capacity results from the high gas and carbon tax sensitivities are identical to those shown in Figure 4, Figure 5, and Figure 6.

Figure 4: Nameplate capacity for TECO BAU Scenario

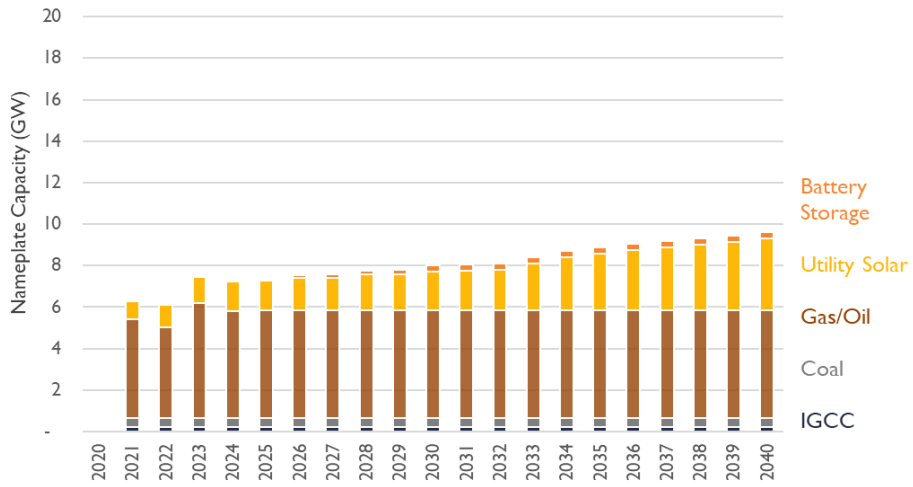


Figure 5: Nameplate capacity for 50% Clean Energy Scenario

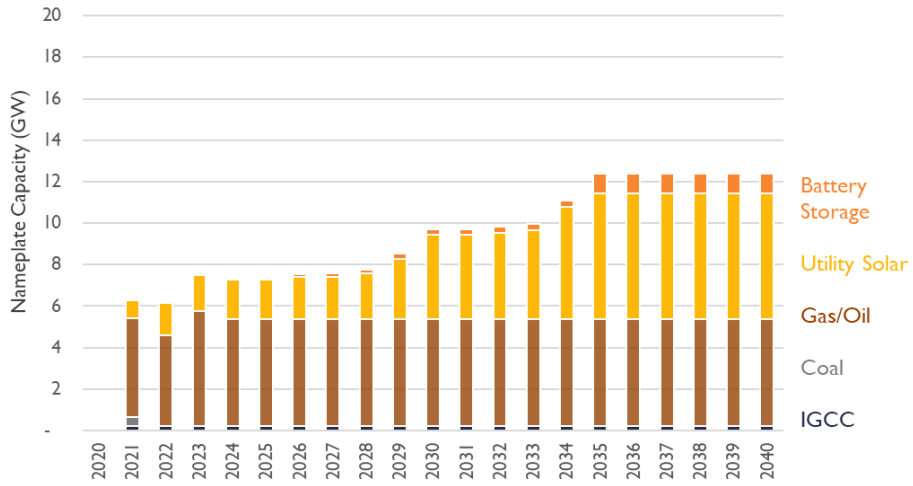
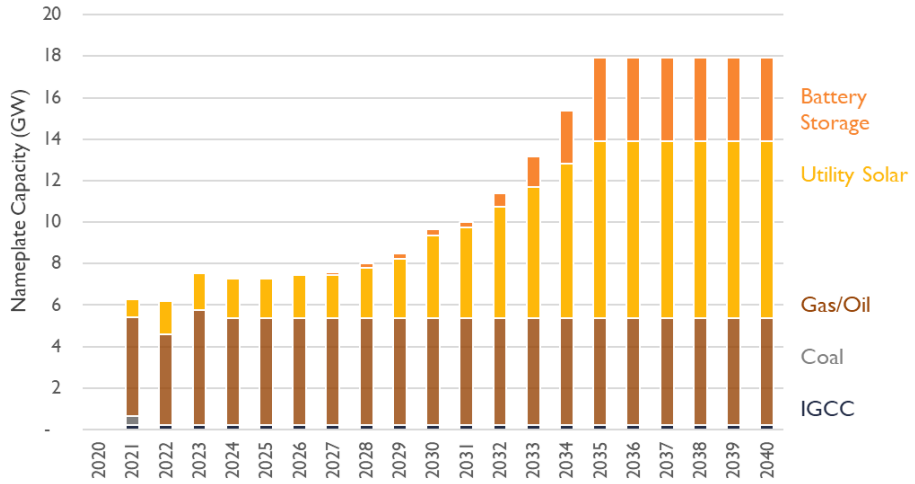


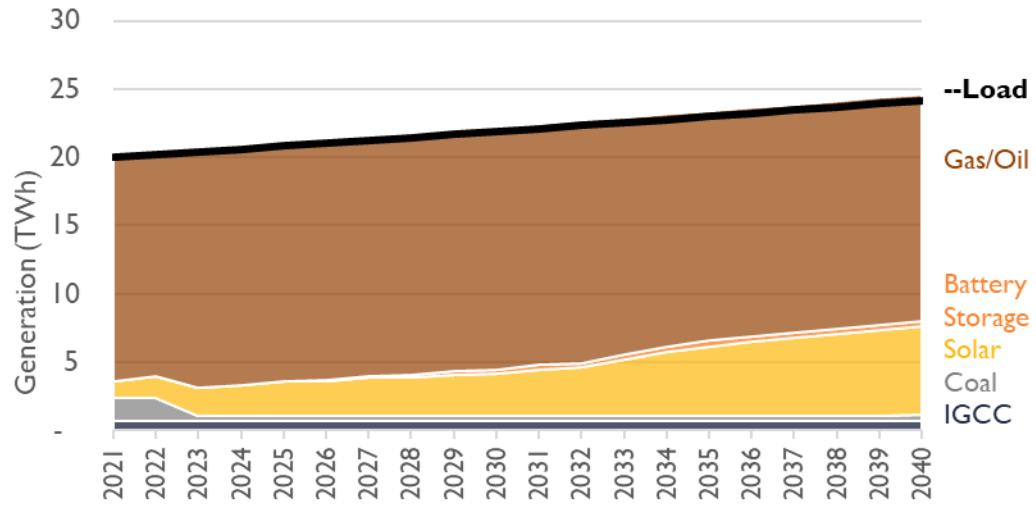
Figure 6: Nameplate capacity for 80% Clean Energy Scenario



Generation Results

In the TECO BAU Scenario, TECO's load continues to rise due to minimal investment in EE and DSM. The Company continues its strong reliance on fossil resources, with most of its energy needs met by its existing gas units through 2040. The generation results for the TECO BAU Scenario are shown in Figure 7.

