Agenda Report

2725 Judge Fran Jamieson Way
Viera, FL 32940

Unfinished Business

I.1. 12/7/2021

Subject:

Workgroup for Innovative Solar Energy Resources (WISER) Recommendations, Clean Energy Transition Plan and Cost-Benefit Analysis for Brevard County.

Fiscal Impact:

Potential costs and offsetting energy savings will be dependent upon the recommendations that are implemented.

Dept/Office:

Planning & Development and Public Works

Requested Action:

It is requested that the Board consider the attached WISER Recommendations, Clean Energy Transition Plan and Cost-Benefit Analysis for Brevard County.

Summary Explanation and Background:

On November 19, 2019, the Board of County Commissioners (Board) approved Resolution 19-238 replacing Resolution 18-056 relating to the formation and function of WISER. WISER members were subsequently appointed by the commission and the first meeting was scheduled for March 30, 2020. The COVID-19 pandemic necessitated a meeting delay and move to virtual meeting format. The group met eight (8) times via Zoom webinar between August 13, 2020 and April 14, 2021, and transitioned to five (5) in-person meetings between May 5, 2021 and November 3, 2021. The group sunset on November 19, 2021. WISER considered three objectives:

1) Develop a cost-benefit analysis and plan for County government to transition to clean energy sources.
2) Make recommendations on improving public access to economically beneficial clean energy technology.
3) Identify policies and practices that serve as barriers to the adoption of advanced energy technology within the County, and make recommendations on policy revisions.

Attached is the Clean Energy Transition Plan and Cost-Benefit Analysis produced by WISER for the Board's consideration that can build upon already implemented significant steps towards clean energy transition. In 2012, Brevard County authorized the ConEdision Solution Investment Grade Audit (IGA) report and implemented many recommended energy conservation measures (ECMs). In 2018, the Board approved the photovoltaic (PV) permit fees waiver program that has saved 1,200+ citizens more than $300,000. Lastly, in 2019, the Board approved the FPL SolarTogether program that will allow the County to virtually offset its power consumption with solar panels without the need to own equipment.

WISER produced the attached presentation which outlines recommendations regarding the three objectives. WISER's main recommendations are summarized in the presentation as follows:

1) Pursue energy conservation grants to allow for the implementation of clean energy adoption strategies, prioritizing no-match grants.
2) Identify and implement additional energy conservation measures (ECM) within County assets including, but not limited to, weatherization, interior and exterior LED lights, HVAC and environmental controls, expanded telework and increased virtual inspections.
3) Consider the creation of an Energy Manager position or employ consultant to potentially begin plan implementation and future plan development as funding/grants permit.
4) Position and prepare the County to transition to alternative fuel & electric powered vehicles/fleet if it is determined viable.
5) Further develop an integrated energy management plan for solar PV systems, EV charging, fleet, maintenance, utility charges, and power resilience.
6) Continue to partner with Brevard County residents and organizations to transition to clean energy sources.

Options for Board consideration:

1) Accept the Clean Energy Transition Plan as a guiding document for Brevard County.
2) Reject the Clean Energy Transition Plan.
3) Allow for the continuation of WISER.
4) Provide other direction.

Staff contact: Amanda Elmore, Planning & Development Assistant Director, 321-307-8996

Clerk to the Board Instructions:

BREVARD County
BOARD OF COUNTY COMMISSIONERS

FLORIDA'S SPACE COAST

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December 8, 2021

MEMORANDUM

TO: Tad Calkins, Planning and Development Director

RE: Item I.1., Workgroup for Innovative Solar Energy Resources (WISER) Recommendations, Clean Energy Transition Plan and Cost-Benefit for Brevard County

The Board of County Commissioners, in regular session on December 7, 2021, considered the WISER recommendations, Clean Energy Transition Plan and Cost-Benefit Analysis for Brevard County, but took no action.

Your continued cooperation is greatly appreciated.

Sincerely yours,

BOARD OF COUNTY COMMISSIONERS
RACHEL M. SADOFF, CLERK

Kimberly Powell

Kimberly Powell, Clerk to the Board

/ns


Workgroup for Innovative Solar
Energy Resources (WISER)
Brevard County, Florida
Energy Transition Plan (ETP)

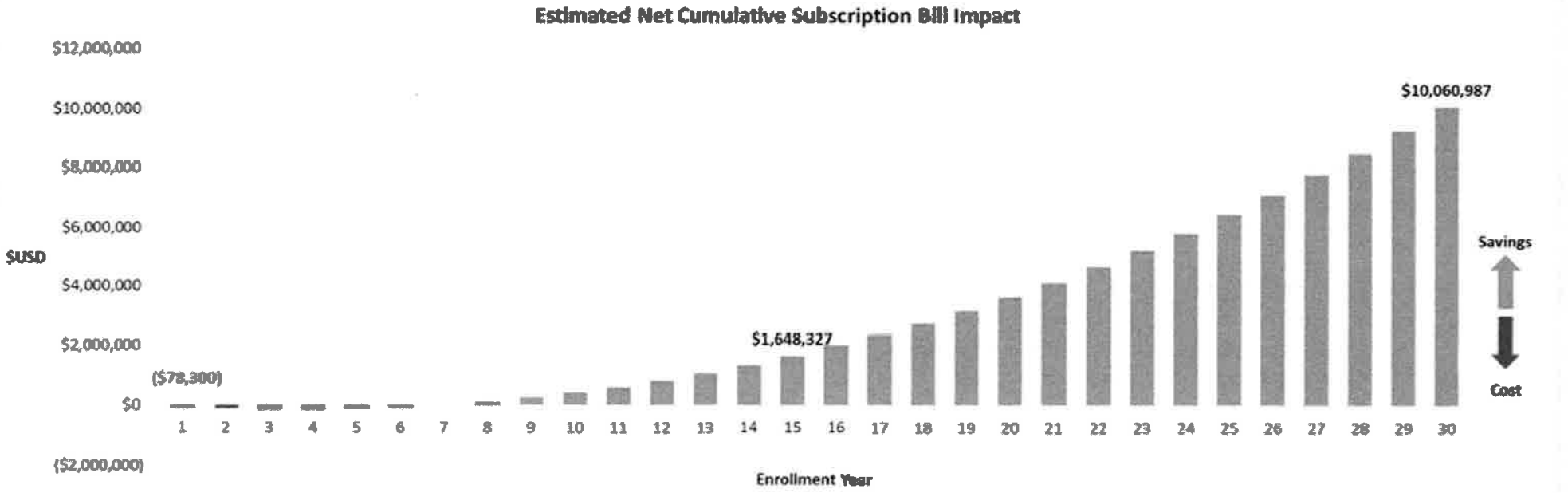
County Energy Accomplishments

Brevard County Government has already taken significant steps in transitioning to clean energy.

- In 2012, ConEdison Solutions completed an Investment Grade Audit (IGA) report and implemented energy conservation measures (ECMs).
- Brevard County has waived PV permit fees since 3/20/18. Current program expires 3/19/2023. There have been 1,228 Solar Photovoltaic fees waived from 3/20/2018 to 10/7/2021 valued at $306,810.80.
- On January 22, 2019, Brevard County approved the FPL SolarTogether program. Allowing the County to virtually offset its power consumption with solar panels without the need of owning equipment.
- Brevard County has recently implemented a telework administrative order for employees and expanded virtual inspections for residential and commercial projects.

County Energy Accomplishments

FPL SolarTogether



WISER Goal 1: Cost-benefit analysis and plan for County government to transition to clean energy sources.

Deliverables:

- Energy Reduction Implementation Plan
- Facility Clean Energy Transition Plan
- Alternative Fuel & Electric Vehicle (EV) Fleet Transition Plan

These are intended to be guiding, living documents to be considered for implementation as funding (prioritize grants) is identified.

WISER Goal 2: Recommendations to improving public access to economically beneficial clean energy technology.

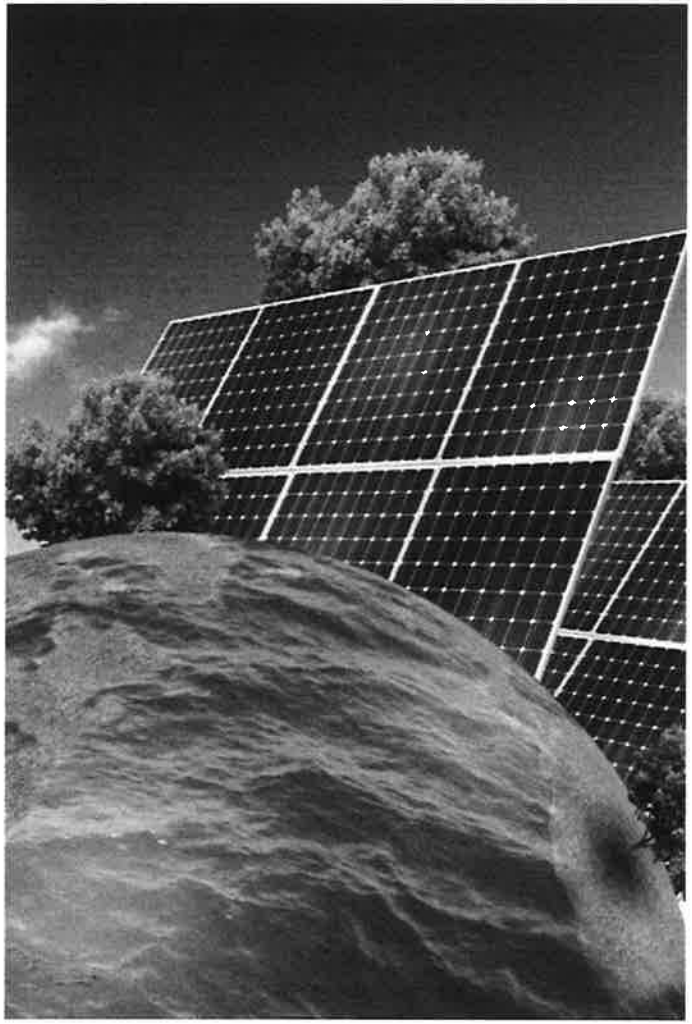
- Provide support for events that highlight clean energy.
- Promote solar ready construction.
- Provide education and disseminate information about optional energy efficient construction, the International Green Construction Code (IgCC) powered by ASHRAE Standard 189.1, and weatherization.
- Support Florida Solar Energy Center and other related community efforts.

WISER Goal 3: Identify policy and practices that serve as barriers to the adoption of advanced energy technology within the County and make recommendations on policy revisions.

- Establish and implement metrics to measure Brevard County's transition to clean energy.
- Continue to support financial alternatives such as grants, reduced permitting costs, etc. for homeowners and home builders.
- Consider the feasibility of implementing local county ordinances that relate to energy management.

Summary Recommendations

1. Pursue energy conservation grants to allow for the implementation of clean energy adoption strategies; prioritize no-match grants.
2. Identify and implement additional energy conservation measures (ECMs) within County assets including, but not limited to, weatherization, interior and exterior LED lights, HVAC and environmental controls, expanded telework and increased virtual inspections.
3. Consider the creation of an Energy Manager position or employ consultant to potentially begin plan implementation and future development as funding/grants permit.
4. Position and prepare the County to transition to alternative fuel & electric powered vehicles/fleet if it is determined viable.
5. Further develop an integrated energy management plan for solar PV systems, EV charging, fleet, maintenance, utility charges, and power resilience.
6. Continue to partner with Brevard County residents and organizations to transition to clean energy sources.



<u>Your WISER Board thanks you and is happy to continue service if it is the pleasure of the Board of County Commissioners.</u>

In appearance from left to right: Bill Young, Bill Debusk Jr., Nick Sanzone (Chair), John Constantinide (Vice Chair), Kimberly Newton, Bruce Lindsay (not pictured)

Any questions?

Energy Transition Plan

Proposed to the Board of County Commissioners of Brevard County, Florida

Executive Summary

Overview

This Energy Transition Plan (ETP) provides Brevard County with information and resources needed when considering the transition to clean energy. The primary initiatives required to move to clean energy are improving energy conservation, evaluating the viability of transitioning to solar and/or wind power, implementing energy storage, and assessing alternative fuel and electric fleet vehicles. Furthermore, using clean, renewable energy to enhance energy resilience can justify the strategic acquisition and installation of renewable energy infrastructure. The ETP and associated documents are intended to be guiding, living documents to be considered for implementation as funding, prioritizing grants, is identified. Assumptions for payback calculations should be examined at time of project consideration, as costs will change over time.

Brevard County Government has already taken significant steps in transitioning to clean energy. In 2012, ConEdison Solutions completed an audit of multiple Brevard County Government facilities that was documented in a 2013 Investment Grade Audit (IGA) report. The IGA report identifies multiple energy conservation measure (ECM) recommendations and documents that implementation of the recommended ECMs would result in avoided cost.

Brevard County has also taken several steps in utilizing technologies to reduce energy consumption, both through reduced transportation and facility usage. The County recently implemented a telework administrative order that will presumably result in gasoline savings, and thus carbon emission reductions, in vehicles and reduction of County facility usage, leading to reduced energy and water footprint at County facilities. The County's utilization of virtual inspections has further reduced driving usage for building inspectors, increasing the lifecycle of County vehicles and further reducing the County's carbon footprint.

Brevard County took another major step in transitioning to clean energy by approving the FPL SolarTogether program on January 22, 2019. SolarTogether provides Brevard County Government the ability to virtually offset its power consumption with solar panels without the need of owning equipment. According to the agenda report for the Brevard County Commission meeting, SolarTogether could result in a potential savings from energy cost of $10 million over a 30-year period.

Brevard County can potentially achieve average annual savings of over $1.7 million over 20 years through continued implementation of ECMs and installation of solar PV systems, if deemed viable.

Among the ECMs, five measures that Brevard County can evaluate to pursue energysavings are as follows.

1. Exterior LED (light emitting diode) lighting
2. Interior LED lighting

3. Weatherization
4. HVAC (heating, ventilation, and air conditioning) and environmental controls
5. Expanded telework, virtual inspections, and vehicle use adaptation

Without the installation of solar PV systems, the ECMs are projected to potentially provide over $620,000 in annual savings, with a simple payback period of 8.11 years. Transitioning to clean, renewable energy will not only save Brevard County money andreduce pollution, but it will also make a substantial impact on cleaning up the Indian River Lagoon. Per Appendix 2, the two primary pollution elements for the IRL are nitrogen and phosphorus. Brevard County can contribute to eliminating 15% of the nitrogen pollution in the IRL through eliminating the burning of fossil fuels.[1]

To reduce the current energy costs of Brevard County and lead the community into a more sustainable and resilient future, the County Commissioners created the Workgroup for Innovative Solar Energy Resources (WISER). WISER is a Commission-appointed group that has been tasked to address the following goals established by the County Commissioners:

1. Develop a cost-benefit analysis and plan for County government to transition to clean-energy sources.
2. Make recommendations on improving public access to economically beneficial clean-energy technology.
3. Identify policies and practices that serve as barriers to the adoption of advanced energy technology within the County, and make recommendations on policy revisions.

To achieve these goals, WISER makes the following overarching recommendations:

1. Create or contract an Energy Manager (EM) position. The County can explore two options for funding this and future positions.
    a. Create a grant-funded EM position in the Brevard County Public Works Department focused on facilities. This position would be maintained by the savings earned from ECM implementation.
        i. In light of the County hiring a grants manager, the new EM position would be fully funded by non-matching grants until ECMs are able to pay for more of the EM's salary.
        ii. This pilot position would provide feedback to the County on how to duplicate the EM position in other departments (e.g., Planning and Development, Solid Waste, Fire Rescue, Transit Services, Library Services, Natural Resources Management, Utility Services, Central Services, and Parks & Recreation) in the future, with other EMs focusing on facility and non-facility items germane to their respective departments.
        iii. The eventual goal would be to have all EMs, each from their respective County department report to the director of a potential Resilience Department, permitting each EM to address each department's needs while providing cross-

department collaboration and coordination. This director would report to the assistant county manager.

   b. Contract energy management services to a third-party vendor who can provide energy management, measurement and verification, and energy savings contract (ESCO) services to eventually serve all County departments. The ESCO services portion of the County may be negotiated with the Contractor to guarantee energy and water savings.

2. Investigate and deploy energy conservation and clean energy adoption strategies in light of Brevard County's participation in Florida Power and Light's (FPL) SolarTogether Program.
3. Investigate alternative fuels and the transition to battery electric vehicles (EV), particulary in light of federal legislation providing significant funding to EV charging infrastructure. If it is determined that charging stations are a viable option for installation on County assets, consider options below.
   a. Create a plan to separate public charging of EVs, which may charge a service rate, versus County EV charging, including separate and distinctly marked EV charging stations.
   b. The County may want to consider contracting the installation and maintenance of EV charging stations, both for County and public use, to a third-party vendor in order to minimize cost to the County.
4. Develop an integrated plan for solar PV systems, EV charging, mitigation of peak demand charges, and power resilience, including the installation of uninterruptible power systems that include battery-backup options.
5. Take actions to empower Brevard County residents to transition to clean energy sources.
6. If it is the pleasure of the Board, maintain WISER as permanent workgroup with broadened responsibility to provide vision and planning to address ongoing energy, water, and resource conservation and transition (e.g., a newly named group, **W**orkgroup for Innovative **S**olutions for **E**nergy and **R**esilience), including the following duties.
   a. Provide research and recommendations on an as required basis to County staff.
   b. Provide the community with information and educational materials for implementing solar and renewable energy resources.
   c. Provide expertise, information, and research at little to no cost to Brevard County residents.
   d. Costs to maintain WISER include the cost of the Commission-appointed staff liaison, which may be an Energy Manager and meeting advertisement.

Brevard County's Public Works Director, Marc Bernath, spoke to WISER on October 1, 2020. While asking that WISER be mindful in their recommendations of resources, in light of both budgetary and staffing limitations, he advised that there is currently no Energy Manager.

Energy Manager
Evaluate the feasibility and funding (grants) for a potential EM, both as a pilot and eventually a position in each County department. The potential EM or contractor would review the goals and timeline of the ETP for implementation. An EM could be responsible for reviewing energy usage data, initially for facilities in the pilot position with the eventual goal of other EMs in respective departments addressing energy consumption by facility and non-facility assets. An EM could ensure that energy conservation projects are completed effectively. The EM can also provide input to county programs relating to clean energy that already exist, such as Florida Power and Light's SolarTogether program. A sample EM job description is included in Appendix 4.

Resilience
Even though a solar PV and storage system might not appear to be economical under traditional cost-benefit calculations, placing a value on the losses incurred from grid disruptions make PV and storage systems potentially fiscally sound investments.[2] Putting a value on the resilience provided by PV solar systems that include battery storage almost doubles the net present value compared to a traditional stand alone PV system.

Battery costs have become an expensive line item for adopting resilience measures. However, proper sizing of batteries based on critical equipment that needs to be powered can justify added cost and may provide a return on services not lost due to providing a redundant power supply. Consider the cost of emergency service communication lost, for example, in comparison with a battery energy storage system. Such critical functions could justify the added redundant power measures.

Brevard County should develop or expand a resilient power plan for critical public and private facilties to keep the lights on, the communication systems running, and emergency services operational when the grid goes down. Ideas can be taken from the City of Cape Canaveral's Resiliency Action Plan, which was approved by the City's Council on June 15, 2021.[3]

Transportation
The future of transportation is rapidly transforming from petroleum to alternative fuels and electric power. Locally, municipalities, such as the Cities of Cape Canaveral and Satellite Beach, are electrifying their fleets with electric vehicles (EVs) and EV-charging stations. Commercially, companies like FPL and Cracker Barrel understand the growing number of EV users and are dedicating parking and infrastructure investments towards accommodating these users.[4,5] Furthermore, Brevard County has an opportunity to offset an estimated 110,123 gallons of diesel and 23,344 gallons of gasoline annually, electrify the vehicle fleet, and connect EVs to buildings to provide supplemental power during outages, helping maintain critical operations.[6] Transportation is rapidly changing due to alternative fuels and the continued development of electric vehicles. Brevard County should take steps to prepare for this transition. This document contains information on how Brevard County can prepare

for this evolution to clean transportation.

WISER ETP Implementation Vision

Once presented to the County Commissioners, discussions can begin on how to move forward with the ETP, and changes can be proposed to the 2022 – 2023 budget cycle, if funding, such as grants, are identified. The proposed changes would include the hiring of an EM or consultant for Public Works who would start as soon as November or December of 2022 and begin evaluating and potentially implementing the ETP. This approximate timeline would begin to see proposed improvements to facilities in early 2023, requests for proposals sent out by June 2023, and confirmations of viability in July and August 2023. With this timeline, the County could expect to see implementation of the first set of energy conservation measures (ECMs) and potential solar arrays, if deemed viable, by October 2023.

For each budget cycle, the EM for Public Works, and each department's EM in the future, would contribute to changes to their respective department's existing budget, with measures justified by cost benefit analyses provided by each EM to support the up-front cost of the ETP improvements. At this point, timelines will vary depending on the creation of the EM, including whether ECMs and or clean energy initiative timelines can be accelerated. With funding identified, each project being scheduled for a budget year will allow the County to finance the project appropriately. Should the Commission create the EM position in Public Works and eventual successive EM positions in other departments, with the eventual goal of all EMs reporting to a potential Resilience Department, the benefit of the money saved from the upgrades can be put into a revolving fund, providing the Finance Department or Budget Office determines such a fund feasible, that is used to fund personnel, including utilities and policy, and complete future County building and infrastructure upgrades, further reducing project implementation timelines and providing additional funding options for the County to consider. Furthermore, if the budget is sourced from a bond, a portion of the savings can be partitioned to pay down the debt on the bond.

Clean energy technologies have reached technology maturity and numerous real-world examples can now be found across municipal and county governments nationwide. Given these developments and **accompanying supporting data, now is an appropriate time to begin adoption of clean energy technologies in Brevard County in order to realize lower utility costs, improve lagoon health, and enhance resilience.** Since 2010, the cost of PV has dropped 82%.[7] The information in this plan will provide guidance for incorporating clean energy sources throughout the years ahead as the cost of clean energy continues to decline.

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Tables

Appendices are available in a separate document included with this plan.

Introduction

The availability of clean energy solutions is increasing almost daily. Adopting the proper clean energy technology at the right time could reduce energy costs for Brevard County. As Brevard County considers adopting these technologies, it will also create a cleaner, healthier environment for its citizens. The Energy Transition Plan (ETP) outlines the steps Brevard County can take to implement clean energy technology and bring about these benefits.

Brevard County created the Workgroup for Innovative Solar Energy Resources (WISER) to initiate a transition to clean energy sources. WISER was tasked by the Brevard County Commissioners to complete the following goals and tasks.

Goal 1. Develop a cost-benefit analysis and plan for County government to transition to clean energy sources.

Goal 2. Make recommendations on improving public access to economically beneficial clean energy technology.

Goal 3. Identify policies and practices that serve as barriers to the adoption of advanced energy technology within the County and make recommendations on policy revisions.

This ETP is the initial product of WISER. The ETP addresses the challenges and opportunities related to the transition to clean-energy sources. Economic sustainability, job creation, energy reliability and independence, and long-term resiliency are all potentially addressed as beneficial results of the plan. The ETP recommends changes that will support the sustainable and resilient growth of Brevard County, its employees, departments, programs, as well as its residents, businesses and other community stakeholders.

This document builds off the 2013 ConEdison Solutions Investment Grade Audit (IGA).[8,9] Reviewing the IGA reveals the potential for millions of dollars in energy savings without considering the energy savings that could be provided by installing solar on the 14 county facilities (designated 01 Facilities) and 17 libraries. Building from the IGA, this ETP is designed to inform and support the efforts of Brevard County to bring about a more resilient, profitable, sustainable[10], and equitable future. Recommendations, such as seeking no match grants, hiring an Energy Manager (EM), initially as a pilot position in the Public Works Department with the eventual goal of hiring an EM for each remaining department, fostering public- private investment partnerships, and increasing public access to clean energy sources, are discussed in the plan and considered essential to preparing for the transition to an energy economy focused on improving existing county infrastructure and investing inadditional infrastructure, creating local jobs, reducing pollution and improving public access to economically beneficial clean energy technologies, such as solar.

The ETP is a living document, allowing the County to adaptively manage recommended energy transition options and solutions based on economic, social, and environmental needs. It identifies steps that can be taken to transition to solar photovoltaic power, recommend or utilize green building practices, including ECMs, and alternative fuel and electric vehicles to reduce energy consumption and the associated costs to the County.

Organized into sections to address these transition opportunities separately, the ETP also includes three appendix documents that address details when considering Energy Reduction, Facility Clean Energy Transition, and Transitioning to Alternative Fuel/Electric Vehicles. The last appendix contains additional recommendations and resources.

Through this ETP, Brevard County could be positioned to commit to Ready For 100,[11] a national movement with a vision of resilient and healthy communities powered by 100% clean, renewable energy. Ready for 100's goals are to achieve 100% clean, renewable energy for electricity by 2035 and 100% clean and renewable energy for heat and transportation by 2050.

The ETP also achieves multiple goals of the Memorandum of Understanding signed by Brevard County and other municipalities for the East Central Florida Regional Resiliency Collaborative and the regional resiliency action plan.

Statement of Purpose

The following are the guiding principles and goals of this ETP, which provide an integrated approach for planning and actions:

- Appropriate stewardship of energy resources: Incorporating best practices in energy conservation and energy efficiency efforts is the most cost-effective way to reduce energy consumption. Best practices can significantly reduce energy use in buildings and transportation systems. These strategies comprise the early steps of this ETP and are central to its structure.

- WISER envisions this ETP to be implemented with leadership from the proposed EM.

- Strategic capital investment: The stakeholders of Brevard County first need to implement no or low cost ECMs to reduce energy consumption and its associated costs. Cost analyses by the EM can prioritize implementation of ECMs, initially at facilities through the pilot position and eventually other assets through successive EM positions, and related clean energy solutions outlined in this ETP. This ETP recommends changes in energy consumption patterns that will spur a smooth and cost-effective transition to clean renewable energy and reduce cost of operations.

- Emphasis on job creation: Projects implementing facility ECMs and, eventually, local renewable energy projects create well-paying, stable, local jobs. Brevard

County's reduction of energy footprint and transition to clean energy will stimulate the creation of new, well-paying jobs. The practices recommended in this ETP will enhance job creation.

- Public health: This ETP strives to maximize the health benefits provided by the transition from our fossil fuel-based economy to a renewable energy economy. A reduction of outdoor air contaminants will be a direct benefit of moving to clean-energy sources.

- Accessibility: This ETP considers the impacts of the energy transition on economic and environmental conditions throughout the County's local communities. Many citizens neither have the financial stability nor resources to qualify for financing needed to invest in home weatherization improvements and renewable energy installations. They could require recommendations for support, which must be seen as maintaining the overall public good.

- Climate and lagoon stabilization: This ETP addresses the need to immediately reduce and ultimately eliminate human-generated greenhouse gases enabling Brevard County to do its part, locally, to restore the Indian River Lagoon and, in the global perspective, to control the continuing increase in average global temperature and extreme climate conditions.

- Energy independence: This ETP endeavors to make the county and the larger community more self-reliant through energy efficiency and conservation and on-site renewable energy development, allowing for reductions of imported fuels.

- Inclusion of all stakeholders: This ETP welcomes the participation of all stakeholders within the county and is designed to integrate their input as part of the development process.

- Coordination with other governments: This ETP has been outlined in a manner that will enable multiple communities in conjunction with Brevard County, either individually or in groups at the county or regional levels, to develop aggregate planning strategies.

- Citizen interface: To achieve these goals, the ETP recommends making WISER permanent, if it is the desire of the Board of County Commissioners. WISER can receive public input regarding the direction and implementation of the ETP and provide feedback to the EM. WISER can also work with the community on outreach and work with the EM to inform the Board of the progress being made to achieve the goals of the ETP.

WISER Goal 1: Cost-benefit analysis and plan for County government to transition to clean energy sources

Three sub-plans along with details on how to perform their related cost-benefit analyses are included as appendices in this document. These sub-plans include details for transitioning Brevard County to clean energy.

1. **Energy Reduction Implementation Plan (Appendix 1)**
   This is a clean energy strategy to reduce energy footprint through building energy audits, energy conservation measures (ECMs), such as weatherization, and potentially installing solar technologies on facilities to the meet remaining energy needs, if determined viable.
2. **Facility Clean Energy Transition (Appendix 2)**
   This provides clean energy solutions for facilities, with a primary focus on solar photovoltaic (PV) systems. Cost-benefit models are included to strategize solar system implementation with ECMs.
3. **Alternative Fuel/Electric Vehicle (EV) and Fleet Transition (Appendix 3)**
   This is a strategy to help Brevard County leaders understand and uncover the opportunities available to get municipalities on the path to electrify municipal fleets and public transit. Furthermore, this provides guidance for how to best encourage personal public investments in EVs by providing the necessary EV infrastructure.

These documents provide a framework for Brevard County to transition to clean energy sources. The plans and cost benefit analyses should be used on an on-going basis to identify cost-effective opportunities to implement clean energy sources.

As described in the cost-benefit analyses, **Brevard County can potentially achieve average annual savings of over $1.7 million over 20 years through continued implementation of ECMs and installation of solar PV systems**. Tables 1 and 2 summarize the information from the cost-benefit analyses completed on a representative sample of the County buildings (both designated 01 and 02 Facilities). The cost-benefit analysis is separate and exclusive from the ConEdison IGA previously mentioned. The analysis does not include the water savings that could result from the implemented ECMs, resulting in further savings that are not included in the analyses as summarized in the tables.

Table 1. Facility ECM and Solar Cost-Benefit Analysis Summary.

	Facility Square Feet (SF)	**Annual Consumption (kWh)**	Energy Use Intensity (kWh/SF)	**Approximate Energy Cost ($)**	**Unit Cost ($/SF)**
Total	**1,742,860**	**31,354,447**		**$3,135,445**	
Average	57,029		18.0		**$1.80**
Estimated annual savings in ECMs[1]:				**6,270,889.4 kWh**	
Estimated cost of ECMs based on cost per SF:				$5,087,892.67	
Energy annual cost savings from 20% reduction:				**$627,088.94**	
Simple Payback of ECMs alone:				8.11 yrs	

[1] Assuming conservative 20% reduction in building energy consumption, not including the ConEdison IGA.

Table 2. EV Cost-Benefit Analysis Summary.

Potential Life Cycle Cost Savings for EV Life	**$1,795**
EV Cost	$31,995
Break Even Period for EV	**7.5 yrs**

Although the installation of solar PV panels was included in the cost-benefit analysis, the calculated payback period of 13.23 years for both ECMs and solar panels provided grounds for WISER to recommend that the County revisit incorporating PV panels once the market for materials and labor improves. The cost-benefit analysis for PV panels on buildings utilizes the same representative sample of County buildings as with the ECM cost-benefit analysis. In comparison to residents and companies, the County does not qualify for federal tax credits that make solar panels more attractive for non-government users. However, WISER recommends that County buildings are renovated gradually to become solar-ready to transition to utilization of PV panels.

The execution of these plans would place Brevard County as a municipal leader in applying cost-effective energy solutions. Other local municipalities have taken concrete steps to make their sustainability plans a reality. The City of Cape Canaveral's Multi-Generational Facility, once constructed, will have its energy needs offset via a rooftop solar array. The building is intended to serve as a Resilience Hub once an appropriate battery energy storage system is installed in the near future. This upgrade will allow the facility to be safely islanded and have the rooftop solar array power operations off grid if necessary. The facility positions the City to meet its resilience needs as part of its resiliency plan recently adopted by its City Council.

The City of Satellite Beach's City Hall has roof-top solar photovoltaic generating electric power to offset electrical consumption from the grid. This, along with numerous other initiatives, fulfill the City's Sustainability Action Plan that their City Council passed.

Although not included in the cost-benefit analysis, there is also value that can be calculated with emission reductions. The federal government has calculated social costs, including changes in network productivity, agricultural yields, human health, and numerous other factors, associated with reducing carbon dioxide, methane and nitrous

oxide emissions.[12] These figures may be referenced in future analyses by the EM.

FPL SolarTogether

In 2020, FPL offered a program called SolarTogether. SolarTogether allows a participant to share in a portion of utility scale solar farms being built by FPL. SolarTogether requires a subscription fee. This subscription fee is added to the normal utility bill and goes toward the cost of building and maintaining the utility scale solar farms. This fee is offset with a monthly credit. The credit is calculated by FPL and is forecasted to increase over time. For most applications, the credit is forecast to result in a break-even point at five to seven years.

Many Florida communities took advantage of the SolarTogether program in 2020. FPL predicts this program will be a substantial value to its subscribers. As an example, Broward County estimated it could save as much as $46 million over 30 years through the program, if able to offset 100 percent of power currently used for buildings and operations with solar energy credits. The upfront subscription cost can be substantial. Broward County estimates that their upfront cost will be approximately $362,000.[13]

FPL's SolarTogether program was considered and approved by Brevard County Commissioners on January 22, 2019. The potential countywide fiscal impact from SolarTogether is *"$158,606 over 1,108 accounts over 4 years. Years 5-7 the County would recoup the additional subscription costs from years 1-4. Starting in year 8 the County will be in a positive credit, up to year 30; where the County shall receive the maximum of $795,394 credits annually."*[14]

There is no guarantee of a payback for SolarTogether. The forecast that FPL uses to show that SolarTogether credits would eventually increase to offset the required subscription charge is difficult to validate. The estimated payback in the form of lower utility bills is based on their forecast of rising fuel costs and carbon dioxide compliance costs. These are simply forecast and do not imply any sort of guarantee of a payback on the subscription investment.[15]

There are numerous advantages to a program like SolarTogether. The leading advantage is its ease to implement. Additional advantages are as follows.

- No contracts
- No upfront cost
- No maintenance
- Can offset power consumption, eliminating the need to have roof space for renewable energy generation.
- Potential for lower utility costs

When FPL calculates its benefits for the SolarTogether program, one figure and calculation is worth noting that provide optimum results, which when utilized, reflects higher payback. These include increased number of hours per year for solar exposure and use of dual tracker for solar exposure per day. Both items may provide a best-case

scenario that may not be representative of the average scenario the County may offer. In comparison, the cost-benefit analysis for ECMs and PV utilization in Appendix 2 uses a more reasonable number of hours per year for solar exposure and a more conservative solar exposure per day that is used by industry and the Florida Solar Energy Center.

Additional details about SolarTogether are in Appendix 2.

Beyond SolarTogether

Brevard County's primary uses of energy are for facilities and transportation. According to FPL's presentation to WISER, the SolarTogether program would offset 85 to 95% of the facility power demand. The SolarTogether program offsets power use but it does not mitigate the demand charges for some facilities that require large peaks of electricity use. Demand charges often represent 30% to 70% of a commercial electric bill.[16] In addition, the SolarTogether program does not address power resilience. Further, clean energy measures can be taken to reduce peak electric demand charges and increase power resilience for Brevard County Government facilities.

On-site solar PV systems can be used to meet the growing electricity demand for Brevard County Government, businesses, and citizens. One source of the increased demand will come from considering the transitioning to EVs. Solar PV systems on homes and buildings combined with battery storage and/or EVs with Vehicle-to-Everything (V2X) technology can provide clean energy, reduce peak electricity demands, and create a power resilient community.

Electric Vehicles to Buildings for Resilience

Some EVs are capable of two-way, or bidirectional, charging. Two-way charging capability will allow for Vehicle to Building (V2B) power, a technology that FSEC has investigated. V2B-capable EVs, along with some interface equipment, will provide power to critical buildings, such as Emergency Operations Centers and future resiliency hubs, during natural disasters. This technology is available today for some makes of EVs. Nissan's Blue Switch project enables deployment of EVs in Japan to provide power to critical locations after natural disasters. The Ford F-150 Lightning can provide critical power for up three days, depending on what is being powered at full charge. The City of Orlando has adopted this same technology for a portion of their power resilience needs. Power resilience is critical in Brevard County, and this technology should be considered in our future power resilience infrastructure.

WISER Goal 2: Recommendations to improving public access to economically beneficial clean energy technology

The second WISER goal was to make recommendations on improving public access to economically beneficial clean-energy technology. Our primary recommendations for this goal are:

1. Provide support for events that highlight clean energy.
2. Promote solar ready construction.
3. Provide education and disseminate information about energy efficient construction, the International Green Construction Code (IgCC) powered by ASHRAE Standard 189.1, and weatherization.
4. Support Florida Solar Energy Center and other related community efforts.
5. Incorporate electric buses for Space Coast Area Transit if and when feasible.
6. Procure, promote, and install EV charging infrastructure at County facilities, if determined viable.
7. Support the installation of EV charging infrastructure at commercial and residential properties.

The steps needed to successfully provide public access to clean energy technology can be performed by WISER are in Appendix 4.

Weatherization

Weatherization is necessary regardless of how energy is generated and is an important first step in education for single-family homes.

Issues around proper home weatherization are also most often coupled with environmental injustices that are directly related to health issues and concerns including air quality and energy costs.

- Educate residents using digital platforms such as social media with simple weatherization tips or links, such as the Florida Solar Energy Center (FSEC), FPL, and government websites, on how to make homes more "energy secure.
  - Weatherization Works[17]
  - Weatherization Assistance Program (WAP)[18]
  - Solar Weatherization Assistance Program (SWAP)[19]

- Create additional media content on weatherization, such as videos, interviews, and webinars. Create a social media flyer defining weatherization with simple tips or links to reputable sources (i.e., FSEC, FPL, and government websites) on how to make homes more "energy secure."

- Create a page on the county website that links to public resources.

Economic Accessibility

- Promote financial resources and references to appropriate assistance programs for weatherization improvements, such as the Weatherization Assistance Program (WAP) and the Solar Weatherization Assistance Program (SWAP), and renewable energy installations.

- Provide information on rebates or materials to homeowners.

