CLEAN ENERGY ROADMAP

Overview

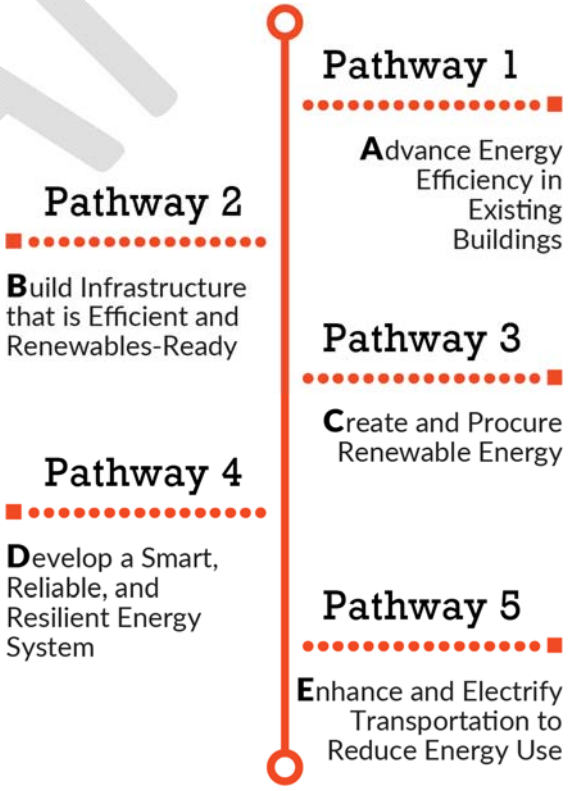
Cities are increasingly seeking to transition to 100% clean energy, thanks to sources that create low or zero greenhouse gas emissions. Given differences among and within cities, there is not a single one-size-fits-all solution to making this transition. Therefore, the City of St. Petersburg will need to pursue multiple, integrated pathways, to achieve its near- and long-term goals. The following five "ABCDE" pathways are presented for St. Petersburg to reach its 100% clean energy goal:

Pathway 1: **A**dvance Energy Efficiency in Existing Buildings
Pathway 2: **B**uild Infrastructure that is Efficient and Renewables-Ready
Pathway 3: **C**reate, and Procure Renewable Energy through Collaboration
Pathway 4: **D**evelop a Smart, Reliable, and Resilient Energy System
Pathway 5: **E**nhance and Electrify Transportation to Reduce Energy Use

Introduction

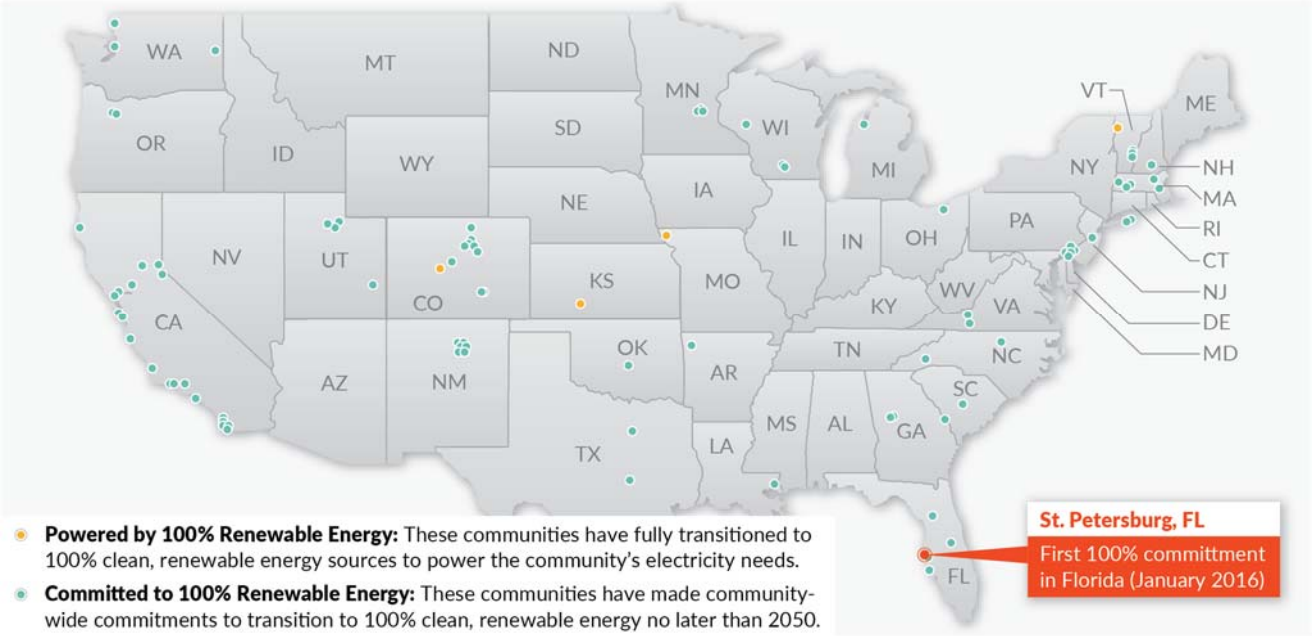
In 2016, the City of St. Petersburg became the first city in Florida and the 20th city nationally to commit to 100% clean energy, part of a national trend of clean energy commitments at municipal levels that now have been adopted by more than 70 U.S. cities[1] (see **Figure 1**). As a critical part of the City's Integrated Sustainability Action Plan (ISAP), this document provides a "roadmap" for how St. Petersburg will reach its goal of 100% clean energy by 2035.

Getting to 100% clean energy is an ambitious task. Currently St. Petersburg, like most cities, relies heavily on the combustion of fossil fuels to power its buildings, infrastructure, and transportation. This 100% clean energy goal will only be achieved through aggressive and immediate action to create an energy network that is clean, reliable, affordable, and equitable.



[1] https://www.sierraclub.org/ready-for-100/commitments

FIGURE 1: U.S. Cities with Renewable Energy Commitments[2]



Source: Sierra Club

Why Clean Energy?

St. Petersburg aims to become a healthy, resilient, and sustainable city, which requires the city to cut greenhouse gas (GHG) emissions that contribute to climate change, reduce environmental impacts, and enhance the resiliency of the city to changing climate conditions and disruptions. Stationary energy consumption (electricity and natural gas consumed in the operation of the built environment) accounted for more than half (54%) of the city's community-wide GHG emissions in 2016. This percentage indicates that any significant reductions in GHG emissions will need to come from this source. Transitioning to clean energy also has the related benefits of improving air quality, reducing demands on an aging grid infrastructure, enhancing resiliency of energy systems, and providing opportunities for job creation and economic growth. These benefits can improve the health, livelihoods, and quality of life of St. Petersburg's residents and visitors.

St. Petersburg embraces the concept of *energy equity* and a *just transition* to a local clean energy economy. According to the Just Transition Alliance:

> "**Just Transition** is a principle, a process and a practice. The principle of just transition is that a healthy economy and a clean environment can and should co-exist. The process for achieving this vision should be fair one that should not cost workers or community residents their health, environment, jobs, or economic assets. Any losses should be fairly compensated. And the practice of just transition means that the people who are most affected by pollution – the frontline workers and the fenceline communities – should be in the leadership of crafting policy solutions."[3]

[2] https://www.sierraclub.org/ready-for-100/commitments
[3] http://jtalliance.org/what-is-just-transition/

St. Petersburg's transition to a clean energy economy must educate and engage its low-income and communities of color to help lead this transition, including influencing decisions about land use, housing, transportation, and energy infrastructure development to ensure that the community is achieving a transition away from a fossil-fuel based economy while simultaneously reducing and eliminating existing disparities in economic opportunity and access to resources.

Case Study: The Partnership for Southern Equity (PSE) and Energy Equity Initiatives

Increasingly, governments, nonprofit organizations, and other stakeholders are approaching sustainability and clean energy initiatives through equity lenses, integrating social, economic, and environmental interests and goals. Located in Atlanta, Georgia, the nonprofit organization Partnership for Southern Equity (PSE) exemplifies this approach. Through its work in "consensus building, issue framing, training, policy advocacy, and collective impact organizing," PSE focuses its efforts on economic development and growth that distribute burdens and benefits in an equitable manner across communities, especially working with and for historically marginalized, disadvantaged, and vulnerable groups. The organization targets three critical issues, all through an equity emphasis: "just energy," "just opportunity," and "just growth." In one representative project, PSE collaborated with a committee of partners to develop the Metro Atlanta Equity Atlas (MAEA), a web-based, publicly-available data and mapping tool that allows users to access and analyze data on community wellbeing, especially related to access and opportunity.

