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CCAC Letters

• 8 CCAC members submitted letters to be appended to the CAP, totaling over 37 pages.
• These letters will be appended to the final 2021 CAP
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Pennsylvania’s DRAFT 2021 GHG Inventory Report (2018 Data Year)
State Inventory Tool (SIT)

• Made available in October 2020, with updates to the tool released in November 2020, August 2021.
• EPA updated all 11 modules with data through 2018.
2018 data shows a net emissions increase from 2017. This is the second consecutive year with a GHG increase.

Emissions increases occurred in the Residential, Commercial, Industrial, and Agricultural sectors.

Emissions decreases occurred in the Transportation and Electricity Production sectors.

The Waste Management sector saw no significant change in emissions.

There was a decrease in CO$_2$ sequestered in the LULUCF sector in 2018 compared to 2017.
Total Statewide Net Emissions (Sources w/ Sinks) (MMTCO$_2$e)

- 2005: 289.62
- 2010: 268.14
- 2015: 248.94
- 2016: 235.00
- 2017: 236.21
- 2018: 241.12

- 2005: 289.62
- 2010: 268.14
- 2015: 248.94
- 2016: 235.00
- 2017: 236.21
- 2018: 241.12

- Total Statewide Net Emissions (Prod w/ Sinks)
- 26% reduction from 2005
- 80% reduction from 2005
Pennsylvania 2018 GHG Emissions
% of Total by Sector

- Residential: 32%
- Commercial: 8%
- Industrial: 27%
- Transportation: 24%
- Electricity Production: 3%
- Agriculture: 2%
- Waste Management: 2%
GHG Emissions Inventory

GHG Emissions (MMTCO$_2$e) by Sector

- LULUCF
- Waste Management
- Agriculture
- Electricity Production
- Transportation
- Industrial
- Commercial
- Residential
- Net Emissions
2018 GHG Emissions By Sector (MMTCO$_2$e)

2018:
- Residential: 21.65 MMTCO$_2$e (17%)
- Commercial: 12.14 MMTCO$_2$e (12%)
- Industrial: 84.98 MMTCO$_2$e (4%)
- Transportation: 63.37 MMTCO$_2$e (-1%)
- Electricity Production: 73.09 MMTCO$_2$e (-3%)
- Agricultural: 9.54 MMTCO$_2$e (1%)
- Waste Management: 4.34 MMTCO$_2$e (0%)

Change from 2017:
- Residential: 12%
- Commercial: 4%
- Industrial: -1%
- Transportation: -3%
- Agricultural: 1%
- Waste Management: 0%
Electricity Production

GHG Emissions from Electricity Production (MMTCO$_2$e)
## Total Electricity Generated, Consumed, and Exported (TWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>Electricity Generated (TWh)</th>
<th>Electricity Consumed (TWh)</th>
<th>Electricity Exported (TWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>218.09</td>
<td>151.56</td>
<td>52.87</td>
</tr>
<tr>
<td>2010</td>
<td>229.75</td>
<td>151.74</td>
<td>68.26</td>
</tr>
<tr>
<td>2015</td>
<td>214.57</td>
<td>150.67</td>
<td>55.21</td>
</tr>
<tr>
<td>2016</td>
<td>215.07</td>
<td>150.53</td>
<td>55.73</td>
</tr>
<tr>
<td>2017</td>
<td>213.64</td>
<td>148.33</td>
<td>56.61</td>
</tr>
<tr>
<td>2018</td>
<td>215.39</td>
<td>154.36</td>
<td>52.57</td>
</tr>
</tbody>
</table>
Electricity Production

Percent Electricity Production By Fuel Type

- **Oil**: 2.3%, 0.2%, 0.3%, 0.2%, 0.2%, 0.3%
- **Natural Gas**: 5.0%, 14.7%, 27.7%, 31.6%, 33.9%, 35.5%
- **Coal**: 55.5%, 48.0%, 30.1%, 25.4%, 22.3%, 20.5%
Electricity Production

GHG Emissions from Electricity Production Sector by Source (% of Total)

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil</th>
<th>Natural Gas</th>
<th>Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>3.5%</td>
<td>3.7%</td>
<td>92.9%</td>
</tr>
<tr>
<td>2010</td>
<td>0.4%</td>
<td>11.5%</td>
<td>88.1%</td>
</tr>
<tr>
<td>2015</td>
<td>0.5%</td>
<td>28.1%</td>
<td>71.3%</td>
</tr>
<tr>
<td>2016</td>
<td>0.3%</td>
<td>34.3%</td>
<td>65.4%</td>
</tr>
<tr>
<td>2017</td>
<td>0.3%</td>
<td>38.5%</td>
<td>61.2%</td>
</tr>
<tr>
<td>2018</td>
<td>0.8%</td>
<td>40.5%</td>
<td>58.7%</td>
</tr>
</tbody>
</table>
Industrial Sector

