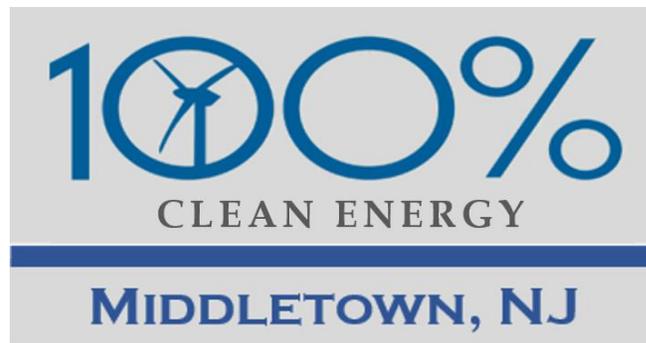


# MIDDLETOWN TOWNSHIP 2020 ENERGY PLAN

Ver 2, 8/8/2020

Prepared by



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# Middletown Township 2020 Energy Plan

V2, 8/8/2020

## 1. The Energy Plan

This energy plan for Middletown Township, NJ outlines Middletown's goals and key actions to save costs, reduce energy usage, and reduce carbon emissions. This plan is informed by New Jersey's 2019 Energy Master Plan (EMP)<sup>1</sup>, which provides a road map to meet the mandates of NJ's Global Warming Response Act (GWRA)<sup>2</sup>. The EMP directives apply to cities and towns statewide.

Both the EMP and this energy plan are informed by the scientific consensus in reports such as the International Panel on Climate Change's 2018 report, "Global Warming of 1.5°C"<sup>3</sup>. This report states that "Without ... urgent [action] ... leading to a sharp decline in greenhouse gas emissions by 2030, global warming will surpass 1.5°C in the following decades", threatening a livable world for our children. We know that the Jersey Shore is on the front lines of this crisis and is, in fact, experiencing sea level rise more quickly than the global average.<sup>4</sup> Furthermore, adaptation plans for the shore area may include large expensive sea wall projects, e.g., a \$119 billion sea wall among other alternatives.<sup>5</sup>

Detailed NJ impacts are described in the "2020 NJ Scientific Report on Climate Change"<sup>6</sup>, published on June 30, 2020 by the NJ DEP. Documented impacts include higher air temperatures (including summer heat-related mortality) and associated increase in wildfires; intensity and frequency of precipitation, floods, droughts; increasing sea level rise, higher ocean temperature, and greater ocean acidification; worsening air quality; agriculture impacts; degraded and stressed water supplies; degraded terrestrial, freshwater, and marine environments; loss of plant and animal species; and increasing invasive species including pests. The degree of impact depends upon the level of future GHG emissions. The report also observes that NJ is warming faster than the rest of the US northeast region and the world.

Increasing global temperatures continue to be measured<sup>7</sup>: "The past decade was the hottest on record", "2019 was the second warmest year ever", and "...the National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration showed global average surface temperatures last year [2019] were 1.8 degrees Fahrenheit higher than the average from the middle of the last century, driven mostly by emissions of the dominant Greenhouse Gas (GHG) carbon dioxide (plus water vapor feedback) resulting from human burning of fossil fuels.

Modeling for the NJ EMP, completed by the expert Rocky Mountain Institute (RMI), has determined that the least-cost responsible solution for meeting the goals and mandates of the GWRA would increase the state's annual energy costs by only 0.2% of state GDP over the period 2020-2050. The RMI model conservatively assumes NO benefit to offset the cost, NO decrease in the price of renewable energy over time, and NO technological advances. Taking any of these into account would *reduce* solution cost well below usual costs, thus saving considerable taxpayer money.

This document is developed in conjunction with Middletown for Clean Energy<sup>8</sup> for the benefit of Middletown, N.J. residents. This plan arises from the April 15, 2019 letter<sup>9</sup> from Middletown for Clean Energy to Middletown Township with the goal of achieving 100% clean energy and signed by almost 300 Middletown residents. Thus, this document serves as further, detailed resident input to Middletown Township for a future update of the Middletown Master Plan and intended Green Building and Environmental Sustainability Element<sup>10</sup>. It also builds upon a draft plan prepared for Middletown Township in 2010<sup>11</sup>, with

substantial updates that reflects today's imperatives. This document is also developed in consideration of the NJ EMP, the New Jersey Integrated Energy Plan<sup>12</sup> with input from the RMI, along with Sustainable Jersey<sup>13</sup>, and Project Drawdown<sup>14</sup>.

Version 1 (draft) of this energy plan was conveyed to the Middletown Township Committee and Mayor on January 31, 2020 with a request for action letter. Subsequently, a verbal request was made at the Middletown Township Committee meeting on February 18, 2020<sup>15</sup>. Unfortunately, as of August 2020, Middletown Township has not made available any actual plans regarding key recommendations, e.g., no plans have been made available regarding Renewable Government Energy Aggregation for the community nor for Community Solar.

Appendix A contains additional background information about the need for action.

## **2. Middletown's Vision and Goals**

**Vision:** A town (and world) where our children and grandchildren can flourish (i.e., leave Middletown and the world better than we found it).

### **Goals:**

- Substantially reduce energy usage and carbon dioxide emissions. Expedite projects to achieve this.
- Reduce Greenhouse Gas (GHG) emissions by 50% by 2030 to avoid the worst of global warming impact before it's too late.
- Meet statewide goals for energy reduction and clean energy.
- Achieve 100% clean energy (carbon neutral) for all Middletown energy consumers by 2050.
- Obtain the Sustainable Jersey's highest level, the Gold Star in Energy.
- Provide net cost and energy savings.
- Attract clean energy businesses and good jobs.
- Demonstrate proactive and strong township-wide leadership role in energy efficiency management and carbon emission reduction.

## **3. Key Recommendations for Middletown Township**

This section outlines recommended high priority actions/projects for Middletown Township. See subsequent sections for further information.

### **A. Implement Renewable Government (Community Choice) Energy Aggregation (R-GEA) (electricity) for the community by December 2020, with the following recommended steps:**

- Appoint a Middletown Township R-GEA champion by September 2020.
- Enact an ordinance (see Appendix B – Example R-GEA Ordinance) for R-GEA by vote of Middletown Township committee by September 2020.
- Appoint a R-GEA consultant by September 2020.
- Team with other towns as appropriate to reduce the cost through bulk bid process.
- Notify Middletown residents about R-GEA program.

- Reach out to all Middletown businesses to offer R-GEA.
- Complete RFP, bid review, and R-GEA Supplier Determination to meet 2020 implementation timeline.

**B. Act as Champion and Leader for Residence, Business, School, and Municipal Solar, use of 100% clean electricity, Energy Efficiency, as well as EV transit.**

**C. Implement Community Solar at Middletown Train Station and Electric Vehicle (EV) Transportation Hub. Meet NJ’s Community Solar application deadline for Program Year 2 during Fall 2020.**

**D. Transition Middletown Township Facilities to 100% Clean Energy (i.e. 100% clean electricity), and electrify space and water heating including heat pump technology.**

**E. Convert Middletown's Municipal Vehicle Fleet to EVs. Convert refuse collection trucks to EV. Develop a Middletown-wide plan with specific locations and requirements for public EV charging infrastructure.**

**F. Convert School Buses to EV Buses in conjunction with Middletown Township School System.**

**G. Maintain a constant push for energy-efficiency with reach out during every year to residents, business owners, and continued focus on municipal actions.**

#### **4. Obtain Middletown Gold Star in Energy, Create Carbon Footprint, and Publish Energy Plan**

##### **Middletown Gold Star in Energy:**

The primary goal of “Gold Star Standard in Energy” is reducing GHG emissions.<sup>16</sup> Sustainable Jersey defines energy “Actions” which will guide the Middletown Green Team in meeting emission reductions described in the Middletown Energy Plan. Sustainable Jersey will award a Gold Star in Energy when Middletown meets two standards:

- **Municipal Operations:** Demonstrate a GHG reduction from municipal operations and facilities at an average rate of at least 3.6% per year for 3 years (10.8% over 3 years or less). The “Municipal Carbon Footprint Action”<sup>17</sup> is completed as a baseline for the beginning of the emission evaluation period. The carbon footprint is again completed to conclude the evaluation, to demonstrate the required 3.6%, per year reduction in emissions.
- **Community-wide emissions:** Demonstrate a minimum GHG reduction of 1% per year from the entire community- residents, schools, businesses, industries, and municipal operations. In addition, 6 specific Sustainable Jersey actions (or pre-approved substitutes) must be completed. Similar to “Municipal Operations”, a “Community Carbon Footprint”<sup>18</sup> is completed at the beginning of the evaluation. The Carbon Footprint Calculator is available on-line.<sup>19</sup> The year the Gold Star in Energy Action is approved is considered the base year for the evaluation. This plan recommends that Middletown start with 2020 as the base year. After 6 years, Sustainable Jersey will audit to determine if Middletown has met a minimum 1% annual reduction<sup>20 21</sup>.

##### **Carbon Footprint**

The Community Carbon Footprint, described above, is used to increase awareness of GHG emissions, while serving to track year to year progress in reducing those emissions and thus helping to mitigate global

warming. It is fundamental to assess progress of the actions recommended in this Middletown Energy Plan.

**Middletown Energy Plan:**

Using this proposed plan as a primary basis, this plan recommends that Middletown issue the formal Middletown Energy Plan during 2020 and update it frequently thereafter. Every five years, a thorough review should consider the current carbon footprint, the actual and planned carbon emission trajectory, and the advent of new technologies. This plan also recommends that Middletown review and update the Middletown Master Plan to reflect the Middletown Energy Plan.