Other organizations and initiatives engaging in similar work include the following:

- Partnership for Opportunity and Workforce and Economic Revitalization (POWER) provides federally-funded training and education for those affected by the shifting coal industry in the Appalachia Region. https://www.arc.gov/funding/power.asp
- Emerald Cities Collaborative (ECC) is a national nonprofit organization that seeks to create equitable and sustainable local economies. http://emeraldcities.org/
- Vital Brooklyn is a state-funded program that targets eight areas of investment for community development and wellness in disadvantaged communities. https://www.ny.gov/transforming-central-brooklyn/vital-brooklyn-initiative-0
- The Center for Neighborhood Technology (CNT), based in Chicago, advances urban sustainability and shared prosperity through transportation, water, climate, and public policy initiatives https://www.cnt.org/

What is Clean Energy?

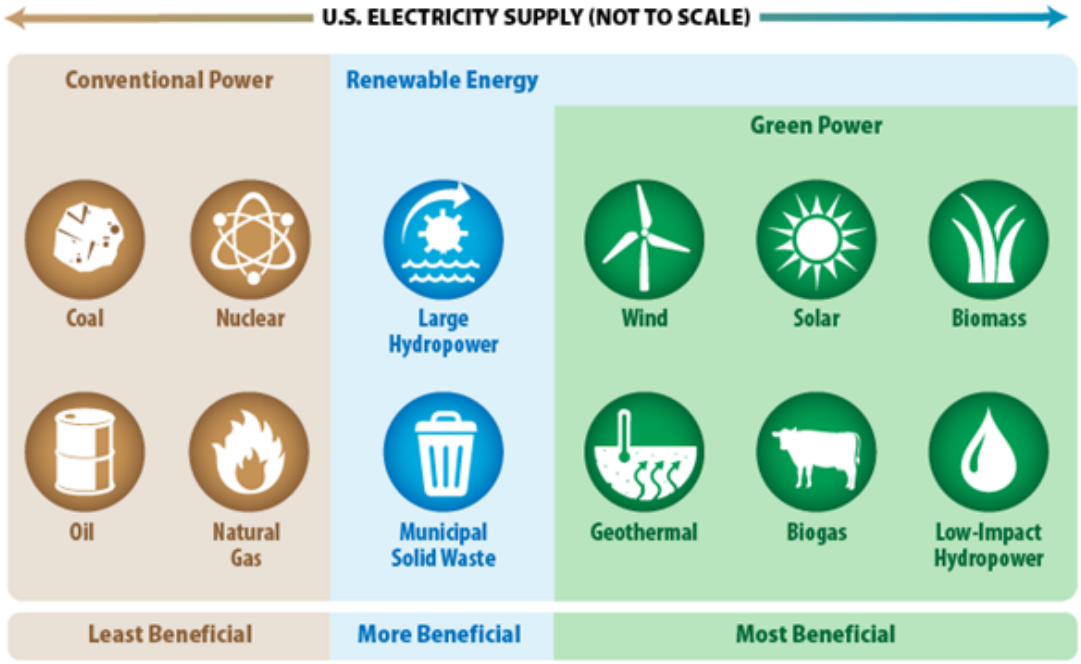
Clean energy does not strictly refer to renewable energy generation. Clean energy can include both *low* and *zero* emissions options, but the intent is to transition away from energy sources that result in GHG emissions or air particulates that reduce air quality and contribute to GHG emissions. Clean energy also considers ways to maximize efficiency in how buildings and infrastructure are powered, and to increase reliance on renewable sources derived from nature, such as wind, solar, and geothermal power (see **Figure 2**). In broad terms, clean energy can refer to any energy source that does not rely on combustion of fossil fuels. However, some sources under that definition can still lead to environmental problems, including air pollution or harmful waste products. For example, other energy sources and technologies that were considered but are *not* part of this Clean Energy Roadmap include the following:

- **Waste-to-energy (WTE) technologies** – Although waste-to-energy technologies represent an innovative reuse of solid waste, can result in reduced GHG emissions and have environmental benefits, this roadmap does not rely on such technologies. WTE facilities are not always emissions free and would need to transition as communities succeed in waste *reduction* and *reuse*.
- **Nuclear energy** - While nuclear energy is GHG emissions-free after plant construction, there are numerous other environmental and health related hazards (e.g., harmful waste, safety and security concerns) associated with the technology that run counter to other sustainability goals.
- **Natural gas** - Natural gas is a *cleaner* alternative to many petroleum-based fuels, however it is not renewable, nor free of emissions, and there are many negative social and environmental impacts associated with its extraction and distribution. Therefore, it is not considered a clean energy solution. In fact, for environmental and financial reasons, many analysts now highlight the long-term viability of renewable energy sources over any fossil fuels, including natural gas.[4]

For the purposes of this document, clean energy includes only long-term energy sources that come from renewable sources in tandem with efficiency gains. Those items are displayed as “Green Power” in **Figure 2**.

[4] https://www.top1000funds.com/2018/10/fossil-fuel-on-last-legs-lovins/

Figure 2: U.S. Electricity Supply – Conventional, Renewable and Green Energy



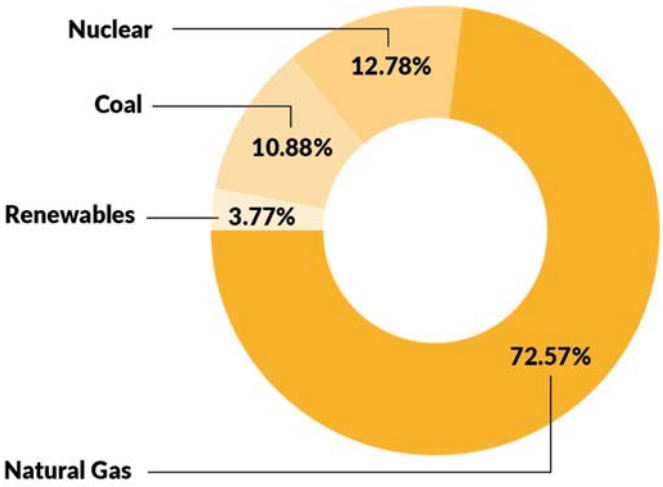
Source: U.S. Environmental Protection Agency (EPA)

State of Florida and Duke Energy Florida Context

Currently, approximately 4 percent of Florida's electricity generation is from renewable sources (see **Figure 3**). While most states require energy providers in the state to provide a certain portion of their energy from renewable sources, Florida is one of only 12 states with no state Renewable Portfolio Standards (RPS).

Partnerships with utility providers are critical to achieve an ambitious 100% clean energy goal. Duke Energy and the City of St. Petersburg are partnering on a highly-visible solar generation project at the new St. Pete Pier with photovoltaic (PV) panels creating shaded parking in the vehicle lot. The PV installation will generate enough electricity to power about 60 homes.

Figure 3: Florida Net Electricity Generation by Source (April 2018)



Source: Energy Information Administration, State Energy Data System

Florida's electricity is generated by a range of sources, with renewables[5] making up only approximately 4 percent of the portfolio.

In addition, there are several barriers in state policies that dampen momentum for increased solar power in Florida, especially related to third party sales, existing laws, and utilities:

- **Third-party sales** – Florida is one of four states where the law prohibits the sale of power to the public by any entity other than a "public utility" (i.e., no third-party sales). This policy limits the simple transfer of surplus energy produced at one city building to another city building or any other building or facility. This policy also hinders community solar and microgrid development.
- **Existing energy laws** – The Florida Energy Efficiency and Conservation Act (FEECA) did not include energy efficiency goals and deployed a two-year payback screen, limiting opportunities and creating restrictions.
- **Utilities** – Utility planning is disjointed, and not all systems are up to date with smart metering, streamlined net metering and billing, and public information, especially during campaigns, can be confusing (e.g., Amendment 1, 2016).

While Duke Energy Florida (DEF) has been a key collaborator with the city and the community with demonstration projects, LED Streetlight Conversion, donations for a Financial Empowerment Center, and development of a highly visible solar carport on the St. Pete Pier, DEF's electricity generation profile indicates that only about 6 percent of its generated electricity is from renewable sources (solar and wind).[6] Duke Energy is one of the largest electric utilities in the country and Florida. Duke Energy Florida (DEF) could have a much greater role in transitioning to 100% Clean Energy while maintaining the company's strengths in infrastructure, safety, and reliability. The City and community partners should continue to look for ways to make such a DEF transition successful.

[5] In this case, renewables refers to non-hydroelectric sources of renewable energy (e.g., wind and solar). Frequently, this distinction is made because of concerns over the potential environmental impacts of hydroelectric energy generation, especially from large dams, even though hydroelectric energy does not come from combustion of fossil fuels.