GHG Emissions from Industrial Sector by Source (% of Total)

- **Natural Gas and Oil Systems**
  - 2005: 7.38%
  - 2010: 7.23%
  - 2015: 9.89%
  - 2016: 9.74%
  - 2017: 9.65%
  - 2018: 9.80%

- **Coal Mining and Abandoned Mines**
  - 2005: 10.71%
  - 2010: 12.80%
  - 2015: 10.70%
  - 2016: 9.88%
  - 2017: 10.68%
  - 2018: 11.14%

- **Industrial Process**
  - 2005: 14.03%
  - 2010: 13.64%
  - 2015: 14.19%
  - 2016: 13.85%
  - 2017: 13.67%
  - 2018: 13.52%

- **Combustion of Fossil Fuels**
  - 2005: 46.46%
  - 2010: 40.08%
  - 2015: 50.56%
  - 2016: 46.11%
  - 2017: 47.98%
  - 2018: 50.52%

Table values presented in MMTCO$_2$e
Residential Sector

GHG Emissions from Residential Sector (MMTCO$_2$e)

- 2005: 23.91
- 2010: 20.21
- 2015: 20.75
- 2016: 18.48
- 2017: 18.53
- 2018: 21.65

Pennsylvania DEPARTMENT OF ENVIRONMENTAL PROTECTION
<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Gas</th>
<th>Propane</th>
<th>Kerosene</th>
<th>Heating Oil</th>
<th>Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>13.53</td>
<td>0.93</td>
<td>0.76</td>
<td>8.56</td>
<td>0.13</td>
</tr>
<tr>
<td>2010</td>
<td>12.30</td>
<td>1.28</td>
<td>0.31</td>
<td>6.32</td>
<td>0.00</td>
</tr>
<tr>
<td>2015</td>
<td>13.11</td>
<td>1.13</td>
<td>0.10</td>
<td>6.42</td>
<td>0.00</td>
</tr>
<tr>
<td>2016</td>
<td>11.92</td>
<td>1.04</td>
<td>0.11</td>
<td>5.40</td>
<td>0.00</td>
</tr>
<tr>
<td>2017</td>
<td>12.11</td>
<td>1.09</td>
<td>0.07</td>
<td>5.27</td>
<td>0.00</td>
</tr>
<tr>
<td>2018</td>
<td>13.94</td>
<td>1.28</td>
<td>0.07</td>
<td>6.37</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table values presented in MMTCO\textsubscript{2}e

Residential Emissions by Fuel Type (% of Total)
## Commercial Sector

Table values presented in MMTCO$_2$e

### Commercial Emissions by Fuel Type (% of Total)

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Gas</th>
<th>Residual Fuel</th>
<th>Motor Gasoline</th>
<th>Propane</th>
<th>Kerosene</th>
<th>Heating Fuel</th>
<th>Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>8.00</td>
<td>0.30</td>
<td>0.03</td>
<td>0.34</td>
<td>0.19</td>
<td>2.64</td>
<td>1.44</td>
</tr>
<tr>
<td>2010</td>
<td>7.79</td>
<td>0.04</td>
<td>0.03</td>
<td>0.42</td>
<td>0.06</td>
<td>1.75</td>
<td>0.47</td>
</tr>
<tr>
<td>2015</td>
<td>8.46</td>
<td>0.00</td>
<td>0.93</td>
<td>0.48</td>
<td>0.01</td>
<td>1.39</td>
<td>0.20</td>
</tr>
<tr>
<td>2016</td>
<td>7.90</td>
<td>0.01</td>
<td>0.94</td>
<td>0.50</td>
<td>0.02</td>
<td>1.13</td>
<td>0.10</td>
</tr>
<tr>
<td>2017</td>
<td>8.08</td>
<td>0.00</td>
<td>0.95</td>
<td>0.45</td>
<td>0.01</td>
<td>1.32</td>
<td>0.06</td>
</tr>
<tr>
<td>2018</td>
<td>9.11</td>
<td>0.00</td>
<td>0.97</td>
<td>0.52</td>
<td>0.01</td>
<td>1.50</td>
<td>0.04</td>
</tr>
</tbody>
</table>

- Natural Gas
- Residual Fuel
- Motor Gasoline
- Propane
- Kerosene
- Heating Fuel
- Coal
### Table 1: Transportation Emissions by Fuel Type (MMTCO₂e)