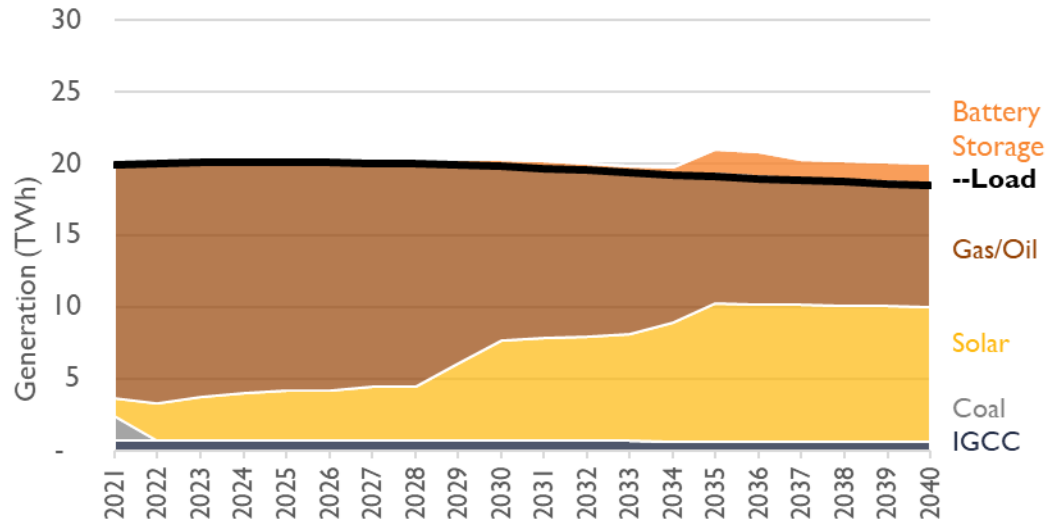
Figure 7: Generation mix for TECO BAU Scenario



In the 50% Clean Energy Scenario, TECO's load declines due to increased investment in EE and DSM. The Company continues to rely on gas in the early years but is able to displace a significant portion of its gas generation with solar PV over the next two decades. By 2035, over 9.5 TWh of load is served by solar generation. This amount would easily allow the City of Tampa to achieve its 100 percent renewable energy resolution.

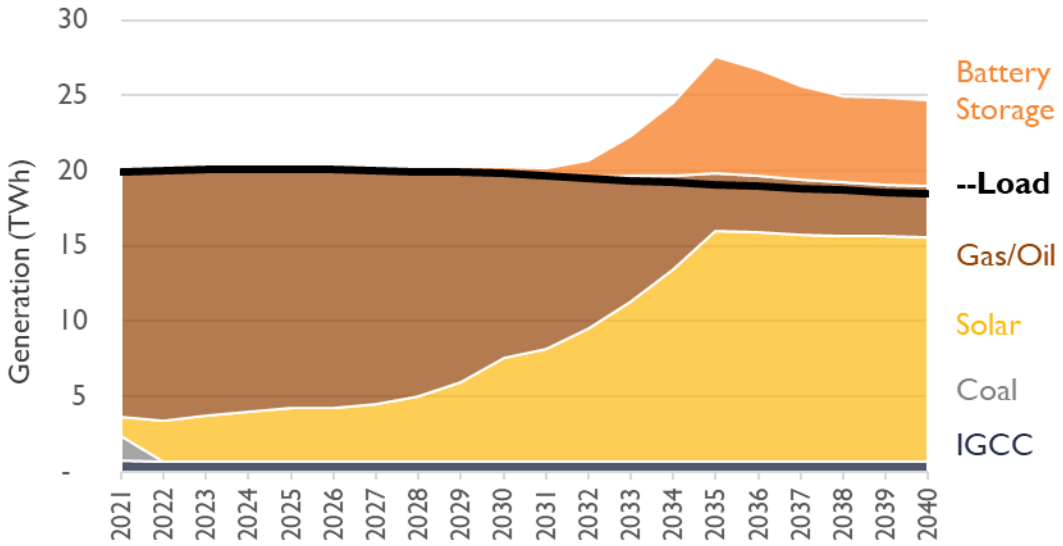
The generation results from the 50% Clean Energy Scenario are shown in Figure 8.

Figure 8: Generation mix for 50% Clean Energy Scenario



In the 80% Clean Energy Scenario, the generation is similar to the 50% Clean Energy Scenario up until 2030. After that, the model ramps up its solar production and utilizes battery storage to a higher degree. By 2035, solar generation amounts to over 15 TWh. This vastly surpasses the amount required for the City of Tampa to meet its 2035 target. The full generation results of this scenario are shown in Figure 9.

Figure 9: Generation mix for 80% Clean Energy Scenario

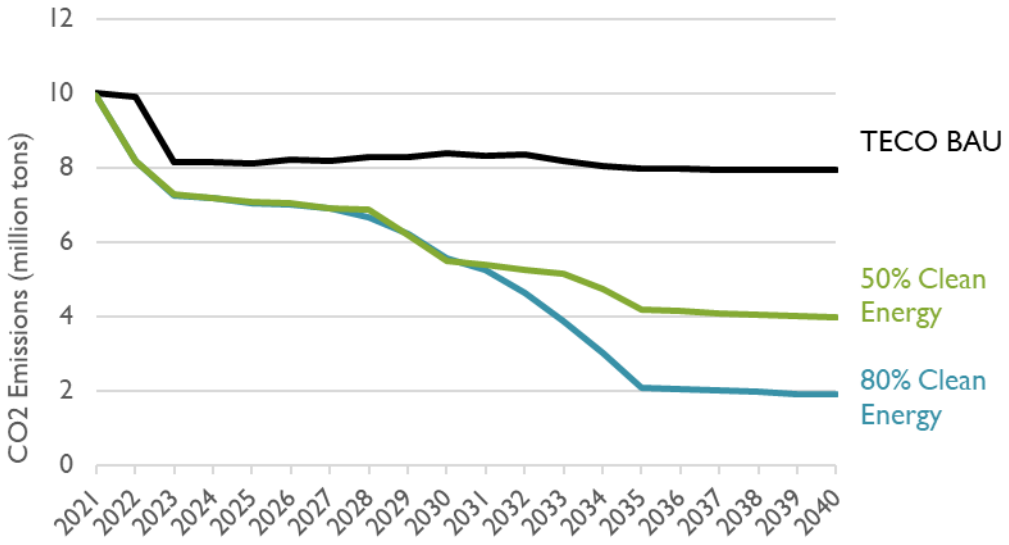


The generation results from the high gas and carbon price sensitivities also look quite similar to the results presented in Figure 7 through Figure 9. Because the resource mix is unchanged between the sensitivity and the original scenario, the model has limited dispatch flexibility.

Carbon Dioxide Emissions Results

We observe very different emissions trajectories between the three scenarios, as shown in Figure 10. In the TECO BAU Scenario, emissions initially drop due to the TYSP's demonstrated reduction in coal generation beginning 2023.[48] However, the trajectory flattens out as load rises and is met by natural gas generation. In the 50% Clean Energy Scenario, emissions decrease due to the retirement of TECO's coal plants and the uptick in solar generation. By 2040, this scenario achieves a 60 percent reduction in emissions as compared to 2021 levels. Over the course of 2021-2040, the 50% Clean Energy Scenario prevents approximately 50 million tons of CO_2 from being emitted compared to the TECO BAU Scenario. In the 80% Clean Energy Scenario, emissions further decrease due to the large amount of solar. 2040 CO_2 emissions are 80 percent lower than 2021 levels in this scenario, and roughly 66 million tons of carbon emissions are avoided over the analysis period.

Figure 10: CO_2 emissions by scenario



Revenue Requirement Results

The results of our modeling show that the 50% Clean Energy Scenario results in ratepayer savings of $400 million in net present value terms as shown in Table 1 below. Displacing existing gas generation with solar PV provides the dual benefit of reducing CO_2 emissions and saving ratepayers money.

[48] TECO 2021 TYSP: Schedule 6.1. History and Forecast of Net Energy for Load by Fuel Source, Base Case Forecast Basis.

Under the High Gas Price and Carbon Tax Sensitivity, the 50% Clean Energy Scenario becomes $1.6 billion cheaper than the TECO BAU Scenario. The 80% Clean Energy Scenario saves $800 million compared to the TECO BAU Scenario under this sensitivity. Given the uncertainty surrounding future gas prices and a potential tax on carbon, it is more financially sound to install renewable energy than to continue to rely on gas.