Work with other government and non-government organizations

Identify local organizations that can assist with improving public access.

- Ask local communities, municipalities, and organizations who are also working to provide public access to weatherization and other clean energy technology information to help share the weatherization information.

- Create and attend community events that support providing public access to clean energy technology.

Residential energy usage can be reduced by 30% through conservation and energy efficiency measure alone.[20] Many citizens neither have the financial stability nor resources to qualify for loans needed to invest in home weatherization improvements and renewable energy installations. They may require recommendations and support, which must be seen as maintaining the overall public good.

WISER Goal 3: Identify policy and practices that serve as barriers to the adoption of advanced energy technology within the County, and make recommendations on policy revisions

The highest-ranking barrier to the adoption of advanced, or clean, energy technology within the County is the lack of a dedicated EM and staffing within the County government. The County could benefit from staff to audit and manage the county's energy use and communicate results to the Commission and public. Brevard County cannot take advantage of advanced, or clean, energy technologies without seeking grants to fund projects and an energy management organization. Therefore, WISER recommends the creation and hiring of an EM position in the County's Public Works Department as a pilot position, with the eventual goal of having additional EM positions created for each County departmentto address their respective energy needs for facility and non-facility assets.

Additional recommendations for this goal are as follows.

- Establish and implement metrics to measure Brevard County's transition to clean energy. Metrics are essential for monitoring the progress and meeting the goals for this transition.
- Support financial alternatives such as grants, reduced permitting costs, etc. for homeowners and home builders to offset future strain on electric, water and sewage infrastructure in anticipation of future population growth.
- Support the development and hiring of maintenance personnel to maintain and repair solar, renewable, and electrified building and vehicle assets.
- Evaluate the adoption of local additions to the Florida Building Code, including parts or all of the International Green Construction Code (IgCC), to require higher standards of energy efficiency beyond current building code requirements. Whereas the Florida Building Code uses the International Building Code as the base code, with revisions to address local hazards (e.g. high winds, flooding), the IgCC positions the code to construct buildings with energy and water conservation as a primary focus. Lowering energy costs will incentivize residents and commercial building owners to implement clean energy.
- Explore the viability of the adoption of local additions to the Florida Building Code so that new buildings and homes are solar ready (i.e. ready to install solar systems). Solar-ready homes are easier to retrofit with solar power.
- Ezamine the adoption of local county ordinances that support new multi-family construction including accommodations for residents to charge electric vehicles. Not having access to home charging is a barrier to using electricity for transportation.

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[2] National Renewable Energy Laboratory. 2018. "Valuing the Resilience Provided by Solar and Battery Energy Storage Systems." Report NREL/BR-6A20-70679. https://www.energy.gov/sites/prod/files/2018/03/f49/Valuing-Resilience.pdf.

[3] City of Cape Canaveral, Florida. 2021. "Resilient Cape Canaveral Action Plan." Plan. https://www.cityofcapecanaveral.org/document_center/Documents/Community%20Development/cocc_ced_sustain_resilient_cc_action_plan20210621.pdf.

[4] Florida Power and Light. 2021. "FPL Evolution™." https://www.fpl.com/energy-my-way/evolution.html.

[5] Nation's Restaurant News. 2010. "Cracker Barrell to Install Charging Stations for Electric Cars. Accessible via https://www.nrn.com/corporate/cracker-barrel-install-charging-stations-electric-cars.

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[7] International Renewable Energy Agency. 2019. Renewable Power Generation Costs in 2019. Report. International Renewable Energy Agency: Abu Dhabi.

[8] ConEdison Solutions. 2013. "Investment Grade Audit, Brevard County – Facilities Department."

[9] ConEdison Solutions. 2013. "Investment Grade Audit, Brevard County – Libraries."

[10] Sustainable development, synonymously defined with sustainability in mainstream dialogue, as defined in the Report of the World Commission on Environment and Development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

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[15] Florida Public Service Commission. 2020. "Petition for approval of FPL SolarTogether program and tariff, by Florida Power & Light Company." Docket No. 20190061-EI. http://www.psc.state.fl.us/library/filings/2019/03066-2019/03066-2019.pdf.

[16] National Renewable Energy Laboratory. 2017. "Identifying Potential Markets for Behind-the-Meter Battery Energy Storage: A Survey of U.S. Demand Charges." Document NREL/BR-6A20-68963. https://www.nrel.gov/transportation/assets/pdfs/behind-the-meter-storage-fy19-q2-progress-report.pdf.

[17] U.S. Department of Energy. 2019. "Weatherization Works!." Document DOE/1561. https://www.energy.gov/sites/prod/files/2019/07/f64/WAP-Fact-Sheet-2019.pdf.

[18] U.S. Department of Energy. 2021. "Weatherization Assistance Program." https://www.energy.gov/eere/wap/weatherization-assistance-program.

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[20] Liaukus, C. 2014. "Reducing Energy Usage in Existing Homes by 30%: Learning From Home Performance with ENERGY STAR." Report. National Renewable Energy Laboratory Contract No. DE-AC36-08GO28308.

Appendices to the Energy Transition Plan

Proposed to the Board of County Commissioners of Brevard County, Florida

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Appendix 1: Energy Reduction Implementation Plan and Cost Benefit Analysis

Brevard County Investment Grade Audit (IGA)

A 2013 document was provided to WISER summarizing an investment grade audit (IGA) by ConEdison Solutions. "The audit was performed to review Brevard County facilities and make recommendations for energy conservation measures (ECMs). ConEdison *Solutions* was engaged to perform an IGA for the County with the goal of developing an Energy Savings Performance Contract (ESPC) that meets the requirements of Florida Statutes, Section 489.145. Per those statutes the ESPC must be self-funding and result in a cash neutral or positive cash flow."[1,2]

The IGA recommended 53 ECMs. These renovations were estimated to result in over $15 million worth of energy savings to Brevard County.[3]

This ETP uses data obtained from this IGA as a starting point. The extent to which the recommendations from the IGA have been implemented was not readily available to WISER. Since IGA data is dated from 2013, any data used from the IGA for current cost analyses should reviewed and updated.

Energy usage can be reduced by 30%,[4] with findings showing 49% energy savings,[5] through conservation and energy efficiency measures. Increased conservation and the transition to clean, renewable energy has the potential to save the county millions of dollars annually in reduced energy costs once the plan is fully implemented.

Energy Reduction Implementation Plan

Brevard County has an opportunity to aggressively pursue a clean energy strategy by reducing energy footprint through building energy audits and installing solar technologies to the meet remaining energy needs. Through these audits, a combination of low-cost and no-cost improvements, as well as strategically implemented capital improvements, will result in maximized value and reduction of cost to the taxpayer.

An energy audit, which may include a facility condition assessment, and building upgrades should be performed before installing a solar photovoltaic (PV) system on a

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[1] ConEdison Solutions. 2013. "Investment Grade Audit, Brevard County – Facilities Department."
[2] ConEdison Solutions. 2013. "Investment Grade Audit, Brevard County – Libraries."
[3] Berman, D. 2014. "Brevard tentatively OKs energy saving plan." Florida Today.
[4] Chu, S. 2012. "The New Energy Saver.gov – Save Money by Saving Energy!" https://www.energy.gov/articles/new-energysavergov-save-money-saving-energy.
[5] Nadel, S., Ungar, L. 2019. "Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050." Research Report. American Council for an Energy-Efficient Economy. https://www.aceee.org/sites/default/files/halfway-there-0919.pdf.

facility. The cost of implementing a solar PV system can be significantly reduced when energy consumption is reduced, resulting in a cost-effective investment in a PV system.

Overall goals that the County should consider, as part of this strategy, are as follows.

1. Reduce energy expenditures and reinvest savings to accelerate investment in energy efficiency and adoption of solar technologies
2. Increase energy resilience for County operations and services
3. Reduce maintenance costs and extend equipment service life
4. Improve outdoor air quality

Through achieving these goals, the County will reduce its carbon footprint.

The County's strategy should address the following actions.

1. Develop and continue efforts driven towards increased energy efficiency
The County should partner with local organizations, particularly the Brevard Sustainability Working Group and the Florida Solar Energy Center, with the goal of learning best practices, enhancing energy efficiency strategies, and fostering dialogue to identify the most effective uses of solar technology.

The County should expand on its current compliance with Florida Statute 255.2575(2), part of the Florida Energy Conservation and Sustainable Buildings Act, by adopting and expanding on new construction requirements related to energy efficiency. The County should consider more stringent energy efficiency-related elements from the following rating systems and building codes:

a. International Green Construction Code, powered by ASHRAE Standard 189.1;
b. LEED v4.1; and
c. Green Globes.

2. Establish a consistent and reliable framework for building energy audits
Among the County's assets, buildings consume the largest amount of energy. To address this category effectively, the County should create a policy to adopt and utilize the latest version of ASHRAE Standard 211 *Standard for Commercial Building Energy Audits* on all current and future County building energy audits and require a minimum of an ASHRAE Level 1 Energy Audit for all County buildings by 2040.

To comply with the latest version of ASHRAE Standard 211, the County should create a

policy to utilize ASHRAE Building Energy Quotient (Building EQ) as a compliance pathway for its building energy audits.

Having an Energy Manager (EM) in each department to address facility energy consumption, amongst other energy items, all reporting to a director of a Resilience Department that is under the assistant county manager, would maintain consistency across County departments regarding energy audit implementation and facility assessment, as well as provide coordination of identifying, planning, and implementing recommended ECMs generated by the audits.

3. Quantify and assess the County's energy footprint

As a first step towards assessing the County's energy footprint, the County should quantify the energy consumption of all assets, both facility and non-facility assets.

Energy consumption in facilities can best be assessed through installation of dedicated building submeters, if a utility meter is not installed for the facility, submeters for facility systems consuming a substantial amount of energy, and a building automation system (BAS) to obtain metrics and track building energy consumption at more granular levels. Sensor installation to assess various metrics affecting facility systems, such as HVAC sensors, can be included with the BAS installation.

Non-facility assets should include, but not be limited to, the following:

a. Streetlights and lighting for public walkways, parks, recreation fields, and marine docks separate from buildings
b. Public parking lots and parking spaces with lighting, electric vehicle (EV) charging stations, and/or meter stations separate from buildings, excluding parking garages
c. Pumping and lift stations serviced by the County
d. County fleet vehicles.

With specific regards to county fleet vehicles, fuel type consumed and mileage should be identified with each vehicle.

Certain non-facility assets to be used for emergency purposes should be assessed in terms of type of fuel used and rate of energy produced, including emergency generators.

For facility assets, which include process plants for water, stormwater, and sewage treatment, the County should quantify the energy use intensity (EUI) of all County

facilities, benchmark each facility against other facilities of the same type within the same climate zone as defined by ASHRAE Standard 90.1 *Energy Standard for Buildings Except Low-Rise Residential Buildings*, and conduct ASHRAE Level 1 Energy Audits. To accomplish this, the County should use ASHRAE Building EQ to obtain free In Operation asset ratings.

As an alternative, the County may utilize the US EPA Energy Star Portfolio Manager program, which benchmarks each building against other buildings of the same type.

Energy audits of County-owned buildings should be scheduled based on prioritization and include, but are not limited to, the following:

a. Parks and Recreation buildings
b. County Government Center
c. County court buildings
d. County administration buildings
e. County Sheriff buildings
f. Fire Department buildings
g. Public Works buildings

The County should consider initiating a pilot program that includes college engineering students assisting professionals in completing ASHRAE Standard 211-compliant Level 1 Energy Audits for County buildings with the aid of ASHRAE Building EQ. This pilot program would orient County personnel with the means and methods of utilizing Building EQ and conducting an ASHRAE Level 1 Energy Audit, as well as engineering students with County procedures in relation to document and building access.

The local ASHRAE Chapter may provide suggestions of how to conduct such a pilot program, as one was successfully completed as a result of a collaboration between Brevard Public Schools, the ASHRAE Space Coast Chapter, and the ASHRAE Florida Institute of Technology Student Branch.

Assessing energy consumption establishes a baseline that may be used for identifying reductions in energy consumption and, eventually, documenting return on investment (ROI).

When assessing energy consumption, water consumption should also be a consideration, as many energy systems are connected to the utilization or production of

water. Water minimization and reuse should be considered in energy assessments and building energy audits.

The County should establish a timeline for completion of the energy assessment. Timelines need to be assessed on a case-by-case basis. An overall timeline should be set as a goal for this phase of the efficiency strategy to be completed.

4. Identify and implement energy conservation measures (ECMs) with County assets. Low-cost and no-cost ECMs for County assets, when identified through energy assessments and, in the case of facilities, through ASHRAE Level 1 Energy Audits, should be implemented in order to maximize energy reductions.

Higher cost ECMs may be paid through allocated budget funding, reinvestment of savings from implementing low-cost and no-cost ECMs, Guaranteed Energy, Water, and Wastewater Performance Savings Contracts (GEWWPSCs) authorized by Florida Statute 489.145, utility rebate programs, grants from other government agencies (e.g. federal, state, water management district), and other funding measures.

The following ECMs may be encountered and should be confirmed in energy assessments.

a. Provide weatherization of door, window, and other envelope sealants to minimize or eliminate conditioned or heated air leakage to the outdoors and infiltration of outdoor air.
b. Optimize HVAC controls and setpoints, lighting protocols, and operations of other energy-consuming systems with the building automation system (BAS). This optimization may include addition of controls and sensors to allow the BAS to have the HVAC system deliver the needed ventilation, heating, and cooling needed, resulting in reducing power consumption for eliminated waste heating and cooling.
c. Streetlights and lighting for public walkways, parks, recreation fields, and marine docks separate from buildings: Convert to LED lighting fixtures and/or light bulbs, depending on the assessed equipment.
d. Room occupancy sensors: Install lighting occupancy sensors in conference rooms, offices, and classrooms, and other rooms with intermittent occupancy. Avoid adding sensors to rooms containing high hazards and requiring machinery or electrical maintenance.
e. Emergency generators: Convert diesel to dual fuel (co-fire natural gas to extend run time and reduce cost).

f. County fleet sedans: Replace gasoline-fueled sedans and with electric-run sedans. Consult with any county policies for life cycle planning of County fleet vehicles to transition to EV use.
g. EV charging stations: Install at least one EV charging station at all County-owned buildings. For each County building, install the number of EV charging stations in proportion to the number of vehicles normally parked at the respective building. Consider partnering with FPL (e.g. through a Public-Private Partnership (PPP)) to evaluate EV charging station options and payment packages.
h. Solar photovoltaic (PV) installations: Install solar PV installations to support County assets, both facility and non-facility. As with considering other renewable energy sources, facilities should consider solar PV coverage based on energy consumption after ECMs are implemented. As a non-facility example, EV charging stations may be powered by solar PV installations with back-up battery equipment to reduce grid reliance and energy expenditure. As a consideration, FPL offers solar installations (e.g. solar "flags") that may be installed in visible areas to showcase the County's commitment to energy efficiency and reduction, obtaining a return on visibility. Additionally, consider exploring FPL Solar power purchase agrECMents for such solar installations.
i. Compressed natural gas (CNG) stations: Partner with Waste Management, FPL, and other companies with fleet vehicles (e.g. through a PPP) to install CNG stations at various County buildings. CNG stations may be strategically placed based on common routes of CNG-fueled vehicles.
j. Variable frequency drive (VFD) motor upgrades: Replace existing motors of pumps, fans, and other thermal and fluid machinery with VFD motors. Consult with any County policies for life cycle planning of County equipment and capitalization plans of equipment replacement to transition to VFD motor use. Consider prioritizing phase-in based on which facilities have higher HVAC and plumbing system use.
k. Process and compress captured methane from landfills and sewage treatment plants with CNG: Capture landfill gas (LFG) and sewage treatment methane for use with mixing with CNG and liquefied natural gas (LNG) in order to reduce methane release, resulting in improved environmental air quality and reduced greenhouse gas emissions

Water reduction and reuse measures should also be considered, especially if those measures are connected to energy systems. The following measures may be encountered and should be confirmed in energy assessments.

a. Low-flow sensor-detecting fixtures: Because sensor-detecting fixtures require a small amount of energy, install low-flow fixtures complying with EPA WaterSense to maximize water efficiency and reduction.
b. Condensate Capture for Landscape Irrigation: Capturing condensate for irrigation would reduce the amount of infrastructure needed to irrigate landscape using utility water systems.
c. Xeriscaping and Drought-Tolerant Plants: Modifying landscapes to include drought-tolerant plants and xeriscaping would eliminate the need for irrigation systems, reducing water consumption and, through system elimination, energy consumption.
d. Cooling Tower Improvements: Improving cooling tower performance, whether through cooling tower replacement or repair and maintenance procedure updates, may lead to energy and water reduction.

5. Review FPL service classification and consider alternative rate programs.
The County should consider hiring a Utility Manager for the Public Works Department who works with the EM and is dedicated to assessing and managing utility consumption by the County, reviewing utility rates, including demand, consumption, and energy offsets, including research utility rates for comparable municipal government entities, participating in utility rate negotiation, and providing insights on utility contracts and utility involvement in GEWWPSCs.

The EM or Utility Manager should review the County's FPL rate structures at its various properties and consider alternative rate programs, including those relating to discounted rates for off-peak periods. In addition to obtaining better rates, utilizing power at off-peak periods promotes grid stabilization and would position the County to become more resilient in the instance of periodic power brownouts or blackouts.

Should the County negotiate better rates for off-peak periods, thermal energy storage (TES) units may be installed for large buildings and campuses utilizing chilled water for air conditioning, resulting in greater use of power during off-peak periods to offset power usage during on-peak periods.

To avoid utilizing power during on-peak demand periods, the County may want to consider changing operational hours of some offices and services during summer

months (i.e. minimize operation between 3:00 pm and 6:00 pm). Also, should ECM implementation substantially lower energy consumption downstream of utility meters, the County may pay lower rate tariffs and fewer demand charges.

In addition to being an ECM, solar PV installations with battery units may be installed to strategically provide surplus power to battery units to reduce facility power usage during on-peak demand periods. During power outages and after hurricanes, these installations may also provide power for facilities to run emergency operations or at a percentage of full-service capacity.

Electric Utility Rates

FPL offers several rate options for commercial (County) customers that should be explored for possible cost savings.

Small commercial buildings are assigned General Service rates that include $0.075/kWh energy charge and no demand charge. Larger buildings can qualify for Time of Use rates of $0.08/kWh peak and $0.05/kWh off-peak with demand charges. Demand charges are calculated on the kWh consumed in any 15-minute window. If a facility consumes 400 kWh during on-peak period in a 15-minute window, its demand is 1600 kW, which can incur a $12/kW/month fee, or $19,200/month. Demand charges typically account for 25% of the total utility bill.

Consequently, buildings can implement some demand side management (DSM) techniques. That has traditionally included thermal energy storage, where air conditioning chillers make ice at night, and then melt the ice during the day's on-peak period to avoid running the chillers. FPL offers a rebate of $600 per kW to encourage the practice. These typically use the Time-of-Use rates to obtain the lower energy cost for ice making. Brevard Schools has 20 ice plants to reduce its demand charges.

FPL normally defines its summer peak hours at 12:00 PM to 9:00 PM, Monday through Friday, and charges $12/kW per month. It has a program to address its peak-peak hours of 3:00 PM to 6:00 PM, Friday through Friday. It will reduce its demand charge to $9/kW and forgive demand charges from 12:00 PM to 3:00 PM and 6:00 PM to 9:00 PM. The Seasonal Time-of Use Demand Rate (STDR) can significantly reduce summer utility bills. Ideally, facilities should change their occupancy hours to maximize savings (shut down at 3:00 PM). Brevard Schools changed its summer occupancy schedule for most schools to 6:00 AM to 3:00 PM. This saves approximately $550,000 each summer. Schools with ice storage do not have to shut down at 3:00 PM since the ice can provide

cooling for the three-hour period. Schools with 1,000-ton chillers receive a $10,000 per month savings.

FPL will conduct an analysis of County buildings to see which rate classification has the lowest annual operating cost. The County can change per account, or meter, once every year. This should be a priority for the new Energy Manager.

Battery technology will offer similar demand side savings. Unfortunately, FPL is not currently offering rebates for batteries, but may in the future. Battery costs are currently much higher than ice storage.

Financing Options, Including Energy Performance Contracting (EPC)

Lighting upgrades typically have a simple payback of 3-5 years based on energy savings. HVAC upgrades typically have simple paybacks of 7-10 years. Commercial loans have high interest rates and short loan periods (5-7 years). The County would probably not commit to a loan to pay for these upgrades.

The County may consider utilizing bonds to pay for energy conservation measures and use the savings to pay down the bonds. Green bonds exist for this purpose.

Some states permit local governments (city, county, school, and state) to enter into guaranteed energy-savings performance contracts. These can qualify for low interest rate (2%-3%) loans with loan periods of 20 years. That permits the energy service company (ESCO) to bundle many more energy conservation measures in the EPC project. The lighting upgrade will actually fund the upgrade of building automation systems (BAS), which have varied payback based on facility area and systems retrofitted. BAS upgrades are urgently needed to ensure proper measurement of metrics and controls of systems. This is often used as a funding vehicle for schools when referendums have repeatedly failed.

Florida statute mandates that the ESCO be qualified, that the ESCO conducts an investment grade energy audit, that the ESCO guarantees the savings, and a Measurement and Verification (M&V) program be implemented to prove the energy savings. Some states have established an independent energy manager to review the EPC and verify that it fulfills the state requirements. Some of the states also mandate an "open book pricing" model. It should be noted that there is no competitive bidding. The scope is negotiated. Typically, the contract is awarded based on an RFQ. There is no shortage of ESCOs. Most utilities have a non-regulated subsidiary ESCO, and most major HVAC equipment manufactures offer similar services.

The Energy Manager should investigate potential EPC opportunities, including a self-performing model as was done by the City of Orlando.

Cost Benefit Analysis for Energy Conservation Measures (ECMs)

Detailed discussions of the cost benefit analysis of ECMs are provided in NIST Handbook 135.[6] The National Institute of Standards and Technology (NIST) developed the Building Life Cycle Cost (BLCC) Programs to provide computational support for the analysis of capital investments in buildings. They include BLCC, the Energy Escalation Rate Calculator, Handbook 135, and the Annual Supplement to Handbook 135.

BLCC is a computer program available for download.[7] BLCC conducts economic analyses by evaluating the relative cost effectiveness of alternative buildings and building-related systems or components. Typically, BLCC is used to evaluate alternative designs that have higher initial costs but lower operating costs over the project life than the lowest-initial-cost design. It is especially useful for evaluating the costs and benefits of energy and water conservation and renewable energy projects.

The life cycle cost (LCC) of two or more alternative designs are computed and compared to determine which has the lowest LCC and is therefore more economical in the long run. BLCC also calculates comparative economic measures for alternative designs, including net savings, savings-to-investment ratio, adjusted internal rate of return, and years to payback.

The cost-benefit analysis for ECMs on a portion of County-owned facilities, selected based on information provided to WISER, is combined with the cost-benefit analysis for installing facility solar panels. The ECM cost-benefit analysis, developed by WISER, utilizes information and methodologies from the Department of Defense's Unified Facilities Criteria, which was dECMed to be appropriate for the initial financial planning of ECM implementation for government buildings under Brevard County. The combined analysis is found in Appendix 2.

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[6] Kneifel, J., Webb, D. 2020. "Life Cycle Costing Manual for the Federal Energy Management Program." Handbook 135. National Institute of Standards and Technology. https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=907459.

[7] U.S. Department of Energy. 2021. "Building Life Cycle Cost Programs." https://www.energy.gov/eere/femp/building-life-cycle-cost-programs.

Appendix 2: Facility Clean Energy Transition Plan and Cost Benefit Analysis

Overview

Clean energy solutions for facilities include solar PV systems, wind, and energy storage. The cost benefit models in the Appendix can optimize clean energy solutions using each of these clean energy solutions. Solutions focus primarily on solar PV systems, since they are currently more cost-effective compared to other clean energy solutions.

Wind power is an option that the county may pursue in partnership with a local utility or through a Guaranteed Energy, Water, and Wastewater Performance Savings Contract (GEWWPSC), as authorized by Florida Statute 489.145. The county should only pursue this option in a partnership and should not take full liability and responsibility of installing wind turbine generators on-shore or off-shore.

The steps required for an effective transition to clean energy for facilities are:

1. Identify and implement facility energy conservation measures (ECMs)
2. Transition electrical power sources to solar photovoltaic (PV) systems
3. Implement Resiliency where required
4. Monitor, measure and periodically report the status of the clean energy transition

The cost-benefit analysis for installing facility solar panels provided by WISER is combined with the cost-benefit analysis for ECMs. The combined analysis is found at the end of this Appendix.

Main References

Primary references used are the following U.S. Department of Energy documents:
1) Solar Powering Your Community: A Guide for Local Governments[8]
2) Guide to Implementing Solar PV for Local Governments[9]

Quotations from these documents will be referenced. The reader is encouraged to read and refer to these documents for additional information on transitioning to Solar Power.

Solar Power Options

Brevard County has two primary options for using solar power as a clean energy solution. Brevard County can either install solar on the rooftops and/or the land

[8] U.S. Department of Energy. 2011. "Solar Powering Your Community: A Guide for Local Governments." Report. Technical Document DOE/GO-102011-3020. https://www1.eere.energy.gov/solar/pdfs/47692.pdf.
[9] U.S. Department of Energy. 2014. "Guide to Implementing Solar PV for Local Governments." Report. https://solsmart.org/wp-content/uploads/ICMA_GuidetoImplementingSolarPVforLocalGovernments.pdf

surrounding the facility, or if available, they can purchase a portion of a utility scale solar farm from the utility provider, Florida Power and Light (FPL).

Rooftop or Customer Owned Solar Equipment
Purchasing and installing a solar PV system on the facility site is the most common method of taking advantage of the clean energy from solar. Solar PV systems co-located with the facility are a good choice for many reasons. Some of these reasons are listed below:

- Brevard County can better control the assumptions used in calculating the cost of ownership of rooftop solar PV. This control allows greater insight into potential payback of the solar PV investment.
- Rooftop solar PV systems can be upgraded with energy storage to provide resilient power for Brevard County facilities.
- Rooftop solar PV provides more efficient use of space than utility-scale solar, especially in states such as Florida where land continues to become scarcer with population growth on the rise.
- Rooftop solar PV contributes to a more decentralized utility grid. The current centralized utility grid is vulnerable to large-scale power outages caused by single point faults.

Example of SolarTogether Versus Rooftop Solar PV
FPL provides a tool to compare SolarTogether to local solar PV installations. A rough comparison is provided below for the Harry T. and Harriette V. Moore Justice Center. The power usage per month required for this analysis was calculated by dividing the value provided in the IGA for the Harry T. and Harriette V. Moore Justice Center by twelve.

As stated earlier, the 2020 SolarTogether program is not open for new participants. This analysis is shown as an example of what a similar program might provide in the future. The analysis results are shown in figure 2 below. Note that the rates may be considered higher and may not reflect exact costs and payback periods. The analysis should be used primarily for comparison purposes.

Figure 1. FPL Comparisons of Harry T. and Harriette V. Moore Justice Center. [10]

The program[11] that produced this analysis is provided by FPL. According to this analysis, the Harry T. and Harriette V. Moore Justice Center does not have sufficient roof space to accommodate the number of solar panels required to offset all of its power demands, assuming no ECMs are applied. The FPL SolarTogether program can offset all of the facility's power demands.

Utilizing Floating Solar PV

Brevard County should investigate building floating solar PV systems on the many retention lakes owned and maintained by Brevard County. Floating solar PV systems could be done in partnership with FPL. FPL partnered with Miami-Dade County in 2020 to build a floating solar PV system near the Miami International Airport. Floating Solar PV systems are also operational at Orlando International Airport, and Altamonte Springs Water Treatment facilities.

Electric Power Demand Charges and Mitigation

"Demand charges are designed as a way for utilities to recover costs associated with providing sufficient electricity generation and distribution capacity to their customers. By basing a portion of a customer's electricity bill on their peak level of demand, the utility

[10] CBSMiami. 2020. "FPL Launches Nation's First Floating Solar Array Near Miami International Airport." https://miami.cbslocal.com/2020/01/28/fpl-floating-solar-array-miami/.

[11] Florida Power and Light. 2021. "WattPlan." https://fpl.wattplan.com/PV/?manual=true.

distributes more of the costs associated with building and maintaining system capacity to those who contribute most to the need for increased capacity.

Demand charges are typically based on the highest average electricity usage occurring within a defined time interval (usually 15 minutes) during a billing period. Unlike electricity consumption charges, which account for the volume (kWh) of electricity consumed throughout a billing period, demand charges track the highest rate (kW) of electricity consumption during the billing period. The greater the need for electricity at any time during the period, the higher the customer's demand.

Demand charge rates vary considerably across utilities, locations, building sizes, and building types. Because the charges are based on the way in which each customer uses electricity, even two customers that consume similar amounts of electricity and are billed under the same utility rate may incur vastly different demand charge expenses. Despite the fact that demand charges often represent from 30%–70% of a commercial electric bill, many customers do not fully understand how demand is measured and billed."[12]

Demand charges can be reduced using a combination of solar PV systems and smart battery storage systems. Peak energy reduction is commonly referred to as "peak shaving." The solar PV system with battery backup equipment installed on-site can also provide backup power for power outages. If designed properly, this dual-purpose system can provide power resilience and save energy cost by reducing peak demand charges.

NREL, as well as many smart battery system suppliers, offer services to assist in development of solar PV systems with battery backup capabilities for reducing peak energy demand charges and providing power resilience. Because these systems rely on smart battery management systems, the cost benefit analysis is beyond the scope of this plan.

Solar Basics

"Solar Photovoltaic (solar PV) cells convert a portion of sunlight energy directly into electricity. When solar radiation in the form of photons penetrates a PV cell, it creates an electrical potential across the cell junction, exciting electrons and causing them to flow as a direct current (DC) through a closed circuit to a load, to which they impart their

[12] National Renewable Energy Laboratory. 2017. "Identifying Potential Markets for Behind-the-Meter Battery Energy Storage: A Survey of U.S. Demand Charges." Report. Document NREL/BR-6A20-68963. https://www.nrel.gov/transportation/assets/pdfs/behind-the-meter-storage-fy19-q2-progress-report.pdf.

energy before returning through the circuit back to the cell to be re-energized.

PV cells are assembled and interconnected into a long string - typically 60 or 72 cells in series - and encapsulated into a weatherproof PV module. Modules are then mounted outdoors as an array, connected together in series to form strings of a particular voltage, and then strings connected in parallel combine to provide the desired total current. The voltage rating times the current rating of all the parallel strings is the total power rating for the array. All modules are tested and rated under strictly defined Standard Test Conditions (STC) to assure consistency between different manufacturers.

"The direct current (DC) electricity generated by an array is usually converted by an Inverter to alternating current (AC) that can be consumed directly by AC loads, or exported to the electricity grid. PV system sizes vary widely, from small residential (a few kilowatts) to commercial (10-1000 kW), to large utility scale (1-100+ MW).

"This guide focuses on the implementation of distributed generation (DG) solar PV projects that are located on municipal-owned buildings or land and connected to the utility grid. Distributed solar PV systems are typically connected to the electric grid through municipality's electric meter at the main electrical service panel (or subpanel) and fed by an array located on a building rooftop, carport or on a parcel of land with an existing or new meter service. Distributed solar PV systems are not necessarily small in scale, and in fact, can range anywhere from residential size to very large rooftop or ground- mounted systems."[13]

[13] U.S. Department of Energy. 2014. "Guide to Implementing Solar PV for Local Governments." https://www.ibts.org/resources/guides/implementing-solar-pv-for-local-governments/.

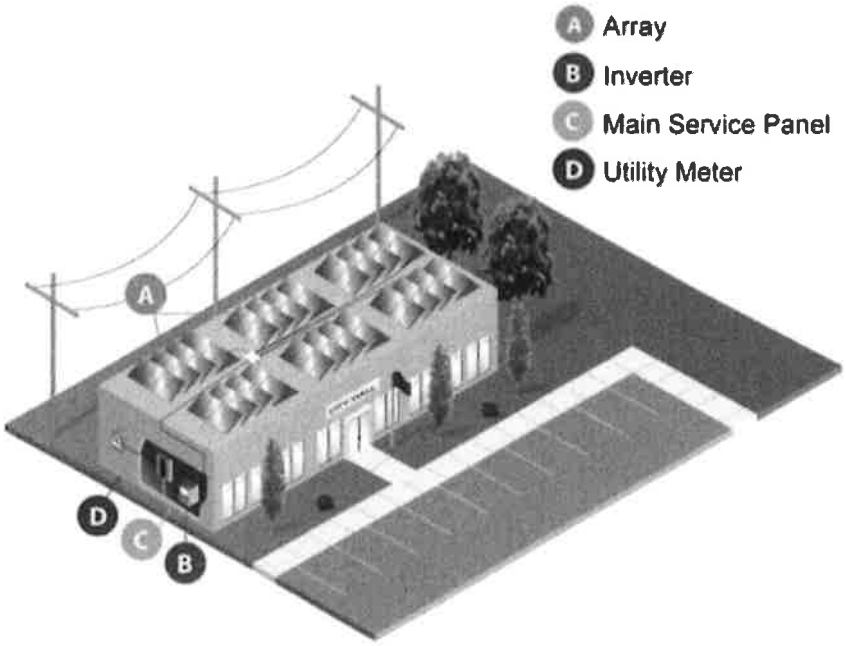

Figure 2. Solar PV System Diagram.

Net Metering and Utility Interconnection

"Net metering allows a particular location to export excess solar electricity onto the utility grid when the facility is not using all that is produced. When energy consumption exceeds solar production, power is drawn from the grid. The utility then nets out this exchange at the end of the billing cycle and charges the municipality only for the net energy consumed (energy delivered less energy received). Utilities might also credit received energy against consumption from other meters owned under the same account. States and utility territories have several variations of this process, including price differentials, where the price of electricity may differ for power supplied to, and taken from the grid system, and also may include caps or other limitations. One of the first steps in implementing solar PV is to get this information from the utility provider, as it will be an important part of the financial analysis and feasibility study.

"The great benefit of net metering is that during a high production time when the system is producing more than the facility is consuming, the excess energy is neither wasted nor required to be stored in expensive batteries, but instead is fed into the larger utility grid (spinning the utility meter backward) as a credit against consumption."[14]

[14] U.S. Department of Energy. 2014. "Guide to Implementing Solar PV for Local Governments." https://www.ibts.org/resources/guides/implementing-solar-pv-for-local-governments/.

Electrical Power Resilience

A city should create a Resilient Power Plan to address the impacts of severe weather and manmade adversities, with an ultimate goal of forming resilience hubs, community facilities that can serve to both address emergency management while have an ongoing goal of minimizing environmental impact. This plan should minimally have the following essential elements:[15]

1. Assign a person or group to be in charge of the designing and implementing the plan.
2. Identify the list of top critical facilities in need of protection.
3. Assess the critical power loads in each priority building/facility that needs power protection.
4. Determine the costs and technology options, including solar plus battery storage, for each resilient power system needed.
5. Find a good developer to design and build the project.
6. Identify financing options to get the job done at least cost, including new revenue streams based on battery storage grid benefits.

A graphical explanation of a resilience hub is provided in the figure below.

Figure 3. Explanation of a Resilience Hub. [16]

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[15] Sanders, R. & Milford, L. 2015. "What Cities Should Do: A Guide to Resilient Power Planning." White Paper. CleanEnergyGroup. https://www.cleanegroup.org/ceg-resources/resource/what-cities-should-do-a-guide-to-resilient-power-planning/.

[16] Traylor, J. 2020. "Signal found: Mercy Corps & community WiFi." https://www.mercycorps.org/blog/signal-found-community-wifi.

An example of successful resilient power planning is the Florida's SunSmart Emergency Shelter Program.

> *"Florida's SunSmart Emergency Shelter Program which has installed more than 115 solar+storage systems in Florida schools, supplying over 1 MW of solar generation capacity and providing resilient power to emergency shelters across the state. Each solar+storage system is composed of a 10-kW PV and battery array; combined, the 115 resilient power systems have the capacity to shelter up to 50,000 people during a disaster.*
>
> *"Electricity system resiliency focuses on preventing power disruption and, when an outage does occur, restoring electricity supply as quickly as possible while mitigating the consequences of the outage. Resiliency in energy services has always been a top priority, especially for critical or high-value facilities such as emergency response centers, hospitals, and shelters. Currently, diesel or gas-powered generators are relied upon for the majority of emergency power needs, though renewable energy and other forms of distributed generation are starting to play a role in energy resiliency."*[17]

The United States has seen an increase in the number of high-impact/high-cost natural disasters—seven of the ten costliest storms in U.S. history have occurred in the last ten years. These high-impact events have sometimes resulted in widespread and long outage durations, demonstrating that existing approaches to energy resiliency were not sufficient in some cases. This was due to several factors, including lack of generators or other forms of backup power; lack of refueling options for backup diesel generators; unreliable operation of backup generators; interruptions in natural gas and other fuel supplies; and aging infrastructure.[18]

The figure below shows factors for consideration when planning for resiliency. The NREL REopt Lite cost benefit analysis tool is discussed in detail in the cost-benefit section of this document. REopt Lite can be used to evaluate a facility resiliency design.

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[17] Sanders, R. & Milford, L. 2015. "What Cities Should Do: A Guide to Resilient Power Planning." White Paper. CleanEnergyGroup. https://www.cleanegroup.org/ceg-resources/resource/what-cities-should-do-a-guide-to-resilient-power-planning/.

[18] Anderson, K., Burman, K., Simpkins, T., Helson, E., Lisell L., and T. Case. 2016. "New York Solar Smart DG Hub Resilient Solar Project: Economic and Resiliency Impact of PV and Storage on New York Critical Infrastructure." NREL. Technical Report NREL/TP-7A40-66617. https://www.nrel.gov/docs/fy16osti/66617.pdf.