**5. Key Energy Saving and Carbon Footprint Reduction Scenarios**

This section summarizes Middletown's key energy saving and estimated GHG reduction scenarios projected to have significant impact in the first 10 years of the plan. GHG (carbon) reduction is expressed in terms of carbon dioxide equivalent. Estimates may change based on changes in assumptions and information. The estimates do not include an assessment of the probability of any individual scenario being implemented, as each scenario requires a tangible and actionable plan committed and underway relatively soon to achieve the estimated results. Not all possible carbon emission savings are currently included; others may be added during the initial 10-year period or later. Rationales for each scenario along with the carbon emission reduction percentage assumed for 2030 are provided in Table 1 and subsequent sections. Bars in Chart 1 represent single or combined carbon reduction scenarios.

Chart 1 Representative Scenarios for Middletown GHG (Carbon) Emission Reduction, in 2030

Estimated tons of GHG emission reduction for each scenario in 2030 relative to 2018  
 Total reductions in 2030: 266K tons. This is 38% of Middletown's 705K pro-rata tons in 2018

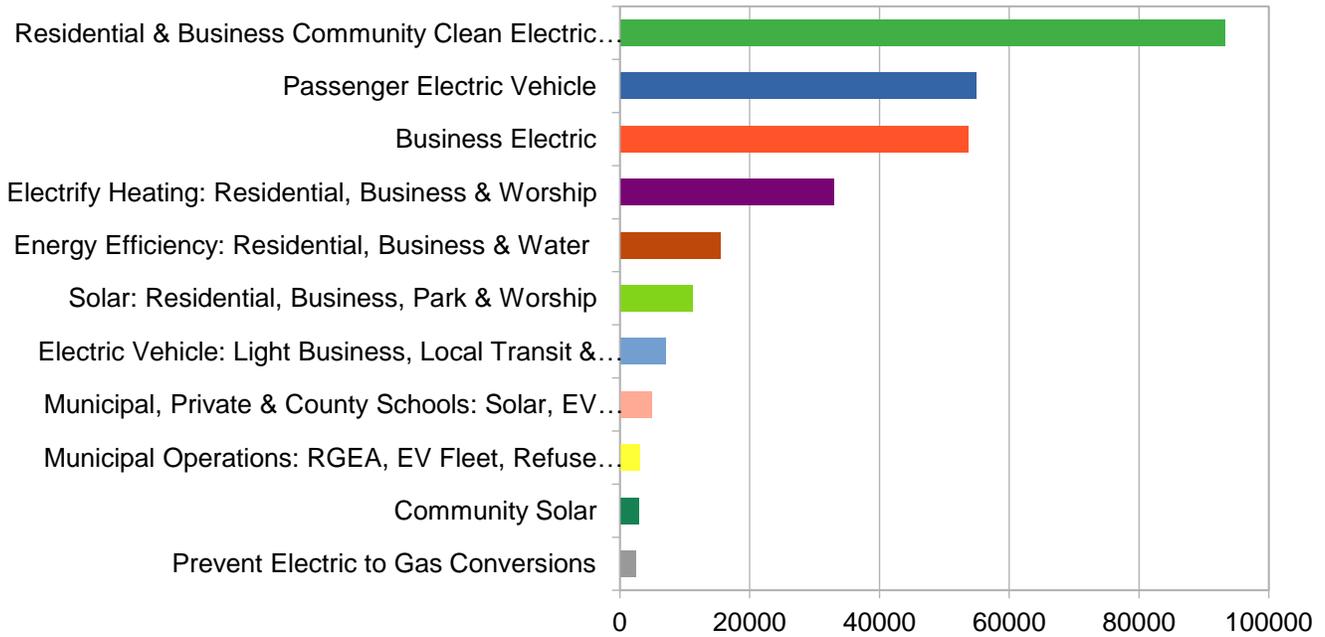
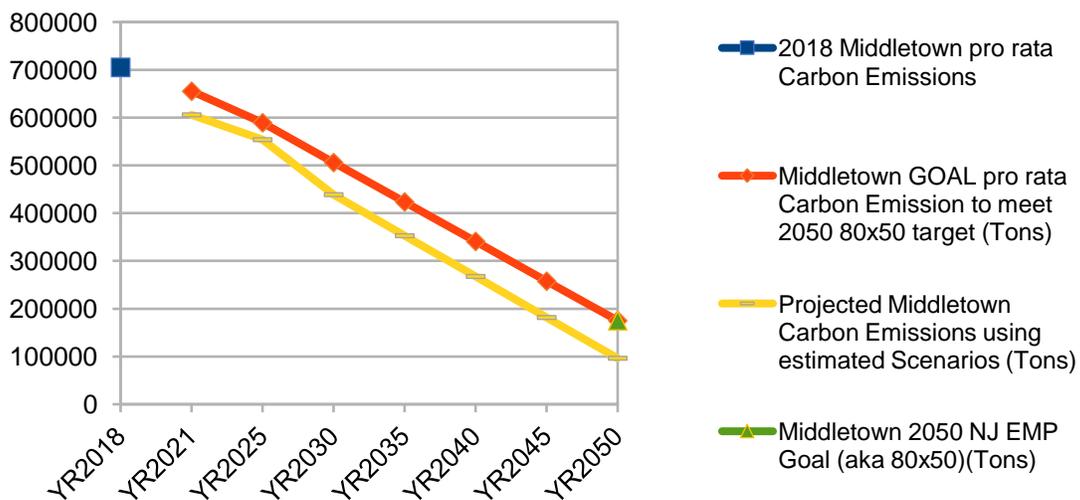


Figure 1 Combined Middletown GHG (Carbon) Emission Reduction Scenarios Compared to New Jersey EMP Goal (Pro Rata Middletown)



Notes:

1. The quasi-linear modeled future projection is based on the adoption of the initial set of scenarios only. We expect that many positive forces over the next 30 years will combine to “bend” this line downward toward zero emissions: the addition of more carbon reduction actions, market forces, and state and federal policies and incentives.
2. Middletown’s share of NJ total annual carbon emissions is calculated to be ~705,000 tons in 2018. This is calculated from Middletown’s per capita share, about 0.7%, of NJ total emissions. Figure 2 page 24 of 2019 NJ EMP<sup>22</sup> (doc. available Jan 2020) gives the overall NJ consumption of 97 MMTCO<sub>2</sub>e as of 2018. The EMP also indicates that 24.1 MMTCO<sub>2</sub>e is the NJ 2050 goal per Global Warming Response Act, aka 80x50. The Figure 1 Middletown goal is based on Middletown's pro rata share based on Middletown population versus New Jersey state wide, linearly declining from 2020 to 2050.
3. Carbon reduction scenarios are not always independent. For example, using rooftop, community or other solar to generate electricity means that the Energy Aggregation scenario will not reduce the amount of carbon already reduced by rooftop or community solar electricity. Energy efficiency measures reduce electric, heating, or fuel demands and thus corresponding carbon emissions, therefore switching to clean electricity does not offset carbon emissions for electricity, heating, or fuel that is no longer needed.
4. Calculations are stored at <http://climate.smiller.org/energy-plan/Middletown-2020-Energy-Plan/ClimateAction-8-1-20.xlsx>

Table 1 Middletown Scenarios for Estimated GHG (Carbon) Emission Reduction

Energy or Carbon Emission Saving Item	Estimated Annual Middletown Carbon Emission Savings	Rationale in Addition to Carbon Emission Reductions	Primary Impacted Parties	Cost Estimates for Township
<b>Renewable Government (Community Choice) Energy Aggregation (R-GEA) to Reduce Electricity Cost</b>				
R-GEA – Community <i>See Section 6</i>	Up to ~81,000 tons spanning all residential electricity based on 100% renewable energy.	Reduce costs for residents as renewable electric rates fall, e.g., at \$100 savings per home per year ~ \$2.4 million per year, or \$24 million over 10 years. Exceed 50% renewable electric 2030 goal. <sup>23</sup>	Middletown Township; Selected Consultant; Selected Electric Supplier; Residents (automatic opt-in for many);	“Renewable Government Energy Aggregation” <sup>24</sup> “Few (if any) costs”. Staff time to hire consultant, review bid responses, and outreach to public and business.
R-GEA – Business <i>See Section 6</i>	Up to ~12,200 tons upon 10% of business electrical consumption via R-GEA based on 100% renewable energy.	Reduce costs for businesses. Exceed 50% renewable electric 2030 goal.	Middletown Township; Selected Consultant; Selected Electric Supplier; Businesses decide opt-in	See above.
<b>EV – Passenger</b>				
EV – Passenger (private cars) <i>See Section 7</i>	Up to ~55,000 tons upon 25% Resident EV. Future plausible 100% Resident EV saves up to ~220,000 tons.	Phase out fossil fuels as quickly as possible to meet New Jersey goal of 100% clean energy by 2050. <sup>25</sup> Note, 24% EV expected by 2030. <sup>26</sup> Replace aging cars with plug-in hybrids or full electric	Many: Car Owners; Multifamily and Senior Housing Owners/Occupants; Businesses; Government Entities; Middletown; EV Vehicle Dealers; EV Charging Facility Owners/Operators	“Make Your Town EV Friendly” <sup>27</sup> 8-12 months staff time for ordinance; charger station standards, training for first responders; modify Master Plan for charger location <sup>28</sup>
<b>Business Electric</b>				
Business Electric <i>See Section 8</i>	Up to ~41,500 tons per NJ RPS utility requirements through 2030. Up to ~12,200 tons for 10% additional savings. (Also see Business R-GEA and Solar items)	Meet and exceed New Jersey specified RPS utility requirement to meet clean energy goals by 2030 and 2050.	Businesses; Electric Utilities	Staff to reach out to Businesses to ascertain electric purchase plans and encourage exceeding NJ RPS requirements.
<b>Electrification of Space Heating</b>				
Electrification: Residential Space and Water Heating <i>See Section 9</i>	Up to ~19,800 tons upon 25% conversion of fossil fuel (e.g., gas) space and water heating to clean electricity. Conversion to 100% by 2050.	Phase out fossil fuels as quickly as possible to meet New Jersey goal of 100% clean energy by 2050. Replace aging HVAC/water heater/appliances with high efficiency electric versions.	Homeowners; HOA; Utilities; Contractors; Middletown standards for new construction in Master Plan	Staff and volunteers provide outreach to encourage heat pumps. Use customary building codes, permitting, and inspection procedures.
Electrification: Business Space and Water Heating	Up to ~13,000 tons upon 25% conversion of fossil fuel (e.g., gas) space and	See prior item.	Business Owners; Utilities; Contractors; Middletown Master Plan for new	Staff and volunteers provide outreach to encourage heat pumps.