Table 1: Net present value of revenue requirement by scenario

Scenario	Total NPV ($Billion)	Delta From TECO BAU ($Billion)
TECO BAU	**$11.8**	
50% Clean Energy Scenario	$11.4	-$0.4
80% Clean Energy Scenario	$12.6	$0.8
TECO BAU Scenario, High Gas Price and Carbon Tax	**$14.8**	
50% Clean Energy Scenario, High Gas Price and Carbon Tax	$13.2	-$1.6
80% Clean Energy Scenario, High Gas Price and Carbon Tax	$14.0	-$0.8

As you can see in Figure 11 and Figure 12, fuel spending is significantly lower under the 50% Clean Energy Scenario than the TECO BAU Scenario but spending on DSM and solar resources is much higher (in both the base scenarios and the scenarios with a carbon tax). Solar resources were offered to the model on an energy basis, therefore the costs associated with the solar resources show up in the non-fuel variable cost category instead of as capital costs.

Figure 11: Net Present Value Revenue Requirement by cost category for base scenarios

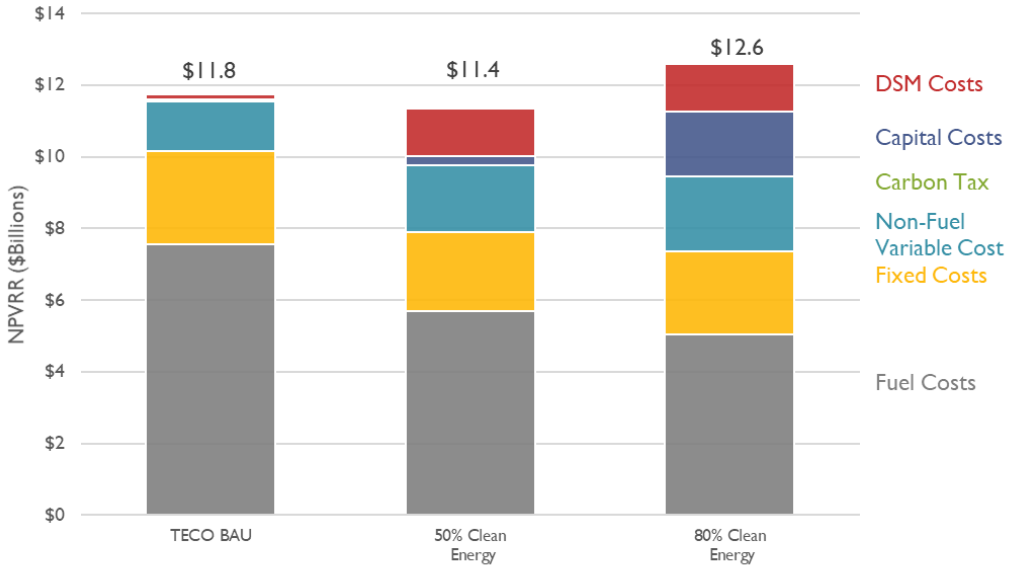
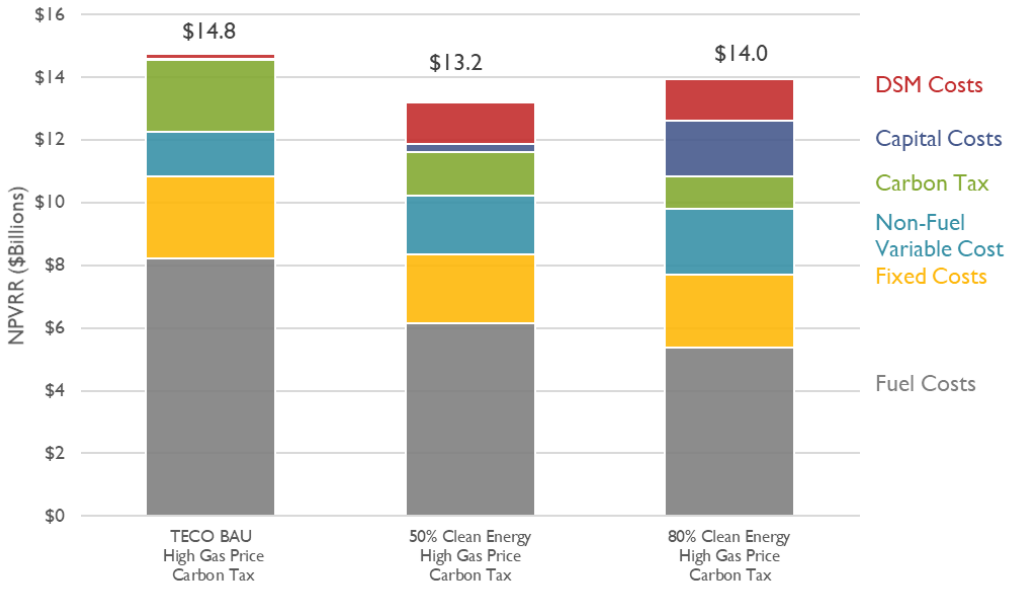


Figure 12: Net Present Value Revenue Requirement by cost category for scenarios with carbon tax



3. REPLACING TAMPA ELECTRIC COMPANY'S COAL CAPACITY WITH RENEWABLE RESOURCES CREATES HIGH QUALITY LOCAL JOBS

Synapse conducted an analysis of the economic benefits of TECO and Tampa 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 TECO BAU Scenario to a future in which TECO pursues the alternative scenario described in 50% Clean Energy Scenario in which TECO's renewable energy makes up half of the generation mix by 2035, including testing the High Gas Price and Carbon Tax Sensitivity.

We find that the 50% Clean Energy Scenario is expected to create 13,250 net job-years over the period 2021–2040 relative to the TECO BAU Scenario. This quantity is even greater—28,000 net job-years—under the High Gas Price and Carbon Tax Sensitivity (relative to the TECO BAU scenario with a high gas price and carbon tax also applied). Table 2 summarizes the results across all sensitivities and scenarios. Full results for the 50% Clean Energy Scenario and High Gas Price and Carbon Tax Sensitivity are discussed in Section 3.2 below. Appendix D provides full results for the other alternative scenarios.

Table 2: Job impact relative to Reference Scenario, 2020–2040 (FTE job-years)

Alternative Scenario	Reference Case	Total Jobs	Average Annual Jobs
50% Clean Energy Scenario by 2035	TECO BAU	13,250	662
50% Clean Energy Scenario by 2035 + High Gas Price and Carbon Tax	TECO BAU + High Gas Price and Carbon Tax	28,070	1,404
80% Clean Energy Scenario by 2035	TECO BAU	16,916	846
80% Clean Energy Scenario by 2035 + High Gas Price and Carbon Tax	TECO BAU + High Gas Price and Carbon Tax	38,227	1,911

Change in jobs is evaluated relative to a reference scenario. The reference scenario is the TECO BAU Scenario either with or without the high gas price and carbon tax assumed.

3.1. Meeting Tampa's energy needs with renewable energy resources and energy efficiency is an opportunity to strengthen the local economy in alignment with the vision of Tampa's leaders

Tampa Mayor Jane Castor has made climate action and job creation top priorities. In her FY2020 budget, she identified job creation as a top objective for the City of Tampa.[49] This is an opportunity to align the City's planned transition to 100 percent renewable energy by 2035 with its job creation aspirations. Tampa's forthcoming 2021 Climate Action and Equity Plan[50] can provide a policy roadmap to bolster, create, and sustain new, high-quality jobs through policies and programs that commit to renewable energy and energy efficiency.