[6] https://www.duke-energy.com/_/media/pdfs/our-company/duke-energy-fast-facts.pdf?la=en

According to the Duke Energy *2017 Climate Report to Shareholders*,[7] the utility has reduced carbon dioxide (CO_2) emissions by 31 percent since 2005 and established a goal to reduce CO_2 emissions 40 percent from 2005 levels by 2030 – an additional 9 percent reduction from 2017 to 2030. Beyond 2030, the company's long-term strategy will further reduce carbon intensity, but specific anticipated levels remain undefined. Duke and its local customers (e.g., municipalities and Pinellas County) are making a concerted effort to transition away from coal-fired power plants, while also investing in renewable sources. However, there is still significant ground to cover. Indeed, Duke's report indicates that the company anticipates that fossil fuels will still contribute 58 percent of its energy generation in 2030 with hydroelectric, wind, and solar still only making up 10 percent of its generation capacity at that time.

State- and Utility-Wide Recommendations

The following recommendations can help the State, Duke Energy, and local jurisdictions transition to 100% clean energy. These strategies are not presented as prerequisites for the St. Petersburg-specific pathways presented later in the document, but rather as a framework that would improve effectiveness and implementation of St. Petersburg's (and other municipalities') clean energy efforts.

1. **Adopt a Transparent and Inclusive Utility Integrated Resource Plan Process** - There is a need for the state to reform the utility planning process to make it more transparent and inclusive of stakeholder participation to ensure the selection of low cost, low risk resource options such as energy efficiency and distributed solar power. This integrated resource plan (IRP) process should allow stakeholder intervention to analyze utility resource plans and to present evidence on how to integrate the lowest cost options and how to reduce long-term risk to customers.
2. **Allow Third Party Sale of Power** – Florida's existing prohibition of the sale of power to the public by any entity other than a "public utility" prevents Florida residents and businesses from utilizing third party power purchase agreements (PPAs), one of the most popular methods of financing in the solar industry. Third party PPAs are a form of third party ownership financing, whereby a commercial business owns and operates a customer-sited renewable energy system (typically photovoltaic (PV)) and either leases the system equipment or sells the power (via a power purchase agreement) to the building occupant. Lifting this prohibition would allow for more opportunities for solar power.
3. **Set Targets and Goals for Energy Efficiency, Conservation, and Renewables** – These benchmarks would help the state guide municipalities and create a statewide framework reducing energy use and/or increasing energy generation by renewables. It would also create metrics by which the state and other entities could measure and review progress.
4. **Adopt a Renewable Portfolio Standard (RPS)** – An RPS that sets targets and timelines for renewable energy development and creates Renewable Energy Credits (REC) would provide another income stream for renewable energy developers, making renewable energy projects more viable for both third-party projects and utility self-build projects. The Federal Energy Regulatory Commission (FERC) has ruled that RPS policy is the purview of a state and thus not preempted by federal law. A state is allowed wide latitude in designing an RPS policy.
5. **Establish Policies that Promote Electric Vehicles (EV)** - Florida is ranked fourth overall in the nation for the number of EVs, and that number is evenly split between EVs and plug-in hybrid electric vehicles (PHEVs). In terms of charging, Florida is ranked 34th in the nation in terms of DC Fast Chargers (DCFC) (i.e., Level 3 charging stations) per 1,000 people and 23rd in the nation in terms of Level 2 charging stations per 1,000 people. The local-, state-, national-, and utility-level actions listed below can help Florida and municipalities improve infrastructure for EVs.

[7] https://www.duke-energy.com//_/media/pdfs/our-company/shareholder-climate-report.pdf

Local laws and policies should particularly target deployment of EV infrastructure and EVs themselves through a variety of mechanisms.:

- Local EV ordinances for EV ready developments and building code streamlining for developers
- Bulk purchase agreements and/or programs to assist in low-cost EV fleet acquisition
- Incentive programs for businesses to install Electric Vehicle Supply Equipment (EVSE), such as charging stations
- Electric vehicle acquisition goals and preference for low or zero emission vehicles in procurement policies
- Electric local rental programs, prioritizing low-income communities
- Parking benefits to EV drivers, such as dedicated spaces or free parking

State level actions should create financial tools and regulations promoting EVs:

- Financial incentives for vehicles (e.g., sales tax rebate, tax credit)
- Financial incentives for charging infrastructure, both public and private
- Simplified state permitting for charging infrastructure to add installation
- Revised building codes to include support EV infrastructure deployment
- Incentives for developers to include EV infrastructure
- EV fleet requirements for state fleets

Federal government should raise the cap of EV tax credits.

Utilities can adjust regulations and programs to promote EVs:

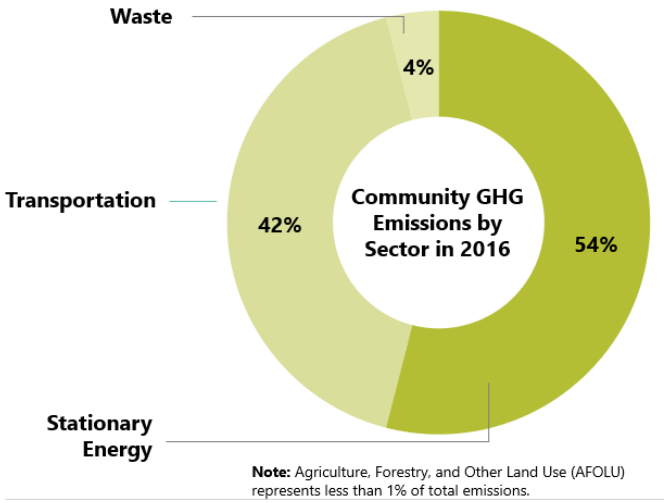
- Exemptions for EV infrastructure providers from regulation as a utility
- EV rates, such as time of use rates for EV drivers
- Utility EV pilot programs
- Definitions and clarifications of utility's role in EV charging stations via utility commission proceedings
- Funding mechanism to support EV charging infrastructure deployment

These different approaches can support local efforts to reach 100% clean energy. However, they are not without challenges and concerns. For example, net metering is currently being challenged across the country. Florida should anticipate similar efforts to seek to undermine the current net metering rule.

St. Petersburg Context

Cities have different profiles when it comes to sources of greenhouse gas emissions. With a large residential and commercial base, nearly all (96 percent) of St. Petersburg's greenhouse gas emissions come from stationary (primarily buildings) and transportation sectors (see **Figure 4**). As a result, the City's clean energy strategy directly targets these sectors, whereas other cities with larger industrial or agricultural sources of greenhouse gas emissions might target those sectors.

Figure 4: Community GHG Emissions (2016)

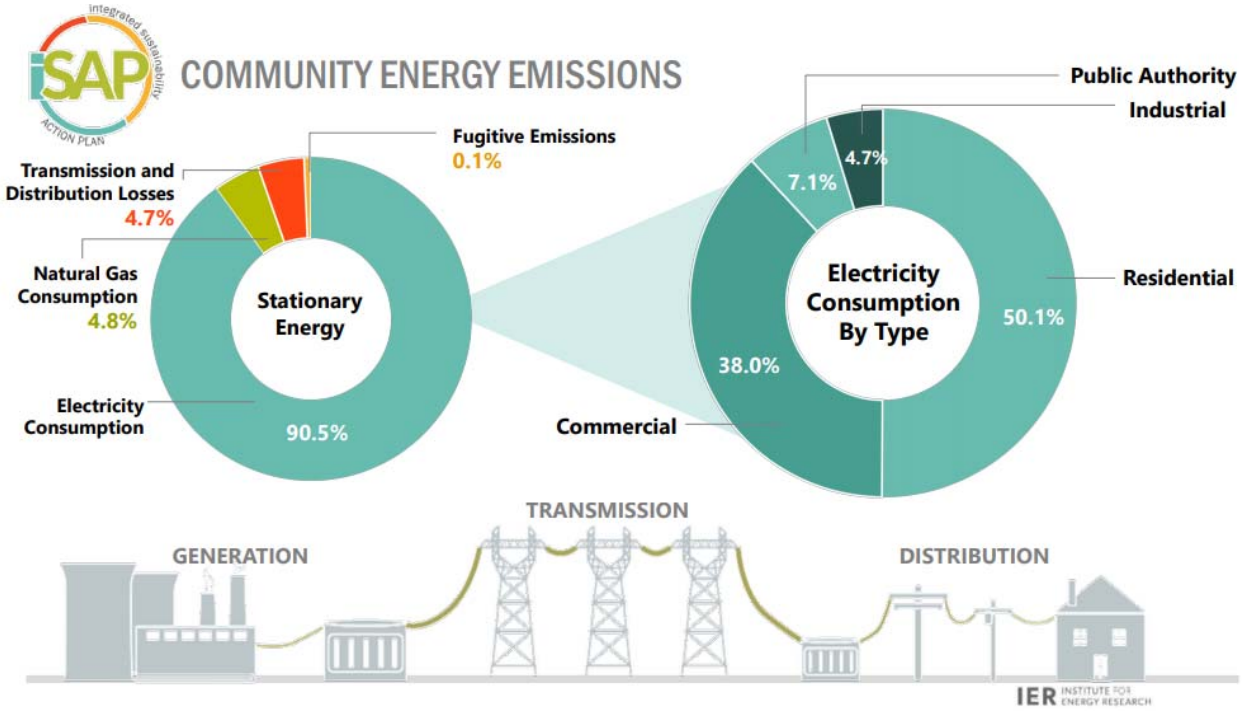


Source: VHB, Inc.