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Gas</th>
<th>Motor Gasoline</th>
<th>Jet Fuel</th>
<th>Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>32,312</td>
<td>628,121</td>
<td>95,404</td>
<td>225,678</td>
</tr>
<tr>
<td>2010</td>
<td>49,517</td>
<td>571,588</td>
<td>70,572</td>
<td>208,177</td>
</tr>
<tr>
<td>2015</td>
<td>45,700</td>
<td>532,669</td>
<td>42,599</td>
<td>214,410</td>
</tr>
<tr>
<td>2016</td>
<td>42,547</td>
<td>535,957</td>
<td>69,246</td>
<td>198,257</td>
</tr>
<tr>
<td>2017</td>
<td>46,188</td>
<td>539,177</td>
<td>114,692</td>
<td>198,552</td>
</tr>
<tr>
<td>2018</td>
<td>48,850</td>
<td>522,404</td>
<td>103,656</td>
<td>210,825</td>
</tr>
</tbody>
</table>

The table presents emissions data in MMTCO₂e for the years 2005 to 2018, categorized by fuel type: Natural Gas, Motor Gasoline, Jet Fuel, and Diesel. The data shows a significant increase in Natural Gas emissions from 2005 to 2018, with a corresponding decrease in Motor Gasoline emissions.
Waste Management Sector

GHG Emissions from Waste Management Sector (% of Total)

<table>
<thead>
<tr>
<th>Year</th>
<th>Wastewater</th>
<th>Solid Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>1.69</td>
<td>3.55</td>
</tr>
<tr>
<td>2010</td>
<td>1.78</td>
<td>2.25</td>
</tr>
<tr>
<td>2015</td>
<td>1.80</td>
<td>2.45</td>
</tr>
<tr>
<td>2016</td>
<td>1.86</td>
<td>2.50</td>
</tr>
<tr>
<td>2017</td>
<td>1.81</td>
<td>2.53</td>
</tr>
<tr>
<td>2018</td>
<td>1.81</td>
<td>2.53</td>
</tr>
</tbody>
</table>

Table values presented in MMTCO$_2$e
## Agricultural Sector

### GHG Emissions from Agricultural Sector (% of Total)

<table>
<thead>
<tr>
<th>Source</th>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burning of Agricultural Crop Waste</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Urea Fertilization</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Liming of Soils</td>
<td>0.03</td>
<td>0.38</td>
<td>0.08</td>
<td>0.16</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Agricultural Soil Management</td>
<td>2.91</td>
<td>2.94</td>
<td>3.30</td>
<td>3.37</td>
<td>3.48</td>
<td>3.44</td>
</tr>
<tr>
<td>Manure Management</td>
<td>1.68</td>
<td>1.93</td>
<td>2.17</td>
<td>2.26</td>
<td>2.22</td>
<td>2.31</td>
</tr>
<tr>
<td>Enteric Fermentation</td>
<td>3.37</td>
<td>3.44</td>
<td>3.43</td>
<td>3.51</td>
<td>3.58</td>
<td>3.59</td>
</tr>
</tbody>
</table>

Table values presented in MMTCO$_2$e
GHG Emissions by Gas, 2018

- Gross CO2: 85%
- CH4: 11%
- N2O: 2%
- HFC, PFC, SF6 and NF3 Emissions: 2%

GHG Emissions by Gas, 2005-2018

- Gross CO2: 287.63, 261.22, 237.89, 225.32, 225.67, 229.41
- CH4: 26.32, 27.70, 29.17, 28.47, 29.08, 29.58
- N2O: 50, 100, 150, 200, 250, 300

Graphs showing emission trends from 2005 to 2018.
Questions?
Public Comment (15 min)
Break
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- **EPO’s Clean Energy Program Plan presentation**
  - EPO’s Clean Energy Program Plan discussion
- New Business
- Next Steps/Next meeting
• Summarizes the Energy Programs Office's energy-related plans, supporting policies, and programs;
• Recommends new clean energy actions to be taken over the next several years;
• Explores approaches that may be taken to anticipate future events and mitigate disruptions to ensure energy resilience and security.
• Guides EPO toward achieving ambitious long-term clean energy goals while fulfilling our obligations to support energy conservation and efficiency, advance clean energy technologies, and ensure energy security and resilience.
Clean Energy Program Plan

Collaborative Effort with our Partners:

In addition to DEP, EPO and our Consultants:

- Offices and agencies within the Pennsylvania government,
  - DCED, PAPUC, Dept of Ag.
- Non-Governmental Organizations,
- Regional planning commissions,
- Energy policy consultants,
- Higher education institutions,
- Technology experts,
- Utilities, and
- Advocacy organizations.
Clean Energy Program Plan

Includes: EPO’s Purpose and Mission

Who We Are and What We do
- History and Function
- Clean Energy Leadership
- Partnerships with Other Agencies, Networks and Programs
- Energy Assurance and Climate Obligations
- Key Programs