Tampa-region's Congresswomen Kathy Castor is also working to support the transition to renewable energy supply and create high-quality jobs in the process. She is the chair of the U.S. House Select Committee on the Climate Crisis. Congresswoman Castor describes how the "Solving the Climate Crisis" plan—a roadmap to net-zero greenhouse gas emission by 2050 proposed by the Select Committee—will "chart the course to good-paying American jobs in solar and wind energy."[51] She notes that the plan "rebuilds our economy through clean energy jobs."[52]

Transitioning TECO's energy supply to incorporate more renewable energy and ramping up energy efficiency, as in the 50% Clean Energy Scenario, is complementary to the climate and jobs goals of the City of Tampa and of the "Solving the Climate Crisis" plan. A long-term commitment by TECO would ensure sustained local opportunities in the energy sector that would support new and existing businesses in the region. Further, efforts by local leaders to develop and train a robust energy workforce would strengthen any TECO initiatives by supplying qualified professionals to operate its efficiency programs and maintain energy supply resources.

3.2. 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 2.7 million U.S. jobs dedicated to these

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[49] City of Tampa. *FY2020 Budget: Transforming Tampa's Tomorrow.* Available at: https://www.tampa.gov/document/fy2020mayoralbudgetpresentation-34766.

[50] City of Tampa. 2021. *Green Tampa – Greenhouse Gases Reduction*. Available at: https://www.tampa.gov/green-tampa/greenhouse-gas-reduction.

[51] Kinane, Sean. 2020. "Kathy Castor announces "Solving the Climate Crisis" plan." *88.5 WMNF*. Available at: https://www.wmnf.org/kathy-castor-announces-solving-the-climate-crisis-plan/.

[52] Derby, Kevin. 2020. "Kathy Castor Keeps the Gavel on the Select Committee on the Climate Crisis." *Florida Daily*. Available at: https://www.floridadaily.com/kathy-castor-keeps-the-gavel-on-the-select-committee-on-the-climate-crisis/.

energy resources, which support the economies where these energy resources are installed.[53] Over half of those jobs are in the construction sector.[54] 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.[55]

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.[56] Further, a large portion of expenditures on coal and gas leave the Florida economy, because there are relatively few in-state jobs in these industries. The mining and extraction jobs sector represented 0.13 percent of all Florida jobs in 2019, which is less than one-quarter of the national share for this sector.[57] 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.

3.3. In Tampa, transitioning to renewables will create 13,250 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 50% Clean Energy Scenario and the 80% Clean Energy Scenario, including testing the High Gas Price and Carbon Tax Sensitivity. Our model converts changes in TECO's 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 respending of (1) utility savings from energy efficiency and (2) rate reductions resulting from lower cost energy resources, including any decrease in carbon taxes. A description of the model, our methodology, and the economic parameters we use are included in Appendix B.

We estimate job creation in units of "net job-years." Each job-year represents a single full-time equivalent job for one year. Some jobs are temporary, such as construction jobs for one-time projects.

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[53] National Association of State Energy Officials and Energy Futures Initiative. 2020. *The 2020 U.S. Energy & Employment Report.* Available at: https://www.usenergyjobs.org.

[54] *Id.*

[55] 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, Inc. for Labor Network for Sustainability. Available at: http://greenjusticecoalition.org/wp-content/uploads/2020/02/20191022-Massachusetts-Infrastructure-Report-Final.pdf

[56] 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.

[57] 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.

Others are longer term and involve ongoing operation and maintenance or program implementation (*e.g.*, a commercial lighting retrofit program or residential 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 renewables and energy efficiency and (2) the decrease in jobs due to reduced spending for fossil-fuel-based generation.

Jobs by resource type

Compared to the TECO BAU Scenario, the 50% Clean Energy Scenario is expected to create around 13,250 net job-years over the period 2021–2040 as shown in Table 3, while the 80% Clean Energy Scenario is expected to create 16,916 net-job years. These jobs are created as TECO transitions away from fossil fuels resources and towards 50 and 80 percent renewable energy by 2035. The result is equivalent to sustaining about 660 jobs each year over the 20-year study period for the 50% Clean Energy Scenario and nearly 850 jobs for the 80% Clean Energy Scenario. The primary cause of job increase is redirecting investments away from coal and natural gas toward energy efficiency and solar power, which support more jobs per dollar spent than fossil fuels. Customer respending of bill savings is another important effect, which stimulates the economy and creates an estimated 7,000 new jobs through 2040 (over 10,000 in the 80% Clean Energy Scenario). These bill savings result from reduced energy consumption (due to energy efficiency programs) and from using lower-cost renewable resources.

Table 3: Change in employment by resource, 50% Clean Energy Scenario and 80% Clean Energy Scenario 2020–2040 (FTE job-years)

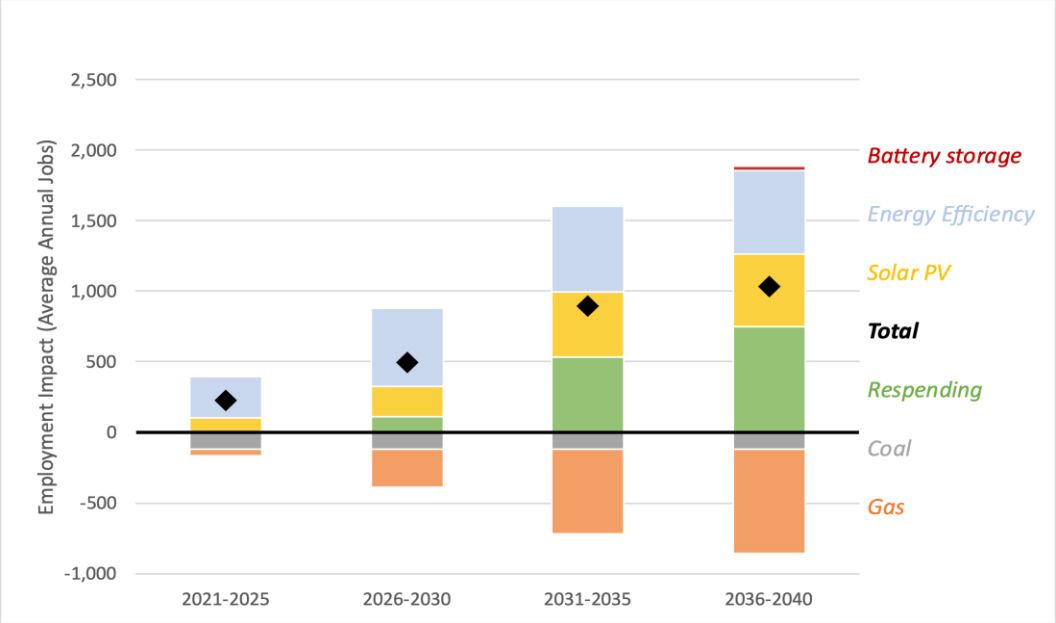
	50% Clean Energy Scenario		80% Clean Energy Scenario	
Resource	Total Jobs	Average Annual Jobs	Total Jobs	Average Annual Jobs
Respending	6,966	348	10,033	502
Solar Power	6,466	323	9,585	479
Energy Efficiency	10,254	513	10,254	513
Battery Storage	191	10	1,279	64
Coal	(2,376)	(119)	(2,375)	(119)
Natural Gas	(8,251)	(413)	(11,859)	(593)
Net total	13,250	662	16,916	846

Job impacts are shown relative to TECO's BAU Scenario.