<i>See Section 9</i>	water heating to clean electricity. Conversion to 100% by 2050.		construction	Use customary building codes, permitting, and inspection procedures.
Electrification: Places of Worship <i>See Section 9</i>	Up to ~200 tons upon 25% conversion of fossil fuel (e.g., gas) space and water heating to clean electricity. Conversion to 100% by 2050.	See prior item.	Places of Worship; Utilities; Contractors	Ministers, congregations and volunteers to provide outreach to encourage heat pumps.
<b>Energy Efficiency Savings</b>				
Residential Energy Efficiency Savings (Nonelectric fossil fuel cutback) <i>See Section 10</i>	Up to ~8800 tons from 10% energy savings spanning Middletown residences. Each additional 10% saves up to ~8100 tons.	Save costs. Reduce energy usage and promote energy-efficiency. Replace aging HVAC/water heater/appliances with high efficiency electric versions.	Homeowners; HOA; Utilities; Contractors; Middletown as champion	Continue green team "Residential Energy Efficiency outreach" <sup>29</sup> to reach 10% participation.
Business Energy Efficiency Savings (Nonelectric fossil fuel cutback) <i>See Section 11</i>	Up to ~5800 tons from 10% energy savings spanning estimated Middletown commercial space (assumes natural gas). Each additional 10% saves up to ~5800 tons.	Save costs. Reduce energy usage and promote energy-efficiency. Replace aging HVAC/water heater/appliances with high efficiency electric versions.	Businesses; Contractors; Middletown Township as champion	Underway. Continue green team "Commercial Energy Efficiency Outreach" <sup>30</sup> campaign to reach 10% participation.
Energy efficiency savings from Water usage savings <i>See Section 29</i>	Up to ~900 tons based on 10% water usage reduction	Reduce water and sewer use, and thus reduce water consumption bills, and also lower sewer costs.	Middletown residents and businesses; water and sewer utilities; Middletown Township as champion	Staff and volunteers provide outreach to promote water conservation.
<b>Solar</b>				
Residential Solar (Electricity) <i>See Section 12</i>	Up to ~7700 tons if solar installations are deployed to 10% more Middletown homes. Each additional 10% saves up to ~7700 more tons.	Reduce resident costs. Assist NJ to meet 50% renewable electric 2030 goal. <sup>31</sup>	Homeowners; Solar Contractors; Middletown to expedite permitting	1. "Make your Town Solar Friendly" <sup>32</sup> : 6 months. Staff time: create solar ordinance <sup>33</sup> <sup>34</sup> ; amend permit fee. 2. "Community-Led Solar Initiatives" <sup>35</sup> min 6-8 months; Create group solar purchasing. Outreach.
Business Solar (Electricity) <i>See Section 13</i>	Up to ~2400 tons for ~300,000 SQFT building, parking or vacant land facility generating ~6,300,000 KWH annually with ~16,000 solar panels. Additional same sized project saves up to ~2400 more tons.	Reduce electricity costs for businesses. Generate renewable electricity on business premises, thus growing renewable footprint. Assist NJ to meet 50% renewable electric 2030 goal. <sup>36</sup>	Businesses; Solar Contractors; Middletown Township as champion and to expedite	Same as residential (above). Outreach to Eastern Mon Chamber of Commerce and to owners of large business roofs, parking or vacant land.
Solar at Parks <i>See Section 27</i>	~860 tons at identified Parks using 10% of	Generate renewable electricity at Parks using	Federal Government; County Government; Solar	Staff outreach to park authorities.

	specific parking, roofs, and grassy/vacant areas near buildings. Field, forest, wetlands and beach areas were not considered.	identified park areas, thus growing renewable footprint.	Contractors;	
Solar at Places of Worship <i>See Section 23</i>	~260 tons using 5% of identified parking, roofs, and grassy/vacant areas near buildings.	Generate renewable electricity using possible roof, parking, and adjacent grassy areas.	Places of Worship; Ministers; Congregations; Solar Contractors	None. Relies on Ministers and Congregations.

**Electric Vehicle – Light Commercial, Local Transit and Landscaping**

EV – Delivery and Light Commercial <i>See Section 14</i>	Up to ~3,850 tons upon 25% EV for delivery/light truck vehicles. Expecting rapid future EV increase saving up to ~15,400 tons.	See prior EV-Passenger reference. Also improve health by eliminating diesel emissions.	Local delivery and commercial light truck operators; EV Vehicle Dealers; EV Charging Owners/Operators; Middletown champion for EV charger deployment	“Make Your Town EV Friendly <sup>37</sup> ” (see “EV-Passenger”). Outreach to owners of delivery services.
EV – Local Transit <i>See Section 15</i>	Up to ~2,870 tons – EV for 5 bus routes. (NJ Transit local bus route; commercial bus route to NYC port authority; 3 bus routes associated with Brookdale) (Note: ride share and commercial bus not included in this estimate)	See prior EV reference. Also improve health by eliminating diesel emissions.	Middletown Township; Bus/EV transit operators; Ride Share Owners/Operators; Brookdale; EV Charging Facility Owners & Operators; NJ Transit	“Make Your Town EV Friendly <sup>38</sup> ” (see “EV – passenger”). Outreach to NJT, Brookdale, senior centers which operate buses.
Battery (Electric) Landscaping Equipment <i>See Section 28</i>	Up to ~290 tons upon 25% conversion of residential, business, school, municipal, highway, parks/fields & places of worship to battery (electric) landscaping equipment	See prior EV reference. Also, substantial smog reduction.	Residents; Businesses; Schools; Middletown Township; Highway Authorities; Congregations; Landscape Equipment Dealers	Volunteer and staff outreach regarding acquiring, operating, and contracting for battery (electric) landscaping equipment

**Middletown Schools, Private, Religious and County Schools**

More School Solar (Electricity) <i>See Section 16</i>	Up to ~3600 tons if solar deployed to more school roofs currently without solar, parking lots, and unused fields (assumes only 25% area utilization and without all parking/unused fields considered yet)	See prior solar rationale.	Middletown School System; Brookdale, CBA, Oak Hill Academy, other religious and private schools, County Vocational High Schools	Staff and volunteers provide outreach to Middletown Township Public Schools and other schools
Electrification: School Space and Water Heating <i>See Section 9</i>	Up to ~1100 tons upon 25% conversion of fossil fuel (e.g., gas) space and water heating to clean electricity. Conversion to 100% by 2050.	See prior Electrification reference.	Middletown School System; Brookdale, CBA, Oak Hill Academy, other religious and private schools, County Vocational HSs	Staff and volunteers provide outreach to Middletown Township Public Schools and other schools
EV – School Bus	Up to ~300 tons upon	See prior EV reference.	Middletown Township;	Staff and volunteers

<i>See Section 17</i>	25% School Bus EV	Also improve children's health by eliminating diesel emissions.	Educational Institutions; School Bus operators	provide outreach to Middletown Township Public Schools, other schools, and bus owners/operators
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**Municipal Operations**

EV – Municipal Fleet <i>See Section 20</i>	Up to ~700 tons upon 25% conversion of patrol and other vehicles to EV. Save ~2800 tons upon 100% EV.	See prior EV reference. Improves health by eliminating diesel emissions. Replace aging cars with plug-in hybrids or full electric.	Middletown Township; Fleet EV Dealers; EV Charging Facility Owners/Operators	Same as “EV- Personal” - above
Renewable Govt Energy Aggregation (electricity) – Municipal Operations <i>See Section 21</i>	Up to ~1100 tons	Reduce costs for Middletown and, thus, taxpayers	Municipal Operations	Middletown Committee resolutions to obtain 100% renewable energy (ref 4/21/20) <sup>39</sup> . Also, “Buy Electricity from a Renewable Source” <sup>40</sup> Underway.
Electrification: Municipal Space and Water Heating <i>See Section 9</i>	Up to ~65 tons upon 25% conversion of fossil fuel (e.g., gas) space and water heating to clean electricity. Conversion to 100% by 2050. See prior item.	See prior Electrification reference. Replace aging HVAC/water heater/appliances with efficient electric versions	Middletown Township; HVAC contractors	Monitor market conditions apply when it becomes cost-effective. Select 100% clean solutions during upgrades at end of life,
EV - Refuse Trucks <i>See Section 20</i>	Up to ~1250 tons upon 100% conversion of refuse trucks to EV.	See prior EV reference. Improves health by eliminating diesel emissions.	Middletown Township; Refuse Contractors	Staff for RFP and contracts.

**Community Solar**

Community Solar (Electricity) Municipal Project <i>See Section 18</i>	Up to ~3,000 tons for an initial 5MW project generating ~ 8,000,000 KWH per year. Each additional 5MW project saves up to ~3,000 more tons.	Generate renewable electricity with community participation. Benefit Low to Moderate Income participants. Assist NJ to meet 50% renewable electric 2030 goal. <sup>41</sup>	Middletown Township (or alternate responsible entity); selected Implementer/Operator; Landowner/Landlord; Subscribers (e.g., Middletown residents)	Underway. <sup>42</sup> Solar consultant is evaluating Train Station canopy to supply electricity to Arts Center and Senior Housing.
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**Prevent Gas Conversions**

Prevent Gas Conversions <i>See Section 19</i>	Avoid up to ~2400 tons by preventing electric to gas conversions	Avoid gas; move towards full electrification.	Homeowners; HOA; Utilities; Contractors	Underway by Shadow Lake Village residents.
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**6. Renewable Government (Community Choice) Energy Aggregation (electricity) – Community Including Residents and Business**

This plan recommends that Middletown establish a Renewable Government (Community Choice) Energy Aggregation (R-GEA)<sup>43</sup> program to reduce cost for the benefit of Middletown electricity consumers. The recommended goal is to get this underway by December 2020.