What does a Clean Energy Transition Look Like for St. Petersburg?

The City of St. Petersburg is committed to transitioning to clean energy for its community-wide stationary energy use by 2035, primarily in the form of electricity use, since 95 percent of current emissions are associated with electricity consumption and electricity transmission and distribution losses (see **Figure 5**). By targeting these sectors that are currently the source of the largest portions of St. Petersburg's current emissions, the City can more effectively transition to clean energy. Figures on the following pages demonstrate the level of reductions needed to reach the city's clean energy goals (**Figures 6 and 7)** and the pathways to get there (**Figure 8**).

Figure 5: St. Petersburg Community Energy Emissions



Source: VHB, 2018

St. Petersburg Commitments

St. Petersburg has joined many cities in the U.S. and around the world in commitments to GHG emissions reductions and clean energy. In the U.S., cities have aligned targets to reduce emissions by 80% by 2050. According to the climate science community, that target is necessary to keep global temperature increases to only two degrees Celsius above pre-industrial levels, often cited as the threshold that global temperatures must be kept below to prevent catastrophic climate change impacts. For example, with a two degrees Celsius global temperature increase, much of St. Petersburg and Tampa Bay are projected to be underwater, including all coastal areas and as far inland in Downtown St. Petersburg as First Street North.[8] In response to these types of projections, St. Petersburg and other cities have committed to emissions reductions targets including those under the national and international efforts:

- Global Covenant of Mayors for Climate Change – Chicago Climate Charter
- America's Pledge and the Carbon Disclosure Project
- We Are Still In
- Ready for 100

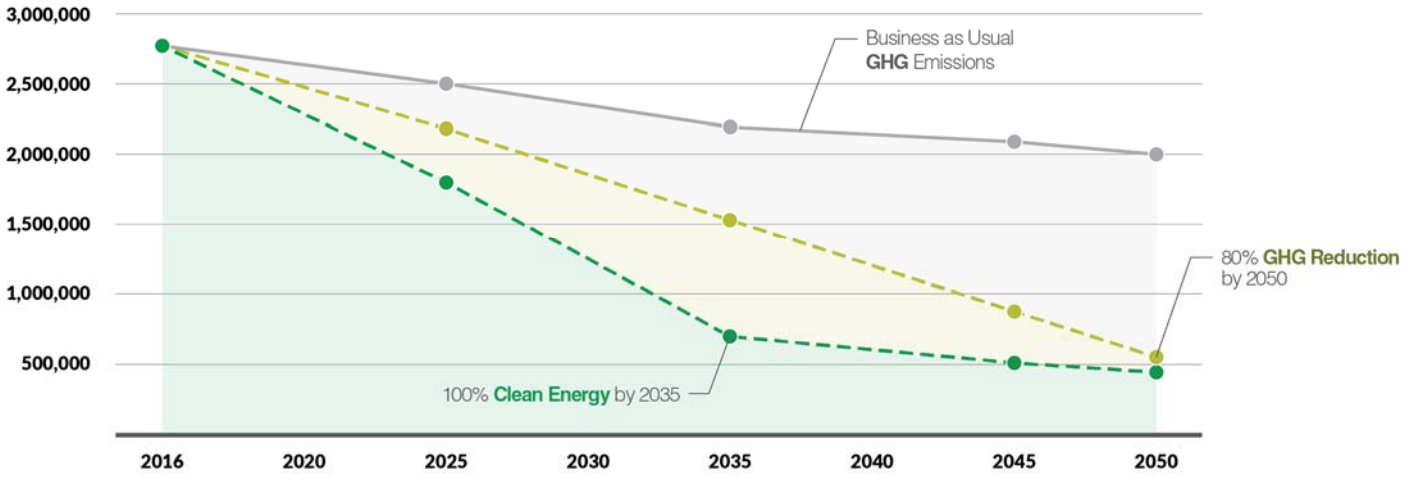
The following GHG emissions forecasts (**Figures 6 and 7**) show the St. Petersburg community-wide emissions through 2050 with a "business-as-usual" (BAU) forecast trend if no significant action is taken to reduce emissions.

[8] https://seeing.climatecentral.org

The charts also show the trend line for transitioning to 100% clean energy by 2035 and the 80 percent reduction in greenhouse gas emissions by 2050, thus demonstrating the reductions needed to reach those goals.

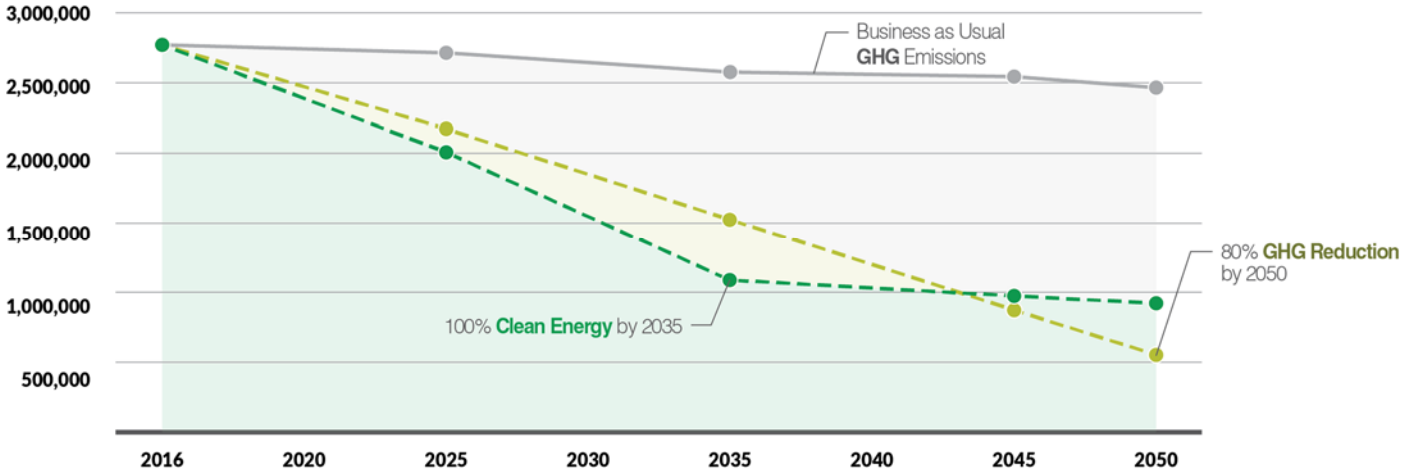
Two charts are depicted below because of uncertainties in the transportation sector. Reductions in the transportation sector (representing 42% of total emissions in St. Petersburg) are necessary to achieve an overall 80% emissions reduction by 2050. Recently, there has been inconsistency and debate at the federal level and within the automobile manufacturing industry regarding fuel efficiency requirements for new automobiles. As a result, two business as usual scenarios are presented below, based on different potential policy futures, related to federal fuel efficiency standards. **Figure 6** considers Corporate Average Fuel Economy (CAFE) standards as currently outlined through 2025, with an assumption of comparable improvements year over year through 2050. **Figure 7** reflects a rescinding of these standards currently being considered by the U.S. Environmental Protection Agency (EPA), with standards essentially frozen as of 2020. The forecast still includes a moderate expectation of fuel efficiency improvements. This assumption is based on an expectation that the international automobile market and consumer demand will continue to push manufacturers to increase the fuel efficiency of new models of automobiles. Indeed, many companies have made such commitments, independent of federal requirements.

Figure 6: St. Petersburg Community GHG Emissions Forecast, Metric Tons CO2e (2016-2050)



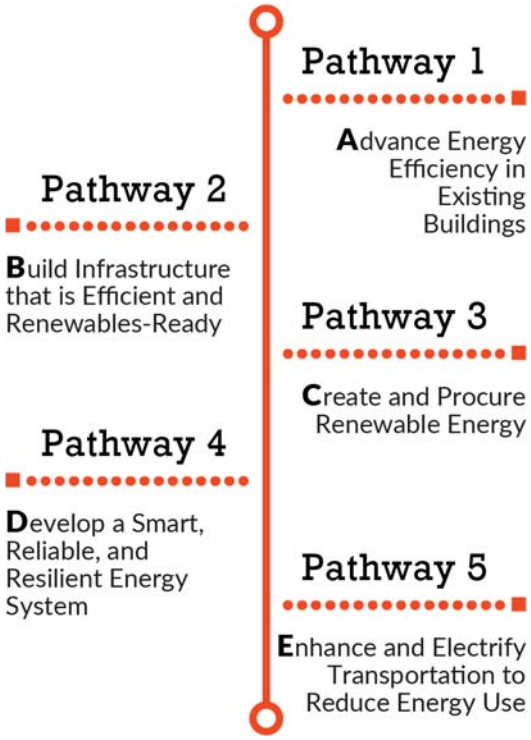
Source: VHB, 2018

Figure 7: St. Petersburg Community GHG Emissions Forecast, Metric Tons CO2e (2016-2050) – Potential Rescinding of CAFE Standards



Source: VHB, 2018

There is not a single one-size-fits-all solution to transitioning to 100% clean energy for every city. To achieve its near- and long-term clean energy goals, the City of St. Petersburg will need to pursue its own unique set of multiple **pathways**, not independently, but rather in conjunction (see **Figure 8**).