A large share of the job creation will occur in the 2030s, associated with construction of solar PV and ongoing support for energy efficiency programs to replace large amounts of natural gas generation. Figure 13 displays the total employment impacts of the 50% Clean Energy Scenario relative to the TECO BAU Scenario for four periods and Figure 14 displays the 80% Clean Energy Scenario results. We find

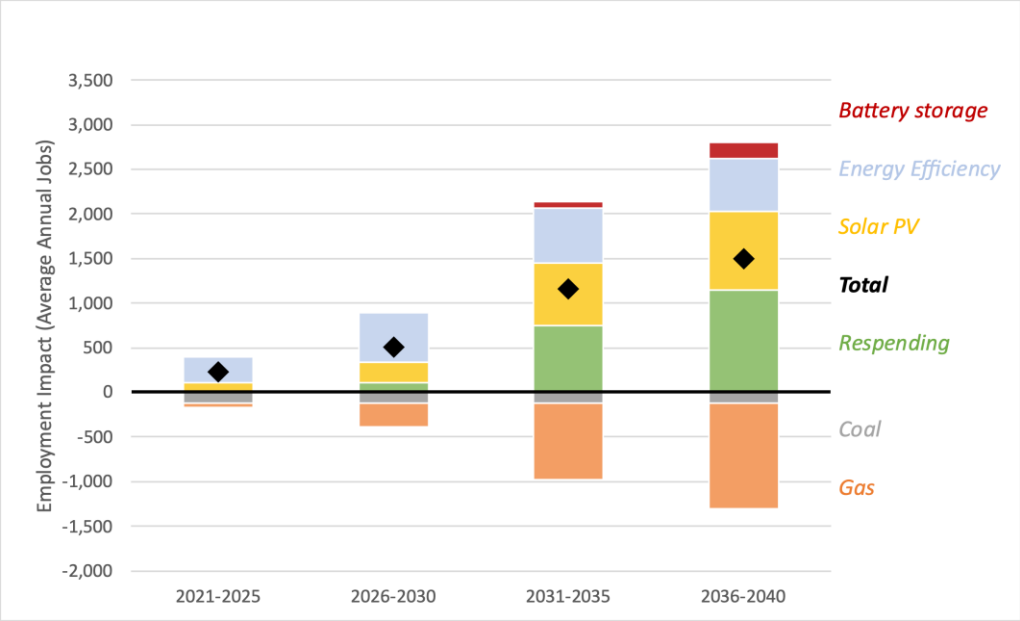
significant net-positive impacts in both clean energy scenarios, which increase over time. Jobs created the through investment in renewable energy resources, energy efficiency, as well as consumer respending of bill savings outstrips losses from decreased investment in coal and gas during all periods.

Figure 13: Average annual employment impact by resource, 50% Clean Energy Scenario, 2020–2040 (FTE job-years)



Job impacts are shown relative to the TECO BAU Scenario.

Figure 14: Average annual employment impact by resource, 80 Percent Clean Energy by 2035 scenario, 2020–2040 (FTE job-years)



Job impacts are shown relative to the TECO BAU Scenario.

Energy efficiency accounts for the largest economic impact at over 10,000 job-years, followed by solar power and respending at around 6,500 job-years each. Induced jobs from customer respending break down into 4,000 job-years due to the use of lower-cost resources and 2,500 job-years due to energy efficiency savings. See Appendix B for discussion of induced jobs. Job losses in coal and natural gas are expected to be 2,400 and 8,200 job-years, respectively. However, as discussed above, a large portion of these jobs are expected to be based outside of the state of Florida. Most of the losses occur in the 2030s. This gives TECO and the City of Tampa a decade to plan for the resource phase out in a manner that minimizes layoffs. Strategies include hiring freezes, jobs reduction through natural attrition (avoiding rehiring when an employee vacates a position), and job retraining.

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 $55,364. At the high end, solar power manufacturing jobs will earn $153,299 on average.[58,59] In our 50% Clean Energy Scenario, the weighted average income for the created jobs across all resources and all sectors is estimated to be $73,460, as compared to an economy-wide average of $62,977.

Many of the jobs created by investment in energy efficiency and renewable energy would be local. Thirty-nine percent of these new jobs would occur in the construction sector, which we expect would be in the TECO service territory and area surrounding 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, as shown in Table 4. But the sector most impacted by this change in investment would be mining and extraction, which we estimate will lose around 130 jobs a year for a total loss of around 2,600 job-years over the study period. However, as discussed above, relatively few of these jobs are likely to be in Florida.

[58] As a comparatively new industry, jobs related to the supply chain for solar electric power generation are not yet tracked by the U.S. Bureau of Labor Standards. We use data provided in recent reports by the National Association of State Energy Officials, Energy Futures Initiative, and the Solar Foundation to estimate employment impacts. These data indicate that 248,034 US workers spent at least 50 percent of their time in 2019 working in the solar supply chain (manufacturing, installation, distribution, and professional services). Another 97,359 employees spent up to half their time in the solar industry.

[59] The Solar Foundation. 2020. National Solar Jobs Census 2019. National Association of State Energy Officials and Energy Futures Initiative. 2020. The 2020 U.S. Energy & Employment Report. Available at: https://www.usenergyjobs.org.

Table 4: Change in employment by sector, 50% Clean Energy Scenario, 2020–2040 (FTE job-years)

Sector	Total Jobs	Average Annual Jobs
All sector respending jobs	6,966	348
Mining and extraction	(2,630)	(131)
Utilities	(743)	(37)
Construction	6,447	322
Manufacturing	435	22
Wholesale trade	376	19
Professional and business services	1,013	51
Other services	1,384	69
Net total across resources	**13,250**	**662**

4. CONCLUSION

Given Tampa's vulnerability to the impacts of climate change, the city and utility must act now to both mitigate the climate impacts of its electricity system, but also adapt its electricity infrastructure to become more resilient. The Company's most recent planning document, the 2021 TYSP, indicates the Company's plan to continue its reliance on its fossil resources. But TECO has an opportunity to step up and provide Tampa with a clear plan on how it will transition from its current reliance on fossil fuels to a clean system that relies on renewables and DSM. A renewable portfolio would not only provide environmental benefits, but as we have shown in this report, would save the citizens of Tampa hundreds of millions to even billions of dollars directly, in addition to providing significant local jobs and economic stimulus.

Our specific recommendations are as follows:

1. TECO should chart a path that is consistent with meeting the City of Tampa's ambitious goal of 100 percent renewable energy by 2035, rather than its current plan to rely heavily on fossil fuels.
2. TECO should not construct any new gas combined cycle or combustion turbine plants and should also accelerate the retirement of Big Bend 4. TECO should also evaluate the risk of any further investments in coal and gas plants being rendered uneconomic before the end of their useful lives by policy changes and continued declines in clean energy costs.
3. TECO should 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 that match regional average levels. TECO should prioritize education, energy audit, and implementation efforts for these programs in the neighborhoods with the highest energy burden in order to help households in frontline communities reduce the burden of high electricity bills.

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

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Appendix A. Resource Plan Methodology and Inputs

Modeling description

Synapse utilized the EnCompass capacity optimization and dispatch model, developed by Anchor Power Solutions. The objective of this power supply planning model is to generate the least-cost resource portfolio that is capable of meeting energy, capacity, and reliability needs while respecting a set of constraints. We set up the model to optimize the capacity expansion over the entire 2021–2040 analysis period.

Topology and transmission

Historically, Tampa has relied on net imports from the rest of Florida to meet some of its load. However, the TYSP shows the net interchange in 2020 and beyond dropping to minimal levels. For this reason, we modeled Tampa as an island in EnCompass and assumed the utility had to meet its full load with its own resources instead of relying on imports and exports from the rest of the state.

Peak load and annual energy

For peak load and annual energy, Synapse relied on Tampa Electric Company's (TECO) 2020 TYSP for the period 2021–2029. For the years 2030 and beyond, Synapse applied the compound annual growth rate (CAGR) from the period 2025-2029. TECO expected COVID impacts to reduce sales by 2.4 percent in 2020 and 2021, before returning to normal, as per the Company's response to 4th supplemental data request. This adjustment was applied to all modeled load forecasts. Scenarios were designed to meet a 20 percent reserve margin in both the summer and the winter.