An R-GEA program enables a New Jersey community to aggregate substantial customer electricity consumption and thus offer a lower cost (e.g., 5 to 10% cost reduction) with a small or no carbon footprint electricity source to the community. The community (via a consultant) obtains bids from third-party power suppliers and then contracts for an electricity cost reduction and carbon savings, making use of renewable energy sources including solar and wind power. A community notification program (via a consultant) includes notifying residential customers of both automatic opt-in and the right to opt out. Residential customers who previously retained the Basic Generation Service (BGS) provider and who do not opt out are automatically converted to the new power offering as per contract with the selected third-party supplier, thus achieving the anticipated cost savings and carbon reduction. All converted customers retain the right to opt out of the program in the future with advance notification to the electricity supplier. (Usually customers who already have personal or community solar are not automatically opted in, though they may opt in for any difference in electric needs.) Businesses may also choose to opt in.

The BGS provider continues its responsibility for the existing and future community physical electrical infrastructure. This responsibility includes infrastructure maintenance and reliability within the serving area up to the existing utility connection point at each consumer regardless of which electricity provider provides the electrical power source. The billing continues nearly the same, with the BGS line item on the electric bill replaced with the third-party supplier at the contracted rate.

The City of New Brunswick<sup>44</sup>, NJ, South Orange<sup>45</sup>, NJ, and Princeton<sup>46</sup>, NJ are examples of NJ communities that have currently established energy aggregation programs to benefit their residents. Further information and other examples, e.g., Glen Rock, NJ, are spotlighted at Sustainable New Jersey.<sup>47 48</sup>

Appendix B contains an example renewable energy aggregation ordinance.

R-GEA can be offered to business<sup>49</sup>. Thus, this plan also recommends that Middletown offer R-GEA to all of Middletown's businesses, with a direct and annual reach out program.

#### Proposed Project Actions:

- Middletown Project Champion assigned
- Township ordinance prepared
- Township ordinance approved
- Engage an R-GEA consultant
- Legal Review
- Initial community notifications completed
- RFP for third-party suppliers issued requesting low cost, both low and no carbon bids, and implementation dates.
- RFP response final date
- Township decision on selected electric supplier
- Supplier contract signed with project dates and costs
- Community notification of supplier, project dates and general customer conversion dates
- Communicate offering and option of opt-in to Middletown businesses, and other institutions such as places of worship
- Middletown R-GEA cutover. Complete customer conversions to new supplier including supplier notification to individual customers. Detailed dates as per project plan.
- Publish (including on web) project status information to Middletown residents throughout project

## 7. Electric Vehicles – Passenger (Private)

In addition to providing a substantially greener future via powering from renewable electricity sources, EVs offer lower per mile energy costs at the equivalent of \$1.00 to \$1.50 per gallon<sup>50</sup>. A local utility currently

offers a range of EV and charging information<sup>51</sup>. EV maintenance and eventually manufacturing is expected to be lower than fossil fuel engines due to the replacement of fuel-based engines and associated components such as fuel and exhaust systems with electric motor-based drive trains.

New Jersey has a goal (new electric vehicle bill S-2252<sup>52 53</sup>) of registering 330,000 zero emission vehicles (ZEV) by 2025, 2 million by 2035, and 80% of light vehicles by 2040. (Middletown's per-capita share would be 2,398 by 2025, and 14,500 by 2035.) Under S-2252, New Jersey intends to provide certain rebates for purchasing EV and installing EV chargers, and intends to advance state fleet EVs, EV charging infrastructure and EV deployment.

Numerous manufacturers (see reference<sup>54</sup> for example) have announced plans to increase manufacturing and availability of EV in their product lines, including possible transitions away from fossil fuel vehicles. They are also redirecting capital from fossil fuel research, development, and manufacturing to EVs. Countries such as Germany are grappling with the rapid change resulting from EV deployment and manufacture. Already almost 10% of new car registrations in Europe are either EV or hybrid vehicles with sales up 40% from a year early.<sup>55</sup>

Manufacturer and government incentives may be available to help purchase certain EV.

Appendix B contains further information about EVs along with information on other impacts including social justice concerns.

Appendix C contains an example list of EVs currently available, announced, or transitioning to EV.

## **8. Business Electric**

Large carbon emission savings are obtained by converting Business Electric to 100% renewable-energy. This plan recommends that Middletown work with businesses to understand the status of and encourage their plans for converting to 100% renewable energy.

Table 1 contains an estimate of the savings due to NJ RPS utility requirements through 2030, along with an estimate if additional savings are obtained from exceeding the RPS and further conversions to renewable energy between now and 2050.

Also see R-GEA section regarding potential business carbon emission savings. And see the Business Solar section for substantial carbon emissions savings from business implementation of solar at business facilities such as roofs, parking canopy, and adjacent lawn areas.

## **9. Electrification of Space Heating (Residential, Business, School, Municipal, Places of Worship, & County Park Facilities)**

Electrification of space and water heating (residential, commercial, and government) is a key aspect of New Jersey energy plan 2050 alternatives<sup>56</sup>. Electrification is also consistent with research<sup>57</sup> that shows electrification with renewable-energy sources is an essential means of replacing fossil fuel usage worldwide to minimize further carbon emissions and global temperature rise. Electrification of space heating would be accomplished primarily via drastic reduction in natural gas usage, drastic reduction in any remaining oil or propane usage, and replacement with clean energy.<sup>58</sup>

New Jersey incentive programs exist for installation of residential electric energy saving heating equipment<sup>59</sup>. Facilities with aging HVAC systems should be encouraged to replace the HVAC with high efficiency electric heat pumps. Widespread conversions from fossil fuel heating to electricity based systems may depend in part on future expanded federal and state incentive programs, as well as in part on resident and commercial business assessment of the relative cost for upfront HVAC equipment replacement and relative ongoing operating expense of fossil fuel versus electric space and water heating going forward, e.g., as the cost of clean energy continues to drop relative to fossil fuel.

A recent limited study<sup>60</sup> calculated the cost of heating with a gas furnace compared to heating with an electric heat pump (reference example<sup>61</sup>). Calculations show that the cost of space heating with a late model, high efficiency heat pump (HSPF 9.7) approaches the cost of heating with a 95% efficient natural gas furnace. The study determined that:

- Heating via electrical heat pump in JCP&L territory is currently 19% more expensive than heating via gas heat in NJNG territory
- Future changes will likely reduce cost of operating a heat pump to less than the cost of operating a gas furnace.
- Electric baseboard heating is over 3 times more expensive than heating with natural gas.

Heat Pump Examples:

- Lennox Heat Pumps (up to HSPF 10.2)<sup>62</sup>
- Trane 3, 4, and 5 ton<sup>63</sup> commercial high efficiency (HSPF 9.0) heat pumps
- Mitsubishi duct-less heat pumps.<sup>64</sup>
- Mitsubishi heat pumps deliver heat to -13 degrees F.<sup>65</sup>

Heat pumps are also available for water heating<sup>66</sup>.

This plan recommends that Middletown keep abreast of federal and state policies and incentives, technology, replacement and installation transition intervals, and costs. As these evolve, this plan recommends that Middletown develop an information program for residents and for publication on the web to encourage residents, businesses, and religious facilities to convert to electric space and water heating, and specifically heat pumps for both. This plan also recommends that Middletown establish guidelines and standards that encourage the installation of heat pumps.

This plan recommends that Middletown develop a plan and schedule for converting 100% of Middletown Township's space and water heating to clean energy, while also specifically considering heat pumps. And that Middletown reach out to Monmouth County about its plans for conversion of facilities in Middletown to clean energy.

School administrations, including Brookdale and both private and religious school operators are also recommended to develop plans for transition of 100% of their buildings from fossil fuel consumption to clean energy.

There may be other alternatives towards reducing carbon emissions, e.g., Renewable Sources for Natural Gas.<sup>67</sup>

## **10. Residential Energy Efficiency**

The annual energy consumption of the average home in New Jersey is 127 million BTU<sup>68</sup> (2009). Space heating accounts for nearly half of the energy<sup>69</sup> used in a New Jersey home (estimated at ~ 45% or 57 million BTU, or ~570 therms). About 80% of the residential space heating in New Jersey uses natural gas.

As previously mentioned, Middletown, in conjunction with utilities and the Middletown Green Team, conducts outreach energy savings events and encourages energy audits for businesses and residences.

The State of New Jersey also offers numerous programs<sup>70</sup> for residential energy savings, including COOLadvantage, WARMadvantage, Comfort Partners, Appliance Rebates and Lighting, ENERGY STAR programs both for home upgrades and new homes, refrigerator and freezer recycling, and programs for Oil, Propane & Municipal electric users.

State utilities offer energy saving (and thus money saving) information and programs. As an example, one utility serving Middletown includes “Energy Saving Tips for Your Home”<sup>71</sup>. Another utility also serving Middletown also provides “More Than 100 Ways to Improve Your Energy Bill”<sup>72</sup>. For example, it suggests replacing incandescent lighting with LED lights, which drastically reduces energy usage, thus reducing carbon emissions and electricity bills, while saving on long term bulb replacement costs. Insulating a home using relatively low-cost caulking, weather stripping, and insulation can also drastically reduce energy usage. Upgrading (replacing) older appliances and equipment with Energy Star appliances and high efficiency heating and cooling equipment also provides drastic energy savings.