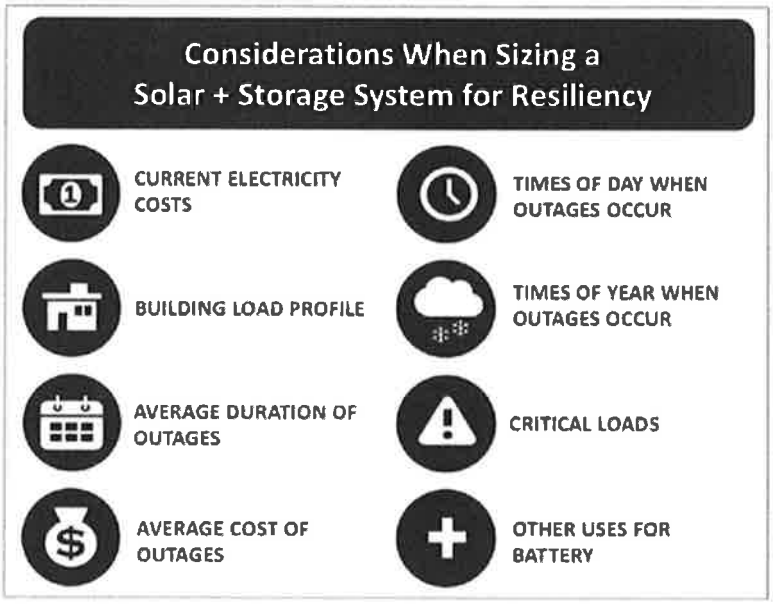

Figure 4. Considerations when sizing a solar and storage system for resiliency.

SolarResilient is a tool that estimates the required rating and physical size of grid-connected photovoltaic (PV) and battery energy storage to provide power for extended periods during a large-scale grid power outage.[19] SolarResilient is designed for buildings that form part of a city's resilience strategy; it allows building owners and city departments to develop equipment sizing before embarking on more detailed studies. When used on a portfolio of buildings, optimum performing scenarios can be selected to provide a holistic energy security strategy for a city or county.

The City and County of San Francisco's Department of the Environment developed a Resilient Solar and Storage Roadmap that is a detailed example for implementing solar and storage for resiliency.[20] This roadmap documents the project's steps of identifying critical facilities, surveying power requirements, assessing renewable potential, evaluating financing options to develop the solar and storage systems for resiliency, and modeling individual sites for solar and storage installation.

Feasibility Study Process Overview

The U.S. Department of Energy published a guide to implementing solar PV for local governments that details the feasibility study process.[21]

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[19] U.S. Department of Energy. 2017. "SolarResilient™." https://solarresilient.org/.
[20] City and County of San Francisco. 2017. "Resilient Solar and Storage Roadmap." Report. https://sfenvironment.org/sites/default/files/fliers/files/sfe_ee_solar_storage_roadmap.pdf.
[21] U.S. Department of Energy. 2014. "Guide to Implementing Solar PV for Local Governments." Report. https://solsmart.org/wp-content/uploads/ICMA_GuidetoImplementingSolarPVforLocalGovernments.pdf.

"The purpose of conducting a feasibility study for a solar PV project is to provide the municipality and its project partners and stakeholders with a general understanding of existing conditions, a review of potential risks, limitations and success factors, a financial assessment, and an outline of the requirements necessary to complete the project. An independent consultant typically conducts a feasibility study, as partners such as investors or other project stakeholders need assurance from an objective party that a municipality's project is sound. Feasibility research includes:

- *Basis of Design and Intent*
- *Evaluating Electricity Consumption*
- *Reviewing Potential Location*
- *Staff and Funding Assessment*

"The study begins then broadly examines existing conditions and assesses site conditions to determine if they are generally favorable for solar PV. Feasibility will also assess potential risks and limitations the project may encounter. In addition, as part of feasibility, project requirements including engineering (structural, electrical, geotechnical, environmental, or other), permitting, utility interconnection, technology, construction and general project timelines will all be reviewed. In addition, a general financial assessment is completed. Project costs and operating costs will not be known, but they will be roughly estimated, and potential revenue sources and energy savings will be identified.

"Once feasibility is complete, the municipality and its partners and stakeholders will have a broad understanding of the current status, site characteristics for solar PV, and risks and rewards to provide a general understanding of all that will be required to complete the solar project.

"If the feasibility study leads the community to move forward with the project, the next steps will include site selections, conceptual designs and initiation of the permit and utility interconnection applications."

Solar PV Implementation Steps

Assumptions for Solar PV Implementation

a) Each facility will only produce (at maximum) enough energy to power that facility. It is assumed that the value of over producing power is not cost effective at the current rate structures

b) Currently FPL does not pay a retail rate for excess power production in Brevard County. Given this price structure, solar PV power systems in Brevard County should be sized to produce no more than the expected yearly demand.

The primary steps needed to successfully transition to solar power are the following:

1. Identify all County facilities to be considered for new Solar power installation

2. Perform an initial desktop analysis to identify the potential for solar production (kWh per Year) on each county facility based on useable roof area or ground area (square feet).

3. Identify the annual energy consumption (kWh per Year) of each facility.

4. Rank each facility based on the **lesser** of the yearly energy usage value from step 3 and the potential yearly power production value from step 2 above. Facilities with the highest kWh value will be ranked highest.

5. Perform a detailed survey of each facility prioritizing those with the highest preliminary ranking

6. Update the priority ranking as required based on survey findings

7. Estimate the size of the Solar PV system (DC System Size (kW)) for the primary candidate facilities.

8. Perform an initial estimate for the cost of a solar energy system on the highest priority facilities

9. Perform a preliminary cost benefit analysis of the highest priority facilities

10. Determine financing plans for the solar energy systems with viable cost benefit analysis (using preliminary cost estimates)

11. Develop a detailed plan that indicates the order and approximate timeline for solar installation

12. Develop a request for proposal document to contract design and installation of selected solar energy systems

13. Rerun cost benefit analysis based on proposals received to confirm viability

14. Initiate installation of selected solar energy systems

15. Continue this process until all feasible facilities are equipped with solar energy systems

1. Identify locations

Table 1 includes a list of 14 facilities provided by the 2013 IGA. This list shows the address of 31 locations made up of 14 county facilities and 17 Libraries. The list also indicates the size of each facility in square feet. This list should be reviewed and expanded on by the Energy Manager (EM) for each respective department to ensure it includes the latest most accurate information.

Table 1. Brevard County Facility Locations and Size.

Facility	Sq. Ft.	Address
Moore Justice Center	203,394	2825 Judge Fran Jamieson Way, Viera, FL 32940
Melbourne Courthouse	26,942	51 South Nieman Avenue, Melbourne, FL 32901
Titusville Government Center Complex	163,774	400 South Street, Titusville, FL 32780
Government Center – Viera	284,095	2725 Judge Fran Jamieson Way, Viera, FL 32940
Detention Center	355,117	860 Camp Road, Sharpes, FL 32927
CSC- Titusville (Inc. Tax Collector and Archives)	140,331	700 Park Avenue, Titusville, FL 32780
CSC - Merritt Island	56,871	2575 North Courtenay Pkwy, Merritt Island, FL 32953
CSC – Melbourne	39,515	1515 Sarno Road, Melbourne, FL 32935
CSC - Palm Bay	14,267	450 Cogan Drive, Palm Bay, FL 32909
Fire Rescue Center - Rockledge	27,852	1040 Florida Avenue, Rockledge, FL 32955
District 3 Commissioner – Melbourne	1,250	1311 New Haven Avenue, Melbourne, FL 32901
Medical Examiner	11,000	1750 Cedar Street, Rockledge, FL 32955
Supervisor of Elections Warehouse	15,000	3850 Lake Drive, Cocoa, FL 32926
New Melbourne Warehouse	32,000	525 North John Rodes Blvd, Melbourne, FL 32934
Libraries		
Central Reference	96,081	308 Forrest Avenue, Cocoa, FL 32922
Central Reference House	3,280	219 Indian River Drive, Cocoa, FL 32922
Satellite Beach	20270	751 Jamaica Boulevard, Satellite Beach, FL 32937
Melbourne	25000	540 Fee Avenue, Melbourne , FL 32901
Melbourne Beach	15000	324 Ocean Avenue, Melbourne Beach, FL 32951
Eau Gallie	18900	1521 Pineapple Avenue, Melbourne, FL 32935
MLK	9600	955 University Blvd, Melbourne, FL 32901
North Brevard Library	30886	2121South Hopkins Avenue, Titusville, FL 32780
Port St. John Library	14864	6500 Carole Avenue, Port St. John, FL 3292
Merritt Island Library	23328	1195 N Courtenay Parkway, Merritt Island, FL 32953

DeGroodt Library	23601	6475 Minton Road, Palm Bay, FL 32908
Micco Library	10552	7921 Ron Beatty Boulevard, Barefoot Bay, FL 32976
Palm Bay Library	8496	1520 Port Malabar Boulevard, Palm Bay, FL 32905
Meadowlane Library	16195	2755 Wingate Blvd., W. Melbourne, FL 32904
Suntree Viera Library	15037	902 Jordan Blass Blvd., Melbourne, FL 32940
Cocoa Beach Library	25612	550 North Brevard Avenue, Cocoa Beach, FL 32931
Cape Canaveral Library	14750	201 Polk Avenue, Cape Canaveral, FL 32920
Total	**1,742,860**	

2. First cut assessment

"The first cut at assessing the solar energy potential of government-owned sites can be made remotely using aerial or satellite images in combination with solar mapping and resource- assessment software. These tools can estimate the amount of space available for an installation, identify shading issues, and estimate how much energy a particular solar technology will produce at that specific location".[22]

The probable Solar PV System power output measured in kWh/Year can be used for the initial prioritization. This value can be based on either roof or ground space available for solar panels. The National Renewable Energy Laboratory (NREL) developed the PVWatts® Calculator[23] that provides this information. The main inputs to PVWatts® are the street address, and the PV System size in kW. If the PV system size is unknown, the PVWatts® program can estimate the PV size in kW based on the user drawing a box around the area on the roof or ground where the solar panels will potentially be installed.

3. Identify the yearly energy use of each facility

Table 2 shows a list of 31 facilities and their energy usage. The baseline utility data for the IGA are based on 12 months of utility data provided from 2011- 2012. Table 4 below indicates the electric utility summary for the facilities audited for the IGA report.

This list needs to be reviewed and updated with the latest power consumption data. It is typically the role of an EM to maintain the power consumption information for County facilities. The analysis of the energy usage data could be completed by an energy savings contractor (ESCO); however, there are issues with hiring an ESCO, such as oversight for accountability and accessibility to the data. Access to reliable and accurate information

[22] U.S. Department of Energy. 2011. "Solar Powering Your Community: A Guide for Local Governments." Report. Technical Document DOE/GO-102011-3020. https://www1.eere.energy.gov/solar/pdfs/47692.pdf.
[23] National Renewable Energy Laboratory. 2021. "PVWatts Calculator." https://pvwatts.nrel.gov/

is another reason to hire an EM so that the County owns, in perpetuity, the measurement and verification data while tracking the success of the ETP.

As the progress of the ETP is measured and yearly energy use is measured and monitored by each department's respective EM, the County will have direct access to the data and to answer questions about the status of the ETP. This decision to hire EMs to complete this task has proven to be affective in the City of Orlando, the University of Central Florida, and other municipalities and public entities across the nation.

Table 2. Brevard County Facility Energy Usage Data.

Facility	kWh	kW
Moore Justice Center	3,884,000	9,663
Melbourne Courthouse	581,760	1,624
Titusville Government Center Complex	3,850,766	8,057
Government Center - Viera	4,227,600	11,710
Detention Center	7,205,749	13,157
CSC- Titusville (Inc. Tax Collector and Archives)	3,095,584	6,483
CSC - Merritt Island	567,060	1,686
CSC - Melbourne	620,003	1,639
CSC - Palm Bay	277,646	764
Fire Rescue Center - Rockledge	430,200	1,311
District 3 Commissioner - Melbourne	13,442	0
Medical Examiner	357,724	773
Supervisor of Elections Warehouse	9,967	0
New Melbourne Warehouse	N/A	N/A
Libraries		
Central Reference	2,150,640	4,074
Central Reference House	5,174	0
Satellite Beach Library	250,68	931
Melbourne Library	407,520	1,283
Melbourne Beach Library	213,997	810
Eau Gallie Library	381,540	1,104
Dr. Martin Luther King Jr. Library	182,520	732
North Brevard Library	650,700	1,731
Port St. John Library	221,552	718
Merritt Island Library	416,940	1,356
DeGroodt Library	346,920	1,227
Micco Library	154,440	592
Palm Bay Library	96,840	427
Meadowlane Library	246,420	838
Suntree Viera Library	204,445	1,168

Cocoa Beach Library	375,222	1,106
Cape Canaveral Library	153,008	532
Total	8,980,059	**75,496**

4. Ranking by maximum Solar PV production capability

For the initial ranking, each facility should be listed along with the **lesser** of the yearly energy usage value from step 3 and the potential yearly power production value from step 2 above. Facilities with the highest kWh value will be ranked highest.

Those facilities with the highest maximum kWh per year value will be ranked highest for this first cut ranking. These are the faculties with the most potential for financial gain from installing solar PV assuming everything else is equal. There are many additional factors that will determine what the best facilities are to install solar PV on. These additional factors will be examined as part of the detailed survey. This priority list only used to select which group of facilities to perform the detailed survey on first.

5. Detailed Survey

"After the sites with the most potential are identified, a trained site surveyor should perform a detailed on-site assessment of municipal buildings and property. Solar site assessments give insight into the economics, technical issues, and energy production potential for specific solar installations. This is a necessary first step in determining which buildings are most suitable and desirable. The assessments should include technical analyses of a building's energy load; roof age, type, and warranty; weight load limitations; available roof space (or ground space for a ground-mounted system); slope, shading, and orientation; optimal conduit paths; and electrical or water heating configuration. A solar developer, trained in-house employee, or qualified independent third party can perform site assessments."[24]

This survey is performed to identify or confirm the following:

1. Available roof area;
2. Roof age and condition;
3. Shading factors;
4. Electrical interconnection access;
5. Conduit routing;
6. Facility energy consumption;
7. Electrical meter location;
8. Potential inverter and disconnect mounting locations; and

[24] U.S. Department of Energy. 2011. "Solar Powering Your Community: A Guide for Local Governments." Report. Technical Document DOE/GO-102011-3020. https://www1.eere.energy.gov/solar/pdfs/47692.pdf.

9. Structural roof issues.

"Identify buildings with upcoming roof replacement scheduled and consider coordinating solar technology and roof installations. It is best not to install solar systems on roofs that need to be replaced in the near future because the solar panels must be removed and reinstalled on the new roof, increasing costs. An ideal approach for installations where roof penetrations are required is to integrate the technology into the structure during roof replacement instead of penetrating an existing roof."[25]

6. Update the priority ranking using information from detailed surveys

Use the detailed survey information to re-prioritize and identify those facilities that should be looked at first for solar energy installation. Facilities with the newest roofs, largest electrical power usage, and the capacity for producing the largest percentage of power with solar should be prioritized for earliest implementation.

Resilience is a critical consideration for prioritizing solar PV installation. Facilities that require backup power may benefit more substantially from solar PV systems. The value of having backup electric power at these facilities should be considered in their cost-benefit analysis. Solar PV and energy storage combine to provide resilient backup power in addition to reducing facility power costs.

It is also important to consider attrition; this refers to any plans for replacing a facility. If a building is scheduled to be replaced it can be rebuilt with the ECM and solar array built into the building designs. Any buildings that fall into this category will be ranked higher because it is easier to build energy efficient buildings than it is to retrofit existing buildings.

The list below shows additional categories to be considered when ranking each facility.

- Resilience Requirements
- Attrition
- Energy Consumption
- Number of ECMs to be Implemented
- Cost of Installing a Solar System
- Lifetime Remaining on the Existing Roof
- Roof Warranty

[25] U.S. Department of Energy. 2011. "Solar Powering Your Community: A Guide for Local Governments." Report. Technical Document DOE/GO-102011-3020. https://www1.eere.energy.gov/solar/pdfs/47692.pdf.

This step should be completed at least once each year. An EM would typically be responsible for this effort. Having a department and or individual who can collect and review this data regularly allows for this update to be completed for a minimal cost to the county. A simple Excel spreadsheet can be used to track the priority ranking.

7. Estimate of Solar PV system size

Once a facility or group of facilities has been selected as potential candidates for solar PV, the next step is to determine the size of the PV solar system(s) needed. This solar PV size estimate is needed as input for some cost benefit analysis models.

The maximum size of a PV system should be the size required to meet the **lesser** of the yearly energy usage and the potential yearly power production. Not all facilities have the capability to produce enough energy to meet their annual usage needs.

The basic formula to calculate the optimal size for a PV solar system is:

The **lesser** of the yearly energy usage and the potential yearly power production (kWh) divided 365 days then divided by 5 (kWh/m^2 per Day from NREL map) X 1.14 (to account for standard energy losses based on PVWatts® default) = **Size** (kW produced per hour of sunlight)

Example:

Reference: a facility that has an area available capable of producing 30,000 kWh a year but only uses 15,600 kWh a year.

The size of the system will be based on 15,600 kWh since the facility uses less energy than the roof area can produce.

For a facility that uses 15,600 kWh a year; the average usage per day = 15,600 kWh / 365 days/year = 42.74 kWh of energy per day.

The approximate PV system size required = (42.74kWh / 5) X 1.14 = **9.74 kW**

This is the power produced per hour of sunlight needed to meet the facility's yearly energy needs.

The PVWatt® tool can be used to improve the accuracy of this value. The PVWatt® tool considers actual weather data instead of the estimated kWh/m^2 per day value of 5.

To use PVWatt® tool first input the system size calculated using the basic formula above along with the facility street address. Then increase or decrease the system size value in

the PVWatt® tool until the calculated yearly power production meets the facility's yearly needs. The resulting system size value is the optimal value to use. For the example above the optimal size determined with the PVWatt® model is 10.26 kW.

8. Initial estimate of cost

Perform an initial estimate for the cost of a solar energy system installation for each of the highest priority facilities. The simplest technique to calculate the cost of a solar energy system installation is to multiply the estimated PV system size by the current average cost for a PV system per watt (W) for Florida.

Figure 5, below, shows US Department of Energy published average cost per kW for solar PV system installations from 2010 to 2018. More recent residential data for average cost per watt by state is available from.[26] The average cost per watt for residential systems in Florida in 2020 is listed as $2.69. This cost is before any discounts such as federal tax credits.

Example: The estimated cost for a 10.26 kW PV solar system based on the 2020 average cost per watt in Florida is $27,599 ($2.69 X 10,260).

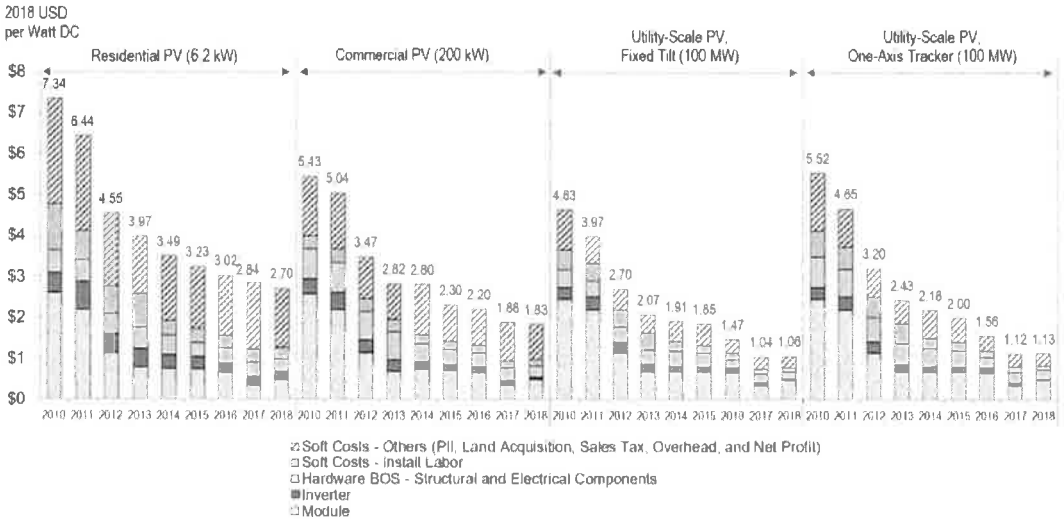

Figure 5. NREL PV system cost benchmark summary (inflation adjusted), 2010–2018. [27]

[26] Energy Sage. 2021. "The cost of solar panels in 2021: what price for solar can you expect?" https://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/.

[27] North Carolina Clean Energy Technology Center. 2017. "Business Energy Investment Tax Credit (ITC)." Database of State Incentives for Renewables & Efficiency." http://programs.dsireusa.org/system/program/detail/658.

9. Cost Benefit Analysis

Two models are recommended for the cost benefit analysis. These models are (1) the NREL REopt Lite: Renewable Energy Integration & Optimization model and (2) the NREL System Advisor Model (SAM).

Both of these tools are free to the public and include extensive user manuals and video tutorials. REopt Lite is available as an on-line tool, while SAM is available as a program download. Both models will produce similar results as they both use the same techniques and data sets. SAM is a more comprehensive modeling tool, but that complexity may not be required in all cases.

If possible, it is recommended that the cost benefit modeling be performed using both modeling tools as a double check on the analysis. It is easy to get incorrect results from these models if all the input parameters are not correct.

Note that the REopt Lite model can also be used to model resilience.

Discount Rate

"The discount rate is the interest rate used to determine the present value of future cash flows in a discounted cash flow (DCF) analysis. This helps determine if the future cash flows from a project or investment will be worth more than the capital outlay needed to fund the project or investment in the present."[28]

Discount rate is an important input to both of the cost-benefit analysis tools recommended in this document. This value can have significant impacts on the output of these models.

The discount rate value can be very different depending on the purpose of the cost-benefit analysis. If a business is performing the analysis, they will use a discount rate equal to what they could have earned investing their money for other capital expenditures for their business. An individual might apply a discount rate that is equal to what they could have earned if their money was invested in a savings or money market account.

[28] Investopedia. 2021. "Discount Rate." https://www.investopedia.com/terms/d/discountrate.asp.

A government or municipality typically would use a discount rate equal to the rate that they can borrow money at. Discount rates are frequently chosen to equal the loan rate to avoid introducing a time value of money to debt-financed capital.[29]

The recommended discount rate to use in these models is the current 20-year AAA Municipal Bond rate. 2% is the Current rate for 20-year AAA Municipal Bond.[30]

REopt Lite Web Tool

"The REopt Lite Web Tool evaluates the economic viability of grid-connected solar photovoltaics (PV), wind and battery storage at a commercial site. It allows building owners to identify the system sizes and dispatch strategy that minimize the site's life cycle cost of energy. REopt Lite also estimates the amount of time a PV and/or wind and/or battery and/or diesel generator system can sustain the site's critical load during a grid outage and allows the user the choice of optimizing for energy resilience.

"REopt Lite is a free, publicly available web version of the more comprehensive REopt model, which is described in REopt: A Platform for Energy System Integration and Optimization. The full REopt model is currently used by National Renewable Energy Laboratory analysts in the provision of project feasibility analysis support to clients. REopt analyses have led to more than 260 MW of renewable energy development.

"The REopt Lite Web Tool provides access to a subset of REopt capabilities and allows a broader audience to run site-specific, optimized, and integrated renewable energy decision analyses. This will help accelerate project development and deployment by greatly expanding access to the REopt capabilities, allowing users to implement some of their project feasibility assessments on their own.

"Users are cautioned that, although this model provides an estimate of the techno-economic feasibility of solar, wind and battery installations, investment decisions should not be made based on these results alone. Before moving ahead with project development, verify the accuracy of important inputs and consider additional factors that are not captured in this model. See Next Steps and REopt Lite Web Tool Results Caution for important details."[31]

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[29] Drury, E., Denholm, P., & R. Margolis. 2011. "The Impact of Different Economic Performance Metrics on the Perceived Value of Solar Photovoltaics." NREL. Technical Report NREL/TP-6A20-52197. https://www.nrel.gov/docs/fy12osti/52197.pdf.

[30] Fidelity. 2020. https://www.fidelity.com/.

[31] Anderson, K. et al. 2021. "REopt Web Tool User Manual." https://reopt.nrel.gov/tool/REopt%20Lite%20Web%20Tool%20User%20Manual.pdf.

NREL developed the REopt Lite model to be used for a commercial business. The federal tax rate needs to be set to zero to ensure this model represents a municipality cost benefit analysis. The federal tax credit is not available to municipal governments. Municipal governments are also not allowed to take advantage of capital cost depreciation. In addition, power savings are treated as added profits for a commercial business. The model assumes that the dollar amount of energy savings is taxed as added profit each year for a commercial business. The "host effective tax rate" input value in REopt Lite also must be set to Zero to eliminate all of these commercial business-related features. This is a very important value to input as the model output is sensitive to these parameters.

In addition, the REopt Lite model will assume NO net metering unless a maximum net metering size limit is entered. Any value less than 1,000,000 is valid. FPL allows net metering in Brevard County. A "net metering system size limit" value larger than the expected energy production value must be entered to ensure net metering is accounted for. It is unlikely that a system will actually exceed this limit. The net metering size limit for each individual system in Florida is 2MW. The cost benefit of solar power is diminished greatly without net metering.

This REopt Lite model provides an estimate of the techno-economic feasibility of solar, wind, and battery, but investment decisions should not be made based on these results alone. Before moving ahead with project development, verify:

- *The utility rate tariff is correct.*
  - *Note that a site may have the option or may be required to switch to a different utility rate tariff when installing a PV, wind, or battery system.*
  - *Contact your utility for more information.*
- *Actual load data is used rather than a simulated load profile.*
- *PV, wind, and battery costs and incentives are accurate for your location. There may be additional value streams not included in this analysis such as ancillary services or capacity payments.*
  - *There may be additional value streams not included in this analysis such as ancillary services or capacity payments.*
- *Financial inputs are accurate, especially discount rate and utility escalation rate.*
- *Other factors that can inform decision-making, but are not captured in this model, are considered. These may include:*

- *roof integrity*
- *shading considerations*
- *obstacles to wind flow*
- *ease of permitting*
- *regulatory and zoning ordinances*
- *utility interconnection rules*
- *availability of funding.*

The economic cost-benefit analysis within REopt is based on general economic theory. The approach and terminology are based on the *Manual for the Economic Evaluation of Energy Efficiency and Renewable Energy Technologies* and abides by the life cycle cost methods and criteria for federal energy projects as described by federal law.[32,33,34,35]

REopt Lite cost-benefit analysis for resilience [36]

"If you select resilience as your focus, there are a few extra inputs required. The first is critical load. This is the load that must be met during the grid outage that you specify.

"The critical load can be entered in three ways.

"The easiest way is to specify the critical load as a percentage. It can be higher or lower than the typical load, depending on the use of the building during a grid outage. To help estimate this number, consider factors such as: Does my whole building need power during an outage, or just portions? The percentage of critical load has a big impact on the outputs. Because it can be difficult to get an accurate estimate, you might want to try different levels of critical load—for example, 50%, 75%, and 100%.

"The most accurate way to enter the critical load is to upload it. This data may be available to you if there are submeters on individual buildings that are part of the critical infrastructure, or if a building has a critical load panel that is metered.

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[32] Short, W., Packey, D. J., and Holt T. 1995. "Manual for the Economic Evaluation of Energy Efficiency and Renewable Energy Technologies." Document NREL/TP-462-5173. https://www.nrel.gov/docs/legosti/old/5173.pdf.
[33] U.S. Government. 2021. Federal Code of Regulations 10 CFR Part 436 - Subpart A. https://ecfr.io/Title-10/sp10.3.436.a.
[34] Fuller, S., and Petersen, S. "Life-Cycle Costing Manual for the Federal Energy Management Program." NIST Handbook 135. https://nvlpubs.nist.gov/nistpubs/hb/2020/NIST.HB.135-2020.pdf.
[35] Cutler, D., Olis, D., Elgqvist, E., Li, X., Laws, N., DiOrio, N., Walker, A., and Anderson, A. 2017. "REopt: A Platform for Energy System Integration and Optimization." Technical Report NREL/TP-7A40-70022. https://www.nrel.gov/docs/fy17osti/70022.pdf.
[36] National Renewable Energy Laboratory. 2020. "REopt Lite Tutorial: Resilience Inputs." Document NREL/FS-7A40-76676. https://www.nrel.gov/docs/fy20osti/76676.pdf.

"Finally, you can build your own critical load profile from common load components. You must be logged in to do so. Through the build process, you can add load types, such as A/C units, lighting, or printers. The Power, Quantity, Start Hour, End Hour, Start Month, and End Month are all prepopulated by defaults, but can be adjusted. Once you save the critical load profile, it will be available for future analyses when you are logged in to REopt™ Lite.

"You will need to provide some information about the outage you want to model. The outage duration is specified in hours. For reference, 1 week is 168 hours. You can select the outage start date from the calendar, and the outage start time from the dropdown.

"You can also autoselect the outage start date based on your load profile. By clicking 'start outage on peak,' the maximum power requirement of your critical load will be included in the outage. This is a good way to plan for a worst-case scenario.

"You can also specify if this is an outage that occurs annually, or once per project lifetime. Your selection here will not impact the system sizes, just financial results.

"Finally, you can also evaluate the economics of adding a backup generator to meet the critical load during an outage. The generator won't run while the grid is operating.

"REopt Lite will size the generator for you. In this case, the model considers the costs and benefits of the generator, alongside the other technologies evaluated, to meet the outage at the lowest life cycle cost of energy.

"You can also specify an existing generator. In this case, the existing generator size will be the minimum size used in the optimization, but REopt Lite may still choose to add additional generator capacity.

"There won't be any installation costs for the existing generator, but the fuel costs will still apply. The default assumptions are for a diesel generator, but can be changed to reflect a natural gas option."

NREL System Advisor Model (SAM)
SAM is a performance and financial model designed to facilitate decision making for people involved in the renewable energy industry:

- *Project managers and engineers*
- *Policy analysts*
- *Technology developers*

- *Researchers*

SAM makes performance predictions and cost of energy estimates for grid-connected power projects based on installation and operating costs and system design parameters that you specify as inputs to the model. Projects can be either on the customer side of the utility meter, buying and selling electricity at retail rates, or on the utility side of the meter, selling electricity at a price negotiated through a power purchase agrECMent (PPA).

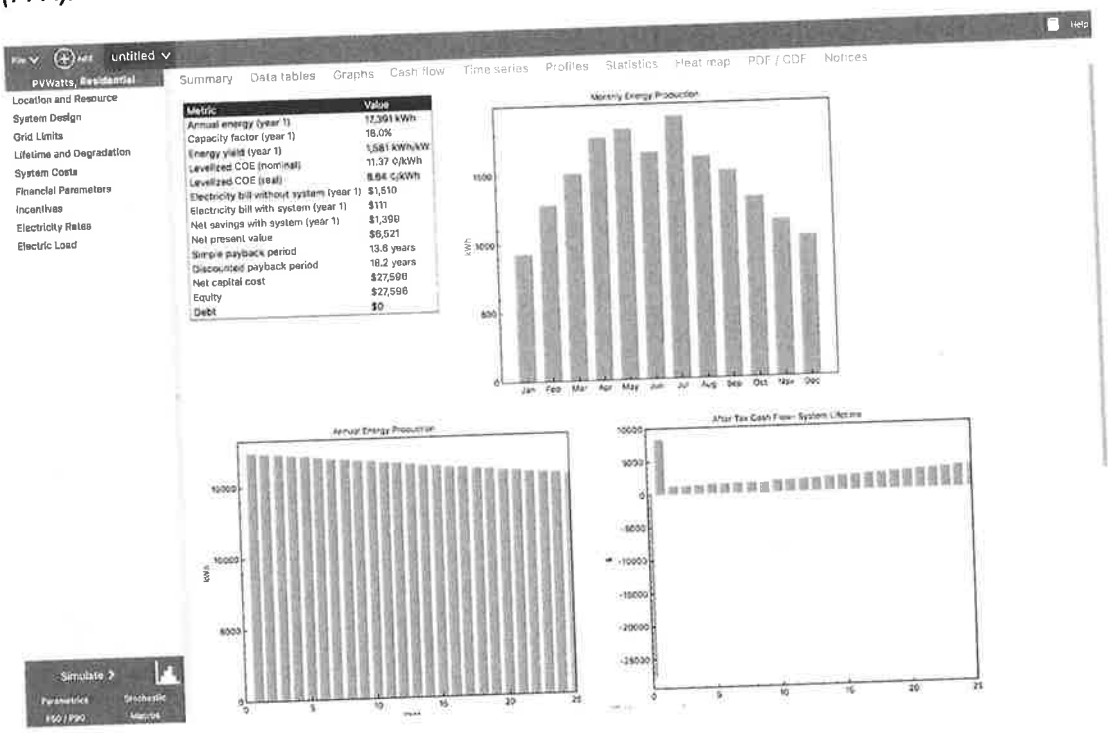

Figure 6. SAM Cost Benefit Analysis Model Output Example. [37]

For videos demonstrating how to use SAM for different kinds of projects, see the SAM website. The image above shows SAM's main window showing monthly electricity generation and the annual cash flow for a photovoltaic system.

The System Advisor Model (SAM) is a free techno-economic software model. SAM can model many types of renewable energy systems:

- *Photovoltaic systems, from small residential rooftop to large utility-scale systems*
- *Battery storage with Lithium ion, lead acid, or flow batteries for front-of-meter or behind-the-meter applications*

[37] National Renewable Energy Laboratory. 2021. "System Advisor Model (SAM)." https://sam.nrel.gov/.

- *Concentrating Solar Power systems for electric power generation, including parabolic trough, power tower, and linear Fresnel*
- *Industrial process heat from parabolic trough and linear Fresnel systems*
- *Wind power, from individual turbines to large wind farms*
- *Marine energy wave and tidal systems*
- *Solar water heating*
- *Fuel cells*
- *Geothermal power generation*
- *Biomass combustion for power generation*
- *High concentration photovoltaic systems*

SAM's financial models are for the following types of projects:

- *Residential and commercial projects where the renewable energy system is on the customer side of the electric utility meter (behind the meter), and power from the system is used to reduce the customer's electricity bill.*
- *Power purchase agrECMent (PPA) projects where the system is connected to the grid at an interconnection point, and the project earns revenue through power sales. The project may be owned and operated by a single owner or by a partnership involving a flip or leaseback arrangement.*
- *Third party ownership where the system is installed on the customer's (host) property and owned by a separate entity (developer), and the host is compensated for power generated by the system through either a PPA or lease agrECMent.*

- Detailed description of SAM[38]
- SAM model[39]

Some tips for using the SAM model are listed below:

1. This model requires the input of the System size
2. The model requires uploading weather data
3. Review of the Electric Load information is recommended. The scaling factor for this input should be adjusted so that the annual usage matches the facility annual usage value.
4. The electric rate escalation factor default value is 0. A realistic rate must be entered to provide accurate results. The REopt model default is 2.3%. The

[38] Blair et al. 2018. "System Advisor Model (SAM) General Description (Version 2017.9.5)." Document NREL/TP-6A20-70414. https://www.nrel.gov/docs/fy18osti/70414.pdf.
[39] National Renewable Energy Laboratory. 2021. "System Advisor Model (SAM)." https://sam.nrel.gov/.

current expected annual escalation rate for the price of electricity provided by a utility is -0.3%.[40] A graph from this report showing the expected price decline is provided below. The bar graph showing prices in 2020 through 2050 were used to calculate the rate of decline.

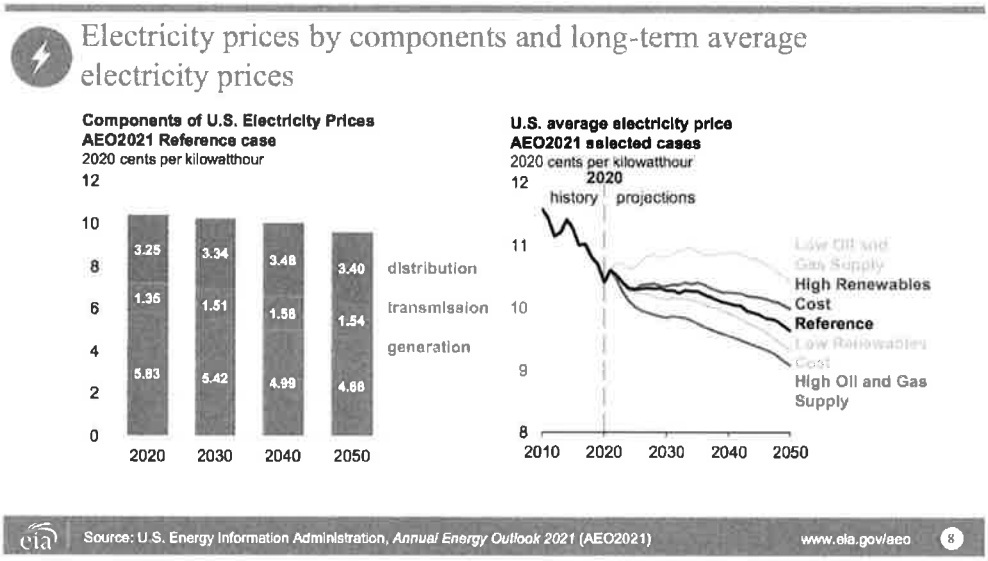

Figure 7. Declining Electricity Costs Forecasted in 2021 EIA Annual Energy Outlook. [41]

10. Financing A Solar Project

The cost benefits of Solar are minimized for municipal governments since they cannot take advantage of federal tax incentives and capital cost depreciation. Various financial arrangements can be used to gain back some of those benefits. Some financial arrangement for procurement of solar power can dramatically improve the cost benefit of solar for municipal governments.