In addition to these pathways, St. Petersburg's goals for a clean energy transition will emphasize several principles:

- **Energy equity and affordability** - Research has indicated low-income and African-American and Latino households, along with renters pay more for utilities per square foot than average, reflecting inefficiency in this housing stock and a higher "energy burden."[9] In the Tampa-St. Petersburg-Clearwater Metropolitan Statistical Area (MSA), median percentage of household income spent on energy bills, known as "energy burden," for the median household was 3.32%, but for low-income households it was 7.28%.[10] This discrepancy indicates that economically disadvantaged populations face higher cost burdens for energy use. Clean and efficient energy strategies can and should aim to reduce this burden for St. Petersburg's most vulnerable residents.
- **Economic feasibility** – The path to clean energy should emphasize low-cost strategies in the near-term, while planning for longer-term investments and leveraging the continued decline in the cost of renewable energy technologies.
- **Economic growth and job creation** – Clean energy technology provides an opportunity for St. Petersburg to be a leader in innovation, expand its economy, and create new quality jobs, by supporting and incentivizing

[9] https://energyefficiencyforall.org/sites/default/files/Lifting%20the%20High%20Energy%20Burden_0.pdf
[10] Ibid.

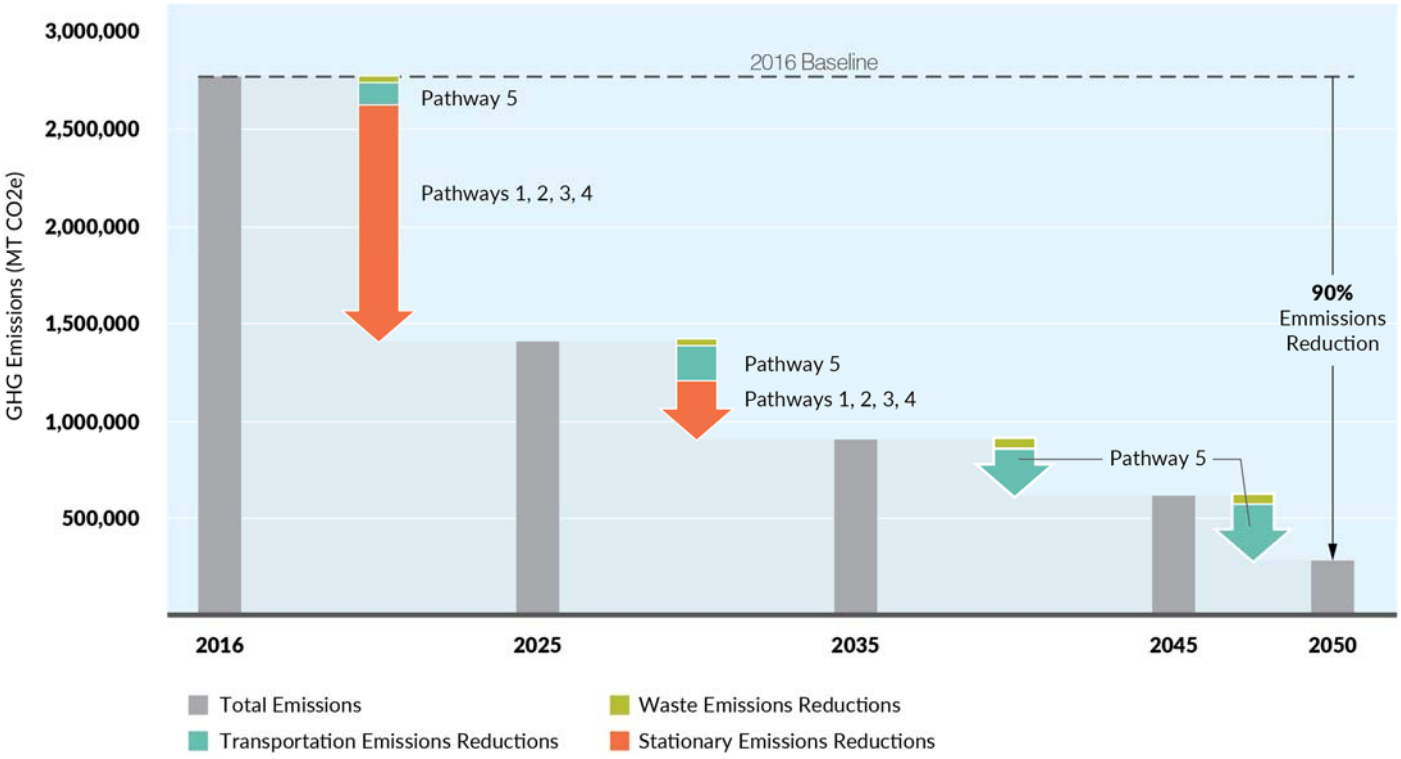
clean energy research, development, financing, and installation industries locally. As these industries grow, there can be opportunities for economic and employment growth, as well as new opportunities workforce development. For example, promoting solar energy can support economic activities, such as panel manufacturing and installation. Reducing energy use can provide cost savings for the city to reinvest in other resources and city services, improving the city's overall fiscal health and financial bottom-line.

- **Innovation and smart city development** – The city can serve as a model for piloting and incubating innovative solutions that will not only help St. Petersburg meet its clean energy goals, but also provide best practices to share with other cities throughout the region and the country. New energy efficiency and renewable technologies are being developed alongside "smart" technology solutions that will allow for even more efficient, transparent, and data-driven management of resources. These data-driven approaches can provide improved management opportunities that can be shared across sectors and regions. For example, networked energy monitoring sensors and controls can help measure and automate energy consumption.
- **Resilience and reliability** – The energy grid consists of aging infrastructure that is also becoming increasingly susceptible to extreme weather, climate change impacts, and even cybersecurity threats. Distributed energy generation with built-in flexibility and adaptability to changing conditions, as well as redundancies, will be critical to the city's future sustainability. In addition to the infrastructure and security work that energy providers are currently undertaking, it will be necessary to work with the Public Service Commission and local energy providers to implement recommendations.

As previously mentioned, it will take multiple pathways working in tandem to achieve 100% clean energy by 2035 and 80% emissions reduction by 2050. First, St. Petersburg must reduce overall energy demand by **25% by 2025, and 35% by 2035** through energy efficiency improvements in existing buildings (*Pathway 1*). It also must reduce projected increases in demand by implementing *Pathway 2* strategies, **working toward net zero construction** for new development. Additional transition to clean energy comes from grid improvements as **grid-supplied energy becomes decarbonized over time** due to efficiency and renewable energy investments from Duke Energy.

In addition to these steps, St. Petersburg (City, businesses, and residents) will need to install the equivalent of 680 megawatts of solar capacity (*Pathway 3*) or equivalent procurement of renewable energy credits (RECs) or similar. This level of solar capacity is equivalent to roughly 68,000 households each generating energy with 10 kW solar installations by 2035, or the estimated roof area needed to accommodate 680 MW of solar is about 1,500 acres. *Pathway 4* describes strategies for a smarter and more resilient grid, which will make the above strategies more efficient and effective. And finally, *Pathway 5* outlines strategies in the transportation sector that will contribute to emissions reductions in that sector. Each Pathway is outlined in more detail in the following sections with a portfolio of strategies to support achieving these goals. **Figure 8** presents a graphic summary of the Clean Energy Roadmap, by depicting the proposed contributions of each pathway toward meeting the 100% Clean Energy goal by 2050.

Figure 8: Clean Energy Roadmap Summary - Pathways's Contributions to 100% Clean Energy by 2050



Source: VHB, 2018

Pathway 1: Advance Energy Efficiency in Existing Buildings

The first step in a transition to clean energy always must be to reduce energy demand, ensuring that existing energy-consuming buildings and infrastructure are operating as efficiently as possible. This initial step not only reduces demands placed on the existing electric grid infrastructure, but also reduces energy costs for building occupants. Whether lowering the "energy burden" for St. Petersburg residents or reducing operational costs for the commercial and industrial sectors, these efficiency enhancements provide economic benefits through energy cost savings in the near term.

By lowering energy use, this pathway also reduces GHG emissions. Equally important, this pathway reduces the generation capacity required to meet operational needs and therefore the renewable energy system size needed, which lowers overall costs for installing those systems. Thus, there is a (negative) feedback loop between this pathway and Pathway 3: The more energy efficiencies realized, the fewer investments in renewable energy systems needed. These savings are extremely important as the city continues to grow, adding more residents and businesses with associated energy demands.