Low cost programs to help identify home energy savings are available. As of the time of this document, homeowners can obtain a home energy analysis for \$49 along with some reduced cost product offerings.<sup>73</sup> Residents should be encouraged to replace aging equipment with high efficiency electric appliances and HVAC systems, including specific consideration of heat pumps.

## **11. Business Energy Efficiency**

This plan recommends that Middletown periodically reach out to and provide outreach events for local businesses to identify energy savings programs they have underway, suggest benchmark programs, provide additional encouragement towards establishing energy savings actions, and request business plans and status regarding energy efficiency improvements. For example, Middletown has communicated with local businesses on energy efficiency programs.<sup>74</sup> As a further example, in February, 2019, the Middletown Green Team and Township Officials held an outreach event<sup>75</sup> for residents and businesses to learn about programs that help make energy-efficiency improvements more affordable.

The State of New Jersey Clean Energy Program<sup>76</sup> offers numerous programs aimed at energy-efficiency for commercial, industrial, local government and multifamily homes, e.g., including Benchmark programs, SmartStart Buildings program, New Jersey Commercial and Industrial incentive programs (i.e., CTEEP), Direct Install for lighting replacement, HVAC and other outdated operational equipment replacements, Large Energy Users Program, and Food Service Equipment. Businesses should be encouraged to replace older equipment with high efficiency electric appliances and HVAC systems.

## **12. Residential Solar**

As of March 2020, more than 126,451<sup>77</sup> homes and businesses in New Jersey have installed a solar electric system. Over 10,000 additional are in the pipeline. Over 175 photovoltaic systems are providing power to the grid, with at least 15 more in the pipeline.

The typical New Jersey residence uses 8,902 kWh<sup>78</sup> per year. For solar to generate this amount of electricity requires a system of about 22 solar panels at 250 watts per panel (using Newark<sup>79</sup> sunlight factor of an average of 4.5 sunlight hours per day). With this solar installation, a residence would save about 3.2 carbon tons per year.

Deploying full solar installations to an additional 10% of Middletown's 23,962 homes (e.g., 2,396 homes) would amount to saving ~7,700 carbon tons per year.

This plan recommends that Middletown encourage residents to add solar installations via Middletown resident communications, mentioning solar benefits in appropriate forums, and developing statistics on Middletown's residential solar penetration and growth rates.

New Jersey Bureau of Public Utility information about residential solar programs and incentives can be found at this reference.<sup>80</sup>

Note also that California is the first state to require solar panels on new homes, starting 1/1/2020.<sup>81</sup>

As of May 1, 2020, New Jersey Solar Renewable Energy Certificates (SRECs) are discontinued and replaced by Transition Renewable Energy Credits (TREC)<sup>82</sup> which are fixed price and not influenced by market conditions that previously set the price of SRECs.

## **13. Business Solar**

This plan recommends that Middletown encourage solar projects at businesses through an active program of community outreach. Potential businesses amenable to rooftop, solar parking canopies, and/or vacant commercial land solar would be identified, followed by encouragement for and tracking of solar project planning, installation, and operation.

This plan recommends that Middletown require new commercial buildings exceeding a defined size install rooftop solar panels (or alternate ground based solar supply), and also provide a parking canopy solar feasibility assessment with plans. As an example, New York City has a new law<sup>83</sup> requiring new buildings to install rooftop solar (or green roof).

An example large commercial solar project<sup>84</sup> is at Great Adventure in Jackson, NJ. As another example, a large solar project of 166 acres to provide enough power (35 MW) for 6500 homes is planned for Toms River.<sup>85</sup> A parking canopy solar panel installation is located at 655 Shrewsbury Ave in Shrewsbury. Numerous other commercial solar installations are now deployed in NJ.

## 14. Electric Vehicles – Delivery and Light Truck

This section describes actions to convert local delivery and light trucks used for commercial delivery, utilities, and residential services to electric trucks. Vehicles include four well known package/mail delivery services (Amazon, UPS, FEDEX, and USPS), supermarket delivery, fast food delivery, furniture delivery, floral delivery, and trucks dispatched for home services, contracting, and maintenance such as plumbing, electrical, cable, telephone, lawn, and other similar services.

Commercial package delivery services are starting to employ EV<sup>86</sup>. Also see commercial examples, e.g., EV truck technology and delivery of initial EV trucks to USPS, an EV Ford Transit<sup>87</sup>, Tesla Semi<sup>88</sup>, and EV truck “Workhorse”.<sup>89,90</sup>

EV conversion for delivery and light trucks is anticipated to provide significant health<sup>91</sup> and air pollution benefits, including reducing gas and diesel exhaust fumes for other vehicle drivers, pedestrians, those residing near major roads, and everyone in the community.

Eventually, combined electric/gas turbine cargo drones<sup>92</sup> may also reduce carbon dioxide emissions.

This plan recommends that Middletown contact all delivery services serving Middletown to determine their EV delivery plans, and consider how Middletown might support their plans, e.g., provision of EV charging infrastructure and delivery vehicle parking.

## 15. Electric Vehicles - Local Transit

This plan recommends that local transit, primarily bus routes, be converted to EV. The carbon emission reduction estimate includes coverage of several NJ transit bus routes traversing Middletown. Thus, this plan recommends that Middletown contact NJ transit to understand and encourage NJ transit plans for EV buses in Middletown.

Example local transit EV information includes the following:

- Numerous EV bus manufacturers<sup>93</sup>
- The Port Authority of NY and NJ has a transition to airport shuttle bus EV well underway<sup>94 95</sup>
- NJ Transit has recently applied to purchase three autonomous self-driving EV shuttle buses which would initially be used in Fort Monmouth<sup>96</sup>
- NJ Transit is in the process of trialing 8 EV buses in Camden<sup>97</sup>
- NJ Transit has received a Federal grant that includes renovating the Wayne bus terminal to support EV buses<sup>98</sup>
- Advocates are seeking complete electrification of all 3700+ NJ buses by 2040<sup>99</sup>
- EV transit consideration for Middletown includes NJ Transit local bus routes, bus routes associated with Brookdale, commercial passenger bus (e.g., trips to/from NYC port authority), senior citizen, special needs, commercial bus operators, and ride for hire (ride share, taxi, limousine).
- Replacing diesel vehicles will result in significant health improvements and address global warming (via greenhouse gas reduction) through reduced emissions and reduction of “black carbon”<sup>100</sup>

This plan also recommends that Middletown consider new paradigms for enhancing local transit to provide

comprehensive local transportation using clean energy, e.g., bus EV. This would also encourage reduced Vehicle Miles Traveled (VMT). For example, Sioux Falls, SD is shifting to an “on demand” bus based local transportation service<sup>101 102</sup> and is also starting to budget for electric buses.<sup>103</sup> A similar service concept could apply to Middletown, including rides to the Middletown train station, to town facilities (buildings, recreation, etc.), to health appointments, to shopping, and for those without vehicles, senior citizens, and special needs.

## **16. More School Solar**

Most Middletown Township schools now have rooftop solar installations, a testament to rapid, essential action undertaken by Middletown Township Schools. At least one private school in Middletown has a solar rooftop.

This plan recommends that Middletown, together with school authorities, identify remaining Middletown Township school building rooftops suitable for solar, areas for deploying solar parking lot canopy and unused field/lawn areas for solar panels during a review of all Middletown Township Schools.

This plan also recommends that Middletown reach out to Brookdale, CBA, Oak Hill Academy and other schools within the township to identify and encourage their plans for solar installations among roof top, parking lots (i.e. for solar canopy), and unused fields.

## **17. Electric Vehicle – School Bus**

This plan recommends that Middletown work with local school authorities to convert School Buses in Middletown to EV buses. The carbon emission reduction is an estimate based on considering conversion of Middletown school bus routes to EV.

The NJ State legislature is looking into school bus electrification.<sup>104 105</sup>

EV school buses are anticipated to provide significant health benefits for children and bus drivers, as well as other vehicle drivers, pedestrians, and residents near or on school bus routes.

## **18. Community Solar**

Middletown is considering establishing an initial Community Solar project, thus enabling residents to lower costs and more fully reduce carbon emissions through their direct active participation including possible ownership shares. This plan recommends that Middletown establish an initial Community Solar project at the Middletown Train Station and apply to meet the state deadline for Program Year 2 during Fall 2020<sup>106</sup>. Middletown is currently working with an energy consultant to determine cost/benefit and feasibility studies for a solar canopy project at the Middletown train station. Per communications with Middletown, the project work is intended to result in electric bill savings for low income residents, including those at senior citizen and veterans’ facilities. This plan also recommends that if planned electric capacity output permits, residents of 55+ facilities in Middletown and beyond those, other residents of Middletown might also benefit through an offering of shares.

This plan also recommends that Middletown consider establishing a small Community Solar installation at the Poricy Park activity center and nearby parking without impacting its historic buildings, fields, forests, nor wetlands.

New Jersey Community Solar<sup>107</sup> projects enable utility customers to participate in a solar energy project located remotely from their property. Currently, an individual project is limited to 5 MW per the State of New Jersey. All New Jersey projects are also subject to a combined power limit. An application needs to be prepared and submitted for approval.

An example Community Solar project is Sussex Solar Gardens<sup>108</sup> located in Sussex County, New Jersey. NJ Clean Energy gave conditional approval to 45 community solar projects in December 2019.<sup>109</sup>

This plan recommends that Middletown also identify and convert any existing waste/brownfield sites to solar. Any future business closures, resulting in brownfields, should be considered for solar. This consideration may extend to sponsoring waste/brownfield solar conversions in the general utility serving area, not just Middletown, as New Jersey's Community Solar program allows for sponsorship within the utility serving area.

An additional recommendation is to implement an EV Transportation Hub at the Middletown Train Station along with Community Solar (see separate section for further information regarding the proposed EV Transportation Hub).