The U.S. department of Energy, Sun Shot initiative produced an excellent document titled *Guide to Implementing Solar PV for Local Governments*.[42] The Financial Options section of the guide describes options for leasing solar power or solar power equipment. Leasing may enable municipal governments to share in the federal tax benefits such as depreciation and tax credits. Low interest municipal bonds are another option to consider for affordable financing for solar.

[40] U.S. Energy Information Administration. 2021. "Annual Energy Outlook 2021." https://www.eia.gov/outlooks/aeo/.
[41] U.S. Energy Information Administration. 2021. "Annual Energy Outlook 2021." https://www.eia.gov/outlooks/aeo/.
[42] U.S. Department of Energy. 2014. "Guide to Implementing Solar PV for Local Governments." Report. https://solsmart.org/wp-content/uploads/ICMA_GuidetoImplementingSolarPVforLocalGovernments.pdf.

Finance Example:
"In 2016, the City of Orlando approved a green bond to implement energy efficiency retrofits to 55 city buildings - including the Amway Center, City Hall, community centers, fire stations and more - in an effort to lower utility bills and achieve our clean energy goals. Since then, the city is saving more than $1.6 million in annual utility spending." (2018 Orlando Community Action Plan)

11. Detailed planning
The next step in implementing clean energy for facilities is to develop a detailed plan. The plan should include timelines for developing request for proposals, receiving and reviewing bids, requesting budget, developing funding methods, and installing solar PV on identified facilities.

12. Request for proposals
Request for proposals (RFPs) can be developed after facilities have been identified as good candidates for solar PV installation. This section provides recommendations on creating RFPs for solar PV projects. The knowledge in this section is based directly on the information provided by a US Department of Energy sponsored project – The Solar Foundation Project document: Steps to a Successful Solar Request for Proposal.[43] The quotes from this document have been selected and edited for applicability to Brevard County.

Early Involvement of a Broad Set of Stakeholders
Purchasing a solar energy system or services requires the expertise of a number of internal stakeholders outside of the procurement division. Including these stakeholders in the early stages of the RFP development process will enhance the success of the RFP that is finally issued. Local government staff with expertise in financial analysis will be required to advise on best practices for ensuring the proposals received will describe systems that are economically viable and that maximize the county's return on investment. Engineering staff will be needed to advise on a site's structural suitability for solar, and facilities staff can offer advice or identify any knowledge gaps (to be addressed by additional training or resources from the installer) regarding operations and maintenance requirements. Support from legal staff will be essential for ensuring the new solar RFP meets the requirements of applicable procurement laws and for the review of any PPA proposals. Because processes and priorities vary across jurisdictions, it is difficult to provide an exhaustive list of internal stakeholders. Each local government

[43] The Solar Foundation. 2012. "Steps to a Successful Solar Request for Proposal (RFP)." https://www.transformgov.org/sites/transformgov.org/files/306458_Steps%20to%20a%20Successful%20Solar%20Request%20for%20Proposal%20Fact%20Sheet.pdf.

should reach out to the various departments of which it is composed to determine who should be included in the RFP development process.

Outcome-Based Requests for Proposals

Outcome-based RFPs, focus on system output requirements rather than specific system-design criteria. Doing so will provide respondents the flexibility to design a system that will lead to the desired output at the local government's desired cost.

In designing an outcome-based solar RFP, however, it is important that this information be reported in a standard format that facilitates easy proposal review. Requiring all respondents to report system performance in terms of kilowatt-hours (kWh) of electricity generated annually over the system's lifetime or in the number of kilowatts (kW) of installed solar capacity will make the local government's review of these proposals much more efficient. To further improve the simplicity and accuracy of the comparison-making process, respondents should be encouraged to use either The NREL PVWatts Calculator and/or NREL's System Advisor Model (SAM) to calculate the Solar PV performance.

Provide Site Information and Conduct Site Assessments

As much as possible, Brevard County should provide potential respondents with as much information regarding relevant site characteristics as is technically or financially feasible. Such information can include aerial photography or topographic maps, facility energy load information, building plans, as well as shading, electrical, and structural analyses of the site. However, Brevard County's ability to conduct some of these analyses may be limited by financial constraints or the availability of in-house expertise. In some cases, the county may be able to pass some of these responsibilities (e.g., shading analyses) off to the respondent, who can recoup these costs in their bids they offer. If Brevard County decides to delegate some of these assessments to the installer or project developer, it is essential to ensure these respondents have easy and adequate site access to gather this information.

Given the complexity and the negotiations involved in solar procurement, many cities and town have found it advantageous to hire a consultant or owner's agent to guide them (and advocate for them) throughout the procurement process. Some states may even provide funding opportunities for municipalities to hire a consultant or owner's agent. For example, the Massachusetts Department of Energy Resources (DOER) has begun providing funding for owner's agent services, and the Merrimack Valley Planning Commission retains an energy management consultant to assist its member

communities with solar procurement and to develop a set of shared standardized procurement documents including RFPs and model contracts.

Key Solar RFP Elements
Brevard County should include as many of the following RFP elements as feasible or applicable to their unique circumstances, along with those elements required by applicable laws. Note that this is not meant to be an exhaustive list of RFP elements. Brevard County will likely want to include more elements than those listed on the following pages.

Roof Integrity and Warranties
For rooftop SWH or photovoltaic (PV) installations, it is necessary to ensure that the building is structurally sound enough to support a solar energy system and that it will continue to be during the project's estimated useful lifetime. A general rule is to select only roofs that will not require replacement for at least 15 years. In addition, roofs should be generally south-facing, avoid excessive shading from vegetation or nearby buildings, remain within acceptable ranges for wind and snow loads, have enough space to support a solar energy system of the size desired, provide for easy and tasteful electrical or plumbing connection, and have no significant aesthetic concerns preventing installation.

Respondents should also be required to ensure that the installation of rooftop solar energy systems will not adversely impact roof integrity or violate existing roof warranties. Contractors should be required to obtain written certification from the parties issuing or overseeing the roof warranty that the proposed solar installation will not nullify or void this warranty, or else provide their own warranty for the roof.

Financial Requirements
Respondents should be required to submit documents that adequately and accurately demonstrate their financial capacity to cover any applicable up-front design and installation costs, any administrative or other costs associated with development, and any costs associated with recurring responsibilities, such as operations and maintenance. These financial capabilities can be certified through statements from financial institutions, business references, annual reports, credit ratings, or other documents dECMed an acceptable substitute.

It is common practice for local governments to make the successful respondent fully and solely responsible for obtaining - and covering all costs associated with - any required permits (e.g., building, construction, electrical, plumbing, environmental, zoning, etc.) and utility interconnection agrECMents.

Team Qualifications and Solar Project Experience

Brevard County should request that respondents submit information indicating their qualifications to undertake the project in question. Company profiles, lists of relevant state licenses and industry certifications, proof of insurance, bonding safety ratings, project team background and qualifications, business references, and any solar project experience (e.g., total number and capacity of systems installed, differentiated by installation type; experience with certain technology brands; experience with grid interconnection) will help procurement staff identify the most qualified candidate for the contract.

Technical Specifications

This section should outline information on respondents' proposed technical approach and further information on the system equipment to be used. For a PV system, this can include information on module type (including brand name, model numbers, and technology), inverters (brand, type, and efficiency), monitoring and data acquisition systems, and balance of system components. However, in an effort to not be overly prescriptive, it is often advised that this section be completed by the respondent.

Operations and Maintenance

Although solar is relatively O&M free, the RFP developed by your procurement team should be cognizant of the operations and maintenance needs that do exist and either contract with the solar developer or another party to handle these responsibilities, or ensure that Brevard County staff has the training and resources they need to perform this function internally. If Brevard County chooses the latter option, the solar RFP should specify that the successful respondent is responsible for either providing the relevant personnel with O&M manuals or onsite training, or both.

Performance Monitoring and Performance Guarantees

An essential component for ensuring that Brevard County receives the product or service contracted through an outcome-based solar RFP is the monitoring of system performance. Such monitoring can accomplish a number of project goals besides merely ensuring system quality, such as tracking production for the purposes of calculating the number of renewable energy credits generated or demonstrating the benefits of the system to the community. At its most basic, system performance can be monitored through inverter kWh displays (for solar PV) or using flow meters and temperature sensors (for SWH). Similarly, given the relative predictability of solar PV output over time, it is not unreasonable to ask the respondent to provide some form of performance guarantee, especially when entering into a power purchase agrECMent.

Milestones with Completion Dates

To ensure the project proceeds as planned, respondents can be required to submit detailed project plans, listing major milestones and anticipated completion dates. Such milestones might include obtaining required permits, equipment purchasing, organizing project finance, commencement of construction/installation and system operation, and approval of interconnection requests. Some local governments have placed a premium on the value of these milestones, making payment for the project contingent on the contractor's ability to successfully adhere to his or her proposed schedule.

Equipment or Labor Origin Requirements and Community Benefits

Jurisdictions wishing to stimulate a local solar market or ensure that as many of the project benefits as possible are retained in the area can include requirements that respondents use local materials and/or labor. Similarly, Brevard County can include requirements within the RFP directing respondents to identify and describe any community benefits associated with the project being proposed.

Before a request for proposals is sent out a team of department heads from select departments lead by the EM should be assembled to review the proposals. Requests for proposals should be sent between steps 8. and 9. The initial cost estimate will give the review team a benchmark/ballpark figure to use as a reference point when reviewing the proposals. Proposals for ECM and solar arrays are competitive and will require a thorough review with the legal team to make sure each contractor is responsible for providing competitive warranties and guarantees that the energy production or reduction will achieve the goals of the ETP.

13. Rerun cost benefit analysis

The cost-benefit analysis for each project should be re-reviewed once proposals are received. This re-evaluation will be the final step to ensure the project costs are within budget and meet the cost saving goals.

14. Installation of selected solar energy systems

Installation of solar PV systems should be completed by the contractors. Contractor installation will ensure warrantees are not voided. Timelines for installation are typically a few months depending on the size of the project. County oversight of the installation process is recommended to ensure the system installed meets the requirements of the system contracted for. Installation typically will be broken down into three phases; site preparation, materials delivery and materials assembly.

15. Continuation

The process outlined in the previous 14 steps can be repeated and adjusted for each facility as the priority list dictates. As the return on investments begins to show profits

the money saved can be used to fund the continuation of purchasing future solar arrays and ECM.

Monitor system performance and promote benefits with the public
Once the solar systems are installed, measure how much electricity is being generated, how much money is being saved, and the carbon emissions abated. These indicators are essential for evaluating the program's success and for justifying further investment in county-owned clean energy.

Transitioning to clean energy will not only save Brevard County money and reduce pollution, but it will also make a substantial impact on cleaning up the Indian River Lagoon. The two primary pollution elements for the IRL are nitrogen and phosphorus. Figure 1 below is from a February 2021 presentation by Dr. Leesa Souto of the Marine Resources Council (MRC). As figure 1 below shows, 15% of the nitrogen is from atmospheric deposition. Atmospheric deposition sourced nitrogen is NOx. NOx comes from burning of fossil fuels. Figure 1 shows that Brevard County can eliminate 15% of the nitrogen pollution in the IRL through eliminating the burning of fossil fuels.[44]

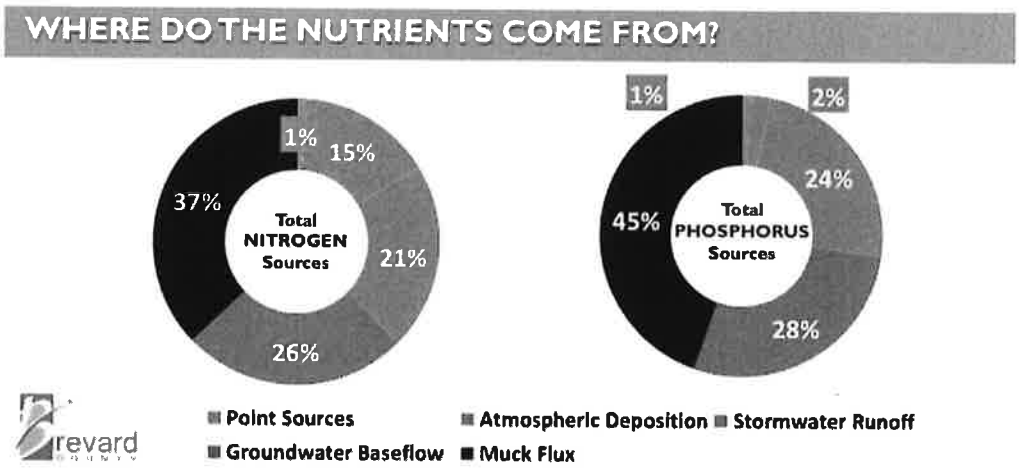

Figure 8. Source of Nutrients for the Indian River Lagoon

Clear indicators are also valuable tools for communicating the benefits of solar energy to the public, encouraging individuals, businesses and institutions to install or access energy produced by solar projects.

[44] Suoto, L. 2021. Presentation to Brevard County Board of Commissioners on the Indian River Lagoon. Marine Resources Council.

Appendix 3: Electric Vehicle Transition Plan and Cost Benefit Analysis

Introduction

The aim of this EV transition plan is to help Brevard County leaders understand and uncover the opportunities available to get municipalities on the path to electrify municipal fleets, public transit, and to help drive personal public investments in EVs through providing the necessary EV infrastructure. We hope this EV transition plan serves as a helpful guide as our community moves forward.

This section is primarily derived from the Electric Vehicle Municipal Toolkit[45] and Electrify the South.[46] Changes have been made to align this information to Florida and Brevard County.

Two additional noteworthy resources for EV transition are Electric Vehicles and EV Infrastructure – an introductory guide for Southeast Florida,[47] and Electric Vehicle Procurement for Public Fleets.[48]

The effort to implement this Electric Vehicle Transition plan will require dedicated Brevard County staff members. The recommendations presented should be accomplished as part of the responsibility of the Energy Manger position suggested earlier in this report.

Electric vehicles now include cars, transit buses, trucks of all sizes, and even big-rig tractor-trailers that are at least partially powered by electricity. Electric vehicles are here to stay and internal combustion engines are becoming obsolete.

As of 2019, nearly 60,000 PEVs were on the road in Florida. Approximately two-thirds of these are fully electric battery electric vehicles (BEVs), while the remainder are plug-in hybrid electric vehicles (PHEVs). The three most popular vehicles are the Tesla Model 3 (BEV), Tesla Model S (BEV), and the Chevrolet Volt (PHEV). The growth in PEV registrations is shown in Figure 8 below. This document was developed to assist Brevard County in preparing for the inevitable evolution to electric vehicles.

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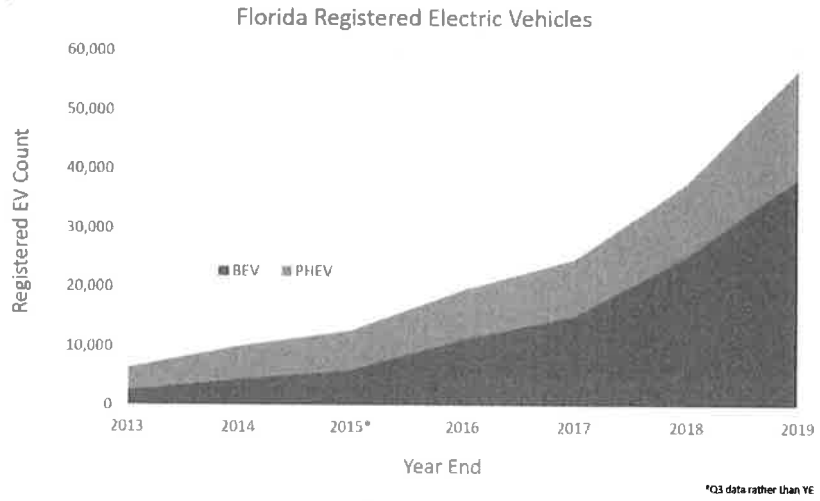
[45] ElectrifyNY. 2019. "Electric Vehicle Municipal Toolkit." https://electrifyny.org/ev-municipal-toolkit/.
[46] Southern Alliance for Clean Energy. 2021. "Promote EV Charging Access and Infrastructure." https://www.electrifythesouth.org/charging-infrastructure.
[47] Southeast Florida Regional Compact Climate Change. 2020. "Electric Vehicles and EV Infrastructure." https://southeastfloridaclimatecompact.org/wp-content/uploads/2020/06/EV-Guidance-06-12-2020.pdf.
[48] Nigro, N., Walsh, A. 2017. "Electric Vehicle Procurements for Public Fleets." https://atlaspolicy.com/wp-content/uploads/2017/10/Electric-Vehicle-Procurements-for-Public-Fleets.pdf.



Source: Florida Power & Light

Figure 9. Growth of Electric Vehicle Registrations in Florida

The growth of EV charging stations is also noticeable in Brevard County. Figure 9 below provides a snapshot of EV charging facilities, excluding residences and commercial buildings where EV charging is provided to residents and clientele, respectively.

Figure 10. Electric Vehicle Charging Stations in Brevard County. [49]

[49] Map and information courtesy of Google Maps.

The transportation sector is a significant source of climate pollution, including sizeable greenhouse gas emissions. Emissions from tailpipes are also responsible for smog, soot, and other toxins that contribute to adverse health outcomes, particularly in children and those suffering from chronic illness.

As a shift in EV use increases, nearly all of the major global automakers have made commitments to transform their platforms to focus on new lines of electric vehicles over the course of the next few years. General Motors announced it will end production of petroleum powered vehicles by 2035, Ford will go all-electric in Europe by 2030, Jaguar will only sell electric powered vehicles beginning in 2025. In January 2021 federal officials began work to devise a plan for converting all federal, state, local and tribal fleets, including 225,000 Postal Service vehicles, to "clean and zero-emission vehicles." Transitioning from vehicles powered by internal combustion engines to a transportation system powered by electricity will take careful planning and preparation.

Aside from the health and environmental benefits that come with reductions in air pollution and meeting state climate change mandates, transitioning to electric vehicles will bring significant economic benefits to households, businesses, and governments.

Electric vehicles are simply more efficient than their gas-consuming counterparts, costing 50 to 70 percent less to operate. Electric vehicles have fewer moving parts than those powered by internal combustion engines, meaning a reduction in maintenance costs, which can be significant when it comes to managing municipal fleets. Fuel savings over the life of an electric vehicle can add up to thousands of dollars.

Local governments across the country are leading the way in facilitating the transition to a clean, electric transportation future.

The aim of this EV transition plan is to help Brevard County leaders understand and uncover the opportunities available to get municipalities on the path to electrify municipal fleets, public transit, and to help drive personal public investments in EVs through providing the necessary EV infrastructure. We hope this EV transition plan serves as a helpful guide as our community moves forward.

For those municipalities which have adopted a renewable energy commitment, such as the Ready for 100[50] resolution to reach 100% clean, renewable energy by 2035 for electricity and 2050 for heat and transportation, the ETP contributes to the resolution

[50] Sierra Club. 2021. "Ready for 100." https://www.sierraclub.org/ready-for-100.

objective of developing an energy transition plan for municipal operations and the community.

Lead by Example: Establish Policy Commitments and Goals

National and state commitments are an important step in moving the country off of fossil fuels, translating these goals into action occurs at the local level. Local leaders can drive progress by promoting the widespread adoption of EVs. Not only are they a viable alternative to gas- and diesel-fueled vehicles, but they are also a wise investment that will serve to benefit the economic bottom line of local governments, businesses, and households. Leadership starts by committing local government to an EV transition and pushing the state and federal governments for the resources to succeed.

Procurement Goals

Set procurement goals for how many electric vehicles should be in the Brevard County fleet in years to come. These goals could be achieved in several ways:

1. Develop an electric vehicle acquisition goal
2. Consideration of electric vehicles first for light-duty
3. Preference for low/no emission vehicles
4. Allow for "Total Cost to Own"[51] to justify EV purchase, versus only upfront purchase price
5. Leasing options (gaining access to the federal EV tax credit)[52]

Examples:

- Coral Gables, FL: 78 electric vehicles by fiscal year 2021[53]
- Largo, FL: 100% electric and hybrid light-duty vehicles[54]
- Broward County, FL: purchase of only zero-emissions electric fleet and transit vehicles by 2030[55]
- Sarasota, FL: 90% electric vehicles by 2024[56]

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[51] City of Seattle, Washington. 2016. Resolution 31696. http://seattle.legistar.com/View.ashx?M=F&ID=4623379&GUID=FBC95DD0-30F9-415F-BE54-84F158816AF8.

[52] U.S. Department of Energy. 2021. "Federal Tax Credits for New All-Electric and Plug-in Hybrid Vehicles." https://www.fueleconomy.gov/feg/taxevb.shtml.

[53] City of Coral Gables, FL. 2016. "Electric Vehicles and Charging Stations." https://www.coralgables.com/electricvehicles.

[54] City of Largo, Florida. 2018. "Largo Environmental Action Plan." https://www.largo.com/document_center/City%20Manager's%20Office/Largo%20Environmental%20Action%20Plan.pdf#page=36.

[55] Broward County Commission. 2018. Agenda Item 28112 for Resolution 2018-607. https://cragenda.broward.org/agenda_publish.cfm?dsp=agm&seq=28112&rev=0&id=0&form_type=AG_MEMO&beg_meetmth=1&beg_meetyr=2018&end_meetmth=6&end_meetyr=2020&mt=ALL&sstr=electric%20fleet&dept=ALL&hartkeywords=&sortby=f.form_num,%20f.rev_num&fp=ADVSRCH&StartRow=1.

[56] City of Sarasota, Florida. 2019. "Environmental Preservation/Sustainability Goals – Fleet Directive." https://docs.wixstatic.com/ugd/05844a_553c2246a81e4174b413262f25131cc1.pdf.

- Boulder County, CO:
  - Background[57]
  - Resolution[58]
- Seattle, WA:
  - Action Plan[59]
  - Resolution[60]
- New York City: Background[61]
- San Antonio, TX: EV Fleet Conversion and Infrastructure Study[62]

Perform Analysis to Transition Fleet to EVs

Brevard County can perform the following steps to transition their vehicle fleet to electric powered vehicles.

1. Document Vehicle Fleet Information
2. Identify vehicles near end of service
3. Calculate cost benefit analysis to replace end of service vehicles with EVs
4. Present preliminary analysis for approval
5. Initiate quotes for EV replacements upon approval
6. Update analysis using detailed quotes and submit for approval
7. Repeat analysis each budget cycle

An Excel based cost benefit analysis tool (Brevard EV Cost Benefit Analysis Tool) is included in the WISER documents for use in this process. Details of this analysis tool are provided in the Electric Vehicle Transition appendix.

Advocate for electric vehicle policies and incentives

Brevard County officials can play an important role in advocating for electric vehicle policies and incentives at the state and federal level that assist local government efforts. Brevard County officials can lobby for enhanced rebates and tax credits for electric vehicles and charging infrastructure, funding for municipal and public transit fleet

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[57] Fryar, J. 2018. "Boulder County promises transition to electric government vehicle fleet." The Denver Post. https://www.denverpost.com/2018/11/13/boulder-county-electric-cars/.

[58] Board of County Commissioners of Boulder County. 2018. Resolution 2018-120. https://assets.bouldercounty.org/wp-content/uploads/2018/11/resolution-2018-120-GoEV-community.pdf.

[59] City of Seattle, Washington. 2019. "Green Fleet Action Plan." https://www.seattle.gov/Documents/Departments/FAS/FleetManagement/2019-Green-Fleet-Action-Plan.pdf.

[60] City of Seattle, Washington. 2016. Resolution 31696. http://seattle.legistar.com/LegislationDetail.aspx?ID=2811912&GUID=9E735C1F-A4C2-4358-B5EF-6007CE47D037&FullText=1.

[61] City of New York, New York. 2015. "NYC Clean Fleet." https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC Clean Fleet.pdf.

[62] City of San Antonio, Texas. 2019. "Electric Vehicle Fleet Conversion and City-Wide Electric Vehicle Infrastructure Study." https://www.sanantonio.gov/Portals/0/Files/Sustainability/ElectricVehicles/EVFleetConversion-EVInfrastructureStudy.pdf.

conversions, and policies promoting vehicle to grid utility tariffs and electric vehicle-ready building codes. State and federal initiatives can help to drive action at the local level.

Commitments/Goals

The first step for Brevard County committing to EVs is to make a public commitment to fleet electrification. This can happen through a resolution, statement of support, or the adoption of a law directing a transition to an all-electric municipal fleet by a certain date. Codifying a commitment in a local law or ordinance is optimal but gaining local political support may take different forms at the start.

The WISER board members recommend that Brevard County establish requirements for the Energy Manager to continue development of a more detailed comprehensive transition plan that includes an assessment of the existing fleet, EV procurement schedules by vehicle class, special considerations for emergency and heavy-duty vehicles, and infrastructure and maintenance investments.

Examples:

- Mayor of the City of Seattle: Executive Order committing to a phase-out of fossil fuel municipal vehicles by 2030[63]

Advocate for electric vehicle policies and incentives

Brevard County officials can play an important role in advocating for electric vehicle policies and incentives at the state and federal level that assist local government efforts. Brevard County officials can lobby for enhanced rebates and tax credits for electric vehicles and charging infrastructure, funding for municipal and public transit fleet conversions, and policies promoting vehicle to grid utility tariffs and electric vehicle-ready building codes. State and federal initiatives can help to drive action at the local level.

Electrify Municipal Fleets

Transitioning to all-electric vehicle fleets for light and heavy-duty vehicles requires thoughtful long-term planning and the ability to tap into resources to facilitate the transition. This section highlights some of the tactics and tools to help ensure successful conversions.

[63] Hightower, K. 2018. "Mayor Durkan Issues Executive Orders Underscoring Seattle's Climate Commitment." Office of the Mayor, City of Seattle. https://durkan.seattle.gov/2018/04/mayor-durkan-issues-executive-orders-underscoring-seattles-climate-commitment/.

Comprehensive fleet assessment

Developing a baseline of the existing municipal fleet is critical. Brevard County should conduct a comprehensive fleet assessment of all light, medium and heavy-duty vehicles to inform the development and implementation of a strategic multi-year fleet replacement plan. The plan can be used to establish annual electric vehicle procurement benchmarks allowing the Brevard County to develop sustainable funding plans for vehicle purchases, charging infrastructure, and fleet maintenance.

Examples:

- The Drive Clean Seattle Implementation Strategy[64]
- The City of Minneapolis Electric Vehicle Study[65]

Aggregate purchasing and shared services

One strategy that can help with the transition is partnering with other government entities to examine the feasibility of obtaining more favorable terms on electric vehicle purchases and leases. Brevard County can structure request for bids to enable capture of federal tax credits. Brevard County can also look for cost-saving opportunities through centralized fleet maintenance operations with shared service agrECMents.

Example:

- Capturing the Federal EV Tax Credit for Public Fleets, Alameda County, CA[66]

The Climate Mayors Electric Vehicles Purchasing Collaborative

The Climate Mayors Electric Vehicles Purchasing Collaborative,[67] a group of over 400 municipal leaders across the country committed to climate action, works to leverage the buying power of the Climate Mayors cities to reduce the costs for EVs and charging station acquisition for all cities in the U.S. to accelerate city fleet transition. The Collaborative is a resource for training, best practices, educational materials, and analysis support for your municipality's EV transition. Additionally, the Collaborative can help identify and prioritize which vehicles to transition first. Contact jwalker@electrificationcoalition.org for more info on how the Collaborative can assist Brevard County.

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[64] City of Seattle, Washington. 2017. "Drive Clean Seattle Implementation Strategy." http://www.seattle.gov/Documents/Departments/Environment/ClimateChange/Drive_Clean_Seattle_2017_Report.pdf.

[65] City of Minneapolis, Minnesota. 2017. "Electric Vehicle Study." https://lims.minneapolismn.gov/Download/RCA/2361/10_Municipal Fleet Electric Vehicle Study.pdf.

[66] EV Smart Fleets. 2017. "Capturing the Federal EV Tax Credit for Public Fleets." https://www.georgetownclimate.org/files/report/Capturing-the-Federal-EV-Tax-Credit-for-Public-Fleets - Case Study.pdf.

[67] Climate Mayors Electric Vehicles Purchasing Collaborative. 2020. "Drive EV Fleets | Climate Mayors." https://driveevfleets.org/.

Heavy Duty Vehicles

Municipalities can begin to transition heavy duty fleets to EVs once a comprehensive fleet assessment is undertaken. Knowledge of drive cycles, duty cycles and operational considerations help the fleet manager estimate what charging infrastructure will be needed, and how often charging will be required. While heavy duty EVs are still becoming optimized for increased range performance, municipalities can ask utility companies to help with charging needs through providing EV infrastructure. Some states such as New York offer incentives to help make the transition to heavy duty vehicles, such as NYSERDA's Truck Voucher Program.[68]

Example: Utility Incentives - PG&E provides incentives for heavy duty fleet conversion[69]

Natural Gas Powered Vehicles

Natural Gas (NG), Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), and RNG (Renewable Natural Gas), and Propane (LP) are all considered equal in this discussion. NG is arguably the cleanest of these gas fuel options.

Transitioning to NG powered vehicles is not considered as a transition to clean energy. Clean energy sources are identified as clean because they eliminate or significantly reduced greenhouse gas emissions. NG when used to power vehicles does not significantly reduce greenhouse gas emissions.

A gasoline powered vehicle produces 430 grams of CO_2 equivalent emissions per mile (gCO_2e/mi), and a NG powered vehicle produces 390 gCO_2e/mi. The NG powered vehicle produces a slight 9.3% reduction in greenhouse gas emissions.[70]

An EV powered by electricity from a NG powered power plant produces only 200 gCO_2e/mi. An EV using NG based electricity is 53% cleaner than a gasoline-powered vehicle. An EV powered by electricity produced with solar and/or wind would produce even substantially less greenhouse gas emissions.

Transitioning vehicles to NG is not a recommended path to clean energy. Investment in NG retrofits or new vehicles, NG infrastructure, maintenance infrastructure, and training will be better spent preparing for transitioning to an EV based fleet.

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[68] New York State Energy Research and Development Authority. 2020. "Truck Voucher Incentive Program." https://www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program.

[69] Pacific Gas and Electric Company. 2021. "EV Fleet Program." https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page.

[70] Office of Energy Efficiency and Renewable Energy. 2015. "Using Natural Gas for Vehicles: Comparing Three Technologies." Technical Report. Document DOE/GO-102015-4685. https://www.nrel.gov/docs/fy16osti/64267.pdf.

Port Canaveral is the second largest cruise ship port in the US. We are awaiting the arrival of the newly fabricated Carnival Mardi Gras, the first LNG-fueled cruise ship in the US. Carnival, Disney, Royal Caribbean, and TUI will all be sailing LNG-fueled cruise ships out of Port Canaveral. No more heavy diesel fuel will be used, a huge environmental victory! Additionally, launch service companies utilizing launch complexes at Kennedy Space Center and Cape Canaveral Space Force Station will be transitioning from kerosene and liquid oxygen rockets to liquid methane (LNG) rockets. Elon Musk stated that methane will fuel the colonization of Mars. FEC Industries is building an LNG plant in Titusville that will produce the LNG for the cruise ships and NASA, but also for power plants throughout the Caribbean. LNG will be the number one export for Brevard County.

Unfortunately, natural gas (methane) contains carbon, which is being targeted for elimination as part of the global warming response. We have moved from a "net zero energy" goal to a "net zero carbon" goal. California cities are prohibiting the installation of natural gas equipment in residential buildings, and California banned coal decades ago.

Although Brevard County could consider embracing a Net Zero Carbon philosophy, the effects on local industry may be inhibitive. An industry-led initiative, supported by the County with incentives, may be a better solution should the County want to pursue this route.

More immediately, a better route would be to embrace the "half a loaf is better than none" philosophy. Natural gas is clean burning, plentiful, and produced in the US. Natural gas is far superior to heavy diesel fuel. It will be the bridge until we develop commercially viable batteries. And it will continue to be used for back up, intermittent usage.

Methane is 21 times worse for global warming than carbon dioxide. By combusting natural gas, we produce one unit of carbon dioxide and two units of water. If we can capture methane, prevent its release into the atmosphere, and convert it to carbon dioxide to produce power, we are actually reducing our carbon footprint.

EV Cost-Benefit Analysis

The cost of EVs is decreasing rapidly. Soon EVs will be more cost effective to operate than internal combustion vehicles. Brevard County should review <u>all</u> vehicle purchases taking into account Life Cycle Costs (LCC) cost-benefit analysis. Brevard County must be

vigilant in taking advantage of the universal shift to clean energy mobility to ensure effective use of taxpayer funds.

Recent headlines point to the future of EVs:

- According to Plug-in Electric Vehicle Cost-Benefit Analysis: Florida: "PEVs are projected to provide a lower total cost of ownership than conventional vehicles in Florida by about 2035, even without government purchase subsidies."[71]

- *Bloomberg New Energy Finance has suggested that EVs will cost less than a comparable internal-combustion vehicle—to build and to purchase—by the mid-2020s.*[72]

- On January 28, 2021, General Motors pledged to stop making gasoline-powered passenger cars, vans and sport utility vehicles by 2035.[73]

Projection of EV Cost Competitiveness

The International Council on Clean Transportation (ICCT) indicates that EVs, which greatly reduce greenhouse gas emissions, are projected to be cost competitive to petroleum-powered vehicles by 2024[74]. The ICCT report figure below shows when EVs are projected to be cost competitive with petroleum-powered vehicles. This projection is based on total cost of ownership. The figure shows that a Battery Electric Vehicle (BEV) with 250-mile range will be cost competitive to a conventional vehicle as early as 2024. BEVs with less range will be cost competitive as soon as 2022.

These projections show that the transportation transition to EVs is coming relatively soon. EVs will become increasingly popular, as they become more cost competitive with conventional vehicles. Brevard County can take advantage of the more economical EVs to lower transportation cost and prepare for the transition to clean energy.[71]

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[71] M.J. Bradley & Associates. 2019. "Electric Vehicle Cost-Benefit Analysis." https://www.mjbradley.com/sites/default/files/FLPEVCBAnalysis07jan19.pdf.

[72] Szymkowski, S. 2017. "Electric cars will cost less to buy than regular cars by 2025: analysis." https://www.greencarreports.com/news/1111144_electric-cars-will-cost-less-to-buy-than-regular-cars-by-2025-analysis.

[73] Mufson, S. 2021. "General Motors to eliminate gasoline and diesel light-duty cars and SUVs by 2035." The Washington Post. https://www.washingtonpost.com/climate-environment/2021/01/28/general-motors-electric/.

[74] Lutsey, N., and M. Nicholas. 2019. "Update on electric vehicle costs in the United States through 2030." International Council on Clean Transportation. Working Paper 2019-06. https://theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf.

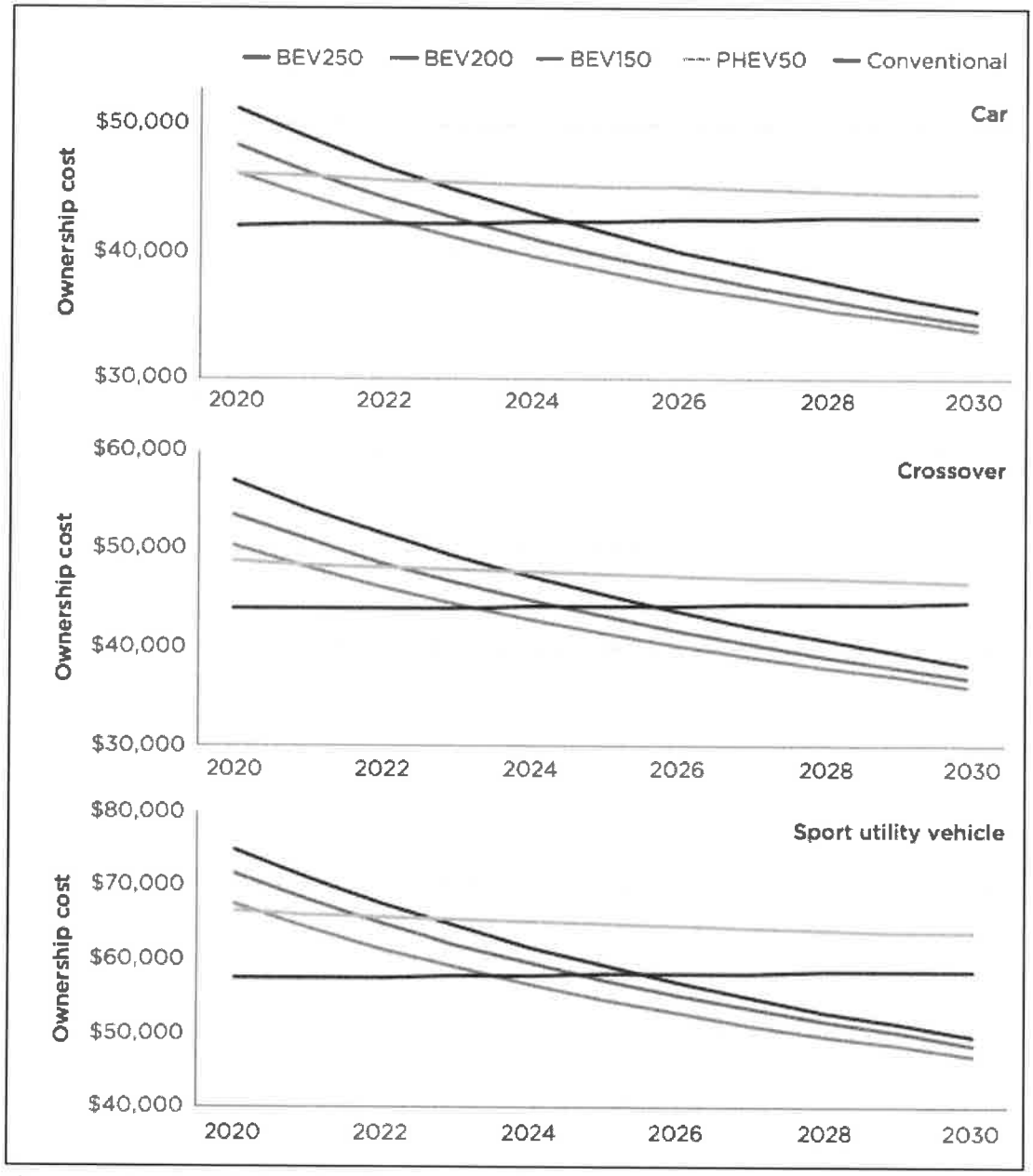

Figure 11. Ownership cost of conventional vehicles and electric vehicles for cars, crossovers and SUVs 2020-2030. [75]

EV Cost Benefit Models

Below are some readily available models for performing cost-benefit analysis of electric vehicles versus internal combustion vehicles.