In total, Pathway 1 strategies are aimed at reducing energy demand by 25% by 2025 and 35% by 2035 from energy efficiency improvements in existing buildings.

City-led Programs for Energy Efficiency

The City of St. Petersburg will continue to lead by example regarding energy efficiency in its operations. Completed and existing energy efficiency and reduction strategies employed by the City include:

- **Benchmarking and Monitoring**
  - According to St. Petersburg's first sustainability plan, *Green St. Petersburg*, by 2011, the city's power supplier conducted energy audits of all City facilities. From these audits, the city prioritized energy conservation measures, particularly projects with payback periods of two years.
  - In 2017, a class of University of South Florida students conducted energy audits on three City facilities. Duke Energy also conducted Level 1 audits on those same facilities.
  - The City of St. Petersburg has been entering energy use data into the Energy Star Portfolio Manager web-based program, run by the U.S. Department of Energy and Environmental Protection Agency. All of the City's facilities have been entered into the program, enabling the City to track its energy use and compare facilities' energy use against national averages. Municipal staff conducted Level 1 energy audits on the 17 facilities with energy use levels higher than national averages.
- **Building Upgrades**
  - Using the data from benchmarking and monitoring, the city identified 51 priority projects at 12 city facilities. The estimated cost for design and implementation of these projects is $3.25 M, with an estimated annual utility savings of $320,500, a simple payback of 10.1 years, and an internal rate of return (IRR) of 11.7%. Based on St. Petersburg's analysis, if these projects were expanded, across every city facility, the total cost would be $28M, with an estimated annual energy savings of $2M. The project would be implemented over five years, with a 15-year payback period.
  - The City will implement deep energy efficiency retrofits and retro-commissioning of municipal facilities, including benchmarking and financing support, as well as completing energy projects, that are estimated to result in 6,700 metric tons CO_2e in GHG reductions.
  - The City may consider entering into a performance contract with an energy service company to streamline the identification and implementation, and to maximize savings, of municipal facility efficiency upgrades.
- **Infrastructure Retrofits**
  - In partnership with Duke Energy Florida, St. Petersburg recently began converting its approximately 31,000 streetlights to LEDs, anticipated to save the City $240,000 in electricity costs ever year. In addition, the City is converting its 300 traffic signals from incandescent bulbs to LED lights, anticipated to save the City at least 68% in energy costs. LEDs last longer than standard lighting, which also will save St. Petersburg maintenance costs as well. The City's streetlight conversion project is expected to reduce 700 metric tons CO_2e by 2020 and 2,450 metric tons CO_2e by 2025.
  - Since 2011, St. Petersburg has been working on the Southwest Water Reclamation Facility Biosolids Waste to Energy Project. Set to be completed in 2019, the project would convert wastewater and biosolids into biogas that could be integrated into the city's natural gas network run by TECO Peoples Gas, including potential infrastructure for the City to run its sanitation trucks and/or a generator on the gas. Depending on how the gas is used, the project is estimated to save the City $14.8 M – $31.6 M over 20 years.

Community-Scale Programs and Policies for Energy Efficiency

The City of St. Petersburg will also pursue the following strategies to improve energy efficiency and reduce overall energy consumption across the residential, commercial, and industrial sectors. The following are a few programs already in place that could be scaled up and marketed.

Existing Programs

- Solar and Energy Loan Fund (SELF) is a non-profit organization that provides low-interest loans for home improvements to improve energy efficiency, water conservation, and storm preparedness. The program has no income requirements, but is particularly valuable to women, veterans, and low-income homeowners who have had trouble getting loans in the past. With this financing, individuals can reduce utility bills and improve quality of life. As of July 2018, SELF has originated 15 loans, totaling $167,826, while also holding 40 community events, drawing over 1,500 participants, and adding 32 contractors to the network. The City anticipates that SELF expansion could reduce 700 metric tons CO_2e by 2020.

- Florida Solar United Neighbors (FL SUN) is a nonprofit that expands access to solar by educating Florida residents about solar energy and helps them organize group solar installations known as solar co-ops. Solar United Neighbors has facilitated more than two-dozen solar co-ops across the state, including the first co-op in Florida in St Petersburg in 2016. Since then, they've helped hundreds of Floridians go solar. The city would like to scale up the program and is working on pathways to do so in 2019.

- Pinellas County Urban League is a non-profit organization that provides low-income home energy and weatherization assistance.

- Duke Energy Florida offers several programs to help support residential and commercial energy efficiency:

    1. Home Energy Check program provides information on home energy use, energy savings kits, recommendations for improvements, and information on available rebates.
    2. Free improvement and weatherization offerings provide services for income eligible customers.
    3. High bill alerts inform customers when hotter or colder weather might create higher bills, so that customers can plan accordingly.
    4. Demand response program provides energy bill credits for reduced energy use in response to periods of higher demand. Currently, St. Petersburg participates in Duke's demand response program for water reclamation facilities and pumping stations, facilities that are on standby electric tariffs. When Duke needs power, the City runs the facilities on backup generators (that meet EPA guidelines) and keeps track of credits owed. Historically, one City employee in one department has kept track of this program, so a more systematic approach across multiple City departments and facilities could help St. Petersburg take further advantage of Duke's demand response program.
    5. Business Energy Check program and incentives includes custom incentive programs, for reducing energy use.
    6. Attic insulation upgrades, window rebates, outdoor lighting services, and heat pump rebates provide funding for improving energy efficiency.

New Strategies

- Adopt a Building Energy Benchmarking and Disclosure Policy – Mandatory benchmarking is an increasingly popular practice among cities. Under such policies, municipal governments require certain buildings to measure energy and water consumption. To date, over 20 cities and other local jurisdictions have passed mandatory benchmarking policies. These cities range in size and location and include large cities like San Francisco, Chicago, and New York City, as well as mid-sized and small cities like Seattle, WA, Berkeley, CA, Portland, ME, and Cambridge, MA. Currently, Orlando is the only city in Florida to pass a benchmarking policy. Under this ordinance, passed in 2016, city-owned buildings larger than 10,000 gross square feet and commercial or multifamily residential buildings larger than 50,000 gross square feet are required to use Energy Star Portfolio Manager for benchmarking, including receiving a benchmarking score. Cities that have enacted similar laws have experienced a 1.6 to 14 percent reduction in energy use, energy cost, or energy intensity over two to four years, with most cities experiencing 3 to 8 percent reductions.

- Establish Property Assessed Clean Energy (PACE)– PACE serves as financing mechanism for commercial and residential properties to fund energy efficiency, renewable energy, and water conservation projects. The program pays for all of a project's cost, repaid through an assessment added to the property's tax bill over a period of up to 20 years. According to the program, the annual energy savings typically exceed the annual assessment payment, so these projects start paying for themselves immediately. PACE requires state and local government legislation and sponsorship. In 2010, Florida passed such legislation, enabling PACE. Pinellas County has also passed enabling legislation; however, no PACE providers have proposed to set up in the county at the time of this final document (January 2019).

- Create a Retrofit Accelerator Program – Retrofit accelerator programs provide advisory services to improve adoption of energy efficiency retrofits. The New York Retrofit Accelerator conducts consultation, connecting interested parties with qualified contractors, incentives and financing, training, and additional support where needed. To start such programs, municipalities must first adopt building benchmarking and disclosure programs as described above. Developing the framework for the building energy law can take approximately three to six months, followed by the local vote for adoption. Next, the municipality should develop a timeline for a phased implementation and then an online tool and appropriate submittal application paperwork. Once implemented, such a program has the potential to create an overall building portfolio energy reduction of 20-30 percent.

Pathway 2: Build Infrastructure that is Efficient and Renewables-Ready

As St. Petersburg continues to grow, there is significant potential to transition to clean energy in the construction of new buildings and infrastructure. It is essential to plan now for a smart, efficient, resilient, and renewables-ready built environment. Since what is built today will be in operation for decades to come, it is critical to build in a way that can accommodate existing and potential future renewable energy technologies. While costs for sustainable building practices continue to decline, and technology continues to improve, a short-term transition to net zero energy will not be feasible; however, new construction should phase in net zero energy strategies.

The City has already implemented several policies and programs to support smart and sustainable new construction practices:

City-owned new construction or redeveloped buildings over 5,000 square feet are required to apply sustainable design and green building certification approaches to design, construction, and operations of new and significantly redeveloped buildings.

- City infrastructure must also implement sustainable design approaches with options for certification under the Institute for Sustainable Infrastructure's Envision program.
- St. Petersburg offers reduced building permit fees for private buildings certified as green buildings.