## **19. Prevent Electric to Gas Conversions**

Gas utilities continue to market gas conversions in New Jersey. Converting existing electric to natural gas raises the prospect of significantly increased carbon emissions compared to a future where electricity is based on 100% clean energy. This plan recommends that no additional electric to natural gas conversions occur. It also encourages converting existing oil installations to electricity rather than gas. This section pertains to space heating, water heating, and other fossil fuel-based applications such as gas cooking and dryers.

## **20. Electric Vehicle – Municipal Fleet**

This plan recommends that Middletown convert its municipal fleet to EV. Prior sections covered both passenger and light truck EVs, and in general are also applicable to the Middletown fleet.

The State of New Jersey is in the process of transitioning its light duty fleet to EV, as per NJ bill S-2252 and the 2019 NJ Energy Master Plan.<sup>110 111</sup>

Jersey City is planning to convert 10% of its municipal fleet to EV by the end of 2020, and 100% by 2030<sup>112</sup>. This year, Jersey City plans to purchase 5 refuse truck EVs and 5 police EVs. Mack Truck plans to test the Mack LR all-electric refuse truck in New York City during 2020<sup>113</sup>. Also see example additional refuse truck EV article here<sup>114</sup>.

This plan recommends that Middletown include a requirement in its refuse collection contracts, perhaps phased requirements with an initial pilot program, to fully deploy refuse truck EVs for 100% of refuse collection by 2021 to 2022. Furthermore, deployment of refuse truck EVs would significantly improve air quality by eliminating diesel exhaust.

Municipal first responder vehicles are also becoming available, e.g., police cars, electric fire truck.<sup>115 116 117</sup> A possible initial application for police EV vehicles in Middletown is for traffic control during road and utility maintenance.

Reduction in vehicle size by sizing to purpose at hand enables reduction of carbon emissions and saves money on an interim basis by cutting fossil fuel consumption, e.g., using small cars for basic traffic control. Purchase of hybrid vehicles may also provide an interim step saving carbon emissions and money, while retaining the legacy advantage of fossil fuel engines, pending subsequent full transition to EVs. For example, there are police interceptor hybrid utility vehicles.<sup>118</sup>

This plan recommends that Middletown phase out its CNG vehicles (which consume fossil fuel and thus generate carbon emissions) as part of the conversion to EV.

## **21. Renewable Government Energy Aggregation (electricity) – Municipal Operations**

Middletown Committee has passed resolutions to obtain 100% renewable energy for municipal operations<sup>119</sup>. This is anticipated to result in substantial carbon emission reductions.

The process mechanics are similar to those described for RGEA – Community.

## **22. Municipal Solar (municipal buildings and parking lots)**

Deriving electricity from solar is important to reduce both the cost of electricity used to power municipal facilities and reduce carbon emissions, as well as provide leadership via example projects. Middletown has contracted for rooftop solar for the new municipal complex under development. Also see the prior sections regarding Middletown’s plans for Community Solar and Solar at Parks.

This plan recommends that Middletown undertake a further technical review of all its buildings, parking lots, and adjacent lawns or maintenance areas to determine feasibility of additional solar panel installations or Community Solar.

## **23. Solar at Places of Worship**

Middletown has about 20 places of worship, a few of which already have some solar deployed. Parking areas, roofs, and adjoining grassy areas that might be considered and reviewed for possible solar have been identified. Much of this consists of parking lots for possible parking canopy solar consideration. A small fraction of the overall identified area was used to compute the possible carbon emission reduction. Five of the places of worship account for 70%+ of the identified area. This plan recommends that all congregations consider newly installing or expanding existing solar panel deployment given the carbon emission reduction benefit to the planet.

## **24. Multifamily and Senior Housing Solar**

Parking lot and rooftop solar facilities at Middletown's senior citizen housing, 55+ housing complexes, assisted living facilities, condo complexes, and apartment buildings represent additional opportunities for substantially increasing solar electric output. This plan recommends that Middletown reach out to Homeowner’s Associations, owners, and operators of these facilities regarding their plans and opportunities for increasing solar output and obtaining savings by deploying solar on rooftops and parking canopies. Solar carbon emission savings are implicitly included under the residential solar sections of this document.

## **25. Municipal Energy Efficiency (municipal buildings)**

Improved Middletown municipal energy efficiency via energy reductions can be accomplished through a combination of energy audits and energy efficiency measures taken over time to reduce electric, gas, and oil consumption of Middletown buildings and facilities through energy saving techniques, including building replacement, insulation, sealing, replacement with more efficient appliances, and steps to directly reduce energy usage such as turning down thermostats and lighting controls. In 2009 and 2018, Middletown participated in the NJ Clean Energy “Local Government Energy Audit” (LGEA) Program. Energy audits and resultant improvements are reducing energy consumption and municipal carbon footprint<sup>120</sup>.

A prior section recommends Middletown take energy measures such as R-GEA for Middletown facilities. Another section recommends that Middletown's space and water heating convert to electric as electric becomes increasingly based on renewable sources. In addition to these primary actions, this plan recommends an annual ongoing program of audits and energy efficiency measures to drive energy consumption down.

An example of major anticipated energy efficiency action, via building replacement, is Middletown's planned new town hall<sup>121</sup>.

## **26. Energy Efficiency - School, Multi-Family Housing, Senior Housing, and Places of Worship**

Schools, multi-family housing, senior housing and places of worship would all benefit from continued energy efficiency programs. Institutions and individuals responsible for these buildings are recommended to obtain audits on an ongoing basis, and then act on any audit recommendations. Energy efficiency measures implemented will save expense, reduce carbon emissions, and often can make a building more uniformly comfortable by reducing drafts.

This plan also recommends that Middletown contact these institutions and organizations to encourage energy-efficiency actions, take an inventory of their current status and understand their action plans.

Other sections of this document deal with additional energy topics, such as energy aggregation for residents, solar for schools, and building heating electrification.

## **27. Solar at Parks**

The “2008 Parks, Recreation and Open Space Master Plan” identifies properties owned by Middletown and property managed by County, State and Federal entities<sup>122</sup>.

This plan recommends that Middletown review over 50 parks, recreation, and adjunct parking areas owned by Middletown. This review would include:

- Evaluate all facilities for solar suitability (e.g., rooftops, canopy parking, and adjacent lawn areas).
- Consider Community Solar installations for roofs, parking areas, and adjacent lawns
- Avoid impact on and preserve existing carbon sequestration areas, wildlife, and natural areas (e.g., forests, fields, beaches, wetlands, trails), and thus also ensure human appreciation of parks fully continues

Possible areas for solar at other parks in Middletown, including Sandy Hook, Thompson, and others, were

also identified via manual inspection of aerial views for identified areas such as roofs, parking areas, and adjacent lawns, and is not an official assessment. A substantial reduction factor was applied to these limited areas as part of the carbon emission reduction estimate. Other areas such as forests, beaches, wild areas, wetlands, fields, trails, and other park visitor areas were excluded from consideration for the sake of tree cover, wildlife, carbon sequestration, open space, and human enjoyment. Also, this assessment does not include consideration of the practical implications of government involvement, planning, community acceptance, approving, funding and building such solar projects in parks.

Sandy Hook offers a large potential area for solar including several large parking lots and unused areas near main building areas and building roofs. Historic buildings and associated lawn areas, beaches, wetlands, vegetation and tree areas near beaches and in other areas were excluded from consideration. Thompson park has parking lots in maintenance areas and near certain park facility buildings, lawn areas near these park facility buildings, and roofs identified for possible solar panels, noting that one building already has a solar panel rooftop installation. Areas near the main park building, pedestrian/bicycle paths, undeveloped areas, areas near the park's lake, fields, ballparks, play areas, and adjacent parking lots were excluded from consideration.

Roofs, parking areas and adjacent frequently mowed lawn areas at Hartshorne Woods, Huber Woods, Tatum and Deep Cut parks, and Stevenson Tract do not appear appropriate for significant solar (excluding forests, fields, wetlands, etc.) based on aerial views and firsthand experience. But limited solar may be feasible to operate building facilities, for future EV charging at parking or for small Community Solar without intruding on fields, forests, and wetlands. As an example, a solar installation at Poricy Park located at the Activity Center, parking area, nearby former house structure, and immediately adjacent lawn areas might generate ~200 KWH (unofficial example estimate).

With the expected expansion of EVs in the coming years, solar parking lot installations with EV chargers might be an attractive offering for visiting drivers, given the need to recharge their vehicles for the return trip. For example, at Sandy Hook, EV recharge could occur while drivers are enjoying their day at the beach, rather than requiring drivers to find charging stations elsewhere and spend significant time waiting at a charging station outside the park before the return trip. Charging for this service might even help defray part of the cost of solar installations at Sandy Hook, or could be offered for free or low cost with the park admission fee for the sake of the environment.

## **28. Landscaping Using Battery (electric) Equipment (Residential, Business, Schools, Middletown Township, Parks/Fields, Places of Worship)**

In recent years, numerous battery powered lawn tools have become available including lawn mowers, trimmers and leaf blowers. At least one substantial battery snow thrower is available.<sup>123</sup>

Purchasing battery (or electric) versions of lawn and residential landscape equipment rather than gas versions is recommended to further reduce carbon emissions and air pollution.

This plan also recommends that Middletown parks maintenance and commercial landscaping services replace fossil fuel lawnmowers, and instead consider acquisition of battery driven commercial lawnmowers, e.g., example reference.<sup>124</sup>

## **29. Water and Sewer Usage - Energy Efficiency and Carbon Emissions**

Treatment, delivery, and consumption of water consumes substantial energy, before, during, and after delivery to the residence or commercial business. Emission reduction opportunities also should be examined for waste treatment. Reducing water consumption not only reduces both the amount and cost of water and its treatment, but also reduces carbon emissions by reducing energy used to deliver and treat wastewater. Example residential savings techniques include fixing leaky faucets, using water efficient appliances such as low consumption toilets and washing machines, low flow shower heads, taking shorter showers, and limiting lawn watering. Further tips can be found at these references.<sup>125 126</sup>

Small and large businesses water savings will also provide substantial energy savings, in addition to water cost related savings. See example business related water saving techniques at this reference.<sup>127</sup>

## **30. Electric Vehicle Transportation Hub at Middletown Train Station**

This plan recommends that Middletown create a EV transportation hub at the Middletown Train Station (or other suitable location), possibly in conjunction with the aforementioned community solar project also at the train station.