Resource mix

For existing and planned baseline resources, Synapse relied on TECO's 2021 TYSP for the period 2021–2029. Beyond 2029, the model was allowed to build incremental resources to meet load growth in the baseline scenario.

Fuel prices

Synapse relied on our own internal gas price forecast for Henry Hub base prices. Our Henry Hub gas price forecast relies on NYMEX futures for monthly prices through December 2022. In 2023, we use a blend of NYMEX futures and annual average prices projected in the U.S. Energy Information Administration's Annual Energy Outlook (AEO) 2020. Starting in January 2024, we exclusively use the annual average prices projected in AEO 2020. 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.

Programs

The 50% Clean Energy Scenario was set up in the model to achieve a 50 percent RPS by 2035. This means that at least half of TECO's load had to be provided by solar resources by 2035. The 80% Clean Energy Scenario was set up to achieve an 80 percent RPS.

Appendix B. 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 B- 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.[60] For labor expenditure share and average labor wage, we use data from an industry-standard economic impact model, IMPLAN.[61] 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

Industry Sectors

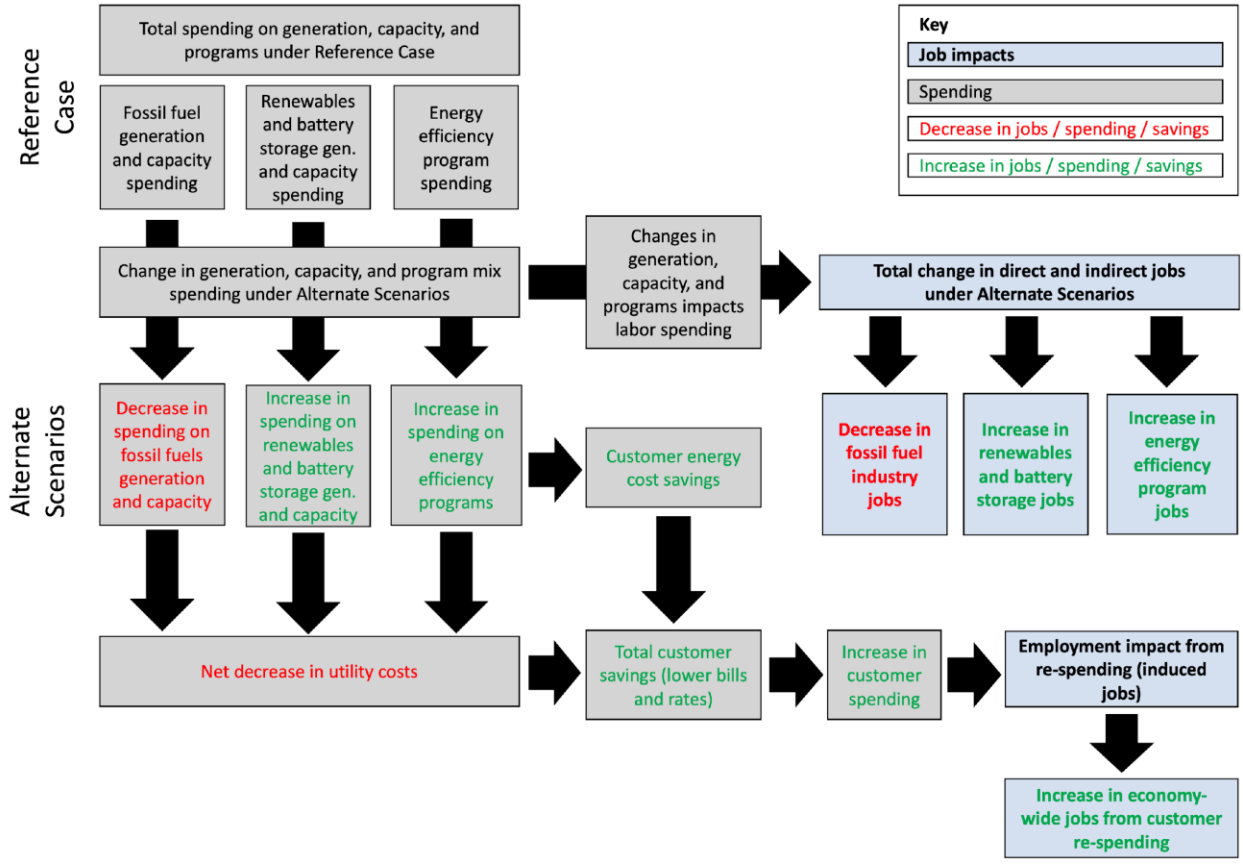
- Mining and extraction
- Utilities
- Construction
- Manufacturing
- Wholesale trade
- Professional and business services
- Other services

[60] National Association of State Energy Officials and Energy Futures Initiative. The 2020 U.S. Energy & Employment Report. 2020.

[61] 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/.

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 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 B- 1: Synapse's economic model for Tampa Electric Company's energy investment



Appendix C. GENERATION AND CAPACITY RESULTS FOR ADDITIONAL MODELED SCENARIOS

Figure C- 1: Generation Mix for TECO BAU with High Gas Price and CO_2 Price Case

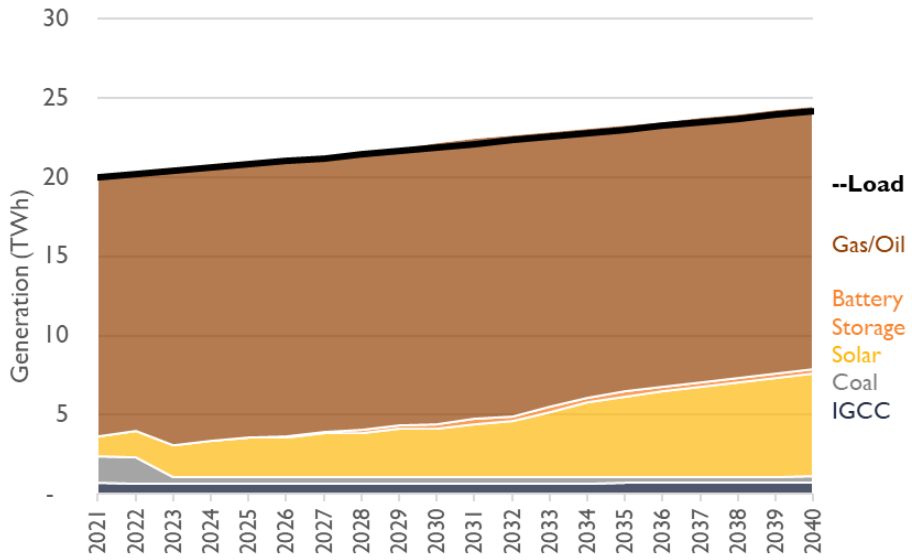


Figure C- 2: Nameplate Capacity for TECO BAU with High Gas Price and CO_2 Price Case