[75] Lutsey, N., Nicholas, M. 2018. "Electric Vehicle Costs and Consumer Benefits in Colorado in the 2020-2030 Time Frame." Report. The International Council on Clean Transportation. https://theicct.org/sites/default/files/publications/ev_Colorado_cost_2020_20190613.pdf.

1. US Department of Energy, Alternative Fuels Data Center, Vehicle Cost Calculator[76]

2. The Fleet Procurement Analysis Tool Fleet Procurement Analysis Tool[77] by Atlas Public Policy, another tool originally created with funding from the U.S. Department of Energy.

3. The Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool[78] developed by Argonne Laboratories, funded by the US Department of Energy.

4. A new cost-benefit analysis tool has been developed called Atlas for public fleets.[79] More information can be obtained by e-mailing Josh Rosenberg, Data Associate with Atlas Public Policy, at josh.rosenberg@atlaspolicy.com.

None of these tools appear robust enough for making financial decisions. The best tool of those listed above is the US Dept of Energy Vehicle Cost Calculator. Unfortunately, the Vehicle Cost Calculator has not been updated for three or four years. In addition, The Vehicle Cost Calculator input values cannot be updated. The inability to update input variables makes this tool unusable for making financial decisions. The Fleet Procurement Analysis Tool and the AFLEET tools appear to be works in progress. It is worth revisiting all of these tools periodically as they will likely undergo significant improvements in the future.

To provide a usable model, WISER has included a simple Excel based cost-benefit analysis tool for comparing Life Cycle Costs of electric vehicles to conventional vehicles. This tool is called the Brevard EV CBA tool. This spreadsheet cost-benefit analysis tool is based on general economic theory and follows the process described in a paper by Morgan Anne Wampler presented to Faculty of the Agribusiness Department California Polytechnic State University 2011.[80] This tool is useful in that it is based on the same economic theory to calculate total ownership cost as all the models listed above and it allows all of the input variables to be updated.

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[76] U.S. Department of Energy. 2021. "Alternative Fuels Data Center: Vehicle Cost Calculator." https://afdc.energy.gov/calc/#result_a.
[77] Atlas Public Policy. 2021. "Fleet Procurement Analysis Tool." https://atlaspolicy.com/rand/fleet-procurement-analysis-tool/.
[78] U.S. Department of Energy. 2020. "AFLEET Tool."https://afleet-web.es.anl.gov/afleet/.
[79] Atlas Public Policy. 2021. https://atlaspolicy.com/.
[80] Wampler, M. A. 2011. "Cost-Benefit Analysis of Installing Solar Panels on the Schnoor Almond Ranch." Capstone Project Paper. California Polytechnic State University. https://pdfs.semanticscholar.org/b2c8/92503293d41b2c5eb0e943f1da7b6da18c8c.pdf.

Example using the Brevard EV CBA tool

This section will describe the Brevard EV CBA tool by using two examples. The first example will use a gas price of $1.00 per gallon. The second example will use a gas price of $2.50 per gallon.

For both examples, we will compare two vehicles that are very similar except for their fuel types[81]. The EV is a Chevrolet Volt price including incentives of $31,995. The Conventional Vehicle (CV) is a Chevrolet Equinox with a price including incentives of $28,235.

For the first example, the inputs are outlined in Table 3 except the initial gas price is set to $1.00 per gallon. The Brevard EV CBA tool estimates the total cost benefit by answering the question "how much do I save purchasing the EV over the CV?" In the first example, using $1.00 per gallon of gas, the EV provides a cost saving of $1,795 over a 10-year period when using a cash purchase of the vehicles. The 10-year cost saving when financing the vehicle purchases is $1,557 assuming a 10% down at 3% interest for 5 years.

The Brevard EV CBA tool provides a visual graphs of when it becomes more cost effective to own the EV over the CV. The tool provides graphs plotted for both cash purchase and financed purchase. Figure 12 shows the financed purchase of this example with initial gas price of $1.00 per gallon. This graph shows that the EV is more cost effective to own after only seven years, when it is financed with the terms stated.

[81] Muhlbaum D. 2020. "Save Money with an Electric Car." Kiplinger's Personal Finance. https://www.kiplinger.com/personal-finance/shopping/cars/601936/save-money-with-an-electric-car.

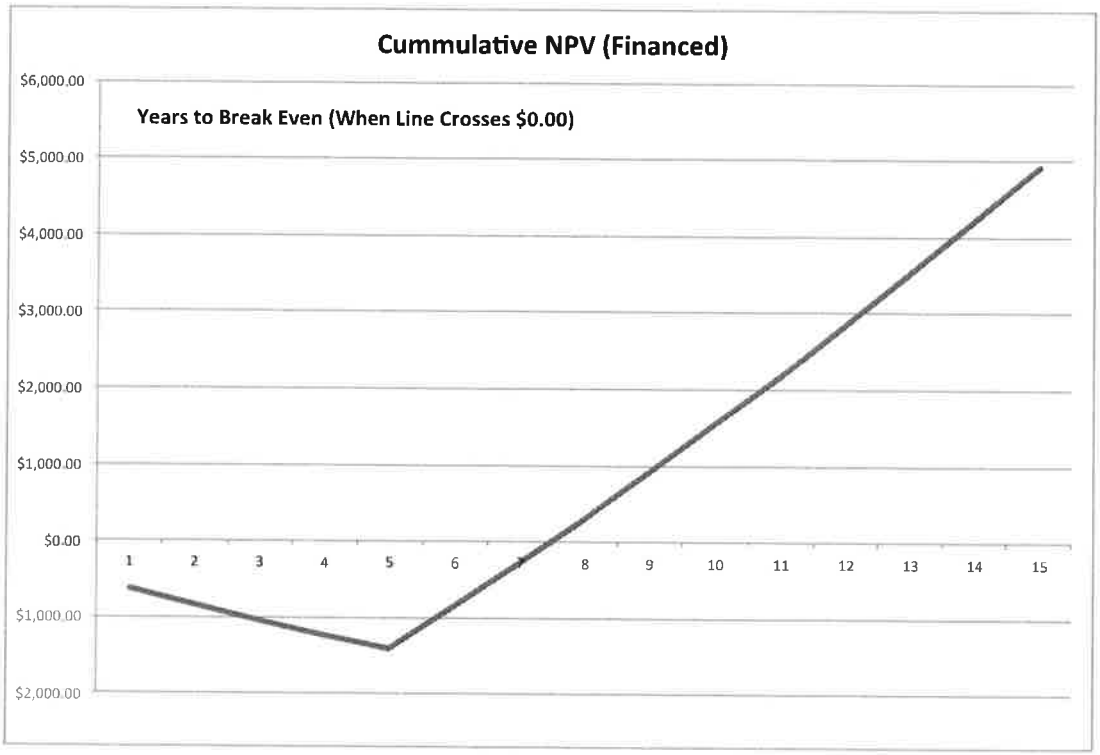

Figure 12 Break Even Graph for Brevard EV CBA Tool

For the second example, the inputs are again outlined in Table 3 with the initial gas price set to $2.50 per gallon. In this example, the EV provides a cost saving of $9,304 over a 10-year period when purchasing with cash. The 10-year cost saving when financing the vehicle purchases is $9,065 assuming a 10% down at 3% interest for 5 years.

Figure 13 shows the financed purchase of this example with initial gas price of $2.50 per gallon. This graph shows that the EV is more cost effective to own after only one year, when it is financed with the terms stated.

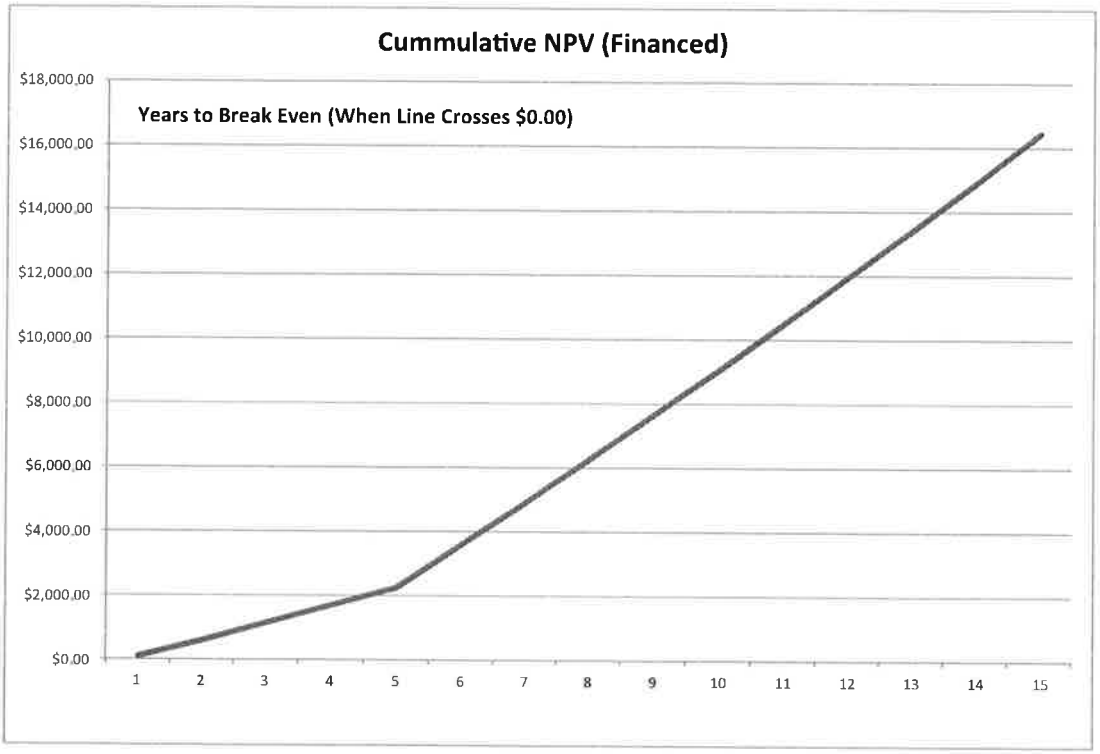

Figure 13 Break Even Graph for Brevard EV CBA Tool with a gas price of $2.50

Below is a table showing the input variables needed for the Life Cycle Cost (LCC) of ownership calculation performed by the Brevard EV CBA tool, information about these values, and their respective values for these examples. These values should be researched and modified to reflect the most recent information prior to performing each cost benefit analysis.

Table 3. Brevard EV CBA Tool Input Definitions

Variable/Input	Description / Source	EV Value	CV Value
Estimated Vehicle Life (Years)	The number of years the vehicle will be owned.	7	7
Discount Rate	Discount rate—The rate used to depreciate future PV revenues and costs into an equivalent present value, given in real dollars. This is the rate of return that the investors expect or the cost of borrowing money. Same as US Department of Energy, Alternative Fuels Data Center, Vehicle Cost	0.35%	0.35%

	Calculator[82] value based on the current national average return on a 5-year CD. 0.35% is the January 2021 average rate on 5-year CD[83].		
Annual Electricity Cost Increase	The expected annual escalation rate for the price of electricity provided by the utility over the financial life of the system. -0.3% based on 2021 EIA Annual Energy Outlook.[84]	-0.3%	N/A
Rate of Maintenance Costs Increase	This is not a consideration in the US Department of Energy, Alternative Fuels Data Center, Vehicle Cost Calculator.[78] This value should be close to the rate of inflation. Recommend using the 10-year breakeven inflation rate calculated by the Federal Reserve Bank of St. Louis.[85]	2.24%	2.24%
Annual Gas / Diesel Costs Increase	The expected annual escalation rate for the price of gasoline/diesel over the financial life of the system. 1.2% based on 2021 EIA Annual Energy Outlook 2021.[86]	N/A	1.2%
Electric Vehicle (EV) Costs	Complete cost of vehicle. Include sales tax in this number.	$31,995	N/A
Conventional Vehicle (CV) Costs	Complete cost of vehicle. Include sales tax in this number.	N/A	$28,235
EV Maintenance Cost Per Mile	Average BEV maintenance cost per mile for first 100,000 miles[87].	$0.020	N/A
CV Maintenance Cost Per Mile	From US Department of Energy, Alternative Fuels Data Center, Vehicle Cost Calculator[88] and American Automobile Association (AAA)[89]	N/A	$0.0538

[82] U.S. Department of Energy. 2021. "Alternative Fuels Data Center: Vehicle Cost Calculator." https://afdc.energy.gov/calc/#result_a.
[83] Bankrate. 2021. "Best CD rates for May 2021." https://www.kiplinger.com/personal-finance/shopping/cars/601936/save-money-with-an-electric-car.
[84] U.S. Energy Information Administration. 2021. "Annual Energy Outlook 2021." https://www.eia.gov/outlooks/aeo/.
[85] Federal Reserve Bank of St. Louis. 2021. "10-Year Breakeven Inflation Rate." https://fred.stlouisfed.org/series/T10YIE.
[86] U.S. Energy Information Administration. 2021. "Annual Energy Outlook 2021." https://www.eia.gov/outlooks/aeo/.
[87] Harto, C. 2020. "Table 2.1. Estimated Per-Mile Repair and Maintenance Costs by Powertrain." From "Electric Vehicle Ownership Cost, Todays Vehicles Offer Big Savings for Consumers, Consumer Reports." https://advocacy.consumerreports.org/wp-content/uploads/2020/10/EV-Ownership-Cost-Final-Report-1.pdf.
[88] U.S. Department of Energy. 2021. "Alternative Fuels Data Center: Vehicle Cost Calculator." https://afdc.energy.gov/calc/#result_a.
[89] American Automobile Association. 2020. "Your Driving Costs." https://newsroom.aaa.com/wp-content/uploads/2020/12/2020-Your-Driving-Costs-Brochure-Interactive-FINAL-12-9-20.pdf.

First Year Incentive for EV Purchase	If applicable, this is value represents tax credits, and other like incentives for purchasing an EV. (There is no incentive in this example.)	$0	$0
Price of Gas / Diesel per Gal	Current price of Gas/Diesel per Gallon	NA	$2.50

Average Electricity Cost per kWh	**Fully burdened dollar amount that the utility charges for each kWh of electricity. The cost is typically calculated from yearly energy bills for the facility being analyzed. This cost includes all cost such as franchise fees, utility tax, receipts tax, customer charge etc. and electricity charges (nonfuel and fuel charges).**	**$0.12**	**N/A**
Miles Driven Per Year	Estimate of miles driven per year	12,171	12,171
CV Average MPG City and Highway	Average of city/hwy values or use percentage weighting based on expected usage environment (i.e., 20% city, 80% highway, etc.)[90]	N/A	25.5
EV kWh Per 100 miles	Note: This is **NOT** the MPGe value. Average of city/hwy values or use percentage weighting based on expected usage environment (i.e., 20% city, 80% highway, etc.)[86]	28.5	
INPUTS Below Are for the Financing Model Only			
Percent of System Financed	Percentage of vehicle costs financed. This model assumes the same percentage would be financed for either the CV or EV	90%	90%
Number of Years Financed	The model only accepts whole years for this value.	5	5
Interest Rate	Interest rate for vehicle loan	3%	3%

Assumptions used in this model.

1. Due to the difficulty in forecasting resale value, this analysis assumes equal resale value of the EV and CV. This assumption is also made in the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool[91] developed by Argonne Laboratories, funded by the US Department of Energy.

    a. The LCC value can be adjusted by adding or subtracting a forecasted resale value difference, if one is warranted
    b. For reference, CAREDGE is a website that forecast auto resale values.[92]

[90] U.S. Department of Energy. 2021. "Fuel Economy." www.fueleconomy.gov.
[91] U.S. Department of Energy. 2020. "AFLEET Tool." https://afleet-web.es.anl.gov/afleet/.
[92] CAREdge.com. 2021. "Car Depreciation Calculator." https://caredge.com/depreciation.

2. Insurance costs are assumed to be similar for both EVs and CVs. This assumption was also made in the AFLEET Tool[93] developed by Argonne Laboratories, funded by the US Department of Energy.
3. This model does not take wear out into account. The model assumes vehicles never wear out. It is assumed that the user will determine the optimal length of time to own these vehicles.

Calculations and cell descriptions for the Brevard County EV CBA Tool are provided in the Additional Recommendations and Resources section of this document.

Public Transit

Mass transit is an integral component to a clean transportation future. While there is no one-size-fits-all approach, Brevard County leaders can play an important role in promoting and advocating for clean transit solutions.

Electrify Public Transportation

Electric buses, while more costly upfront, offer significant savings over time due to reduced fuel and maintenance expenses. Communities will enjoy additional benefits with local air quality improvements.

Federal funding may be available for the purchase of electric buses. The Federal Transit Administration has a "Low or No Emission Bus Program". This Low or No Emission competitive program provided funding to state and local governmental authorities for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, and leasing of required supporting facilities. Under the FAST Act, $55 million per year was available until fiscal year 2020[94].

For example, Greensboro, North Carolina is transitioning its transit buses to electric and will be saving $300,000-350,000 per bus over the lifetime of each vehicle due to dramatically lower maintenance and fueling costs.[95] Additionally, federal cost-share funding for transit buses efficiently leverages local funding. Cost-share funding via the

[93] U.S. Department of Energy. 2020. "AFLEET Tool." https://afleet-web.es.anl.gov/afleet/.
[94] Federal Transit Administration. 2021. "Low or No Emission Vehicle Program – 5339(c)." https://www.transit.dot.gov/funding/grants/lowno#:~:text=Overview,leasing%20of%20required%20supporting%20facilities.
[95] Yale Climate Connections. 2019. "Greensboro, N.C., invests in electric buses." https://www.yaleclimateconnections.org/2019/04/greensboro-n-c-invests-in-electric-buses/.

federal Low or No Emission Vehicle Program - 5339(c)[96] and the Diesel Emissions Reduction Act (DERA)[97] for buses efficiently leverages local funding.

Examples:

1. Orlando-LYNX-OUC-Proterra: With Orlando's assistance, LYNX applied funding from a Low or No Emission (Low-No) Grant from the Federal Transit Administration (FTA) to purchase seven battery electric buses, which will be procured through Proterra Inc. Orlando Utilities Commission assisted in the procurement of charging stations and batteries to help LYNX successfully deploy the project.[98]
2. Miami-Dade, FL[99]: Purchase of 33 electric buses[100]
3. Florida State University in Tallahassee, FL[101]
4. Broward County, FL[102]
5. The Metropolitan Transportation Authority has committed to an all-electric New York City Transit bus fleet by 2040.[103]
6. The Capital District Transportation Authority is planning an All-Electric Bus Line.[104]
7. California commits to electrify all fleets by 2040.[105]

EV Car-share Partnerships

Car-share companies present an opportunity to expand access to electric vehicles, particularly for low-income households. Brevard County can partner with car- share organizations on pilot programs to test the most effective and efficient methods to offer

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[96] Federal Transit Administration. 2021. "Low or No Emission Vehicle Program – 5339(c)." https://www.transit.dot.gov/funding/grants/lowno.

[97] U.S. Environmental Protection Agency. 2021. "Diesel Emissions Reduction Act (DERA) Funding." https://www.epa.gov/cleandiesel.

[98] LYNX. 2021. "LYNX to Receive $1.9 Million Federal Transit Administration Grant." https://www.golynx.com/news-events/lynx-to-receive-1.9-million-federal-transit-administration-grant.stml.

[99] Price-Williams, A. 2018. Memorandum for Agenda Item No. 11(A)(4). Miami-Dade County, Florida. http://www.miamidade.gov/govaction/legistarfiles/Matters/Y2018/182156.pdf.

[100] Proterra. 2019. "Miami-Dade Purchases 33 Proterra Catalyst E2 Electric Buses and Proterra Charging Systems. https://www.proterra.com/press-release/miami-dade-purchases-33-proterra-catalyst-e2-electric-buses-and-proterra-charging-systems/.

[101] Heller, D. 2019. "Florida State becoming a driving force in electric-vehicle technology." Florida State University News. https://news.fsu.edu/news/2019/02/14/fsu-electric-buses/.

[102] Broward County, Florida. 2018. "County Joins Under2 Coalition; Announces Ambitious Electric Vehicle Goals." Press Release. https://webapps.broward.org/NewsRelease/View.aspx?intMessageId=11286.

[103] Metropolitan Transportation Authority. 2019. "MTA Deploys First All-Electric Articulated Bus Fleet to 14th Street Busway." Press Release. https://www.mta.info/press-release/nyc-transit/mta-deploys-first-all-electric-articulated-bus-fleet-14th-street-busway.

[104] Capital District Transportation Authority. 2020. "CDTA Introduces First Electric Buses in Upstate New York." Press Release. https://www.cdta.org/news/electric-buses-roll-out.

[105] California Air Resources Board. 2018. "California transitioning to all-electric public bus fleet by 2040." Press Release 18-65. https://ww2.arb.ca.gov/news/california-transitioning-all-electric-public-bus-fleet-2040.

the community EV car-sharing options. Programs that focus on serving multi-family buildings can help to break down barriers to EV use by providing access to convenient and affordable charging opportunities and vehicles.

Examples:

1. Chattanooga, TN[106]
2. Sacramento, CA[107]
3. Los Angeles, CA[108]

EV Ride-Share Resolutions

Ride-hailing services such as Lyft, Uber, and traditional taxis allow for expanded use of electric vehicles in a municipality. When ride-share services use electric vehicles, emissions can be reduced up to 53% compared to a private vehicle trip using an internal combustion engine. Brevard County can partner directly with ride-share companies to offer incentives for drivers that choose to switch to EVs. In Columbus, OH this is being done through the Transportation Service Provider Battery Electric Vehicle Rebate Program.[109] Brevard County can also investigate setting targets for conversion to EVs for ride-share companies that operate within their district. The Electrify California Ride-Hailing bill provides an example that can be scaled to a municipal level.[110] Once partnerships are established with ride-share companies, both parties can benefit from investment in ride-share charging hubs. Installation of fast chargers in high traffic areas for ride-share drivers, such as airports, can help relieve range anxiety and provide charging for the general public as well.

First / Last Mile Solutions

Not every household is situated within a reasonable walking distance to public transit options. This is commonly referred to as the last mile problem. Brevard County can

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[106] Omarzu, T. 2016. "Electric car-sharing program launhes in Chattanooga." Chattanooga Times Free Press. https://www.timesfreepress.com/news/business/aroundregion/story/2016/oct/12/electric-cars-rent-thursday-chattanooga/391586/.

[107] Sacramento Metropolitan Air Quality Management District. 2021. http://www.airquality.org/Our-Community-CarShare/.

[108] Greencommuter. 2021. "Car Sharing." https://greencommuter.org/carsharing.

[109] City of Columbus. 2019. "Smart Columbus Transportation Service Provider (TSP) Battery Electric Vehicle (BEV) Rebate Program. https://d3hzplpmmz6qe4.cloudfront.net/2019-06/181212_TSP_BEV_Rebate_Program_App_One-Pager.pdf.

[110] Office of California Senator Nancy Skinner, District 9. 2018. "Governor Signs Senator Skinner's Electrify California Ride-Hailing (E-car) Bill." https://sd09.senate.ca.gov/news/20180913-governor-signs-senator-skinner%E2%80%99s-electrify-california-ride-hailing-e-car-bill.

partner with local transit agencies to develop non-fossil last mile solutions utilizing electric vehicles, e-bikes, e-scooters and other modes of transport.

Examples:

1. Stuart, FL EV Trams[111]
2. Swoop (Miami Beach, FL), Free Eco Friendly Taxi[112]
3. Circuit (Palm Beach, Fort Lauderdale, Hollywood, Miami, FL), Free EV Ride Shuttle[113]
4. Freebee (multiple areas around South Florida) Free EV Ride Shuttle[114]
5. The American Public Transportation Association offers examples of local first/last mile solutions.[115]

School Bus Electrification

In addition to transitioning public transit buses to all electric fleets, school districts can also commit to phasing out standard buses for electric bus fleets. As mentioned above, there are significant cost savings and health benefits to investing in electric bus fleets. School buses also present the opportunity for battery backup to stabilize the energy grid. Brevard County can help school districts transition to electric bus fleets through exploring partnerships with utility companies that pay for the cost of the electric buses in exchange for battery storage over time.

During emergencies, electric school buses can support school district buildings, especially those acting as emergency shelters, by providing power to those facilities' critical functions. This use of electric school buses enhances facility resilience, especially in cases where solar and other renewable energy resources are not able to provide facility power (e.g. during hurricanes and periods of high cloud coverage, low wind velocities, etc.).

Acquiring an electric school bus fleet will require maintenance personnel who are familiar with these vehicles. With vehicles transitioning from combustion to electric motors, Brevard County can help start training mechanics new skill sets for these vehicles, and other EVs that are acquired by the County, in anticipation of the market's transition to EVs.

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[111] Stuart Main Street. 2018. "Maps/Tram/Parking." https://stuartmainstreet.org/mapstramparking/.

[112] Miami.com. 2011. "Swoop offers free,eco-friendly taxi on South Beach." https://www.miamiherald.com/miami-com/nightlife/article225878670.html.

[113] Stewart, D. 2019. "Circuit's Free Shuttle Service Expands to Hollywood; Points to a Growing Transportation Trend." Broward-Palm Beach New Times. https://www.browardpalmbeach.com/news/circuit-the-free-ride-shuttle-service-in-hollywood-florida-10267122.

[114] Freebee. 2021. https://ridefreebee.com/.

[115] American Public Transportation Association. 2021. "First Last/Mile Solutions." https://www.apta.com/research-technical-resources/mobility-innovation-hub/first-last-mile-solutions/.

Brevard County can also take advantage of available statewide funding such as the Florida state funding available to replace school buses with electric buses through its share of the Volkswagen Diesel Emissions Settlement. More information on this program is available at the Florida Department of Environmental Protection Volkswagen Settlement web site.[116] Additionally, Brevard County leaders can lobby state officials to provide additional statewide funding for school bus electrification programs, including training for EV maintenance personnel.

Examples:

1. West Palm Beach-FPL: Florida Power and Light and West Palm Beach partnered on Florida's first electric school buses. The pilot will explore vehicle to grid technology using the bus batteries and provide data that will inform future applications.[117]
2. Virginia calls for utilities to cover cost of electric school buses and associated infrastructure through HB75.[118]
3. Dominion Energy electric transportation initiative replaces diesel school busses in Virginia.[119]
4. California Air and Resource Board provides $7.5 million in grant funding to pay for Zero-Emission Electric Bus Deployment.[120]

As another example, in New York State, there are a number of private companies that help support school districts in the transition to electric buses through private financing options. These companies provide the buses and charging infrastructure with budget-neutral financing and help with grant applications.

EV Charging Access and Infrastructure

The key to a successful transition to electric vehicles is a robust network of charging infrastructure. Accessible charging points increases consumer confidence in the

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[116] Florida Department of Environmental Protection. 2021. "DEMP – Volkswagen Settlement and DERA." https://floridadep.gov/air/air-director/content/demp-volkswagen-settlement-and-dera.

[117] Doris, T. 2019. "Green buses: West Palm getting 5 electric school buses that recharge FPL grid when they're not in use." The Palm Beach Post. https://www.palmbeachpost.com/news/20190731/green-buses-west-palm-getting-5-electric-school-buses-that-recharge-fpl-grid-when-theyre-not-in-use.

[118] Virginia General Assembly. 2019. "Electric utilities; electric school bus pilot program." House Bill 75. https://lis.virginia.gov/cgi-bin/legp604.exe?201+sum+HB75.

[119] Walton, R. 2019. "Dominion launches electric school bus initiative, aims for 100% electric fleet in Virginia territory by 2030." Utility Dive. https://www.utilitydive.com/news/dominion-launches-electric-school-bus-initiative-aims-for-100-electric-fl/562021/.

[120] California Climate Investments. 2021. "Sacramento AQMD Unveils Nation's Largest Zero-Emission Electric School Bus Deployment." http://www.caclimateinvestments.ca.gov/press-releases/2017/5/12/sacramento-aqmd-unveils-nations-largest-zero-emission-electric-school-bus-deployment.

reliability of EVs. Publicly available stations also offer alternatives to drivers that may not have the option of charging at home.

Electric driving requires a paradigm shift in how we fuel our vehicles as fueling can take place at home, in the community, or along our highways. People's perceived lack of visible charging stations is often cited as one of the top barriers contributing toward car buyers not purchasing electric vehicles. Thus, designing and planning effective charging systems will require addressing unique needs and removing barriers, both factors that local leaders are positioned to influence.

References:

- Useful tool to help determine the amount of charging needed is the Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite, from the Alternative Fuels Data Center, U.S. Department of Energy.[121]
- Detailed discussion of Florida county-by-county EV infrastructure needs are addressed in the December 2020 Florida Electric Vehicle Roadmap Executive Report.[122]
- The New York State Energy Research and Development Authority (NYSERDA) Planners & Municipalities, and Best practices guide to EV charging stations.[123]

Brevard County can take a lead role in promoting EV infrastructure investments through building and parking ordinances, streamlined permitting, utility partnerships, and public access initiatives. This section takes a look at opportunities for Brevard County action on charging access and infrastructure.

Resilience Planning

It is important to incorporate electric transportation in resilience planning for three primary reasons:

1. Adequate charging infrastructure needs to be deployed along evacuation routes to ensure that personal and fleet EVs can evacuate safely;
2. First responder and essential service EVs need access to charging infrastructure backed-up by battery storage to ensure accessibility during power outages (such

[121] U.S. Department of Energy. 2021. "Alternative Fuels Data Center: Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite." https://afdc.energy.gov/evi-pro-lite.

[122] Florida Department of Agriculture and Consumer Services. 2020. "Florida Electric Vehicle Roadmap." Executive Report. https://www.fdacs.gov/ezs3download/download/95682/2638040/Media/Files/Energy-Files/EV-Roadmap-Report/EV_ROADMAP_REPORT_2020.pdf.

[123] New York State Energy Research and Development Authority. 2021. "Best Practice Guides and Cases." https://www.nyserda.ny.gov/All-Programs/Programs/ChargeNY/Charge-Electric/Best-Practices.

installations can also serve as emergency charging hubs for communications and other electronic devices);

3. With the proper charging technology and building electrical system integration, stored energy in fleet EVs, especially medium and heavy duty vehicles such as transit and school buses, can be used to power essential services such as shelters.

EV Make-Ready Building Codes

Brevard County can play an effective role in helping to facilitate the adoption of electric vehicles in the community through updates to the local building code; requiring all new building construction to be EV make-ready. This will ensure that new buildings are properly equipped to handle the installation and operation of EV charging infrastructure. The knowledge that a residence or workplace will have the capacity to accommodate charging stations eliminates a potential consumer deterrent from the purchase or lease of an electric vehicle. Similar to new building construction, Brevard County can also require new parking facilities be designed to accommodate the installation of charging infrastructure.

EV make-ready policies ensure that buildings permitted today are prepared to support the electrification of transportation. EV make-ready policies require new homes, buildings, and parking structures to have the conduit and wiring in place to accommodate incremental additions of EV chargers later on. It does not require builders to install the charging stations now. It is more cost effective to add these features during initial construction or during a major building upgrade rather than retrofitting existing buildings and parking lots when the need for EV chargers arises.

One study found retrofitting costs for EV chargers, such as expanded electrical panels, raceways and prewiring, are as high as $3,550 per space compared to around $900 for new construction.[124] The cost to prewire homes is even less. The International Code Council adopted EV ready standards for commercial and residential buildings;[125] however, Florida recently failed to adopt state-wide building codes to require EV make-ready, leaving it to municipalities to implement EV make-ready policies.

Nationwide, cities have passed EV make-ready policies requiring between 10% and 20% of new commercial parking spaces be prepared for the installation of Level II charging

[124] Pike, E., Steuben, J., & Kamei, E. 2016. "Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco." http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf.

[125] Coren, M. J. 2020. "New US building codes will make every home ready for electric cars." https://qz.com/1781774/new-us-building-codes-require-plugs-for-electric-cars/.

with 208 Volts/40 Amps or 240 Volts/40 Amps. Most cities focus policies on zoning ordinances and land use modifications as opposed to building codes. Summary of Best Practices in Electric Vehicle Ordinances from the Great Plains Institute is a guide to EV and EV charger ordinances in the US.[126]

Examples:

- Boca Raton, FL[127]
- Surfside, FL[128]
- Miami Beach, FL[129]
- Coral Gables, FL[130]
- St. Petersburg, FL[131]
- Hollywood, FL[132]
- Miami-Dade County, FL[133]
- Atlanta, GA: Background[134] & Ordinance[135]
- Seattle, WA: Background[136] & Ordinance[137]
- New York City, NY[138]
- Plug In America/Sierra Club Template Ordinance[139]

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[126] Cooke, C. and Ross, B. 2019. "Summary of Best Practices in Electric Vehicle Ordinances." Guide. https://www.betterenergy.org/wp-content/uploads/2019/06/GPI_EV_Ordinance_Summary_web.pdf.
[127] City of Boca Raton, Florida. 2017. Ordinance 5420. https://www.myboca.us/DocumentCenter/View/10355.
[128] Town of Surfside, Florida. 2014. Ordinance No. 14-1617, https://library.municode.com/FL/Surfside/ordinances/code_of_ordinances?nodeId=724412.
[129] City of Miami Beach, Florida. 2016. Ordinance No. 2016-3988. https://www.miamibeachfl.gov/wp-content/uploads/2017/08/2016-3988-Ordinance.pdf.
[130] City of Coral Gables, Florida. 2019. Enactment #2019-19. https://coralgables.legistar.com/LegislationDetail.aspx?ID=3896154&GUID=71C9899F-4BD9-4AF0-AEF0-1603D4BE20CF&Options=ID%7CText%7C&Search=2019-19.
[131] City of St. Petersburg, Florida. 2021. "Parking garages." Ordinance 16.40.090.3.5. https://library.municode.com/fl/st._petersburg/codes/code_of_ordinances?nodeId=PTIISTPECO_CH16LADERE_S16.40.090PALODEST_16.40.090.3.5PAGA.
[132] City of Hollywood, Florida. 2021. "Installation of Electric Vehicle-Charging Infrastructure Required." Ordinance 151.154. https://codelibrary.amlegal.com/codes/hollywood/latest/hollywood_fl/0-0-0-53981#JD_151.154.
[133] Miami-Dade County, Florida. 2019. Ordinance 190516. http://www.miamidade.gov/govaction/matter.asp?matter=190516&file=true&fileAnalysis=true&yearFolder=Y2019.
[134] City of Atlanta, Georgia. 2017. "City of Atlanta Passes 'EV Ready' Ordinance into Law." Press Release. https://www.atlantaga.gov/Home/Components/News/News/10258/1338?backlist=/.
[135] City of Atlanta, Georgia. 2017. Ordinance No. 2017-76. https://library.municode.com/ga/atlanta/ordinances/code_of_ordinances?nodeId=869232.
[136] City of Seattle, Washington. 2019. "Council Approves New Electric Vehicle Readiness Rules for Parking." https://buildingconnections.seattle.gov/2019/04/30/council-approves-new-electric-vehicle-readiness-rules-for-parking/.
[137] City of Seattle, Washington. 2019. "Electric Vehicle Readiness Ordinance." https://publicola.com/wp-content/uploads/2019/02/SDCI-Electric-Vehicle-Readiness-ORD.pdf.
[138] City of New York, New York. 2013. "Electric vehicle charging stations in open parking lots and parking garages." Law 2013/130. https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=1501659&GUID=65344E17-4C65-4751-81E7-7A0D4DD9F7CD&Options=&Search=.
[139] Plug In America. 2017. "Building Codes for EVs Template." https://pluginamerica.org/wp-content/uploads/2017/08/Building-Codes-for-EVs-Template.docx.

Solar Carports

EV make-ready policies can include solar carports, which are overhead canopies built to cover parking areas and can be designed to charge EVs. Solar carports can be installed for residential and commercial properties with the primary use to offset energy consumption at the property for facilities and, where there are EV-charging stations, for EVs. Furthermore, solar carports provide shade for parking spots that may be constructed with asphalt, concrete, or gravel base, providing shade for occupants' vehicles that extend their life cycles. Benefits of solar carports result in increased property value due to the energy and shade generating benefits associated with these systems.

Multi-Unit Dwelling Charger Support and Incentives

The vast majority (80%) of EV charging takes place at home.[140] For the roughly 30% of Floridians that live in multi-unit dwellings (MUDs) like apartment buildings and condos, the majority do not have a power outlet accessible necessary for home charging.[141] As noted in the previous section, it is cost-prohibitive to install the infrastructure post-construction (pricing referenced above), with the result that most MUD residents are denied the benefits of home charging . This underscores the importance of a city or county taking make-ready policies to ensure equity and accessibility for all community members. When new MUD projects are being considered, installation of shared charging equipment at MUD developments should be required or encouraged.

Examples:

1. Florida State Statute protects condo owners from prohibitive rules by Homeowner Associations regarding installing a charging station in their common element parking area.[142]
2. California Air Resources Board Multi-family Building Standards[143]

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[140] Pure Planet. 2021. "EV Home Charging." https://purepla.net/electric-vehicles/setup.