St. Petersburg will also pursue the following strategies for new construction and development:

- Introduce a "feebate" or Tax Abatement Program for New Developments over a Specified Size - A feebate program typically targets low efficiency or high energy using facilities and charges them a surcharge, while providing a refund to high efficiency or low energy using facilities. Such a program can be structured so that developers would earn tiered levels of credits based on the levels of improvement over standard building code, encouraging green building performance standards. This system would provide developers with flexibility and incentives to incorporate green building elements as they see feasible and economically viable. This program could be targeted to individual neighborhoods or areas of the city, so that proposed green building elements for buildings in each of these areas prioritize locally unique needs and opportunities. As a result, developers may be able to receive larger incentives for addressing such local needs and opportunities.
- Develop a Training or Education Program for Contractors and Building Inspectors to Improve Compliance with Florida Energy Conservation Code - It is not uncommon for buildings to be built out of compliance with existing energy codes, or at least inconsistent with their original planning and design. Commissioning is the process by which recently-completed buildings' components are evaluated to ensure that they have been installed and operated as intended, especially in terms of energy use. Research has shown that new construction building commissioning can create a 13 percent whole energy savings, with a payback of 4.2 years. These types of savings can be realized, through training of contractors and building inspectors to conduct such work, as well as basic compliance review.
- Adopt a More Stringent Local Energy Efficiency Code – Municipalities are permitted to adopt energy codes that go beyond the requirements of the state's Florida Energy Conservation Code. Often referred to as "stretch codes," these regulations can lead to energy savings by reducing energy demand in new buildings. This will require development of a stretch code strategy with design standards (e.g., 40% improvement over ASHRAE 90.1-2013 standard) and/or performance standards (e.g., zero net energy) and adoption at the local level.
- Require All New Construction be "Solar-Ready" – Similar to stretch codes, through local building code, municipalities can require that all new construction be able to accommodate solar power technologies. This "solar-ready" provision can require new buildings to include the ability to install solar photovoltaic (PV) panels, net metering, and inverters. Such provisions would also relate to design features of the building, including roof and electrical design. The City should consider including this provision within any adoption of more stringent energy code so as to only require one new code adoption.
- Adopt Green Building Standards for Affordable Housing – Standards and policies requiring the integration of green building principles into affordable housing development can be developed through coordination with developers and funders of affordable housing. Because green building principles promote energy and water efficiency, they can play a critical role in keeping utilities affordable, thus contributing to homeownership and rental affordability. Green bundling standards also address indoor air quality, healthy building materials, and durability, sometimes directly related to energy use. These elements are all important to occupants,

especially of affordable housing units, who are often disproportionately burdened by respiratory and other illnesses. Standards should also include siting decisions that will encourage improved mobility and access to community resources. By increasing mobility, particularly through modes other than private automobiles, this type of access can have positive connections to Pathway 5: Enhance and Electrify Transportation to Reduce Energy Use. The Enterprise Green Communities standards could serve as useful guidance for this strategy.

Pathway 3: Create and Procure Renewable Energy

As previously stated, it is critical for St. Petersburg to reduce overall electricity consumption throughout the city through Pathways 1 and 2 (already discussed). With the implementation of Pathways 1 and 2, overall energy demand would be reduced. As a result, the city then would have reduced – but by no means eliminated - needs for investments in renewable energy installations and/or procurement of clean energy generated elsewhere. While Pathways 1 and 2 can create substantial energy savings, alone, they are not enough to get St. Petersburg to 100% clean energy by 2035. An additional portion of energy would still need to be sourced from renewable energy installations beyond the increased renewables in Duke's energy grid. Pathway 3 describes strategies for the deployment of renewable energy installations and the role of clean energy procurement (including purchase of Renewable Energy Credits (RECs) in the city's transition to clean energy by 2035.

According to the Solar Energy Industries Association, solar costs in Florida have fallen by 53% in the past five years.[11] The state also ranks third in the nation for solar generation capacity. With an average of 361 days of sunshine per year and its nickname as "The Sunshine City," St. Petersburg is particularly well-suited to take advantage of solar energy. As costs continue to decrease at an accelerated pace, coming closer to parity with conventional electricity sources, there is a substantial opportunity for St. Pete to capitalize on the clean energy generation potential, as well as the economic growth and job creation potential, of solar energy.

Existing Programs

- **Sunlit City Parks –** St. Petersburg installed solar panels at 18 city parks and recreational facilities, generating an estimated 261,368 kWh every year, with a $2.4 million federal grant.
- **Solar United Neighbors (Solar Co-ops)** – Solar United Neighbors has developed systems and processes by which residential customers can buy a lease or share in a community or neighborhood solar project, in return for a proportional credit on their electricity bill. This set-up enables groups to leverage their resources to more effectively implement solar projects at larger scales than individuals. It also allows individuals to participate in solar projects, without necessarily installing the panels on their own property, often referred to as "virtual net metering." Currently, there are three Solar Co-Ops in St. Petersburg. In terms of energy cost savings, Solar United Neighbors estimates $20,000 in savings and $13,000 in net profit for a 4 kW system and $40,000 in savings and $26,000 in net profit for an 8 kW system over a 25 year lifetime of a project.
- **Duke Energy -** Duke Energy allows customers to generate their own renewable electricity and offset their bill through net metering that effectively sells electricity back to the grid. Florida's Public Service Commission (PSC) sets the rules for these types of systems. For facilities generating less than 10 kW of solar power, Duke

[11] https://www.seia.org/state-solar-policy/florida-solar

has an application and net metering process, but not fee. Facilities with larger generating capacities have more complicated processes and fees.

New Opportunities

- **Community Solar** – There are opportunities to expand community solar, building on the existing solar co-ops. Increasing the number of co-ops and/or participants in existing co-ops, especially with virtual net metering, would open numerous opportunities for independent solar developers to come into the state and build projects that could offer significant benefits and cost reductions across communities. This type of scale-up could reduce 4,000 -20,000 MT of CO_2e. over the next 5-10 years. Until state regulations are changed, scaling up community solar will not be possible without Duke Energy Florida taking the lead, but the City and Duke are committed to building on recent successful collaborations.

- **Rooftop Solar** - St. Petersburg has limited open space and open parking lots that could host ground mount and carport solar installations, respectively, but there are large warehouse and commercial rooftops, as well as land outside of St. Petersburg that could host solar projects for use by the City. This effort could build on the Sunlit City Parks initiative, which included several rooftop sites on recreation centers. Future, large on-site rooftop projects could be built "behind-the-meter," meaning their primary goal would be to serve the load within the facility on which they are located or next to. As the cost of solar equipment keeps dropping, this type of project would become more cost competitive.

- **Contract Opportunities with Duke Energy for Solar Energy** – St. Petersburg can explore competitive contract opportunities with Duke Energy for the purchase of Solar Energy. As mentioned previously, Duke is currently expanding its solar generating capacity, and the City could contract with Duke to ensure a larger portion of its energy is generated by solar facilities.

- **Partnerships with Better Buildings Initiative to Implement a "Clean Energy for Low-Income Communities Accelerator" (CELICA) Program** – These types of programs enhance clean energy production and consumption within low-income communities. The program will aim to expand financing options, increase availability, awareness, and connections to resources and programs, provide solutions to enable use of clean energy at different types of properties (e.g., rental and multifamily), and create quality technical jobs in the process of supporting and expanding the clean energy industry.

- **Incentives and Partnerships for Development of Clean Energy Technology Incubators** - Clean technology incubators frequently involve local government, academic institutions, and private industry coming together to grow the clean energy sector, with associated economic, employment, and environmental benefits. By establishing partnerships and financial structures (e.g., incentives), St. Petersburg can create the foundation for clean energy technology incubators.

- **Battery Storage Development and Deployment** – Battery storage can be co-located with solar projects to store electricity when it is not needed and discharge it when it is. Batteries can be arranged behind the meter to address the energy needs of a home, business, or facility, or in front of the meter to help address fluctuations in demand on the local utility's system. Batteries can also provide resilience benefits, with stored electricity for use during disruptions to the grid, such as during extreme weather. Batteries are coming down in cost at a surprisingly rapid pace. Many states have added battery storage mandates or targets to their policies and regulations, and St. Petersburg should consider this approach as well.

- **Other Technologies** – Clean energy technologies continue to evolve with new innovations. Given St. Petersburg's sunny climate, solar PV currently represents the city's best option for clean energy generation, but the city should also explore other existing and still-to-be developed technologies, including solar thermal, fuel cells, and geothermal. The city should develop mechanisms for piloting and scaling existing technologies, while also not precluding future technologies.