Considerations for the EV transportation hub include the following:

- EV bus transit hub
- “On demand” EV buses using smartphone, computer, and telephone for EV bus requests for pick up within a short distance of request origination. Example services are at references.<sup>128 129</sup> Also consider fixed EV bus routes.
- Enable efficient EV for all residents with a wide range of demographics including commuters, shoppers, medical patients, employees, high density housing residents, senior citizens, special needs, and those without cars.
- Fast EV charging infrastructure, available for commuters, others, buses, and delivery vehicles.
- Solar canopy at train station, e.g., via Community Solar
- Reduce VMT along with EV carbon emission reduction.
- Improve health with reduced diesel emissions associated with VMT reductions.
- Regional transit EV leadership, including for commuter parking lots, Middletown and Red Bank train stations, Bayshore and Riverview Hospitals, Brookdale college, Sandy Hook, shopping centers, High School North and High School South, and involve surrounding towns including Red Bank, Rumson, Sea Bright, Holmdel, Shrewsbury, Atlantic Highlands, Keansburg, Keyport, and Hazlet.
- Coordination with New Jersey Transit regarding train stations, bus routes, and plans for bus electrification. Request that Middletown be among the first receiving NJT EV bus routes.
- Consider EV bus transit to airports, transportation hubs, major office locations, Newark, and New York City.
- Consider EV bus transit to Belford and Seastreak ferries in Atlantic Highlands.
- EV delivery vehicle hub, i.e. via coordination with major package delivery services.
- Emergency micro grid interconnection and support.
- The estimated carbon emission savings for this EV transportation hub proposal consist of a combined portion of estimated savings listed for each of Community Solar, Electric Vehicle – Local Transit, Electric Vehicle – Delivery and Light Truck, and Electric Vehicle – Passenger together with VMT reductions.

### **31. Develop Plan for EV Charging Station Siting and Deployment**

This plan recommends that Middletown establish a plan and requirements for deploying EV charging stations throughout the township as part of the 2020 release of the Master Plan as encouraged by recent legislation<sup>130</sup>. This legislation also encourages that EV charging infrastructure be considered for inclusion in local redevelopment plans. This plan also recommends that Middletown pass requisite ordinances to support EV charging station plans and deployment.

As part of Middletown's EV plan, EV charging stations would be required at all new developments as well as medium to large re-purposed commercial facilities and encouraged at smaller business establishments. EV charging stations would be required in commercial properties such as shopping malls, gas stations, hotels, and medium to large businesses for their employees and patrons, as well as multi-family, senior housing and schools. There are grant opportunities for the Township, businesses and residents under the state's new EV Incentive Program S-2252<sup>131</sup>.

This plan recommends that Middletown establish municipal EV charging stations at township or government facilities (e.g., the train station, the library, the municipal complex, Kanes Lane and other municipal properties including recreational facilities) for its own and/or EV use. Middletown might directly own and operate EV charging stations, or contract with others, e.g., via lease agreement for operation on municipal properties. Middletown also plans at least 2 EV charging stations at the new municipal complex. It is also recommended that Middletown plan for and work with county and other governments regarding establishing EV charging station facilities at non-municipal government schools (e.g., Brookdale), parks, commuter parking lots, and other government facilities, including post offices.

Further, this plan recommends that Middletown reach out to package delivery, postal delivery, and ride share services regarding their plans regarding the recharge of EV supporting these services to ensure sufficient EV charging support in Middletown.

### **32. Hydrogen and Fuel Cells for Heavy Vehicles**

Hydrogen, hydrogen/ammonia, and fuel cells may be available in the future to fuel heavy vehicles such as dump trucks, loaders, garbage trucks, and trains<sup>132</sup>, as well as for fuel cell electric generation. For example, construction manufacturers are interested in fuel cells.<sup>133</sup> Farmers are interested in hydrogen and hydrogen/ammonia fueled vehicles, where the original energy source is solar.<sup>134</sup> Farming concepts might be extended to other heavy vehicles. (There is now little to no focus on farming in Middletown itself.) Hydrogen passenger cars are also available.<sup>135</sup> This plan recommends that Middletown remain abreast of advances in these technologies for heavy vehicles, fleet vehicles, and fuel cell electricity generation so as to ensure timely incorporation of carbon emission free vehicles into the Middletown owned and contracted vehicle fleets, and for fuel cell electricity generation, when both technically feasible and cost effective. Another possibility is increased use of hydrogen in manufacturing<sup>136</sup>, displacing other fossil fuels.

### **33. Naval Weapons Station Earle Associated Facilities and Other Possibilities**

There are other facilities and areas in Middletown that might provide substantial solar upon feasibility assessment. For example, the Naval Weapons Station Earle associated facilities in Middletown include large dock and dock area facilities, several miles of railroad track and adjacent road, a large emergency facility, and several other substantial facilities that include substantial paved areas and buildings. The Middletown Fire Department also has a facility near the Naval Weapons Station Earle tracks/road. Other candidates for

consideration might include the New Jersey Transit railroad and Garden State Parkway corridors. No estimate is included here at this time for any of these facilities or infrastructure. Each would require feasibility assessment, estimates and proposals, and working with the respective government authorities. However, this plan recommends that Middletown work with each of the responsible authorities to assess possible plans for deploying solar at these facilities. Doing so could very well also result in substantial solar deployment and hence carbon reduction given the combined area of all of these.

## APPENDICES

### A. Appendix A – Background for Action

The importance of reducing energy usage for cost savings and national economic security has long been recognized, including efforts that date back to the 1970's in part triggered by the oil embargoes of that era.<sup>137</sup> Consequently, homeowners, businesses and government entities have sought for decades to reduce energy costs through energy efficiency measures. Measures such as the deployment of LED lights, far more energy efficient HVAC equipment, appliances and homes including the federal government energy STAR program<sup>138</sup>, home insulation improvements, and drastic vehicle mileage improvements due to everyday actions by Americans, government standards, and manufacturer technology improvements have led to far more efficiency and substantially reduced costs that benefit everyone.

However, as early as 1965, at the presidential level<sup>139</sup> and otherwise, it became widely known that the emission of the greenhouse gas carbon dioxide – e.g., from fossil fuel emissions for transportation (cars, trucks, and airplanes), electricity generation from coal and natural gas plants, industrial production, and deforestation - along with other pollutants such as methane, nitrous oxide, and carbon black, were primary drivers of the planet wide “greenhouse effect”<sup>140</sup>. The greenhouse effect has led to rapid global warming and climate change thus jeopardizing planet earth<sup>141</sup>. Ample testimony regarding global warming is available, e.g., the famous testimony of James Hansen, NASA scientist, to Congress in 1988.<sup>142 143</sup>

The effect of global warming has become far more obvious in recent decades and years, with the hottest global average temperatures occurring in recent years<sup>144</sup>, rising sea levels<sup>145 146</sup> due to ice melt and thermal expansion, depletion of ocean oxygen<sup>147</sup>, species extinction, increasing ocean acidification<sup>148</sup> with impact on shellfish, coral (e.g., marring of Australia's Great Barrier Reef<sup>149</sup>) and other marine species including potential extinction, and the potential for more numerous strong storms worldwide. Numerous reports of direct impacts abound, e.g., “State Birds Face a Focused Exodus”<sup>150</sup> which reports that “New Jersey: Goldfinch could lose 100% of its summer range in the state”. Mounting evidence of coming polar bear extinction<sup>151</sup>. And glacier loss in Glacier National Park<sup>152</sup>, Montana is an average of 39% since 1966 with some having lost as much as 85% by 2015. Plants are growing higher up in Mount Everest.<sup>153</sup> Drastic impacts on many hundreds of millions of people living in low lying areas in the USA and worldwide, on agriculture, from storm damage, and on world economies are expected unless immediate drastic steps are taken to reduce and eliminate carbon dioxide (and methane) emissions, aka pollution.

Having mostly postponed substantial action for decades, countries and localities world-wide need to take drastic action now<sup>154</sup>.

Corporations are taking note, e.g., Microsoft's President Brad Smith<sup>155</sup> indicates that the planet needs to be carbon neutral by 2050, and towards this, Microsoft plans to be 20 years early. Microsoft plans to have its own electricity supply 100% renewable for all buildings and campuses by 2025, to be net carbon negative by 2030 including suppliers, and by 2050 compensate for all carbon Microsoft has emitted into the atmosphere since its founding in 1975. And the world's banks are preparing for climate risk<sup>156</sup>.

Countries and states are taking note, e.g., as of 2019, Denmark sourced 47%<sup>157</sup> of its power from wind. As announced in June 2020, New Jersey is embarking on building a wind port to support manufacturing and staging of offshore wind turbines including the potential for hundreds of industrial and port related jobs<sup>158</sup>. Floating windmills<sup>159</sup> are another new means of generating wind power. Other states are taking note, e.g., Maine and Vermont obtain greater than 40%<sup>160</sup> of power from renewable energy (excluding hydro power) as of 2017, and several states have high fractions of renewable energy including hydro power.