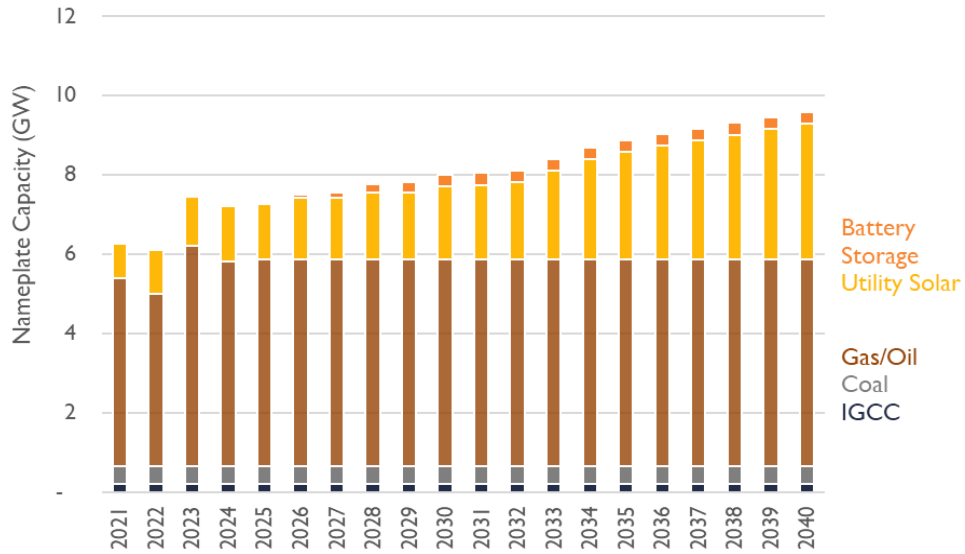


Figure C- 3: Generation Mix for Clean Energy Case with High Gas and CO_2 Price

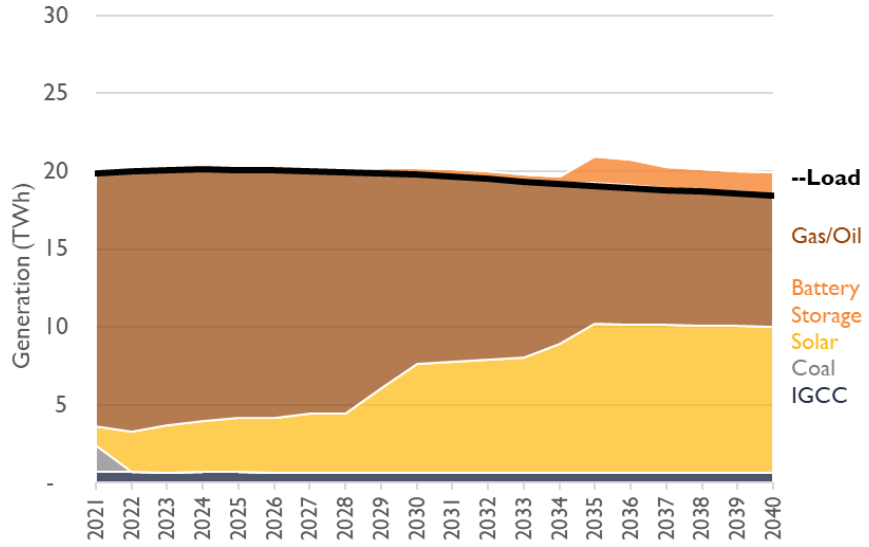


Figure C- 4: Nameplate Capacity for Clean Energy Case with High Gas and CO_2 Price

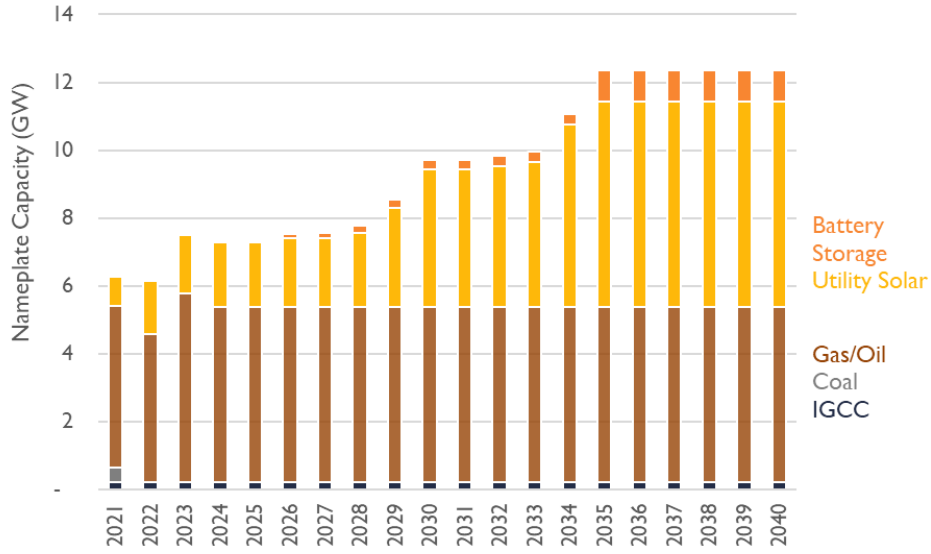


Figure C- 5: Generation Mix for 80 percent Clean Energy by 2035 with High Gas and CO_2 Price Case

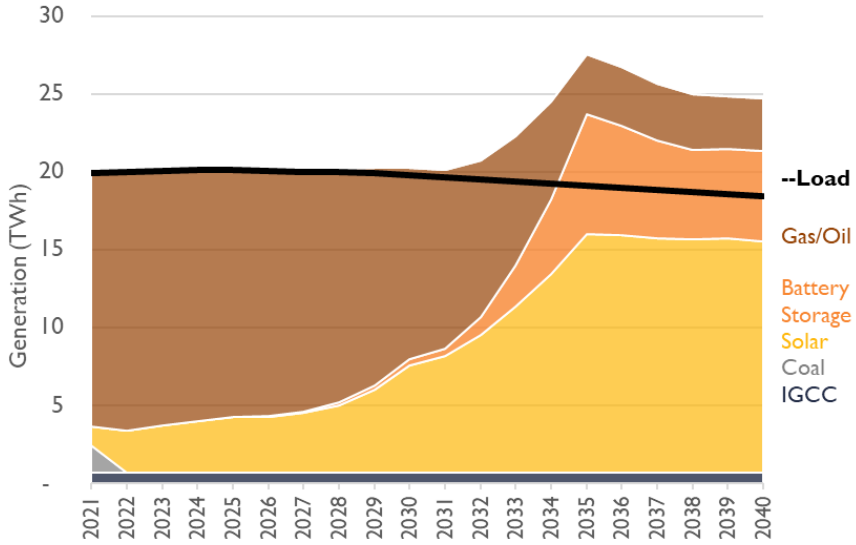
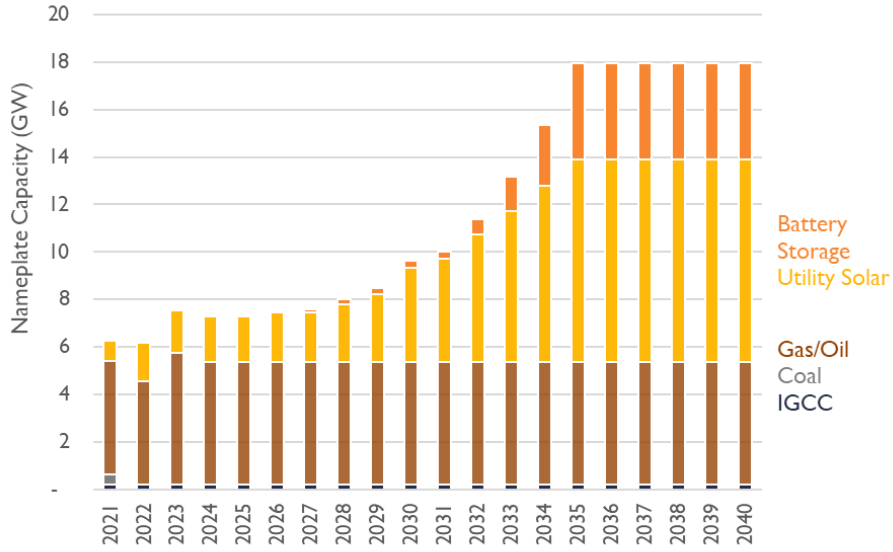


Figure C- 6: Nameplate Capacity for 80 Percent Clean Energy by 2035 with High Gas and CO_2 Price Case



Appendix D. JOB IMPACTS RESULTS FOR OTHER MODELED SCENARIOS

Synapse performed energy and economic modeling for a range of potential clean energy scenarios, as alternatives to the TECO BAU Scenario. Section 3.3 presents the results of the job impacts study for the 50% Clean Energy Scenario and the 80% Clean Energy Scenario. This section contains the results for the High Gas Price Carbon Tax Sensitivities.