[141] Shimberg Center for Housing Studies. 2017. "Overview of Housing in Florida." http://www.shimberg.ufl.edu/publications/tab2.pdf.

[142] Florida Legislature. 2020. Florida Statute 718.113. http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0700-0799/0718/Sections/0718.113.html.

[143] California Air Resources Board. 2019. "EV Charging Infrastructure: Nonresidential Building Standards." https://ww2.arb.ca.gov/sites/default/files/2020-08/CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020_Intervening_Code.pdf. Note that this document addresses multi-family building standards.

Streamlined Permitting

Permitting for the installation of electric vehicle charging infrastructure can be streamlined to encourage rapid deployment. Brevard County can assemble a task force to examine potential roadblocks that may exist in the permitting process and make recommendations on improvements to expedite the process. Priority could be given to installations that co-locate with renewable generation. Brevard County can work with the local electric utility to ensure a seamless process from installation to operation at public and private locations.

Examples:

- Municipalities that have adopted streamlined EV charging infrastructure ordinances.
  - San Jose, CA[144]
  - Loma Linda, CA[145]

City/County Charging Station Installation Guidelines and Best Practices

Brevard County can clear up any confusion around how to go about installing EV charging equipment by providing clear expectations to stakeholders such as step-by-step instructions or installation guidelines. Brevard County can maintain hard copies of the resources and digital copies on their website for installation at different types of sites.

Examples:

- Atlanta, GA EV Readiness Workbook[146]
- Chicago, IL Multi-Unit Dwelling EV Charger Installation Guide[147]
- California: Charging Station Permitting Guidebook[148]

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[144] City of San Jose, CA. 2016. Council Item 2.15. Council Agenda 05-24-2016. http://sanjose.granicus.com/MetaViewer.php?event_id=2137&meta_id=574036.

[145] City of Loma Linda, CA. 2017. Council Bill #O-2017-04. http://www.lomalinda-ca.gov/UserFiles/Servers/Server_7279443/File/Board-City%20Council/City%20Council/Electric%20Vehicle%20Charging%20Ord_%20%28FINAL%29.pdf.

[146] City of Atlanta, GA. 2018. "Electric Vehicle Readiness Workshop. https://www.atlantaga.gov/home/showdocument?id=34401.

[147] City of Chicago, IL. 2014. "How to Install Electric Vehicle Charging Stations at Multi-Unit Dwellings." https://www.chicago.gov/content/dam/city/progs/env/CACCEVGuide.pdf.

[148] California Governor's Office of Business and Economic Development. 2019. "Electric Vehicle Charging Station Permitting Guidebook." http://businessportal.ca.gov/wp-content/uploads/2019/07/GoBIZ-EVCharging-Guidebook.pdf.

- NYSERDA guidelines on proper installation of public charging stations - best practice guides for public charging stations[149]

Workplace Charging for County Employees

Workplace charging is one way to encourage and support employees who drive electric. It extends their all-electric driving range, enabling those with long commutes or those who lack home charging to drive electric. According to the U.S. Department of Energy, an employee with access to workplace charging is six times more likely to drive electric than the average worker. It can attract visitors as well. It can be free or have a subscription fee. Additionally, daytime charging can easily take advantage of low-cost, environmentally friendly solar power.

Examples:

- City of Seattle, WA[150]
- City of Atlanta, GA[151]
- U.S. Department of Energy Sample Workplace Charging Policy[152]
- U.S. Department of Energy Plug-In EV Handbook for Workplace Charging Hosts[153]
- Drive Electric Florida - Providing Workplace Charging for Your Employees' Plug-in Electric Vehicles[154]

Workplace Charging for Private Sector Employees

Encouraging workplace charging in Brevard County is another way to build infrastructure. When new projects are being considered for permitting, encourage the property/business owner to consider installing workplace charging.

Examples:

- MetLife[155]
- TECO[156]

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[149] New York State Energy Research and Development Authority. 2015. "Site Owners of Electric Vehicle Charging Stations on Commercial Properties." https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Transportation/ChargeNY-Site-Owners-EV-Charge-Stations-Commercial-Best-Practices.pdf.

[150] City of Seattle, WA. 2021. "Transportation Electrification - Environment." https://www.seattle.gov/environment/climate-change/drive-clean-seattle.

[151] City of Atlanta, GA. 2014. "City of Atlanta Joins U.S. Department of Energy Workplace Charging Challenge." Press Release. https://www.atlantaga.gov/Home/Components/News/News/2888/1338?arch=1&selcat=26.

[152] U.S. Department of Energy. 2015. "Sample Workplace Charging Policy." Policy Guidance. https://afdc.energy.gov/files/u/publication/Sample_Workplace_Charging_Policy.pdf.

[153] U.S. Department of Energy. 2013. "Plug-In Electric Vehicle Handbook for Workplace Charging Hosts." Handbook. Document DOE/GO102013-3925. https://afdc.energy.gov/files/u/publication/pev_workplace_charging_hosts.pdf.

[154] Florida Power and Light. 2012. "Drive Electric Florida." White Paper. Document 25290. http://www.driveelectricflorida.org/PDFs/wpc.pdf.

[155] U.S. Department of Energy. 2016. "Workplace Charging Success: MetLife." https://afdc.energy.gov/case/2831.

[156] TECO Energy. 2014. "TECO Energy offers workplace charging to employees with electric vehicles." Press Release. https://www.tecoenergy.com/company/mediacenter/article/index.cfm?article=769.

- Zappos[157]

Brevard County-Owned Public Charging Stations

Brevard County can spur EV adoption in the community by providing public access to EV charging stations. There are examples of both free and pay-to-charge systems.

Examples:

- Fort Lauderdale, FL[158]
- Miami Beach, FL[159]
- North Florida Transportation Planning Organization[160]
- Alameda County, CA[161]

Brevard County-Owned Fleet Charging Stations

Some cities install charging stations to support their fleets' electrification specifically and do not designate them for public use. This ensures the stations are always available for their use.

Example:

- City of Seattle, WA[162]

Permit Curbside Charger Installation in Public Right of Way

A challenge for some businesses and residences is lacking off-street parking at which to install a charging station. Some cities have addressed this issue by permitting installation of curbside EV chargers.

Examples:

- New Orleans, LA- On-Street Electric Vehicle Charging Resources for the City of New Orleans[163]
- Los Angeles, CA- The Bureau of Street Lighting has installed Level 2 electric vehicle charging stations on 284 of the streetlights in the City of Los Angeles.[164]

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[157] U.S. Department of Energy. 2015. "Workplace Charging Success: Zappos.com." https://afdc.energy.gov/case/2830.
[158] City of Fort Lauderdale, FL. 2021. "Electric Vehicles Charging Stations." https://gyr.fortlauderdale.gov/greener-government/transportation-connectivity/greener-driving-and-parking/electric-vehicle-charging-stations.
[159] City of Miami Beach, FL. 2021. "Electric Vehicles." https://www.mbrisingabove.com/climate-mitigation/electric-vehicles/.
[160] Bortzfield, B. 2018. "Publicly Funded First Coast Area EV Charging Station Expected to More Than Double." WJCT Public Media. https://news.wjct.org/post/publicly-funded-first-coast-area-ev-charging-stations-expected-more-double.
[161] Alameda County, CA. 2021. "Electric Vehicle Charging." https://www.acgov.org/sustain/what/transportation/evcharging.htm.
[162] Government Fleet. 2018. "Seattle Adds 156 EV Charging Stations to Power City Fleet." https://www.government-fleet.com/278625/seattle-adds-156-ev-charging-stations-to-power-city-fleet.
[163] Southeast Louisiana Clean Fuel Partnership. "On-Street Electric Vehicle Charging Resources for the City of New Orleans." http://cityofno.granicus.com/MetaViewer.php?view_id=3&clip_id=2322&meta_id=323753.
[164] City of Los Angeles, CA. 2020. "EV Charging Stations." http://bsl.lacity.org/smartcity-ev-charging.html.

- Seattle, WA[165]
- Plug In America/Sierra Club Template Ordinance[166]

Pair EV Charging Stations with Renewables

Several companies offer solar canopies to generate the power for charging stations. Solar canopies have the additional benefit of providing an attractive, shady parking place so cars are sheltered from the sun. Battery backup systems can be added to solar canopies co-located at critical facilities such as water treatment plants or hospitals.

Example:

- University of Central Florida, Orlando, FL[167]
- Stuart, FL: 150 car solar canopy parking lot with EV charging stations[168]

Free Up Access to Chargers with Instructional Signage and Code Enforcement

One challenge for public EV charging is that access to chargers can be blocked by non-EVs or EVs that are not actively charging. Brevard County can discourage this from happening by ensuring adequate instructional signage that only actively-charging EVs (determined by whether or not they are plugged in) should be parked in those spots. Some states, such as Florida, outlaw non-EVs from parking in EV-designated spaces, but local enforcement may not happen. Brevard County can encourage enforcement.

Examples:

- Miami-Dade County, FL Ordinance[169]
- Florida State Statute[170]
- Sierra Club/Plug In America Template Ordinance[171]

Way Finding Signs for Drivers to Locate Chargers

Many potential EV drivers fear not being able to find public charging when they may need it. Brevard County can help increase visibility of the availability of EV chargers and also help EV drivers better utilize existing EV chargers by providing way finding signs on

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[165] City of Seattle, WA. 2019. "Electric Vehicle Charging in the Public Right-of-Way." https://www.seattle.gov/transportation/projects-and-programs/programs/new-mobility-program/electric-vehicle-charging-in-the-public-right-of-way.

[166] Plug In America. "Right of Way Charging Template." https://pluginamerica.org/wp-content/uploads/2018/05/Right-of-Way-Charging-Template_2018.docx.

[167] Kaufman, B. 2015. "FAQs: UCF's Electric Vehicle Charging Stations." http://sustainable.ucf.edu/node/45.

[168] Florida Power and Light. 2021. "Kiwanis Park – FPL SolarNow." https://solarnow.fpl.com/project/kyp/.

[169] Miami-Dade County, FL. 2019. "Electric Vehicle Infrastructure Requirements." Ordinance 190516. http://www.miamidade.gov/govaction/matter.asp?matter=190516&file=true&fileAnalysis=true&yearFolder=Y2019.

[170] Florida Legislature. 2020. "Electric vehicle charging stations." Florida Statute 366.94. http://leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0366/Sections/0366.94.html.

[171] Plug In America. "Uniform Signage Requirement Template." https://pluginamerica.org/wp-content/uploads/2018/05/Uniform-Signage-Requirement-Template_2018.docx.

the street for public charging stations. Additionally, EV charging locations can be made highly visible with signposts and painted parking spots.

Efforts by the Central Florida Clean Cities Coalition are underway to get Florida highways designated as "Alternative Fuel Corridors" by the Federal Highway Administration.[172] Brevard County can support these efforts for the economic benefit of attracting EVs to local businesses or downtown areas offering charging stations.

Interoperability and Open Charge Point Protocols

Open Charge Point Protocols (OCPP) are the international standards established by the Open Charge Alliance.[173] These standards are intended to ensure interoperability between the main components of EV charging:

- the vehicles,
- charging infrastructure,
- charging software,
- and the electric grid.

These components need standardization to provide reliable charging experiences and long-term flexibility as vehicles, charging infrastructure and charging software evolve overtime. Thus, OCPP compliance is often a requirement of EV charger grant and rebate programs.[174]

Establish Education and Outreach Initiatives

Most American drivers are not aware of the cost, public health, and environmental benefits of driving electric. Educational opportunities can be offered to both staff and citizens to increase understanding of electric vehicles, charging, and the cost savings to taxpayers. Examples include having EV information on your website, hosting outreach activities such as "ride and drives" at which staff and citizens can ride or drive in electric vehicles, and outreach to local business fleet departments to offer information about both light and heavy-duty electric vehicle options.

Consumer Education and Informational Materials

Brevard County can partner with non-profit organizations to expand engagement and increase understanding among citizens about the practicality and benefits of electric

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[172] U.S. Department of Transportation. 2021. "Alternative Fuel Corridors." https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/.
[173] Open Charge Alliance. 2021. https://www.openchargealliance.org/.
[174] Electric Power Research Institute. 2019. "Interoperability of Public Electric Vehicle Charging Infrastructure." Document 3002017164. https://05844af6-4b41-4f94-bcab-881f516a20f2.usrfiles.com/ugd/05844a_ab1b3fd72ead41d1b86b21f7e61651ca.pdf.

driving. They can host information on their website about their own EV initiatives as well as links to additional resources, such as the PlugStar Program.[175]

Examples:

- Boca Raton, FL[176]
- Coral Gables, FL[177]
- Sacramento, CA[178]

Outreach Events

Partnering with other organizations to host electric vehicle community events are a great way to bring current EV drivers together with community members who want to learn more. Events can take place as showcase events, ride and drives, or parades. The best way to get people excited about EVs is for them to test drive them. It also offers an opportunity for Brevard County officials to show their support for electric transportation. Driving on Sunshine, a campaign of the Southern Alliance for Clean Energy (SACE), is pleased to offer electric driving experiences free of charge to licensed drivers 25 years and older.[179]

Examples:

- Partner for a Driving on Sunshine Event[180]
- St. Petersburg Earth Day[181]
- National Drive Electric Week[182]
- Drive Electric Earth Day[183]

Promote Economic Development by Investing in Electric Transportation

There are many economic development benefits of electrifying transportation to the local economy.

1. Tax dollars saved operating electric public fleets can be invested in other areas.
2. Purchasing "local" electricity instead of out-of-state gas keeps transportation dollars circulating in Florida.

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[175] Plug In America. 2021. "PlugStar Shopping Assistant." https://plugstar.zappyride.com/cars/browse?zip=34688.
[176] City of Boca Raton, FL. 2021. "Electric Car Charging Stations." https://www.myboca.us/1182/Electric-Car-Charging-Station.
[177] City of Coral Gables, FL. 2021. "Electric Vehicles and Charging Stations." https://www.coralgables.com/electricvehicles.
[178] City of Sacramento, CA. 2021. "Sacramento Electric Vehicle Initiatives." https://www.cityofsacramento.org/Public-Works/Electric-Vehicle-Initiatives.
[179] Electrify the South. 2021. "Driving on Sunshine." https://www.drivingonsunshine.org/.
[180] Electrify the South. "Host an Electric Vehicle Ride and Drive." https://05844af6-4b41-4f94-bcab-881f516a20f2.usrfiles.com/ugd/05844a_fd6ac7eec2af4a6da8e16c2966fe0ffe.pdf.
[181] Chart 411. 2021. "Treasure the Gulf." https://www.earthdaysp.com/.
[182] Plug In America. 2021. "National Drive Electric Week." https://driveelectricweek.org/.
[183] Plug In America. 2021. "Drive Electric Earth Day." https://driveelectricearthday.org/.

3. Increased spending on electricity for transportation puts downward pressure on electricity rates for all ratepayers.[184]
4. Increased spending power of consumers saving $1,000+/year on reduced fuel and maintenance costs with EVs.
5. Price-stability of electricity vs gasoline/diesel for fleet fuel budgeting.
6. Value of stored energy in EV batteries that can serve the grid to meet peak-demand needs and resilience during an emergency.
7. Ability to pair with solar spurring on another clean energy sector and enabling the cascading economic development benefits.
8. Public health dollars saved by reduced air pollution leading to reduced disease and ER visits and increased productivity.
9. Climate-cost avoidance achieved by reducing transportation carbon emissions and maximized by cleaning the grid in parallel.

Those benefits can be maximized through strategic partnerships that highlight the value Brevard County places on advanced technology solutions.

Strategic Charging Incentives for EVs

Discounted charging rates for EVs at Brevard County owned chargers in targeted areas within the county can attract EV drivers for a two-fold benefit. It increases spending opportunities for EV drivers in shopping areas while charging and directs EVs to parking decks/lots that are underutilized. Dedicated EV-designated parking spaces and signage (include training for law enforcement for blocking EV spots [i.e. car must be plugged in in order to qualify]) make charging visible and demonstrate Brevard County's commitment to clean energy.

Examples:

- Coral Gables, FL Provides free parking and EV charging.[185]
- Sacramento, CA Provides free or discounted parking and charging to EV drivers. Participants receive free parking until EV parking transactions exceed 5% of overall parking transactions in any one garage, at which point all EV program participants for that garage will be charged 50% of regular parking fees for the garage.[186]

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[184] Lowell, D. 2019. "Plug-In Electric Vehicle Cost-Benefit Analysis: Florida." Report. https://www.mjbradley.com/reports/plug-electric-vehicle-cost-benefit-analysis-florida.
[185] City of Coral Gables, FL. 2016. "Electric Vehicles and Charging Stations." https://www.coralgables.com/electricvehicles.
[186] City of Sacramento, CA. 2017. "Electric Vehicle Strategy." Report. http://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Electric-Vehicles/EVStrategy_171212_FINAL_CityOfSacramento.pdf?la=en.

Engage Economic Development Offices

Public-Private Partnerships
Brevard County should engage economic development offices to cultivate partnerships that would accelerate EV market development.

Example:

- Drive Electric Orlando renting an EV from Enterprise allows for VIP parking in theme parks and hotels.[187]

Marketing Material
Integrate information into marketing collateral that provide awareness Brevard County's electric transportation successes both externally and internally.

Example:

- Largo, FL Charging Station Ribbon Cutting[188]

Workforce Development
Engage Brevard County businesses and entrepreneurs to identify demonstration and collaboration opportunities.

Example:

- Miami-Dade College Tesla START program[189]

DC Fast Charging Hubs
Brevard County can leverage public-private partnerships to install direct current (DC) fast charging 'hubs' to grow the infrastructure needed to support different types of electric transportation. High-powered hubs can also be co-located with transit and school bus infrastructure to maximize efficiency and decrease costs.

1. **Electric Taxi, Uber/LYFT TNC Targets**
   Transportation Network Companies (TNCs) are increasing among cities and their greenhouse gas emissions are also increasing. Brevard County should engage directly with TNCs to ensure EV adoption and charging infrastructure is being planned accordingly.

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[187] Drive Electric Orlando. http://pluginperks.com/.
[188] Guerra, J. L. 2018. "Largo gives sustainability plan a spark with its first electric vehicle charging stations." Largo Leader. https://www.tbnweekly.com/largo_leader/article_311416fa-fd80-11e8-b044-af608e7ad633.html.
[189] Marchante, M. 2019. "MDC students are being trained to fix cars of the future. Hers how Tesla is involved." Miami Herald. https://www.miamiherald.com/news/local/education/article237969394.html.

Example:

- Atlanta, GA[190]

2. **Multi Unit Dwelling and On-Street Parking Targets**
   Brevard County is seeing a rise in multi-unit dwellings and many urban neighborhoods lack access to off street parking. In both scenarios, home charging, which accounts for 80+% of an EV driver's charging needs, is lacking. Fast charging neighborhood hubs can serve as an alternative 'home charging' option and make EV ownership accessible to more residents.

3. **Resiliency/Evacuations Targets**
   When hurricane evacuation is necessary, more fast charges will be needed. Hubs or depots designed to serve a specific need most days, such as charging transit buses, school buses, or rideshare, can be utilized for evacuation when needed. Such cross utilization requires careful planning and can make hub installations more economical by spreading the costs over multiple beneficiaries.

4. **Downtown Parking and Congestion Mitigation**
   Public fast charging and Level II charging hubs can entice EV drivers to locations such as park and rides from where (electric) shuttles can provide access to work place or shopping areas. This can reduce the need for additional parking, ease the strain on existing parking, and reduce traffic congestion while providing EV drivers with the benefit of charging.

EV Charging Station Incentives

Brevard County can offer a rebate for the equipment and labor costs associated with the installation of both public and private EV charging stations. Sarasota County, FL maintains a web site that directs residents toward grant opportunities such as the Charge Up! program, which covers up to 50% of EVSE costs. The Sarasota Florida funds come from pollution recovery fees.

Example:

- Sarasota County, FL Charge Up! Program[191]

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[190] Keenan, S. R. 2018. "Partnership aims to put more electric vehicles in Atlanta's rideshare market." Curbed Atlanta." https://atlanta.curbed.com/2018/11/1/18051520/georgia-power-lyft-electric-vehicles-atlanta-rideshare-traffic.

[191] Sarasota County, FL. 2021. "Electric Vehicles." https://www.scgov.net/government/sustainability/sustainability/electric-vehicles.

EV Group Buy Program
Brevard County can partner with local dealerships to coordinate group buy programs for EVs. Group buy programs help raise consumer awareness about opportunities to purchase an EV and help consumers get a good deal.

Example:

- Green Energy Consumers Alliance[192]

Expand Equity and Access
Frontline communities typically experience disproportionately negative impacts from pollution caused by the transportation sector for several reasons including, but not limited to, proximity to major roadways. One report from the Union of Concerned Scientists found a 66% higher exposure of air pollution from vehicles among communities of color than for white communities.[193] These emissions increase the risks of asthma, cancer, and other pollution-related illnesses. Frontline communities also experience stronger barriers to EV adoption due to higher upfront costs and lack of access to charging infrastructure. These burdens and barriers warrant a targeted approach to increasing electric transportation equity and access among members of frontline communities.

Charging Access for Frontline Communities
When opportunities for citing locations for charging stations occur stakeholders should advocate for equitable access to frontline communities.

Outreach Events in Frontline Communities
Host education and outreach events in frontline communities to ensure all community members are engaged in electric transportation opportunities and awareness of the benefits. Community input meetings and events are more likely to be successful if they meet community members where they are including language interpretation, childcare, support with travel to meetings and attendance incentives.

Prioritize Frontline Communities for Electrification
As more of the public transportation sector becomes electrified, frontline communities should be prioritized for electric buses. Research that has shown that "pollution inequity" associated with air pollution disproportionately causes poor health outcomes

[192] Green Energy Consumers Alliance. 2021. "Drive Green." https://www.greenenergyconsumers.org/drivegreen.
[193] Pinto de Moura, M. C., Reichmuth, D. 2019. "Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic." Union of Concerned Scientists. https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles.

to frontline communities. Because electric transit buses have no road-level pollution their routes should be serving communities that would benefit the most from them.

Example:

- Mother Clara Hale Bus Depot, NYC[194]

Voucher, Low-Interest Financing, Point of Purchase Rebates, and Used EV Rebates for Low-Income Drivers

Vouchers, low-interest financing, and point-of-purchase rebates are more effective than traditional rebates for helping lower the initial cost of vehicles for low-income consumers, by reducing the amount of financing needed. Also, allowing used EVs to qualify for rebates makes them even more accessible for low-income customers. Additionally, targeting incentives to low-income customers via an income cap directs limited funds to consumers who need the benefit the most.

Example:

- San Joaquin, CA Air Pollution Control District[195]

Car share Programs

Partner with a community development organization to develop an EV car share pilot for members of the community with limited transit opportunities.

Example:

- Forth Community Electric Vehicle (CEV) Project [196]

Engage Your Local Utilities

Local utilities are essential partners - after all, they provide the electricity. Because of their role, engaging with your local utilities should be a first step. Local utilities can be partners in increasing EV adoption rates. They can offer EV friendly rates where it is cheaper to charge an EV at low-use times of the day and can install charging infrastructure through pilot programs. Additionally, municipalities can partner with local utilities to create education and outreach events and programs.

EV Charging Infrastructure

The local utility will be in a good position to help draft EV-ready building codes and design incentives. Also, the utility needs to know where you are encouraging the

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[194] We ACT for Environmental Justice. 2021. "Mother Clara Hale Bus Depot." https://www.weact.org/campaigns/mother-clara-hale-bus-depot/.

[195] San Joaquin Valley Air Pollution Control District. 2021. "Drive Clean in the San Joaquin." http://valleyair.org/drivecleaninthesanjoaquin/replace/.

[196] Teebay, C. 2018. "Electrifying Community Car Share." Forth. https://forthmobility.org/news/electrifying-community-car-share.

charging stations so that it can take early action to ensure that its distribution system is ready to deliver the power. The utility may have ideas on where to direct that infrastructure, may be willing to install it for free for certain fleet uses, or may have solar projects in the works that would be easily paired with an EV charger. Finally, the utility may have experience with different EV chargers or installers that would suggest criteria for offering an expedited permit, and when more cautious scrutiny may be needed.

Utility EV-Friendly Rates

Many utilities offer rates that encourage EV drivers to charge during the time of day when the utility has surplus energy. This does several things. It helps the utility to keep a consistent outflow of energy without having to turn on additional generation. It benefits all utility users by selling more energy but in a more consistent pattern. It benefits EV drivers because they are charging their EV when rates are lower.

Example:

- Georgia Power, GA[197]

Utility EV Charger Pilot Programs

Utilities can benefit from pilot programs to get comfortable with EV programs. Such pilot programs can focus on deploying utility-owned charging infrastructure and offering rebates to customers for the installation of non-utility-owned chargers. Pilot programs can help utilities gather data and grow their understanding of how EV customers interact with the grid.

Example:

- Duke Energy Florida Park and Plug program[198]
- Florida Power and Light EVolution program[199]

Streetlight and Power Pole Charging Access

Cities can use the electricity already wired for LED converted lightposts to easily allow for EV charging. There are devices which can retrofit a light post in a cost-effective manner to allow for charging of the electricity.

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[197] Georgia Power. 2018. "Plug-in Electric Vehicle." https://www.georgiapower.com/residential/billing-and-rate-plans/pricing-and-rate-plans/plug-in-ev.html.

[198] Duke Energy. 2018. "Duke Energy Florida launches Park and Plug EV charging station pilot to encourage clean transportation." Press Release. https://news.duke-energy.com/releases/duke-energy-florida-launches-park-and-plug-ev-charging-station-pilot-to-encourage-clean-transportation.

[199] Florida Power and Light. 2021. "Energy My Way | FPL Evolution." https://www.fpl.com/energy-my-way/evolution.html.

Examples:

- Los Angeles, CA[200]

[200] City of Los Angeles, CA. 2020. "EV Charging Stations." http://bsl.lacity.org/smartcity-ev-charging.html.

Appendix 4: Additional Recommendations and Resources

Steps to Promoting Public Access to Renewable Energy Sources

1. Identify all existing partners who can assist with improving public access.

   Partner organization starter list:

   a. Florida Solar Energy Center
   b. ReThink Energy Florida, Brevard
   c. League of Women Voters of the Space Coast
   d. Turtle Coast Sierra Club
   e. Space Coast EV Drivers
   f. City of Satellite Beach
   g. City of Cocoa
   h. City of Cape Canaveral
   i. City of Cocoa Beach
   j. City of Titusville
   k. City of Palm Bay
   l. City of Melbourne
   m. Space Coast Progressive Alliance
   n. American Solar Energy Society
   o. Florida Solar Energy Association
   p. Florida Solar Energy Industry Association
   q. Florida Renewable Energy Association
   r. National Renewable Energy Laboratory
   s. Sierra Club
   t. Audubon Club
   u. Eastern Central Florida Regional Planning Council
   v. U.S. Green Building Council Brevard
   w. ICLEI – Local Governments for Sustainability

2. Create and attend community events that support providing public access to solar power.

3. Create a page on the county website that links to public resources.

4. Partner with other communities and municipalities who are also working to provide public access to solar power.

Staffing and Organizational Barriers

Energy Manager

Brevard County's Public Works Director, Marc Bernath spoke to the WISER board on October 1, 2020. He asked that WISER be mindful in their recommendations of resources, both budgetary and staffing and limitations thereof. He advised that there is currently no Energy Manager.

The highest-ranking barrier to the adoption of advanced (clean) energy technology within the County is the lack of a dedicated Energy Manager (EM) and staffing within the County government. The County needs staff and leadership to manage the counties energy use. Brevard County cannot take advantage of advanced (clean) energy technologies without an energy management organization. WISER recommends creating a new pilot position of "Energy Manager," in the Brevard County Public Works Department, focused on facilities to carry out the recommendations of the ETP. This pilot position would provide feedback to the County on how to duplicate the EM position in other departments (e.g., Planning and Development, Solid Waste, Fire Rescue, Transit Services, Library Services, Natural Resources Management, Utility Services, Central Services, and Parks & Recreation) in the future, with other EMs focusing on facility and non-facility items germane to their respective departments.

An example EM job description is included in the resource section of this document, which may be adapted to the respective functions of the department that an EM is hired for.

Organization

The organizational structure of Brevard County could be improved to better address barriers to clean-energy adoption. An eventual goal would be to have all EMs, each from their respective County department, report to a director of a new Resilience Department, permitting each EM to address each department's needs while providing cross-department collaboration and coordination. This director would report to the assistant county manager. This department would enable the EMs to work with their respective departments.

Should the Commission create the EM position in Public Works and eventual successive EM positions in other departments, with the eventual goal of all EMs reporting to a Resilience Department, the benefit of the money saved from the upgrades can be put into a revolving fund that is used to fund department personnel, including utilities and policy, and complete future County building and infrastructure upgrades, further

reducing project implementation timelines and providing additional funding options for the County to consider. Furthermore, if the budget is sourced from a Bond, a portion of the savings can be partitioned to pay down the debt on the bond.

Metrics Barriers

Like the saying goes, "you can't manage what you can't measure." Simply not having metrics to measure progress is a barrier. Brevard County lacks metrics to measure the benefits of moving to clean-energy sources. Below are measurements and metrics to consider alleviating this barrier:

1. Energy (power and fuel) consumption percentage reduction, compared to current or past year consumption, by a future calendar or budget year
    - Example: Reduce County energy consumption by 40%, compared to FY 2020 consumption, levels by FY 2030

2. Renewable energy generation increase that is a percentage of County electrical energy by a future or calendar budget year
    - Example: Increase County renewable energy use to 30% of electrical consumption by FY 2030

3. Amount of dollars financed for renewable energy and clean energy technology programs including residential and commercial property owners in Brevard County.

4. Percentage of Brevard County Facilities transitioned to Solar Power

5. Percentage of Electric Powered Vehicles in Brevard County Fleet

Building Code Barriers

The County can pass ordinances to augment the Florida Building Code to foster clean energy use throughout the county. Here are a few examples of how building codes can remove barriers.

- Require access to EV charging at apartment complexes.
    - This action removes a significant barrier for people that live in apartments and want to drive an electric vehicle.

- Require homes, particularly multi-family residences, to be more energy efficient.
    - The more energy efficient homes are, the lower the cost a solar PV system would be to offset energy consumption.

- Require new homes to be solar ready to reduce the cost of installing solar.

These and additional ordinances, which augment the Florida Building Code and remove barriers to clean energy, are explained in detail under the appropriate sections of this ETP.

Future WISER Activities

Ready For 100 is a national movement with a vision of resilient and healthy communities powered by 100% clean, renewable energy. If Brevard County were to commit to Ready for 100, the ETP would meet the resolution's objective of developing an energy transition plan. The Ready for 100 goals are to achieve 100% clean, renewable energy for electricity by 2035 and 100% clean and renewable energy for heat and transportation by 2050. The ETP also achieves multiple goals of the Memorandum of Understanding signed by Brevard County and other municipalities for the East Central Florida Regional Resiliency Collaborative and the regional resiliency action plan.

The steps needed to continue recommendations on policy revisions regarding the ETP and related advanced / clean energy technology and ECMs can be performed by joint efforts of WISER are as follows.

1. Identify and recommend investment in areas that enhance accessibility and education.
2. Review continuation of instillation costs fee waiver for solar instillation.
3. Educate the community about existing access to the Florida Building Code relating to energy efficiency in facilities and infrastructure.
4. Provide access to Subject Matter Experts (SMEs) who can speak or provide information to the County and communities on the following topics:
   - Energy audits and platforms to assist with audit completion
   - Financial mechanisms
   - Community education on the use of energy conservation measures and utilization of renewable energy technologies
   - Utilization of renewable energy sources (SMEs particularly from Florida Solar Energy Center can speak to this topic)
   - Utility rebates associated with applying energy conservation measures and installing energy storage equipment
5. Continue discussions with municipal personnel, such as from the Cities of Satellite Beach and Cape Canaveral, who are experienced with the creation of

policy and implementation of advanced / clean energy technology and related infrastructure.

6. Update Facility inventory for the County
7. Update County budget documents
8. Update Previous County energy audit
9. Update WISER website
10. Continue review of current ordinances, statutes, and various administrative policies by Brevard County, other municipalities, and the State of Florida related to advanced / clean energy technology.
11. Pursue testimonials from residents and companies on current policies that serve as barriers to the adoption of advanced / clean energy technology within the County.
    - May be collected through social media and the County website; WISER can review and incorporate accordingly
12. Identify and review case studies by Brevard County municipalities (i.e. towns and cities) related to advanced / clean energy technology.
13. Continue review of case studies by Florida-based model municipalities outside of Brevard County.
14. Develop additional recommendations to assess and implement energy conservation measures across all County buildings based on current technologies, with the option to utilize financing mechanisms to pay for the implementation.
15. Provide input to the EM for the continued implementation of advanced /clean energy technology within County government based on energy consumption after implementing energy conservation measures, with the option to utilize financing mechanisms to pay for the implementation.
    - NOTE: Policy should be clear that adoption of technology does not intend for the County to generate more energy than is consumed.
16. Develop recommendations to modify policies that increase access to residential and commercial property owners to implement the adoption of advanced / clean energy technology within County government, with the option to utilize financing mechanisms to pay for the implementation.
17. Develop recommendations to establish partnerships between the County and municipalities associated with removing common barriers and increasing access to advanced / clean energy technology.
18. Develop recommendations to establish partnerships between the County and municipalities associated with removing common barriers and increasing access to advanced / clean energy technology.

19. Establish partnership with the Florida Solar Energy Center and other partners on keeping the County advised on updated State policy related to advanced/clean energy technology and opportunities for the County to better align with or take advantage of those updated policies.

Potential Future WISER Initiatives

- Evaluating switching to natural Gas-powered vehicles versus electric powered
- Solar PV systems on retention ponds
- Wind power
- Self-Powering Water Treatment Facilities
- Community Power Grids for Resilience

Additional Energy Conservation Measure (ECM) Recommendations

A list of additional Energy Conservation Measures (ECM) recommendations are listed below for consideration by the EM and the Public Works Department. The list below should be adjusted, as new technologies are made available.

- Interior Lighting Improvements and Controls
- Exterior Lighting Improvements and Controls
- Water Conservation Measures
- Vending Misers
- Variable Frequency Drives
- Energy Management Control Systems
- Chilled Water Plant Replacement
- Thermal Storage
- Boiler Replacement
- Roof Improvements
- Building Envelope Improvements
- Ice Machine Heat Exchangers
- Water Cooled Ice Machine Replacement
- Ozone Laundry System
- Plumbing Fixtures Controls
- Cooling Tower Submetering
- Air Handling Unit Replacements
- Cooling Tower Refurbishment
- Network Computer Controls
- Stainless Steel Plumbing Fixtures
- Window Film
- Window Replacement

- Exterior Insulation and Finishing System
- Chiller Extended Warranty With Service AgrECMents
- Modular Headworks Optimization

Additional Solar PV System Resources

Space Coast Solar Co-Op[201]**:** 2020 was the third year for the solar co-op in Brevard County. Co-ops in 2018 and 2019 were organized and hosted by the League of Women Voters. 2020's current co-op is organized by Citizens Climate Lobby - Space Coast Chapter (CCL).

Partner organizations are:

- ReThink Energy Florida, Brevard
- League of Women Voters of the Space Coast
- Turtle Coast Sierra Club
- Space Coast EV Drivers
- City of Satellite Beach
- City of Cocoa
- Space Coast Progressive Alliance

Solar United Neighbors[202] – non-profit organization that partnered with local organizations and municipalities in 2018, 2019, and 2020 to educate residents and create Solar Co-ops.

Interstate Renewable Energy Council provides information and tools to policymakers, regulators, developers and others interested to support the adoption and implementation of shared renewable programs.[203]

This excellent website[204] provides tools and resources including cases studies and policy evaluations for policymakers, community leaders, and others working to increase solar access.

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[201] Solar United Neighbors. 2021. "Space Coast Solar Co-op." https://coops.solarunitedneighbors.org/coops/space-coast-solar-co-op/.
[202] Solar United Neighbors. https://www.solarunitedneighbors.org/.
[203] IREC. 2016. "Shared Renewable Energy for Low- to Moderate-Income Consumers: Policy Guidelines and Model Provisions. https://irecusa.org/publications/shared-renewable-energy-for-low-to-moderate-income-consumers-policy-guidelines-and-model-provisions/.
[204] 2021. "Low-Income Solar Policy Guide. https://www.lowincomesolar.org/.

Clean Energy States Alliance report identifies barriers to deployment of solar and strategies to address those barriers.[205]

Energy Transition Plan Resources

1. Energy Law Summit presentation by Dr. Jim Fenton, Florida Solar Energy Center (presentation from 4:50 to 54:00)[206]

2. Savannah Georgia transition plan[207]

3. 2018 Green Works Orlando Community Action Plan[208]

4. Solsmart[209] - To help communities achieve designation, SolSmart provides no-cost technical assistance from a team of national experts who work to evaluate programs and practices that impact solar markets, and identify high-prospect opportunities for improvement. A select number of communities also hosted SolSmart Advisors: fully-funded, experienced staff who work in communities for periods of up to six months.