**B. Appendix B – Example Renewable Energy Aggregation Ordinance**

**MIDDLETOWN TOWNSHIP, NEW JERSEY  
ORDINANCE NO. [NNN] AN ORDINANCE OF MIDDLETOWN TOWNSHIP ESTABLISHING A  
RENEWABLE ELECTRIC AGGREGATION PROGRAM**

**WHEREAS, the State of New Jersey has been engaged in a process to establish a competitive marketplace through deregulation and restructuring the electric utility market; and WHEREAS, the establishment of a government aggregator and an energy aggregation program to purchase electric generation service to N.J.S.A. 48:3-93.1 et seq. and N.J.A.C. 14:4-6.1 et seq. will increase competition for the provision of electric power to residential and non-residential users, thereby increasing the likelihood of lower electric rates for these users without causing any interruption in service;**

**and WHEREAS, under the aggregation process the residential and non-residential ratepayers may likely receive a direct reduction in their electric bills;**

**and WHEREAS, the realization of energy cost savings is in the interests of the health, safety and welfare of the residents and non-residents of Middletown Township (the “Township”);**

**and WHEREAS, the Township hereby finds that it is in the best interests of residential and non-residential ratepayers for the Township to create the opportunity for them to enter into an aggregation agreement in order to seek substantial savings on electric rates;**

**and WHEREAS, renewable energy suppliers can select electricity production with renewable mixtures between the minimum NJ mandated Renewable Portfolio Standard (RPS) up to 100% renewable sources with no greenhouse gas emissions;**

**and NOW, THEREFORE BE IT ORDAINED, by the Township Committee of Middletown Township in the County of MONMOUTH and the State of New Jersey, duly assembled in public session, as follows:**

- 1. The Township publicly declares its intent to become an aggregator of electric power on behalf of its residential and non-residential users of electricity pursuant to the Government Energy Act of 2003, N.J.S.A. 48:3-91.3 to -98, and implementing regulations.**
- 2. The Township will utilize approved vendor, [VENDOR], Reverse Energy Auction Platform pursuant to the NJ E-PROCUREMENT Pilot program (P.L. 2001, c.30) under the NJ Department of Community Affairs. The Reverse Energy auction will seek bids from licensed and appropriate third-party suppliers. If such winning bid is selected and agreement executed, individual residential and non-residential consumers would retain the option not to participate and to choose any alternatives they desire.**
- 3. The Mayor and Township Clerk are hereby authorized and directed to execute any documents necessary to carry out the purpose of the Ordinance.**
- 4. All ordinances and parts of ordinances inconsistent herewith are hereby repealed.**
- 5. If any portion of this ordinance shall be deemed invalid by any court of competent jurisdiction, the remainder shall survive in full force and effect.**
- 6. This ordinance shall be effective immediately upon adoption and publication in accordance with law.**

**NOTICE IS HEREBY GIVEN THAT THE FOREGOING Ordinance was introduced at a meeting of the Township Committee of the Township of MIDDLETOWN, in the County of MONMOUTH and State of New Jersey, held on [DATE] and will be further considered for final passage after public hearing thereon at a regular meeting of said Township Committee to be held at the Municipal Building, [ADDRESS], New Jersey on [DATE] at [TIME].**

## C. Appendix C – Electric Vehicle Social Justice, Health, Characteristics and Hybrids

### Health and Social Justice<sup>161</sup>:

- An important goal is to ensure that EVs are affordable for lower-income people, especially during the transition from gas to EV. EV may especially impact if used fossil fuel vehicles become obsolete quickly, and if shortages of gasoline, gasoline stations (due to closures), and maintenance for fossil fuel vehicles occurs while newer EVs take over the bulk of the market.
- Also, ensure suitable and equitable EV charging facilities for multifamily housing, especially low-income multifamily housing, and senior housing. (Wealthier homeowners and homeowner's associations are much more likely to be able to afford EV chargers and enhanced electrical outlets to support rapid EV charging.)
- Resident health is expected to benefit from the drastic reduction in automobile, transit bus, and school bus exhaust, as well as from area reduction in pollutants from retired fossil fuel plants, especially retired coal plants, including those west of New Jersey. Residents can look forward to clearer skies, less smog, and less air pollution in dense neighborhoods near roads. While health impacts may not be measurable for years, tangible cost reductions in health care cost should materialize in the decades ahead, thus adding to the benefits of EVs and the general shift to clean energy.
- Substantial reductions in both diesel and fossil fuel vehicle deliveries to homes and businesses would occur with the advent of EV delivery vehicles, diesel tanker truck fuel deliveries would decline to gas stations, and EV refuse trucks would replace diesel trucks, thus substantially lowering carbon emissions while also resulting in improved health directly in neighborhoods.
- EV reliability and usage is likely to reduce the number of maintenance and gas station employees required to maintain and fuel vehicles over the long term. While employment impacts may be limited within Middletown itself, state and national employment and training impacts are significant. Offsetting this is the expected increase in jobs to install and service clean energy facilities, EV chargers, etc. EVs may also reduce the number of vehicle sales staff required if the marketing of new EV shifts more to the internet or if vehicle usage shifts more to corporate-owned fleets for ride sharing and away from individual ownership. However, it should be noted that numerous manufacturers offer EVs today in their showrooms via existing marketing paradigms.

### EV Characteristics:

- In general, typical EV range per charge is currently much shorter than gas vehicle range per tank. Owners must take EV charge capacity, EV range, and EV charging station locations and type of EV charger/fitting into account when planning vehicle trips and charging times.
- Future solid-state car batteries<sup>162</sup> may increase driving range and battery length for EV cars.
- Governments and electric utilities will need to ensure sufficient electric utility infrastructure to serve residences and businesses for EV charging.
- In general, current EV original purchase costs are typically higher than gas vehicles, even with government subsidies (which eventually expire by vehicle make based on sales volume).
- However, the operational cost of EV over several years is lower, both regarding per mile electricity costs and maintenance costs due to less complex power trains.
- Reduction in gasoline vehicles and thus gasoline taxes means that governments will need to increase revenues in other ways to continue to fund required road maintenance.
- In the event of accidents, emergency personnel including fire and rescue personnel need to be trained and equipped to handle high-voltage EV power trains and possible battery fires to avoid personal and vehicle occupant injury. On the other hand, the risk of fossil fuel fires and explosions is eliminated.
- New considerations may arise, e.g. increased grid usage during EV charging at home, potentially during peak electric usage periods. Another example is grid and availability impacts associated with

EV charging before, during, and after storms or power interruptions. At the same time, risks associated with conventional fossil fuel usage, delivery and storage, e.g. storage tanks, ground and water contamination, and both pollution and accidents associated with tanker trucks, are expected to gradually diminish as EV usage takes its place.

#### **Other Selected EV Information:**

- The first electric car in the USA was developed circa 1890-91.<sup>163</sup>
- An average passenger vehicle emits 4.6 carbon tons per year (11,500 miles).<sup>164</sup>
- A typical suburban police vehicle is estimated to emit 6.9 carbon tons per year (est. 50 miles per day based on low end of city versus highway police car driving, or 18,000 miles per year).<sup>165</sup>
- See references for examples<sup>166 167</sup> of charging station information.
- Volta<sup>168</sup> charging station use recently observed at Cinema Hazlet 12 (October 2019)
- Charging stations can also be observed at area car dealers
- Electric boat and ferry<sup>169</sup> implementation, e.g., “Electric Maids” at Maid of the Mist in Niagara Falls.<sup>170</sup>
- Electric plane implementation, e.g., vintage seaplane conversion of a de Haviland Beaver seaplane, which were first airborne in 1956.<sup>171</sup>

#### **Hybrid Vehicles:**

- A possible interim vehicle is the hybrid vehicle combining both gas and electric power trains and combining certain characteristics of both types of vehicles. Hybrid vehicles have been readily available from several manufacturers for several years and thus represent a well-honed vehicle technology, which is widely deployed. However, hybrid vehicles may not achieve the carbon emission reductions considered necessary within the decades immediately ahead.<sup>172</sup> But hybrids are clearly better than full fossil fuel vehicles in this regard, while avoiding EV range limitations. Many hybrids are comparable in price to similar gas vehicles.
- A plug-in hybrid combines somewhat larger battery and an external charging port. Battery range is typically 50 miles or less (as of 2020). Driving the hybrid less than the battery range each day means no fossil fuel usage is necessary. The hybrid is then charged overnight using a 120- or 240-volt 15 amp outlet. Yearly greenhouse gas emission from the plug-in hybrid use of electricity could be zero if the internal combustion engine is never used and if charged with 100% renewable electricity, e.g. either 100% renewable municipal R-GEA or third-party electricity. The least expensive 100% renewable third party electricity can be priced less than that supplied by the local serving utility.<sup>173</sup>

#### **D. Appendix D – List of Passenger EVs (not a complete list)**

- Audi e-tron<sup>174</sup>
- Bollinger Motors<sup>175</sup>
- BMW i3<sup>176</sup>
- Chevrolet Bolt<sup>177</sup>
- Fiat 500e<sup>178</sup>
- Ford<sup>179</sup>
- Ford Mustang SUV<sup>180</sup>
- GM<sup>181</sup>
- GMC electric truck<sup>182</sup>
- Honda Clarity Electric<sup>183</sup>
- Hyundai IONIQ Electric<sup>184</sup> & Kona Electric<sup>185</sup>
- Infiniti QX Inspiration (concept)<sup>186</sup>

- Jaguar I-PACE<sup>187</sup>
- Kia Soul EV<sup>188</sup>
- Mercedes Benz EQC<sup>189</sup>
- Nissan Leaf<sup>190</sup>
- Porsche Taycan<sup>191</sup>
- Rivian<sup>192</sup>
- Tesla<sup>193</sup>
- Volkswagen ID series<sup>194</sup>
- Volvo XC40 Recharge<sup>195</sup>

## E. Additional Possible Project Action Lists

Additional possible project action lists are available at the following [link](#). These lists were developed during 4Q19 to reflect specific actions and then current possible timelines for certain previously mentioned action sections as these sections were envisioned at that time. The reader is referred to these lists to garner specific additional items for consideration in any actual subsequent detailed project plans:

<http://climate.smiller.org/energy-plan/2020/appendix-E-to-Q.doc>

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