50% Clean Energy with High Gas Price and Carbon Tax Sensitivity

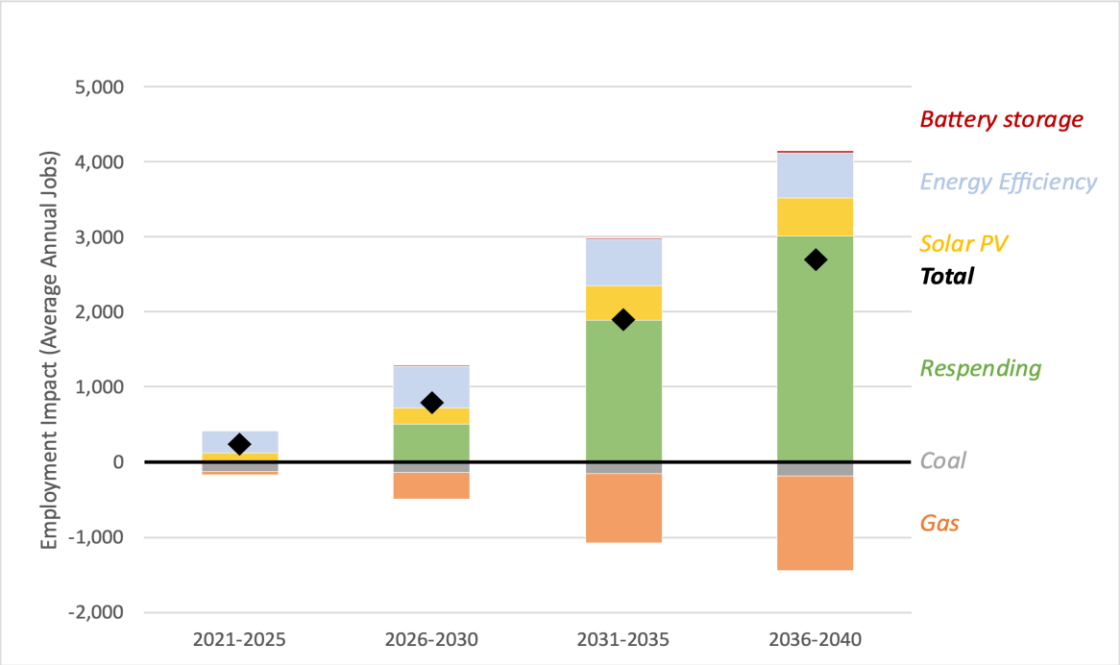
Synapse conducted a sensitivity analysis to estimate the effect of higher gas prices and a carbon tax on the job impacts of the 50% Clean Energy Scenario relative to the TECO BAU Scenario (also with higher gas prices and a carbon tax). We find that job creation increases to 28,000 net job-years under the High Gas Price and Carbon Tax Sensitivity. Under the sensitivity, the 50% Clean Energy Scenario saves additional $2.6 billion in natural gas spending and $2.2 billion in carbon tax spending; this lowers utility costs relative to the TECO BAU Scenario with a high gas price and carbon tax assumed, resulting in 25,000 additional jobs through customer respending. These results are shown in Table 5 and Figure 15.

Table 5: Change in employment by resource, High Gas Price and Carbon Tax Sensitivity, 2020–2040 (FTE job-years)

Resource	Total Jobs	Average Annual Jobs
Respending	27,088	1,354
Solar Power	6,466	323
Energy Efficiency	10,254	513
Battery Storage	193	10
Coal	(2,963)	(148)
Natural Gas	(12,967)	(648)
Net total	**28,070**	**1,404**

Job impacts are shown relative to the TECO BAU Scenario with a high gas price and carbon tax assumed.

Figure 15: Change in employment by resource, High Gas Price and Carbon Tax Sensitivity, 2020–2040 (FTE job-years)



Job impacts are shown relative to the TECO BAU Scenario with a high gas price and carbon tax assumed.

80 Percent Clean Energy by 2035 with High Gas Price and Carbon Tax

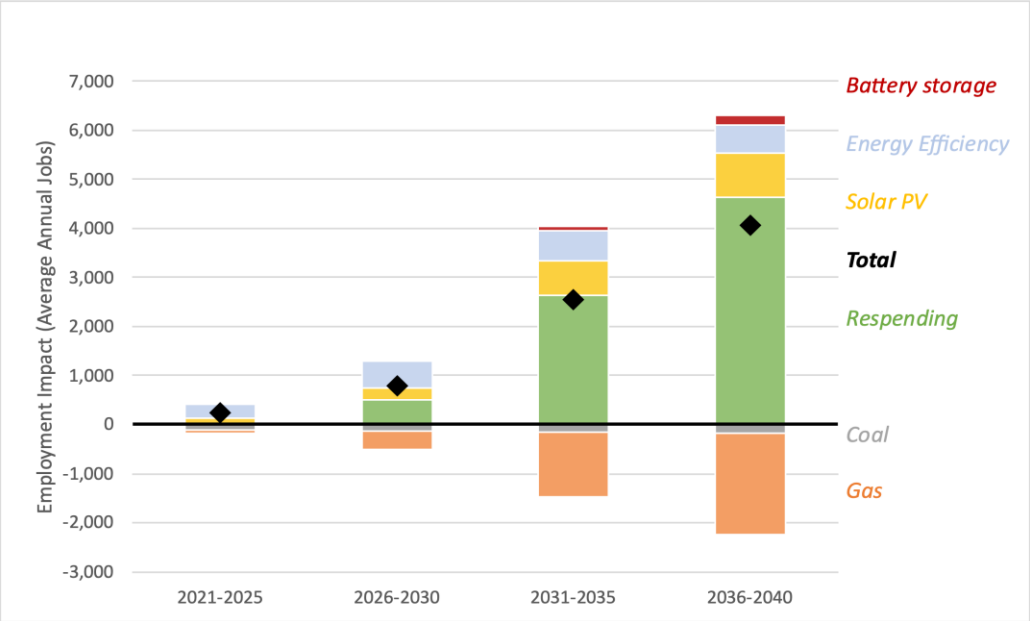
This model run adds a sensitivity to the 80 Percent Clean Energy by 2035 Scenario, in which natural gas prices increase substantially and imposes a carbon tax. We compare this scenario to the TECO BAU Scenario with the same High Gas Price and Carbon Tax Sensitivity. Table D-1 and Figure D-1 and show the results.

Table D-1: Change in employment by resource, 80 Percent Clean Energy by 2035 Scenario with High Gas Price and Carbon Tax sensitivity, 2020–2040 (FTE job-years)

Resource	Total Jobs	Average Annual Jobs
Respending	39,052	1,953
Solar Power	9,585	479
Energy Efficiency	10,254	513
Battery Storage	1,281	64
Coal	(2,962)	(148)
Natural Gas	(18,983)	(949)
Net total	**38,227**	**1,911**

Job impacts are shown relative to the TECO BAU Scenario.

Figure D-1: Change in employment by resource, 80 Percent Clean Energy by 2035 Scenario with High Gas Price and Carbon Tax sensitivity, 2020–2040 (FTE job-years)



Job impacts are shown relative to the TECO BAU Scenario with High Gas Price and Carbon Tax Sensitivity.