5. EPA - Local Government Solar Project Portal[210]
   EPA - Solar Powering Your Community: A Guide for Local Governments[211]

6. C40 Knowledge / Sunshot
   Complete Guide to Implementing Solar PV for Local Governments[212]
   How to install solar panels on city-owned property and lead by example[213]

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[205] Clean Energy States Alliance. 2021. "Solar with Justice: Strategies for Powering Up Under-Resources Communities and Growing an Inclusive Solar Market." https://www.cesa.org/resource-library/resource/solar-with-justice/.
[206] Fenton, J. 2021. "Florida's Energy Future." Seminar. Energy Law Summit. https://vimeo.com/506156807/746bb2e0d8.
[207] City of Savannah, GA. "100% Savannah." https://www.savannahga.gov/DocumentCenter/View/20525/100Percent-Public-Engagement-Presentation.
[208] City of Orlando, FL. 2018. "Community Action Plan." https://www.orlando.gov/files/sharedassets/public/departments/sustainability/2018_orlando_communityactionplan.pdf.
[209] Solsmart. 2021. "What is Solsmart?" https://solsmart.org/how-we-help/what-is-solsmart/.
[210] U.S. Environmental Protection Agency. 2021. "Local Government Solar Project Portal." https://www.epa.gov/repowertoolbox/local-government-solar-project-portal.
[211] U.S. Department of Energy. 2011. "Solar Powering Your Community: A Guide for Local Governments." Report. Technical Document DOE/GO-102011-3020. https://www1.eere.energy.gov/solar/pdfs/47692.pdf.
[212] U.S. Department of Energy. 2014. "Guide to Implementing Solar PV for Local Governments." Report. https://solsmart.org/wp-content/uploads/ICMA_GuidetoImplementingSolarPVforLocalGovernments.pdf.
[213] C40 Knowledge. 2021. "How to install solar panels on city-owned property and lead by example." https://www.c40knowledgehub.org/s/article/How-to-install-solar-panels-on-city-owned-property-and-lead-by-example?language=en_US.

Brevard County EV CBA Tool Calculations and Cell Descriptions

Table 4. EV CBA Tool Cell Descriptions

EV CBA Tool Tab		
Column Label	**Description**	**Excel Calculation**
CV Cost – EV Cost	CV Cost – EV Cost + First Year Incentive for EV Purchase	+G6-G5+G9
CV Fuel Cost – EV Fuel Cost	**CV fuel cost – EV fuel cost per year**	**+X10 – Y10**
CV Fuel Cost (column X)	CV fuel cost at the end of year (n) (includes escalation rate)	+$X$10*(1+$C$9)^B13
EV Fuel Cost (column Y)	**CV fuel cost at the end of year (n) (includes escalation rate)**	**+$Y$10*(1+$C$7)^B13**
CV Maint Cost – EV Maint Cost	CV Maint Cost for one year minus EV Maint Cost at the end of year (n) (includes escalation rate)	=+(($G$8*K7)-($G$7*K7))*(1+$C$8)^B13
Annual Cash Flow	**Cash Flow for Year (n) = Total of Vehicle Cost Difference, Fuel Cost Difference and Maintenance Cost Difference for Year (n)**	=+D13+F13+G13
NPV of Annual Cash Flow	Net Present Value at end of Year (n) of Annual Cash Flow	=+H13/(1+$C$6)^B13
Cumulative NPV	**Running Total of NPV at end of Year (n)**	**+I (n) +I (n-1)**
	Spreadsheet Reference Cells	
B13 (end of Year) B(n)	**(n) Represents year**	
C5 (Estimated Vehicle Life in Years)	Input Value	
C6 (Discount Rate)	**Input Value**	
C7 (Annual Elect Cost Increase)	Input Value	

C8 (Rate of Maint Cost Increase)	Input Value	
C9 (Annual Fuel Cost Increase)	Input Value	
D(n)	CV Cost – EV Cost	
F (n)	CV Fuel Cost – EV Fuel Cost	
G5 (EV Cost)	Input Value	
G6 (CV Cost)	Input Value	
G7 (EV Maint Cost per Mi)	Input Value	
G8 (CV Maint Cost per Mi)	Input Value	
G9 (First Year Incentive for EV Purchase)	Input Value	
G (n)	CV Maint Cost – EV Maint Cost	
I(n)	NPV of Annual Cash Flow at end of Year (n)	
K5 (Price of Gas / Diesel per Gallon)	Input Value	
K6 (Average Elect Cost)	Input Value	
K7 (Miles Driven per Yr)	Input Value	
K8 (CV average MPG)	Input Value	
K9 (EV kWh / 100 mi)	Input Value	
X10 (CV Fuel Cost at start of year 1)	Miles Driven per Year / CV average MPG	K7/K8 X K5
Y10 (EV Fuel Cost at start of year 1)	Miles Driven per Year/ 100 X EV kWh per 100 mi X Avg Elect Cost / kWh	+$K$7/100*$K$9*$K$6

Table 5. EV CBA Tool Financing Tab Cell Descriptions

Financing CBA Tool Tab		
Column Label	**Description**	**Excel Calculation**
Additional Down Payment	Difference between down payment on EV and CV	-C6
Additional Yearly Loan Payments Over CV Loan Payment	Yearly Loan Payments for Additional Cost of EV over CV	F6*12
Annual Cash Flow (Financed)	Cash Flow for Year (n) =	=SUM(D(n):F(n))

	Total of Down Payment Difference, Fuel Cost Difference and Maintenance Cost Difference for Year (n) and Additional Yearly Loan Payment	
NPV of Annual Cash Flow with Yearly Loan Payments	Net Present Value at end of Year (n) of Annual Cash Flow	=+G9/(1+$C$5)^B(n)
Spreadsheet Reference Cells		
C4 (EV Cost – CV Cost)	From EV CBA Tool Tab	
C5 (Discount Rate)	From EV CBA Tool Tab	
C6 (Additional Down Payment)	Difference between down payment on EV and CV	C4 – F5
F4 (Percent of Vehicle Cost Financed)	Input Value	
F5 (Additional Amount Financed)	Additional amount financed for EV vs CV	C4 * F4
F6 (Increase in Monthly Payment)	Monthly Loan Payment for Increased Value Financed (EV verses CV)	=PMT(+I5/12,+I4*12,+F5,0,0)
I4 (Interest Rate)	Input Value	
I5 (Number of Years Financed)	Input Value	

Energy Manager Job Description template [214]

[*name of community/municipality*]
[*department, responsible to*]
[*full-time or part-time permanent*]

Overview

[*describe the main purpose of the job] [insert vision statement from Energy Plan*]
The Energy Manager is a new position primarily responsible for implementation of the community's *Energy Plan*, with roles including development and/or coordination of a municipal energy management program and serving as a champion for other energy projects/programs within the community. The community's leadership is committed to reducing energy waste and realizing other economic and environmental benefits through improved energy efficiency and renewable energy generation.

- Reports directly to [*top administrator*]
- Maintains a functional, working relationship with building/facilities managers, planning staff, financial managers, and elected/appointed officials
- Responsible for municipal energy management across departments and service areas such as buildings, facilities, fleet vehicles, infrastructure, and renewable energy generation facilities
- Responsible for directing the work of consultants or other assigned staff as needed for specific implementation programs or projects
- Assists the [*Technical Advisory Committee*] in its responsibility to provide community energy recommendations to City Council [*township board, county board, village board*]
- Helps build energy policy into standard practices of the community including revisions to a community master plan, capital improvement plan, economic and community development initiatives, and land use planning.
- Acts as a champion and/or project manager for key energy initiatives within the community with the aid and guidance of the [*Technical Advisory Committee*]

Roles and Responsibilities

The Energy Manager is the point-person for energy management across the community. Effective management of municipal energy demonstrates leadership to the community while generating operational savings. The Energy Manager also serves as an information resource on energy efficiency and renewable energy topics to the broader community as needed to promote additional energy savings and support the community's energy goals. Responsibilities may include any of the following:

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[214] Adapted from Community Energy Management – Best Practices.
Michigan Office of Climate and Energy. "Community Energy Management – Best Practices." https://www.michigan.gov/documents/energy/MEO_CEM_BP_Strategy_507780_7.pdf.

Energy Planning:

- Coordinates the development and periodic update of the community's *Energy Plan* through a transparent public participation process with the guidance of the [*Technical Advisory Committee*].
- Works with the [*Technical Advisory Committee*] to prioritize and plan the implementation of actions in the *Energy Plan*.
- Develops an *Action Plan* annually to implement the prioritized actions in the *Energy Plan*.
- Develops an *Annual Report* of progress along with an evaluation and recommendations for the *Technical Advisory Committee*, departments, City Council, and general public.
- Ensures capital investment projects incorporate energy efficiency and renewable energy and are appropriately prioritized in the Capital Improvement Plan (CIP) to meet the targets in the *Energy Plan*.
- Researches viable technologies, best practices, and program ideas to advance local clean energy and sustainability goals.

Municipal Energy Management:

- Acts as an energy liaison providing leadership and guidance to all municipal staff. Maintains a functional, working relationship with building/facilities managers, financial managers, planning staff, and elected/appointed officials.
- Monitors municipal energy consumption, measures savings, and provides monthly reports to municipal departments and service areas.
- Works with municipal *Green Team* (cross-department representatives) to expand energy awareness, find cross-department synergies, share savings, and achieve energy reduction targets concurrent with meeting other community goals.
- Plans and oversees staff education and training on relevant energy topics.
- Plans and oversees orientation and ongoing training of local officials (elected and appointed) on the *Energy Plan* and current energy management *Action Plan*.
- Directs the work of consultants as needed, for specific implementation programs.
- Oversees funding allocation from department fees (or other sources as applicable) for municipal energy management.
- Oversees municipal revolving energy fund allocations from savings generated by completed capital projects (if applicable).
- Assists the municipality with putting together a financial package for energy efficiency and/or renewable energy projects including access to utility rebates, low interest financing, and power purchase agrECMents.

Community Engagement & Support:

- Raises energy awareness through public outreach and education and develops/utilizes the community's *Community Energy Webpage* as the central hub of communication.
- Works proactively with community partners to advance community energy goals including regional stakeholders, neighboring jurisdictions, and utilities.

- Coordinates with other staff and committees on policies, zoning, and permitting that affect energy conservation and renewable energy generation in the community.
- Acts as an energy liaison and provides technical assistance to community residents and businesses.
- Maintains membership in Michigan Green Communities network, participate in energy networking with other Michigan communities, and make regular progress on the Green Communities Challenge.
- Develops a sustainable funding plan and/or other recommendations for supporting residents and businesses in achieving community energy targets.

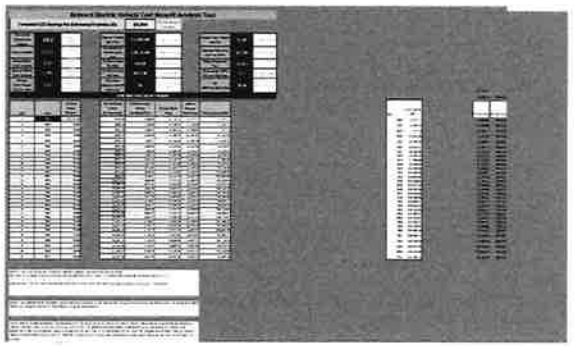
Qualifications

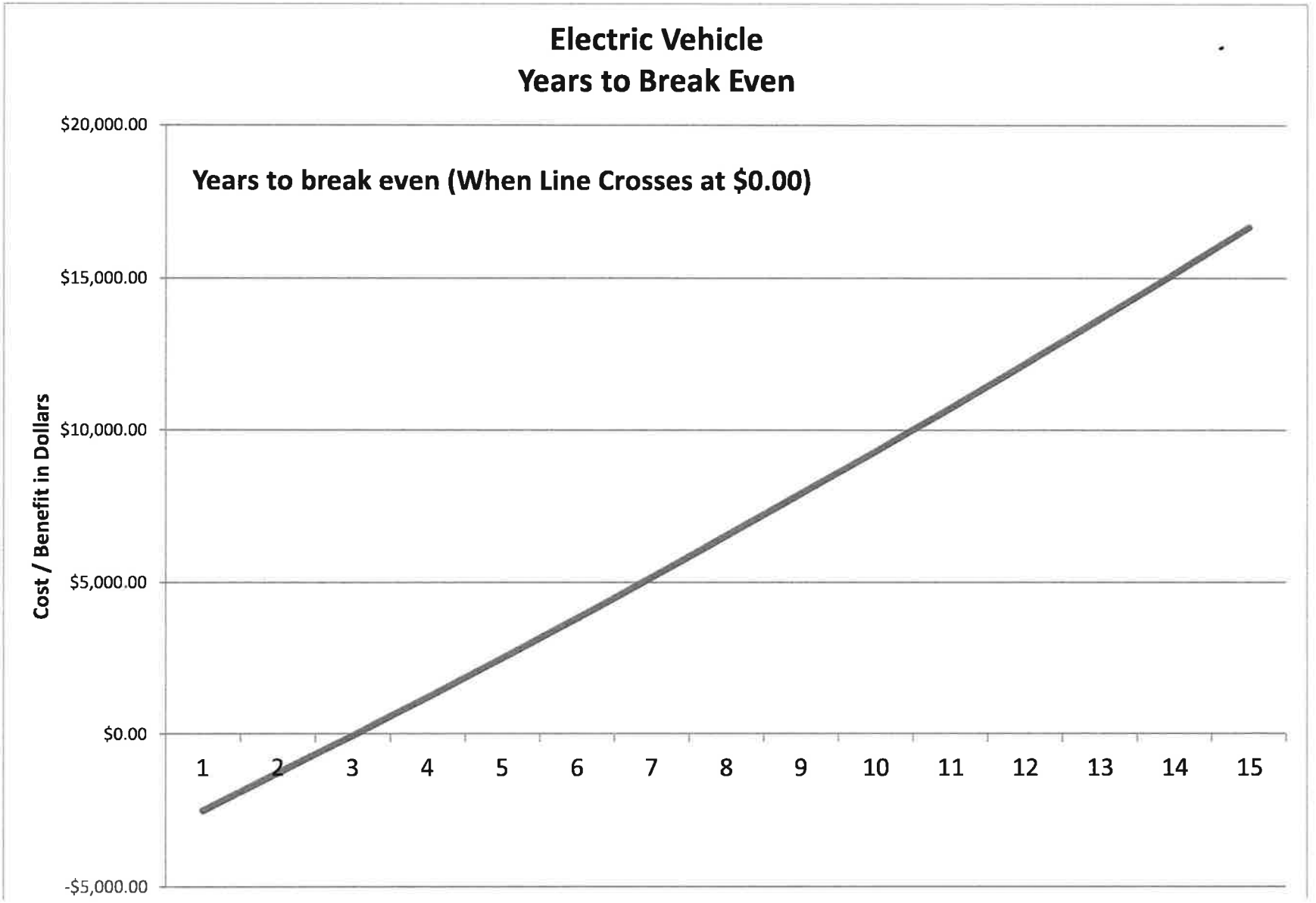
The Energy Manager must possess technical knowledge in energy-related topics along with the ability to provide leadership and effectively communicate with residents, businesses, municipal staff, and local officials.

- A minimum of [*2, 5*] years of related professional experience including development and implementation of energy efficiency and renewable energy programs with an understanding of local government decision-making processes.
- Dynamic and skilled professional in project management, community engagement, analysis, building capacity, teamwork, and implementation skills.
- Preferred Education: Bachelors degree or higher in Engineering, Environmental Science, Sustainability, Natural Resource Management, Environmental Policy/Management, Urban Planning, Public Policy, Public Administration, or a similar field.
- Desirable certifications include Certified Planner, Certified Energy Manager, LEED Accredited Professional, Project Management Professional, or Registered Professional Engineer
- Fluency with Energy Star Portfolio Manager and other energy benchmarking software.
- A thorough understanding of commercial building energy efficiency measures including those related to the building envelope, lighting, HVAC, occupant behavior, and equipment upgrades.
- An ability to assist the municipality with assessing the technical and financial viability of renewable energy installations.
- An ability to assist the municipality with project scoping, contractor selection, project management, and QA/QC.

Work Environment

The Energy Manager will work in an office environment with occasional navigation of field conditions (HVAC systems, lighting systems, buildings, fleets, renewable energy site, etc.), and community meetings. There will be occasional travel to neighboring communities, state meetings, and conferences.




Electric Vehicle
Years to Break Even
Years to break even (When Line Crosses at $0.00)
Cost / Benefit in Dollars
$20,000.00
$15,000.00
$10,000.00
$5,000.00
$0.00
-$5,000.00
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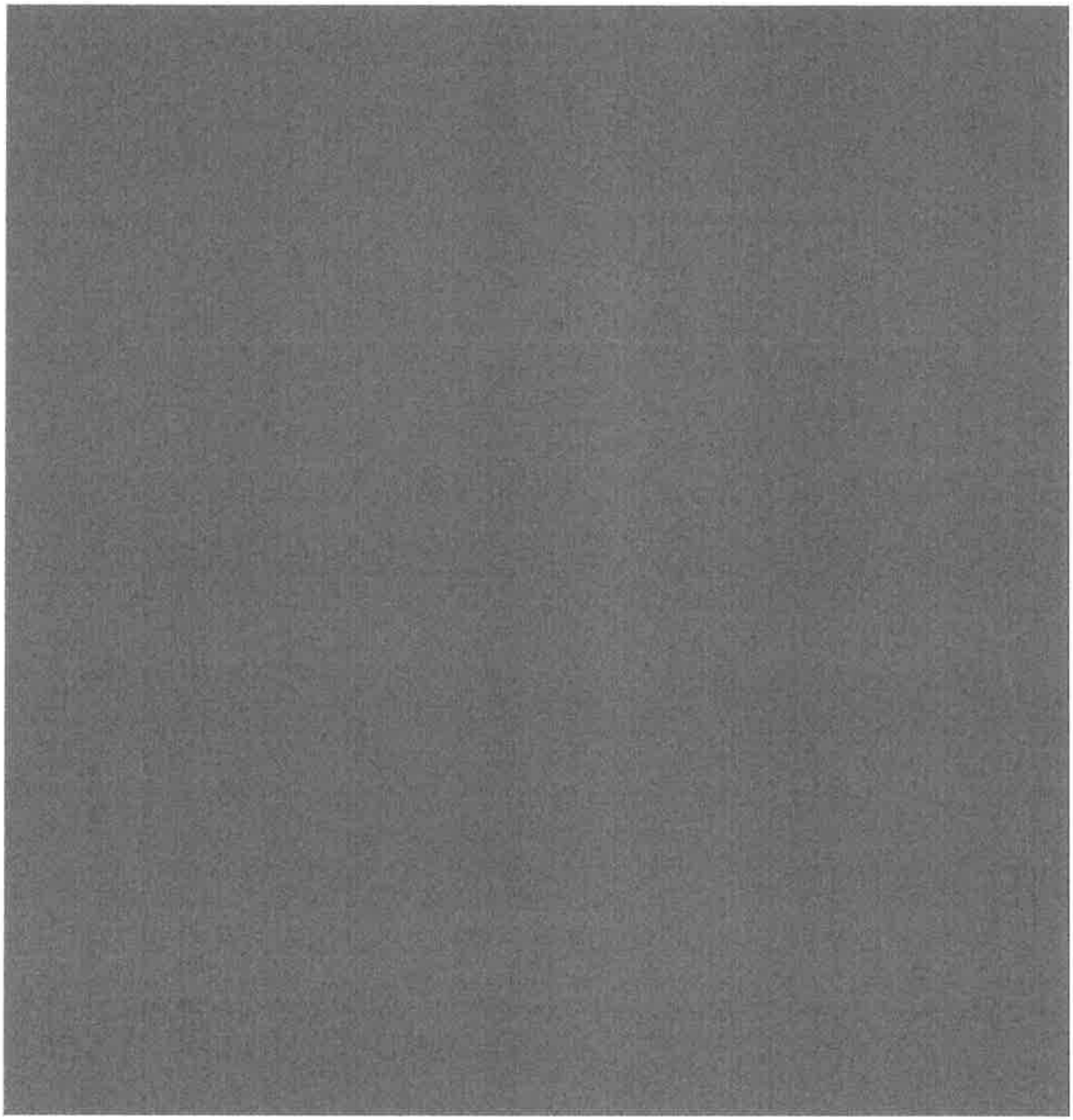
Potential LCC Savings with Financing

EV Cost - CV Cost	$3,760.00		Percent of Vehicle Cost Financed	90.0%
Discount Rate	0.35%		Additionl Amount Financed	$3,384.00
Additional Down Payment	$376.00		Increase in Monthly Payment	$60.81

Year	Year	Annual Cash Flow From Fuel and Maint Cost	Additional Down Payment	Additional Yearly Loan Payments over CV Loan Payment
1	2021	$1,213.15	$376.00	$729.67
2	2022	$1,238.31	$0.00	$729.67
3	2023	$1,263.84	$0.00	$729.67
4	2024	$1,289.77	$0.00	$729.67
5	2025	$1,316.09	$0.00	$729.67
6	2026	$1,342.82	$0.00	$0.00
7	2027	$1,369.95	$0.00	$0.00
8	2028	$1,397.50	$0.00	$0.00
9	2029	$1,425.47	$0.00	$0.00
10	2030	$1,453.88	$0.00	$0.00
11	2031	$1,482.72	$0.00	$0.00
12	2032	$1,512.01	$0.00	$0.00
13	2033	$1,541.76	$0.00	$0.00
14	2034	$1,571.97	$0.00	$0.00
15	2035	$1,602.66	$0.00	$0.00
16	2036	$1,633.82	$0.00	$0.00
17	2037	$1,665.48	$0.00	$0.00

	18	2038	$1,697.63	$0.00	$0.00
	19	2039	$1,730.29	$0.00	$0.00
	20	2040	$1,763.47	$0.00	$0.00
	21	2041	$1,797.17	$0.00	$0.00
	22	2042	$1,831.41	$0.00	$0.00
	23	2043	$1,866.20	$0.00	$0.00
	24	2044	$1,901.54	$0.00	$0.00
	25	2045	$1,937.45	$0.00	$0.00
	26	2046	$1,973.94	$0.00	$0.00
	27	2047	$2,011.01	$0.00	$0.00
	28	2048	$2,048.68	$0.00	$0.00
	29	2049	$2,086.96	$0.00	$0.00
	30	2050	$2,125.86	$0.00	$0.00
	31	2051	$2,165.39	$0.00	$0.00

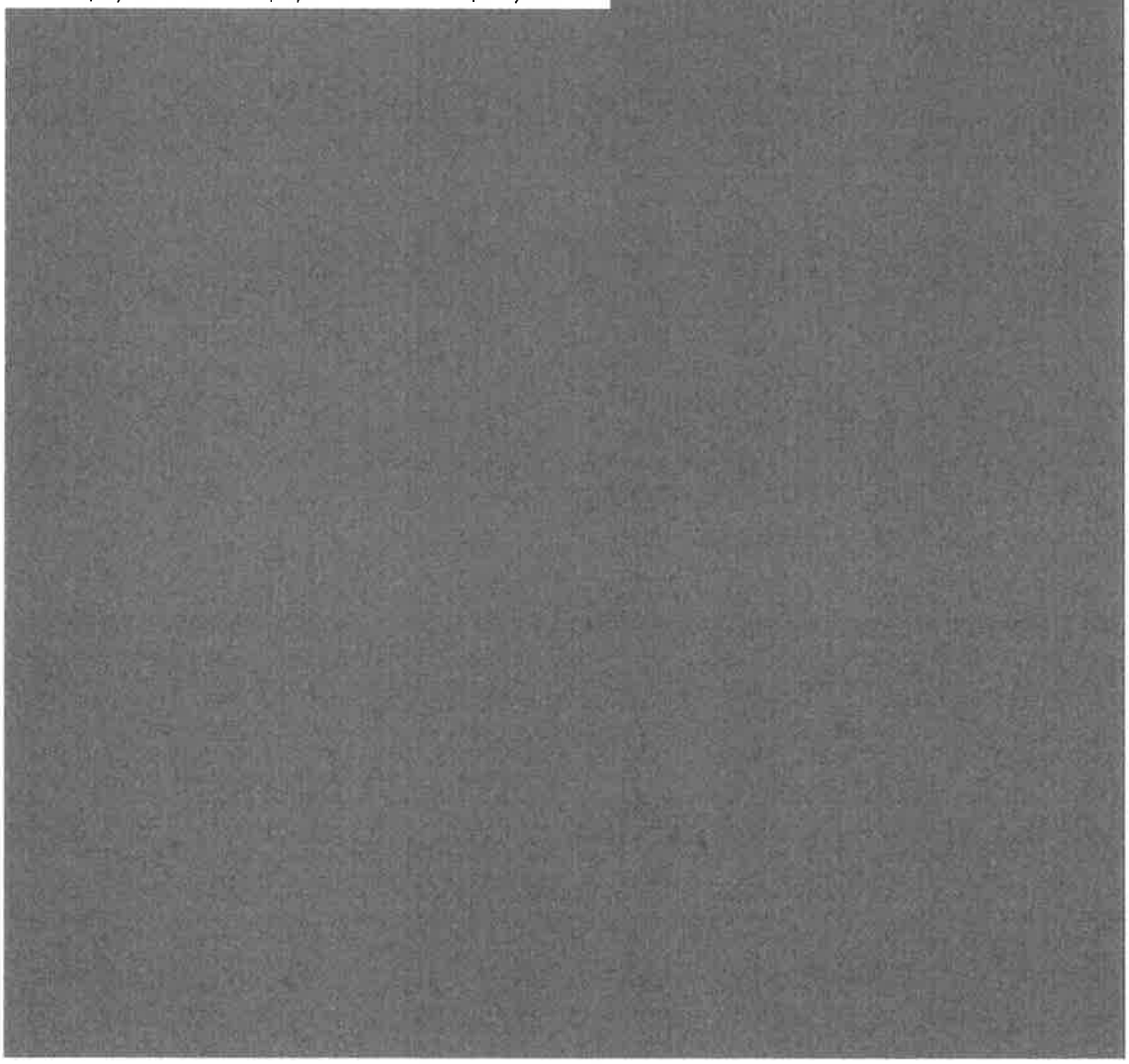


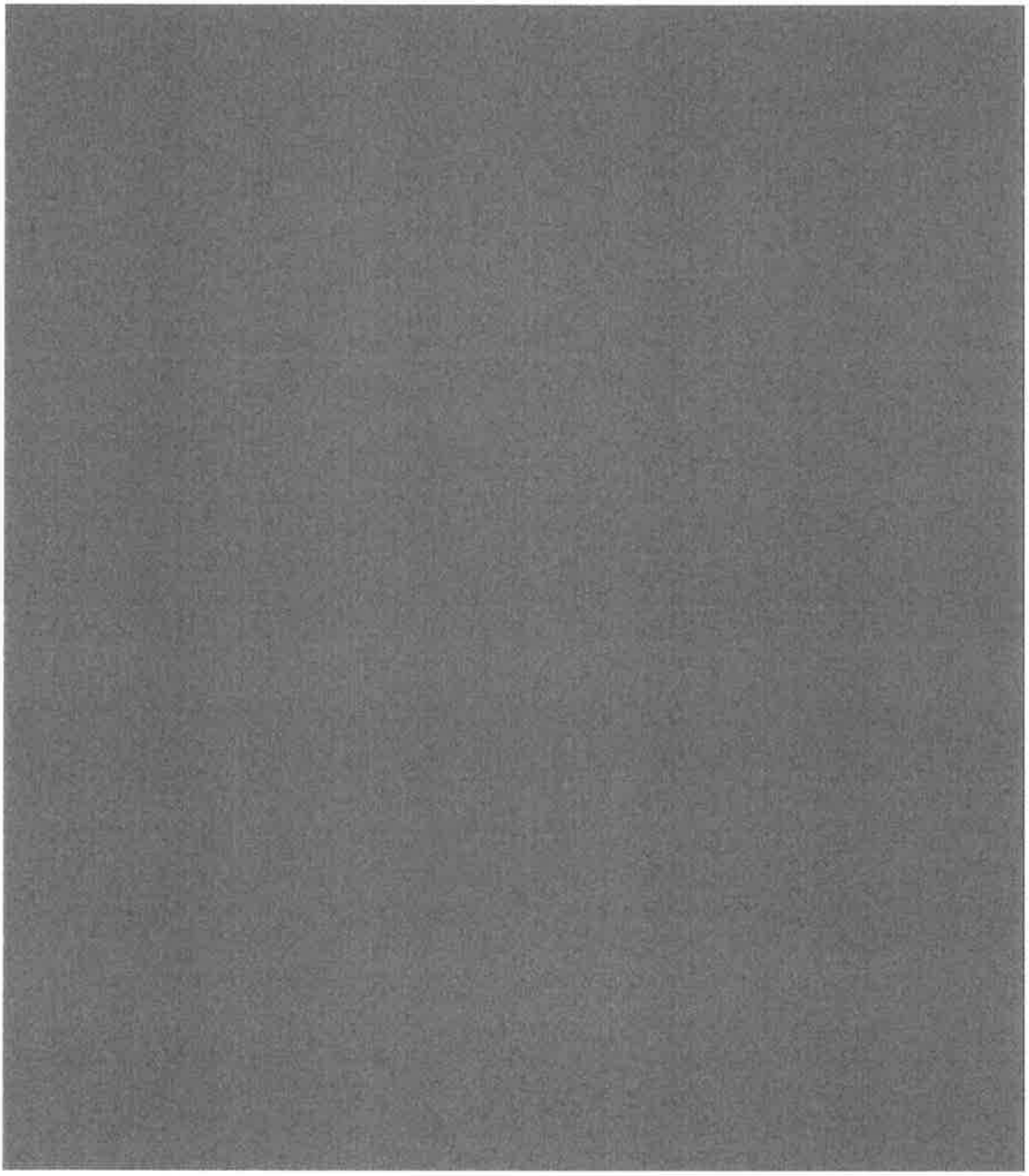
$9,065	
Number of Years Financed	5
Intrest Rate	3.0%

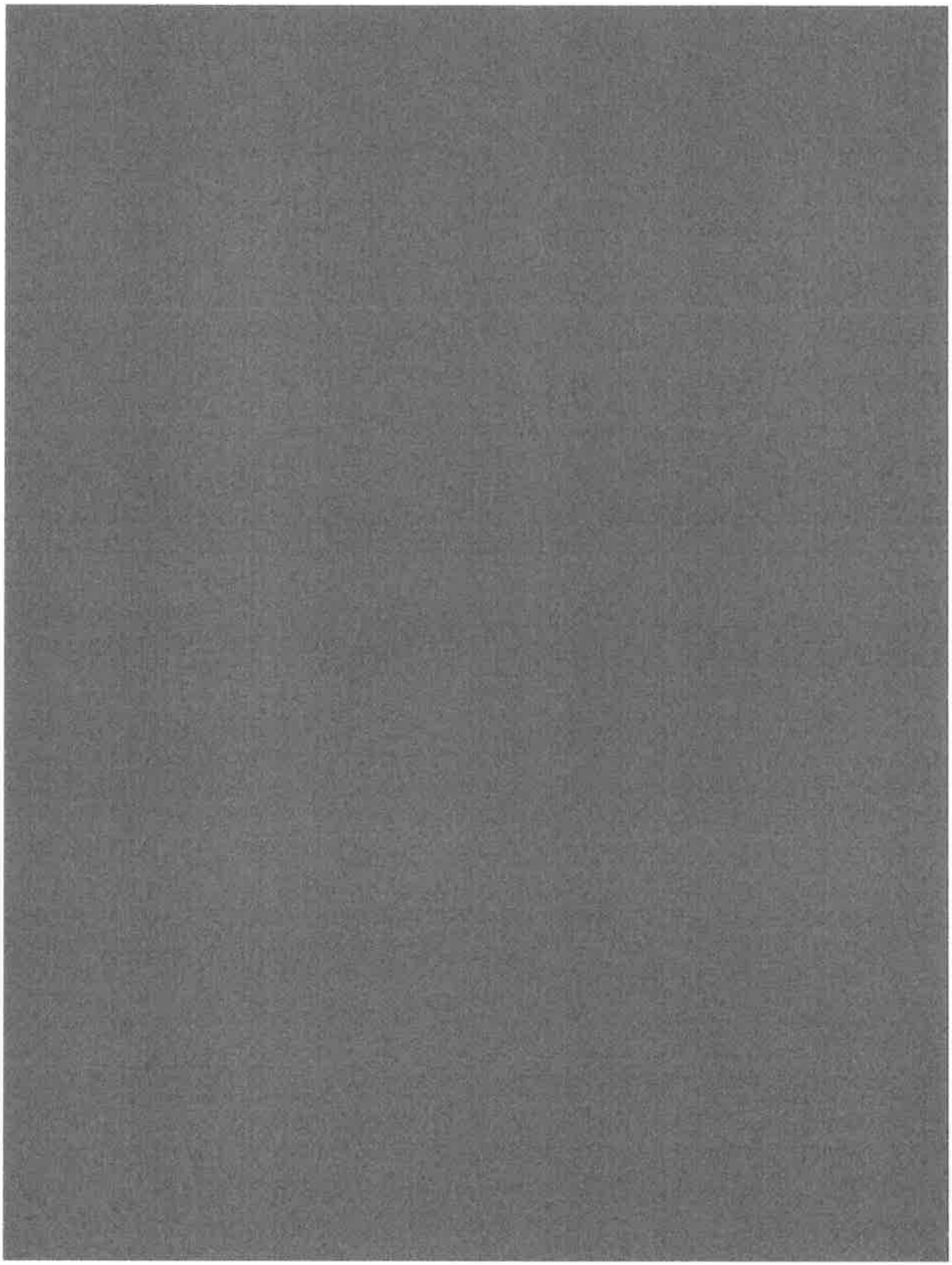
Only Values in Blue Can Be Changed

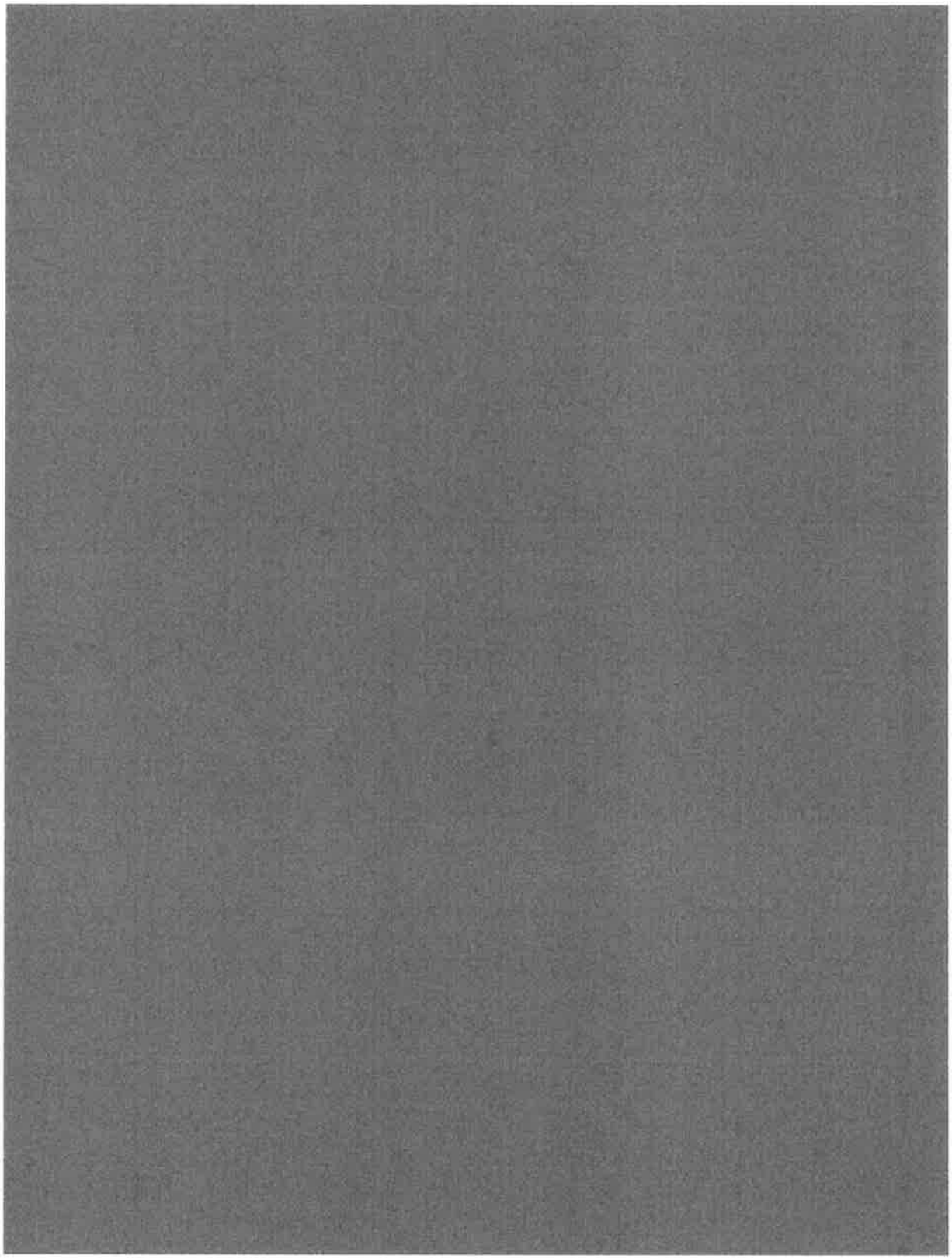
Annual Cash Flow (Financed)	NPV of Annual Cash Flow with Yearly Loan Payments	Cummulative NPV (Financed)
$107.48	$107.10	$107.10
$508.63	$505.09	$612.19
$534.17	$528.60	$1,140.80
$560.10	$552.32	$1,693.12
$586.42	$576.26	$2,269.38
$1,342.82	$1,314.96	$3,584.34
$1,369.95	$1,336.85	$4,921.19
$1,397.50	$1,358.98	$6,280.17
$1,425.47	$1,381.34	$7,661.51
$1,453.88	$1,403.96	$9,065.47
$1,482.72	$1,426.82	$10,492.28
$1,512.01	$1,449.93	$11,942.21
$1,541.76	$1,473.30	$13,415.51
$1,571.97	$1,496.93	$14,912.44
$1,602.66	$1,520.83	$16,433.27
$1,633.82	$1,544.99	$17,978.26
$1,665.48	$1,569.43	$19,547.69