- **Renewable Energy Credits (RECs) and/or Offsets** – The Pathways and strategies presented in this report can provide St. Petersburg with a clean energy roadmap, through its own direct actions and efforts. However, gaps in 100% clean energy might remain, particularly in the near term, due to forces outside the City's control. For example, if Duke Energy does not meet its solar generating capacity goals, it will be more difficult for St. Petersburg to source its electricity from clean energy. Renewable energy credits (RECS) and/or offsets can help fill those gaps. RECs allow generators of renewable electricity to sell their rights to others interested in supporting renewable electricity. Offsets enable purchasers to counter their greenhouse gas emissions by supporting activities that reduce greenhouse gas emissions. These options are especially attractive in cases where renewable energy or other greenhouse gas reducing activities are not available or economically feasible. While RECs and offsets support clean energy and greenhouse gas reducing activities, respectively, they do so indirectly, by financially supporting external projects. Therefore, St. Petersburg should prioritize its own clean energy projects, but RECs and offsets can play an important role in filling any gaps.

Pathway 4: Develop a Smart, Reliable, and Resilient Energy System

St. Petersburg's energy system is a critical component of its clean energy plan. Regardless of advancements in efficiency and renewables, a large portion of St. Petersburg's energy will still come from relatively large, centralized infrastructure. Given that nearly all of Duke Energy's electric generating capacity will continue to come from fossil fuels, it is critical that St. Petersburg explore opportunities for clean energy within the broader energy system, not just individual buildings or renewable energy installations. Strategies for more resilient energy infrastructure are necessary for protecting the city's businesses and residents from climate change impacts and typically have the dual benefit of improving efficiency and reducing overall demand. In other words, a clean and efficient energy system is a more resilient one.

- **Smart Grid (including syncrophasers)** - Smart grids use digital technology for sensing and communication in order to increase the ability to monitor the system and allow the electric system operator (the utility) to address issues more quickly, often, in an automated fashion. These approaches improve efficiency, security, and operations by providing more effective information and capacities to respond to that information.

  One increasingly valuable component of a smart grid are synchrophasers. Synchrophasers increase the utility's visibility of the conditions on the electric lines by creating a high definition view of the system utilizing many data points per second, instead of one data point every 4 to 10 seconds, as with Supervisory Control and Data Acquisition (SCADA) system (the current standard). Utilizing this wealth of data, synchrophasers also provide an ability to address problems in close

> The City is exploring opportunities to incorporate "Smart Cities" technologies and infrastructure into the future redevelopment of the Tropicana Field site. Smart Cities is term that generally refers to the use of information and communication technologies to increase operational efficiency, share information with the public and improve both the quality of government services and the welfare of residents.

to real time. The technology has been used in numerous demonstration projects on the west coast and provides an opportunity for St. Petersburg.

- **Microgrid** - A microgrid, as its name suggests, is an energy system that utilizes distributed energy generation and storage as well as demand management technology to operate with or independently from the main power grid. A smart microgrid takes this concept a step further by incorporating metering and software components to manage energy demand. A smart microgrid also adjusts and controls which sources and components to be utilized, based on demand or other conditions. Smart microgrids are especially valuable in campus settings, neighborhood scales, and particularly when supporting critical facilities. They are also part of a more robust strategy for increased distributed generation, renewable energy sourcing, and smart demand management. Because of the distributed and flexible nature of smart microgrids, they also provide resilience benefits. For example, smart microgrids can be connected with solar PV generation with backup energy storage at critical facilities, including district hurricane shelters.

- **Provide Centralized and/or District Energy Plants for Large Institutional, Residential, or Commercial Developments** – Centralized and/or district energy plants can improve energy efficiency and reduce energy demand by producing the energy in one location and distributing it to a network of connected buildings or units. Because of this set-up, centralized and/or district energy plants are particularly well-suited to large institutional, residential, and commercial developments, such as hospitals, universities, and residential and commercial complexes. These systems also provide flexibility and independence for these types of facilities. The energy reduction potential of such systems is at least 30% of cooling electrical energy usage. In addition, the diversity of buildings connected to a centralized and/or district energy plant can serve as an advantage because it increases flexibility across the system because these systems are designed to meet the collective peak load, which is generally lower than the total peak load. For example, residential buildings tend to need electricity for air conditioning at night and on weekends, while office buildings tend to need electricity for air condition during the day on week days. With a centralized and/or district energy plant providing energy across these types of buildings, it can balance these loads, providing a sense of load leveling to minimize collective peak load.

  Centralized and/or district energy plants require master planning and three to five years from inception to system delivery. Regulatory requirements include easements for plant piping for possibly non-regulated utility companies, permitting approvals (e.g., federal and state Department of Transportation approvals if crossing roadways), and depending on ownership, a rate utility structure.

Pathway 5: Enhance and Electrify Transportation to Reduce Energy Use

The final Pathway for St. Petersburg involves the transportation sector, which represents over 40 percent of St. Petersburg's greenhouse gas emissions. The strategies listed under this pathway involve the city's municipal fleet, infrastructure for private vehicles, changes to the built environment, and policy innovations to encourage reduced vehicle miles traveled (VMTs) and use of clean energy when vehicles are used.

- **Municipal Fleet Improvements** – St. Petersburg's municipal automobile fleet presents opportunities for clean energy savings through management, maintenance, tracking, and technology improvements. First, smart management of the fleet can reduce vehicles miles traveled (VMT) among municipal employees during the workday. St. Petersburg should explore creating a centralized, web-based vehicle pool that

enables city employees to share vehicles across departments and share trips for common work destinations. In addition, whenever possible, virtual meetings should be encouraged, to reduce VMT.

Preventative maintenance also can ensure that existing vehicles run as efficiently as possible. The City should develop a comprehensive vehicle preventative maintenance program for upkeep and tracking of vehicles. Portions of this program could be automated through tracking devices installed on municipal vehicles. Tracking information could help city employees identify and resolve maintenance problems leading to vehicle inefficiencies. This program would also have the additional benefit of tracking vehicle safety concerns and unsafe driving patterns.

The City should also continue to convert its municipal fleet to fuel efficient, hybrid, and alternative fuel vehicles. As electric vehicles are procured, and while Duke Energy's electric generation is still almost entirely fossil fuel-based, St. Petersburg should develop ways to charge electric vehicles with renewable energy, such as by solar PV installations. In addition, the City should continue developing the potential to run its sanitation vehicles (and any other heavy-duty vehicles) on the biogas produced at the Southwest Water Reclamation Facility.

- **Public Transportation** – Expansion of public transportation presents another opportunity to reduce VMT. St. Petersburg should work with Pinellas Suncoast Transit Authority (PSTA) to grow and/or improve the current bus network, including the St. Petersburg Trolley Downtown Looper, and increase ridership. There may also be potential to connect St. Petersburg with the Brightline high speed rail line, should it expand to Tampa, or the broader Florida High Speed Rail Plan, should it ever be revisited. While uncertainty remains, St. Petersburg can position itself to take advantage of these opportunities, especially connections to Tampa, including the existing Amtrak stop. In addition, St. Petersburg should continue to support the relaunch of the Tamp-St. Petersburg Cross Bay Ferry.
- **Active Transportation** – Non-motorized transportation is another avenue for clean energy savings. Honored as a Silver-level Bicycle Friendly City by the League of American Bicyclists, St. Petersburg already has an extensive trail and bicycle route network and is part of the Coast Bike Share program. Expanding and encouraging these offerings as alternatives to motorized vehicle travel can lead to energy savings.
- **Policy and Incentives** – Non-physical transportation approaches, including policies and incentives, can also help St. Petersburg reach its goals. Policies and incentives can encourage people, starting with municipal employees, to use public or active transportation instead of personal automobiles. Options might include providing free or discounted transit passes (i.e., PSTA GO Card or Passport), modifying parking fees, or creating "car-free" days.
- **Complete Streets** – The City adopted a Complete Streets policy in 2015, which encourages safe and accessible use of roadways for all users. The Complete Streets program aims to make strategic connections and improvements within the grid of streets such that a network of routes and facilities are provided for all modes to safely and comfortably reach all parts of the City. As the City continues to roll out this program, it will encourage more residents and visitors to consider transit, walking, and/or bicycling, thus reducing VMT and vehicle fuel consumption.
- **Electrical Vehicle (EV) Charging Stations and Network** – EV charging stations are another opportunity for St. Petersburg to encourage clean energy. Currently, the city has 22 stations, including 13 that are city-owned and free to use, and several others that are privately owned by networks, such as Charge Point. The City

should continue to provide and operate these facilities for the public to encourage electric vehicle use. Keeping the price free – or at least below the price of gas – will be critical. As mentioned previously, because Duke Energy sources nearly all its electricity from fossil fuels, St. Petersburg should also explore opportunities to tie these EV charging stations to renewable energy sources, such as solar PV.

These systems should be tied to distributed battery infrastructure through home and local charging, enabling residents and the City to effectively utilize the EV network. In addition, operational energy savings can be realized by connecting these systems to batteries and facilities, enabling use of the electricity stored in the vehicles and batteries for peak load shaving and backup power. As described in *Pathway 3*, EV networks can be tied directly to PV installations, leading to GHG reductions. Additional EV purchases and use alone could reduce up to 300 MT of CO2e.