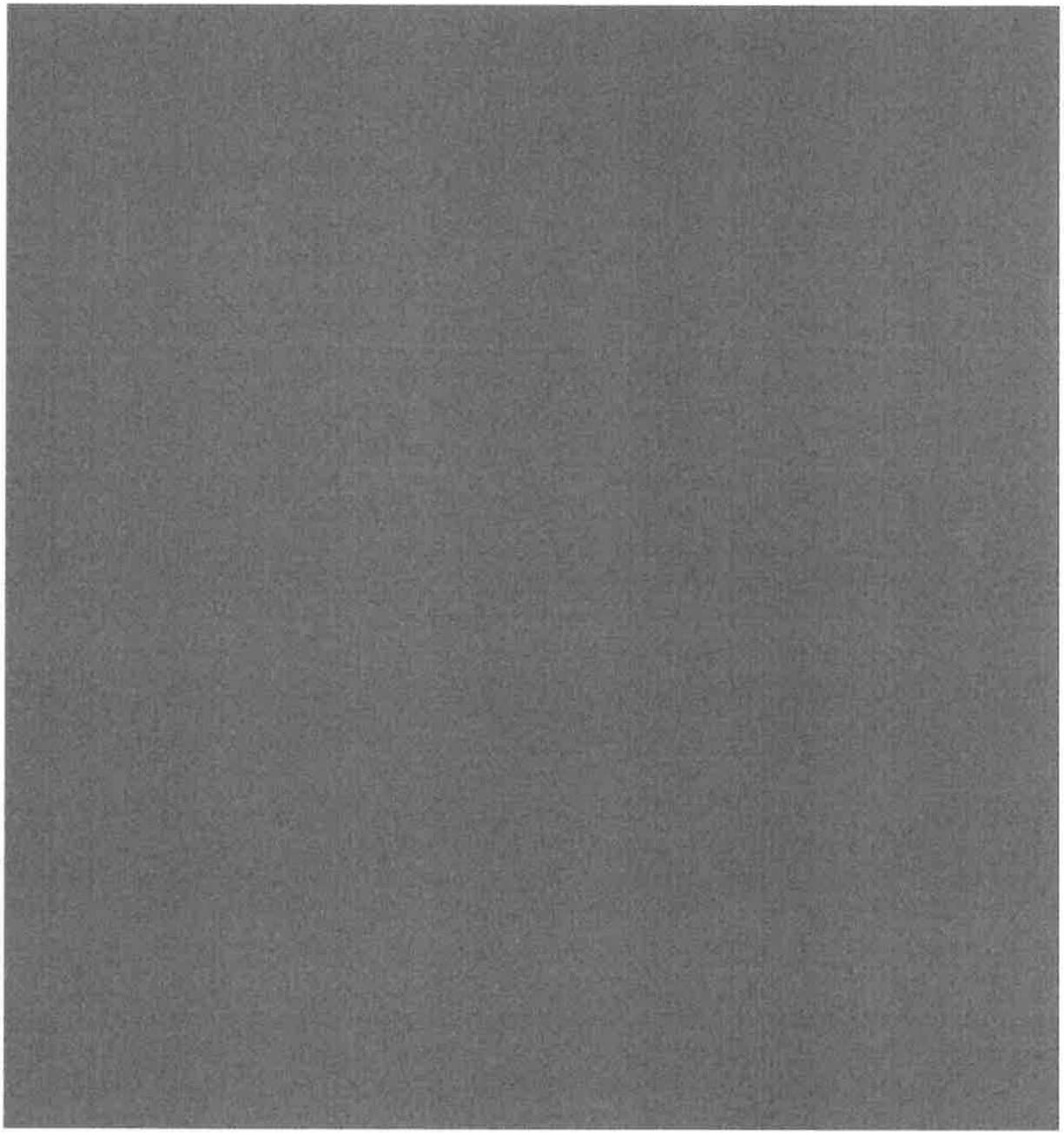
$1,697.63	$1,594.15	$21,141.85
$1,730.29	$1,619.16	$22,761.00
$1,763.47	$1,644.45	$24,405.45
$1,797.17	$1,670.03	$26,075.49
$1,831.41	$1,695.92	$27,771.40
$1,866.20	$1,722.10	$29,493.50
$1,901.54	$1,748.59	$31,242.10
$1,937.45	$1,775.40	$33,017.50
$1,973.94	$1,802.53	$34,820.02
$2,011.01	$1,829.97	$36,650.00
$2,048.68	$1,857.75	$38,507.75
$2,086.96	$1,885.86	$40,393.61
$2,125.86	$1,914.31	$42,307.93
$2,165.39	$1,943.11	$44,251.04

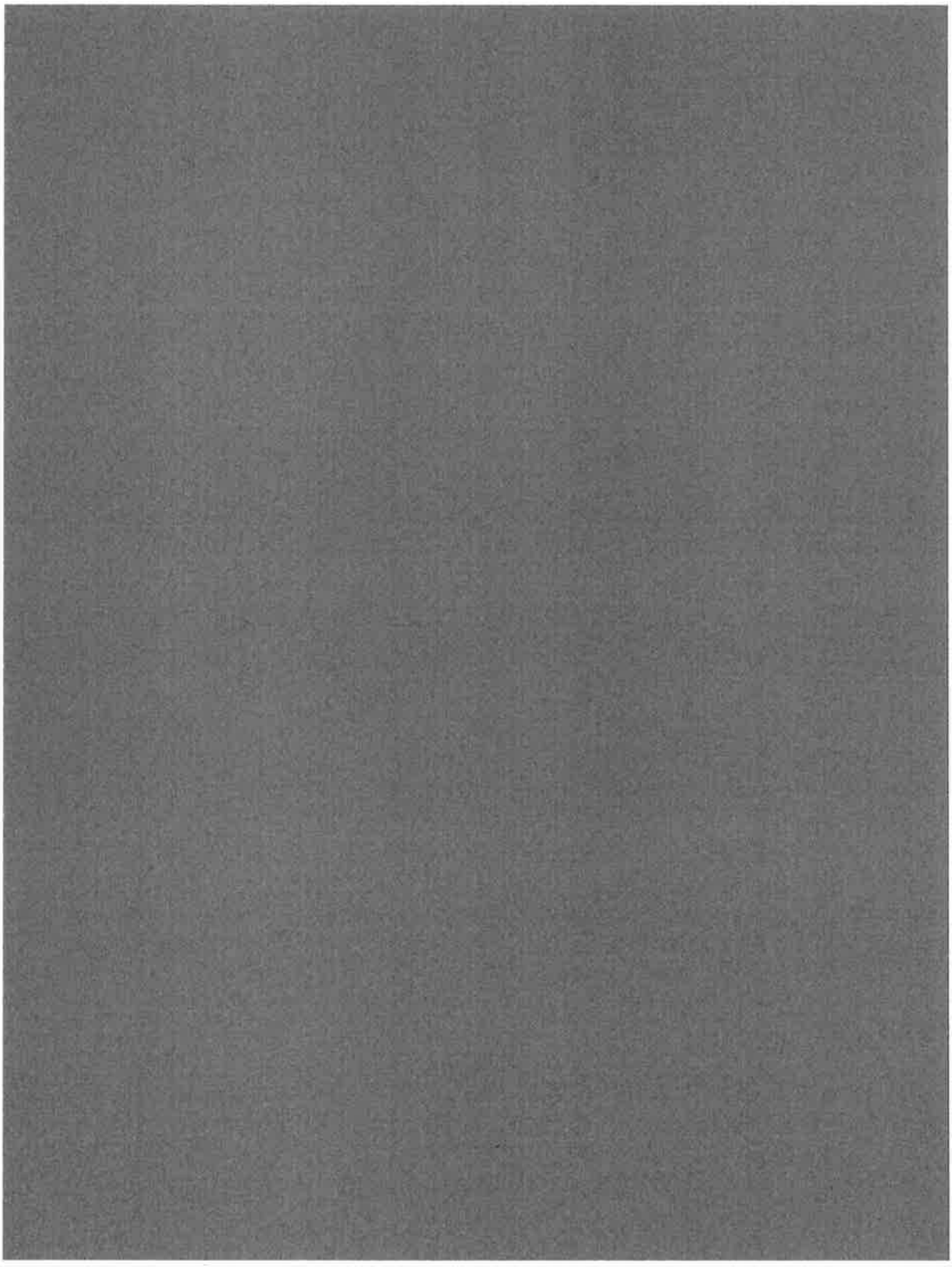


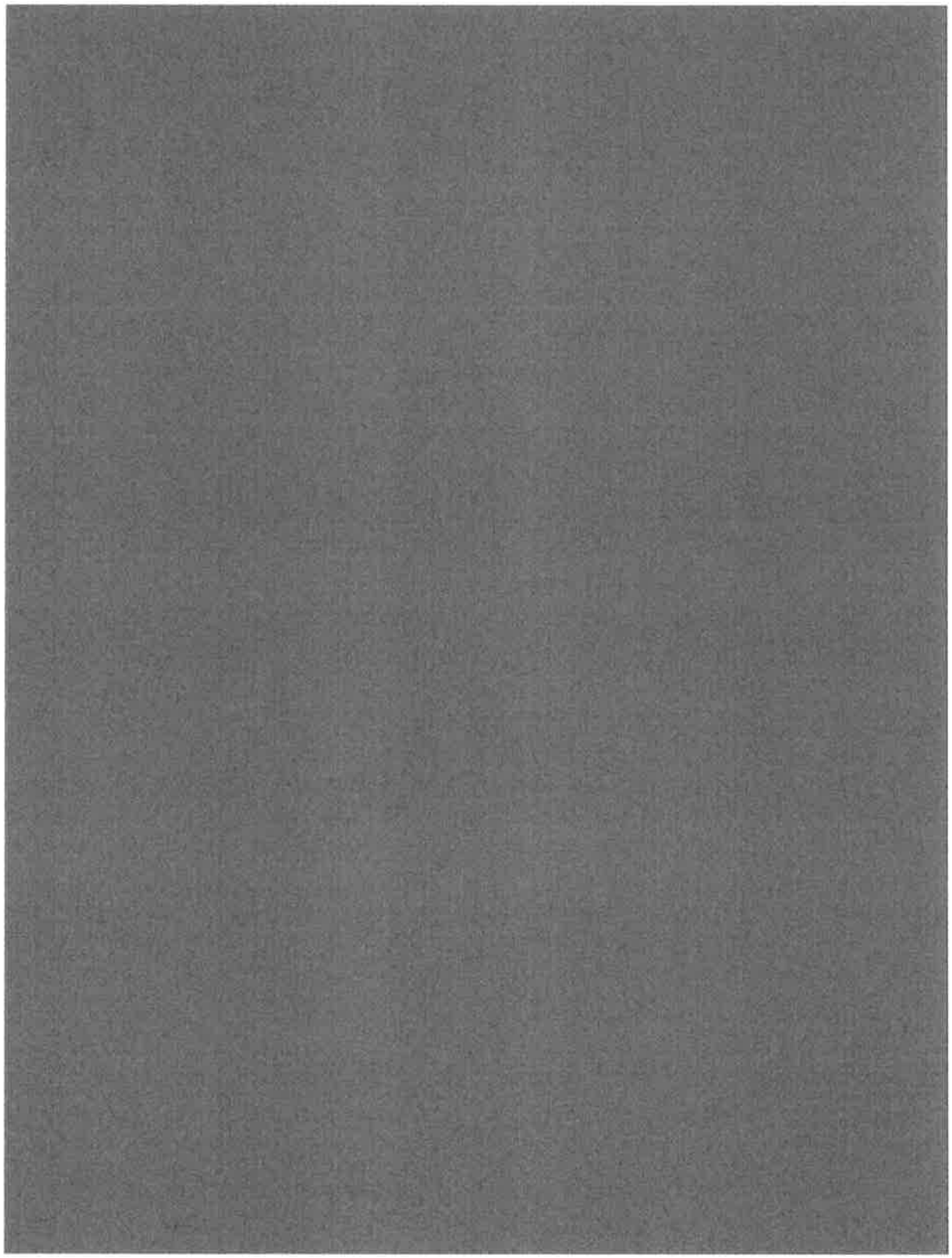


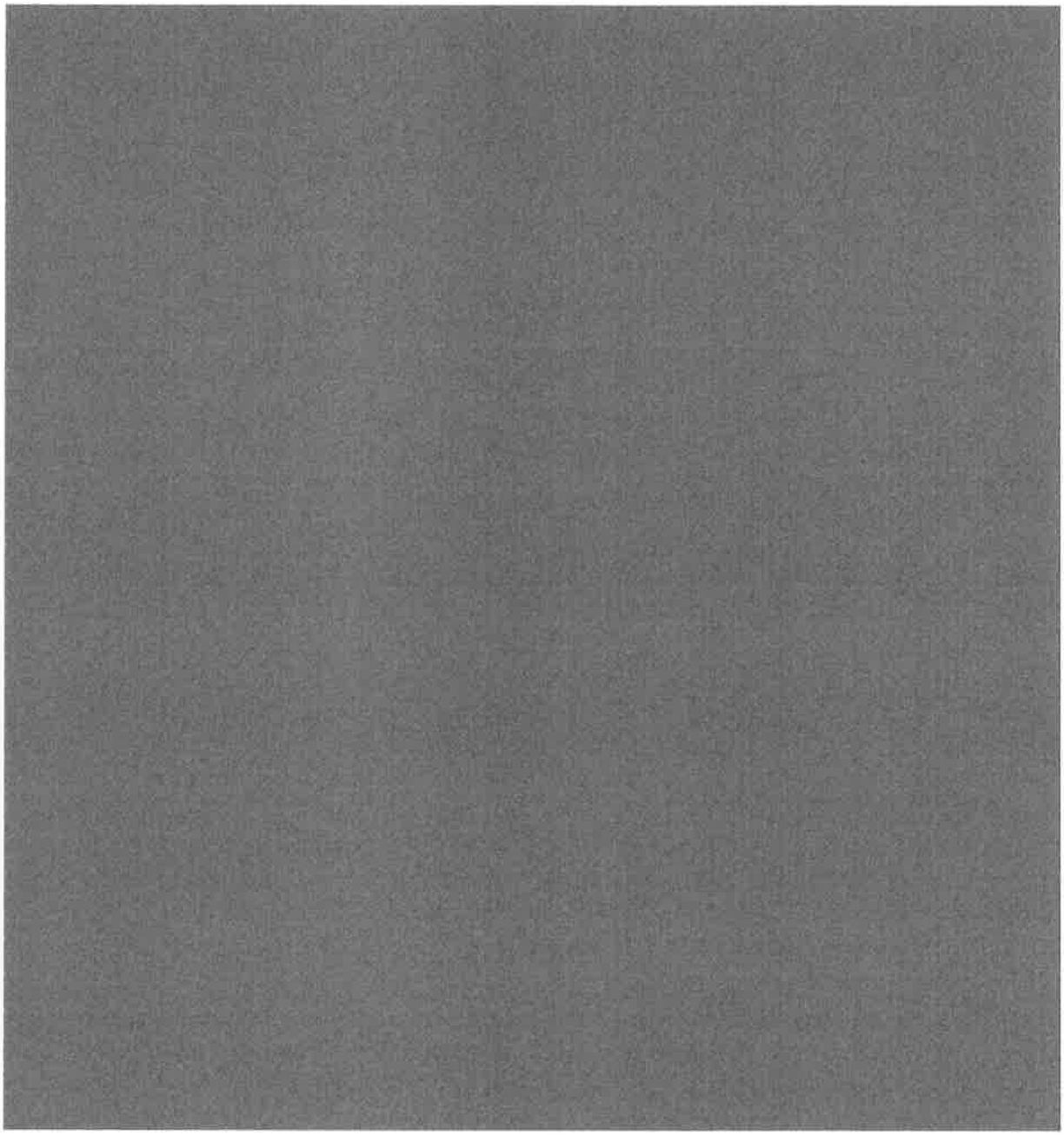


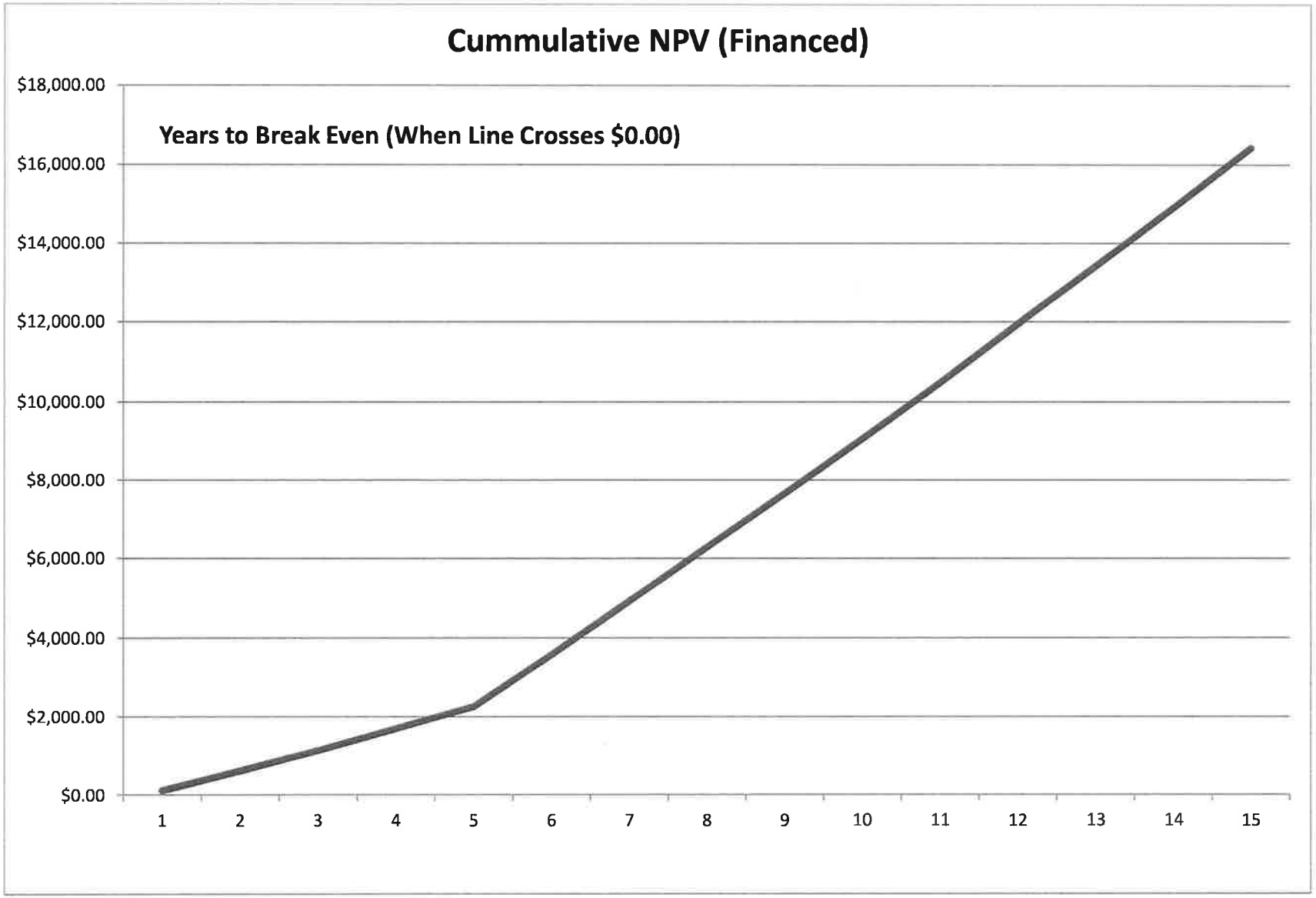











Cummulative NPV (Financed)
Years to Break Even (When Line Crosses $0.00)
$18,000.00
$16,000.00
$14,000.00
$12,000.00
$10,000.00
$8,000.00
$6,000.00
$4,000.00
$2,000.00
$0.00
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Solar Power Cost Benefit Analysis (Reference Only - recre

Based on Morgan Anne Wampler paper presented to Faculty of the Agribusine
University 2011. Reference https://pdfs.semanticscholar.org/b2c8/92503293c

Discount Rate	6%
Annual Elect Cost Increase	1.5%

Year	Year	System Cost	Tax Credit	Avoided Electricity Costs
0	2020	-$615,825.00	$0.00	$0.00
1	2021	$0.00	$184,747.50	$49,555.84
2	2022	$0.00	$0.00	$50,299.18
3	2023	$0.00	$0.00	$51,053.67
4	2024	$0.00	$0.00	$51,819.47
5	2025	$0.00	$0.00	$52,596.76
6	2026	$0.00	$0.00	$53,385.71
7	2027	$0.00	$0.00	$54,186.50
8	2028	$0.00	$0.00	$54,999.30
9	2029	$0.00	$0.00	$55,824.29
10	2030	$0.00	$0.00	$56,661.65
11	2031	$0.00	$0.00	$57,511.58
12	2032	$0.00	$0.00	$58,374.25
13	2033	$0.00	$0.00	$59,249.86
14	2034	$0.00	$0.00	$60,138.61
15	2035	$0.00	$0.00	$61,040.69
16	2036	$0.00	$0.00	$61,956.30
17	2037	$0.00	$0.00	$62,885.64
18	2038	$0.00	$0.00	$63,828.93
19	2039	$0.00	$0.00	$64,786.36
20	2040	$0.00	$0.00	$65,758.16
21	2041	$0.00	$0.00	$66,744.53
22	2042	$0.00	$0.00	$67,745.70
23	2043	$0.00	$0.00	$68,761.88
24	2044	$0.00	$0.00	$69,793.31
25	2045	$0.00	$0.00	$70,840.21
26	2046	$0.00	$0.00	$71,902.82
27	2047	$0.00	$0.00	$72,981.36
28	2048	$0.00	$0.00	$74,076.08

29	2049	$0.00	$0.00	$75,187.22
30	2050	$0.00	$0.00	$76,315.03

eation of spreadsheet in paper below)

ess Department California Polytechnic State
l41b2c5eb0e943f1da7b6da18c8c.pdf

Annual Cash Flow	NPV of Annual Cash Flow	Cummulative NPV
-$615,825.00	-$615,825.00	-$615,825.00
$234,303.34	$221,040.89	-$394,784.11
$50,299.18	$44,766.09	-$350,018.02
$51,053.67	$42,865.64	-$307,152.38
$51,819.47	$41,045.87	-$266,106.51
$52,596.76	$39,303.36	-$226,803.15
$53,385.71	$37,634.82	-$189,168.33
$54,186.50	$36,037.12	-$153,131.21
$54,999.30	$34,507.24	-$118,623.97
$55,824.29	$33,042.31	-$85,581.66
$56,661.65	$31,639.57	-$53,942.09
$57,511.58	$30,296.38	-$23,645.71
$58,374.25	$29,010.21	$5,364.50
$59,249.86	$27,778.65	$33,143.15
$60,138.61	$26,599.37	$59,742.52
$61,040.69	$25,470.15	$85,212.66
$61,956.30	$24,388.87	$109,601.53
$62,885.64	$23,353.49	$132,955.02
$63,828.93	$22,362.07	$155,317.09
$64,786.36	$21,412.74	$176,729.83
$65,758.16	$20,503.70	$197,233.53
$66,744.53	$19,633.26	$216,866.80
$67,745.70	$18,799.78	$235,666.57
$68,761.88	$18,001.67	$253,668.25
$69,793.31	$17,237.45	$270,905.70
$70,840.21	$16,505.67	$287,411.37
$71,902.82	$15,804.96	$303,216.33
$72,981.36	$15,133.99	$318,350.32
$74,076.08	$14,491.51	$332,841.84

$75,187.22	$13,876.31	$346,718.15
$76,315.03	$13,287.22	$360,005.37

Annual Energy Outlook Electricity Escalation Calc

Electricity Cost Category	2020 Electricity Price	2050 Electricity Price	Projected Escalation Rate over 30 Years
Total Cost per kWh	**10.43**	**9.62**	**-0.3%**
Distribution Cost	3.25	3.4	
Transpertation Cost	1.35	1.54	
Generation Cost	5.83	4.68	

Reference https://www.eia.gov/outlooks/aeo/pdf/04%20AEO2021%

%20Electricity.pdf

Annual Energy Outlook Electricity Escalation Calc

Electricity Cost Category	2020 Electricity Price	2050 Electricity Price	Projected Escalation Rate over 30 Years
Total Cost per kWh	**2.25**	**3.25**	**1.2%**

Reference https://www.eia.gov/outlooks/aeo/pdf/04%20AEO2021%

620Electricity.pdf

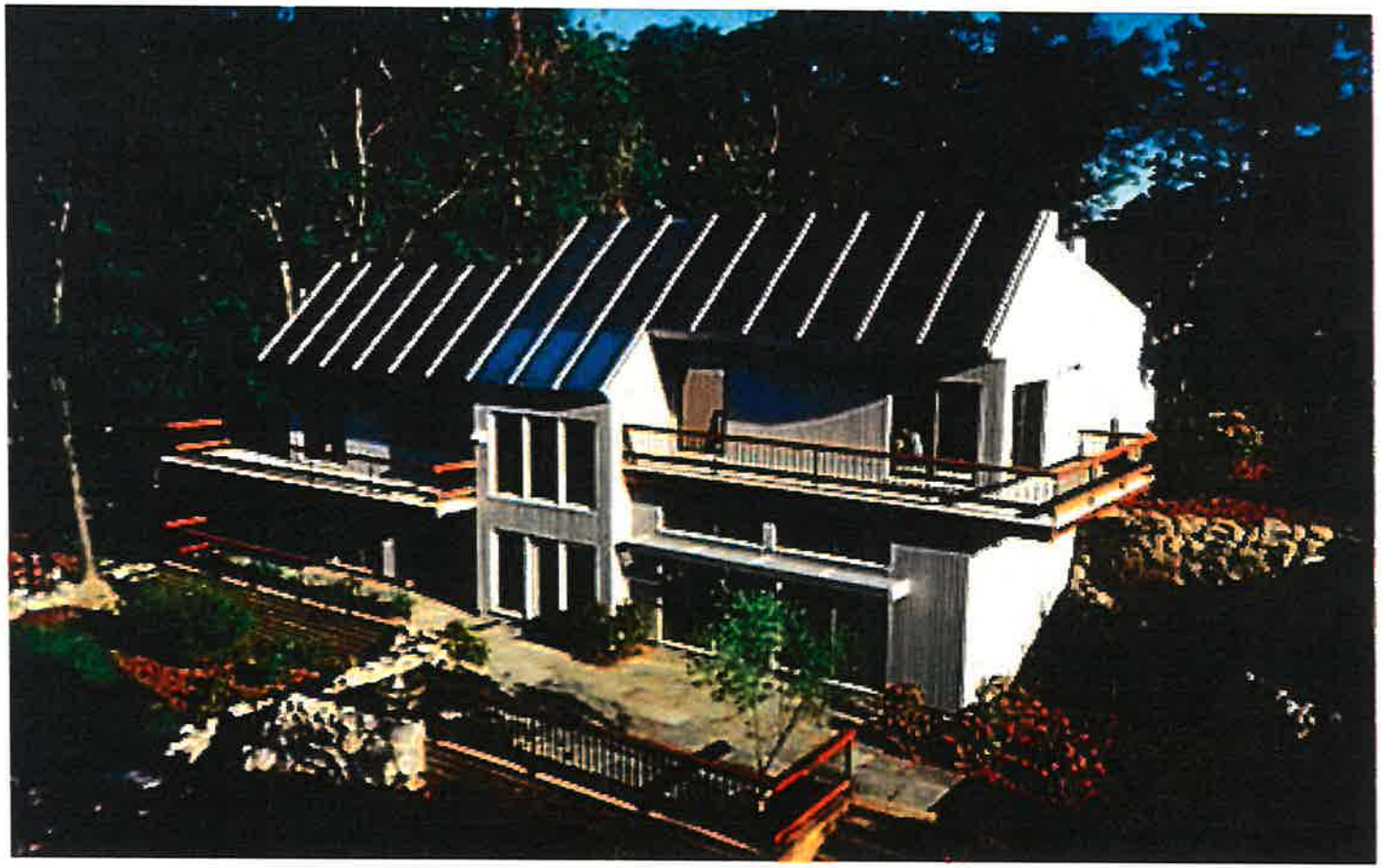
Aug 28 2021

Corrected Model to include fuel price in calculation - modified cell X10 to include X K5 (fuel price)


Bayside High,
Brevard County
Sun Smart E-Shelter

Suntree Farm

Your home is your castle - independence



Net Zero energy – energy production greater then consumption
- site consumption – sustainable - fortified home –
truly disaster resistant
Built in 1982 in Mass.

* NREL

Suntree Farm

Living Sustainably

Bill's Historic 1903 house

House has 2 PV arrays (2.6 kW PV Grid-tied and 700 W PV Stand-alone for Critical Loads), and Solar Thermal Hot Water collector with a PV pump, and many solar powered consumer items like cooker, water distiller, chargers, lights, and radios.

F.15
gave by Tobia

RE: Historical Commission Elimination

George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>

Tue 5/21/2019 10:23 AM

To:Molly Thomas <M.Thomas@cityofcapecanaveral.org>; Roz Foster <Roz@callhenry.com>; Bob Gross <mosquito.county@gmail.com>;

Cc:Michael Boonstra <mboonstra@brev.org>; Bob Swenson <swenb@aol.com>; Dan Reiter <reiter2012@gmail.com>; Dr. Ben Brotemarkle <ben.brotemarkle@myfloridahistory.com>; Dr. David Paterno <dpaterno@aol.com>; Gregg Young <greggyoung35@hotmail.com>; Jane Beach <jbeach002@cfl.rr.com>; Paula Beckner <pjbeckner@aol.com>; Margaret Goudelock <meghango@yahoo.com>; Tammy Moon <tmoon@brev.org>; Henry Parrish <huparrish3@hotmail.com>; Martha Loss <mjloss@att.net>; Sean Taylor <sean.taylor5.st@gmail.com>;

I really hope this particular Commissioner does not get re-elected!

George P. Kistner III, FCRM, CPE
Records and Information Manager
Tel: (321) 394-3223 | Mob: (321) 626-0864
gkistner@portcanaveral.com | www.portcanaveral.com
Canaveral Port Authority | 445 Challenger Road | Cape Canaveral | FL | 32920

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From: Molly Thomas <M.Thomas@cityofcapecanaveral.org>
Sent: Tuesday, May 21, 2019 8:38 AM
To: Roz Foster <Roz@callhenry.com>; Bob Gross <mosquito.county@gmail.com>
Cc: George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>; Michael Boonstra <mboonstra@brev.org>; Bob Swenson <swenb@aol.com>; Dan Reiter <reiter2012@gmail.com>; Dr. Ben Brotemarkle <ben.brotemarkle@myfloridahistory.com>; Dr. David Paterno <dpaterno@aol.com>; Gregg Young <greggyoung35@hotmail.com>; Jane Beach <jbeach002@cfl.rr.com>; Paula Beckner <pjbeckner@aol.com>; Margaret Goudelock <meghango@yahoo.com>; Tammy Moon <tmoon@brev.org>; Henry Parrish <huparrish3@hotmail.com>; Martha Loss <mjloss@att.net>; Sean Taylor <sean.taylor5.st@gmail.com>
Subject: RE: Historical Commission Elimination

CAUTION - EXTERNAL NON-CPA EMAIL

Yes, Bob, thank you for putting this together! Going forward, this would be good information to share with incoming commissioners so everyone is on the same page.

RE: Advisory Board Docs - PRR 10507

George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>

Mon 5/20/2019 2:10 PM

To:Molly Thomas <M.Thomas@cityofcapecanaveral.org>; Michael Boonstra <mboonstra@brev.org>; Bob Swenson <swenb@aol.com>; Dan Reiter <reiter2012@gmail.com>; Dr. Ben Brotemarkle <ben.brotemarkle@myfloridahistory.com>; Dr. David Paterno <dpaterno@aol.com>; Gregg Young <greggyoung35@hotmail.com>; Jane Beach <jbeach002@cfl.rr.com>; Paula Beckner <pjbeckner@aol.com>; Margaret Goudelock <meghango@yahoo.com>; Tammy Moon <tmoon@brev.org>; Henry Parrish <huparrish3@hotmail.com>; Martha Loss <mjloss@att.net>; Sean Taylor <sean.taylor5.st@gmail.com>;

I noticed that too.
Trust me, it isn't difficult to find inaccuracies when Tobia is involved! Been there, done that, LOL

George P. Kistner III, FCRM, CPE
Records and Information Manager
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gkistner@portcanaveral.com | www.portcanaveral.com
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From: Molly Thomas <M.Thomas@cityofcapecanaveral.org>
Sent: Monday, May 20, 2019 2:09 PM
To: Michael Boonstra <mboonstra@brev.org>; George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>; Bob Swenson <swenb@aol.com>; Dan Reiter <reiter2012@gmail.com>; Dr. Ben Brotemarkle <ben.brotemarkle@myfloridahistory.com>; Dr. David Paterno <dpaterno@aol.com>; Gregg Young <greggyoung35@hotmail.com>; Jane Beach <jbeach002@cfl.rr.com>; Paula Beckner <pjbeckner@aol.com>; Margaret Goudelock <meghango@yahoo.com>; Tammy Moon <tmoon@brev.org>; Henry Parrish <huparrish3@hotmail.com>; Martha Loss <mjloss@att.net>; Sean Taylor <sean.taylor5.st@gmail.com>
Subject: RE: Advisory Board Docs - PRR 10507

CAUTION - EXTERNAL NON-CPA EMAIL

Perfect! I knew you wouldn't And I love how they referred to one of their Library Directors as a "helpful employee" !
Another inaccuracy, they have our meeting dates listed as the first Tuesday of each month.

From: Michael Boonstra [mailto:mboonstra@brev.org]
Sent: Monday, May 20, 2019 2:04 PM
To: George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>; Molly Thomas <M.Thomas@cityofcapecanaveral.org>; Bob Swenson <swenb@aol.com>; Dan Reiter <reiter2012@gmail.com>; Dr. Ben Brotemarkle <ben.brotemarkle@myfloridahistory.com>; Dr. David Paterno <dpaterno@aol.com>; Gregg Young <greggyoung35@hotmail.com>; Jane Beach <jbeach002@cfl.rr.com>; Paula Beckner <pjbeckner@aol.com>; Margaret Goudelock <meghango@yahoo.com>; Tammy Moon <tmoon@brev.org>; Henry Parrish <huparrish3@hotmail.com>; Martha Loss <mjloss@att.net>; Sean Taylor <sean.taylor5.st@gmail.com>
Subject: Re: Advisory Board Docs - PRR 10507

I know exactly what they are referring to. It was a question about our county logo and date the county was founded. Marian Griffin is our library director. The request came in to both Marian and I, I did the research forwarded it to her and she was the one that replied to the email. So, they were not ignored, I guess they just didn't realize that Marian is associated with us. So obviously, just a big misunderstanding that should be easy to clarify if passed on. I am sure I still have the emails.

Michael J. Boonstra

Genealogy Librarian/Archivist

Catherine Schweinsberg Rood Central Library &

Brevard County Historical Commission

308 Forrest Ave

Cocoa, FL 32922

(321) 633-1794

From: George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>
Sent: Monday, May 20, 2019 1:32:41 PM
To: Molly Thomas; Michael Boonstra; Bob Swenson; Dan Reiter; Dr. Ben Brotemarkle; Dr. David Paterno; Gregg Young; Jane Beach; Paula Beckner; Margaret Goudelock; Tammy Moon; Henry Parrish; Martha Loss; Sean Taylor
Subject: RE: Advisory Board Docs - PRR 10507

Got it.

George P. Kistner III, FCRM, CPE

<jbeach002@cfl.rr.com>, Molly Thomas <M.Thomas@cityofcapecanaveral.org>, Paula Beckner <pjbeckner@aol.com>, Margaret Goudelock <meghango@yahoo.com>, Tammy Moon <tmoon@brev.org>, Henry Parrish <huparrish3@hotmail.com>, Martha Loss <mjloss@att.net>, Sean Taylor <sean.taylor5.st@gmail.com>
Subject: RE: Historical Commission Elimination

Well put Roz!
Just about every County in the State, not to mention other States have Historical Commissions or something similar. Getting rid of this or any other advisory boards would be a huge mistake!
John Tobia just loves to stir the pot in everything!
I have dealt with him on a public records level at the Port. He tried to throw me under the bus, even though he clearly does not know records law.

George P. Kistner III, FCRM, CPE
Records and Information Manager
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From: Roz Foster <Roz@callhenry.com>
Sent: Friday, May 17, 2019 10:40 AM
To: Michael Boonstra <mboonstra@brev.org>; Bob Gross <mosquito.county@gmail.com>; Bob Swenson <swenb@aol.com>; Dan Reiter <reiter2012@gmail.com>; Dr. Ben Brotemarkle <ben.brotemarkle@myfloridahistory.com>; Dr. David Paterno <dpaterno@aol.com>; Gregg Young <greggyoung35@hotmail.com>; Jane Beach <jbeach002@cfl.rr.com>; Molly Thomas <M.Thomas@cityofcapecanaveral.org>; Paula Beckner <pjbeckner@aol.com>; George P. Kistner III, FCRM, CPE <gkistner@portcanaveral.com>; Margaret Goudelock <meghango@yahoo.com>; Tammy Moon <tmoon@brev.org>; Henry Parrish <huparrish3@hotmail.com>; Martha Loss <mjloss@att.net>; Sean Taylor <sean.taylor5.st@gmail.com>
Subject: Re: Historical Commission Elimination

CAUTION - EXTERNAL NON-CPA EMAIL

It will be interesting to see reasons for getting rid of advisory boards who are made up of non-paid citizens & provide great services for the county at their own expense in time, labor & travel. Not to mention the many benefits provided to the community. DAH! Roz