EPO Five Focus Areas
- Energy conservation and efficiency
- Advanced energy technologies
- Energy security and resilience
- Climate change mitigation and adaptation
- Education and outreach
Clean Energy Program Plan

Includes: Near-Term Planning Suggestions and Tools

Recommendations for Short-Term Program Actions or Initiatives
• Actions that will develop a pathway to achieving long-term Commonwealth climate and energy goals while providing residents and businesses with clean, reliable energy.
• Focus on both expanding or enhancing existing programs; and developing new programs

Guiding Principles and Best Practices for EPO Planning and Programming
• Enhance collaboration between government and stakeholders.
• Enhance the marketing of programs and communication of results.
• Integrate energy assurance and resilience in planning efforts.
• Consider the needs of vulnerable communities and the effects of actions on equity, access, and inclusion.
Clean Energy Program Plan

Includes: Suggestions on Measurement and Evaluation

To Ensure Programs are on Track and are Delivering Expected Results:

- Conduct program assessments periodically to assess progress over the program duration
- Develop and deploy a program tracker to provide a comprehensive overview of ongoing efforts
- Reconfirm Program metrics – examples provided in report
  - Funds invested in clean energy programs.
  - Number of business or people trained.
  - Website hits or downloads on specific resources or training materials.
  - Number of new clean energy projects implemented across the state, or total installed new capacity.
  - Number of communities directly benefitting from EPO-funded programs, and varied characteristics of those communities to ensure equity.
Clean Energy Program Plan

Includes: Forward Looking Priorities

Technology Areas for Trend Tracking
• Carbon capture utilization and sequestration (CCUS)
• Offshore wind and Energy Storage
• Disruptive digital technologies
• Small and large distributed energy resources
• Alternative fuels
• Transportation innovations

A Focus on Energy Resilience
• An overarching priority for EPO’s programs both today and into the future is to maintain and enhance preparedness to respond to and assist in recovery from disruptive events that affect Pennsylvania’s energy systems.
An Emphasis on Equity

• The effects of climate change are growing and the burdens of climate change are not equally distributed.
• Communities that are especially vulnerable or underrepresented often suffer the most, and climate change impacts can exacerbate existing social inequalities.
  • Access to clean, affordable energy is a key strategy to address both concerns.
• EPO should increase its work with the DEP Environmental Justice Office and other agencies to create programs to benefit vulnerable communities and consider the needs and concerns of these communities
Clean Energy Program Plan

Includes: Guidance on Ensuring Success

• Strive to identify and recognize the potential for technology to both solve problems and enhance business practices in the energy marketplace to achieve EPO’s mission.

• Look to anticipate needs and implement adjustments to programs to leverage technologies and services with the potential to have the largest effect either by broad implementation or via transformational breakthroughs in technology.

• Dedicate staff time and efforts to focus on planning and building relationships with a broad set of stakeholders of differing perspectives.

• Seek regular input from stakeholders to keep program implementers up to date on what is happening around the Commonwealth and how technology, program, and project implementation is changing.
# Clean Energy Program Plan

## Project Recommendations:

<table>
<thead>
<tr>
<th>Renewable Energy</th>
<th>Energy Efficiency</th>
<th>Transportation</th>
<th>Energy Workforce</th>
<th>Climate and Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Solar Guidance for Local Government</td>
<td>+ Provide Outreach to Wastewater Treatment Plant (WWTP) Operators on Energy</td>
<td>+ Modernize the Alternative Fuels Incentive Grant Program</td>
<td></td>
<td>+ Create a Green Bank for Energy Efficiency and Renewable Energy</td>
</tr>
<tr>
<td>+ Support Community Solar Efforts</td>
<td></td>
<td></td>
<td>+ Expand Climate Planning Efforts with Local Governments</td>
<td></td>
</tr>
</tbody>
</table>
## Clean Energy Program Plan

**Progress on Recommendations:**

<table>
<thead>
<tr>
<th>Recommended Programs</th>
<th>Renewable Energy</th>
<th>Energy Efficiency</th>
<th>Transportation</th>
<th>Energy Workforce</th>
<th>Climate and Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Solar Guidance for Local Government</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>+ Expand Climate Planning Efforts with Local Governments</td>
</tr>
</tbody>
</table>
# Clean Energy Program Plan

## Progress on Recommendations:

<table>
<thead>
<tr>
<th>Renewable Energy</th>
<th>Energy Efficiency</th>
<th>Transportation</th>
<th>Energy Workforce</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Solar Guidance for Local Government</td>
<td>Provide Outreach to Wastewater Treatment Plant (WWTP) Operators on Energy</td>
<td>Modernize the Alternative Fuels Incentive Grant Program</td>
<td></td>
<td>Create a Green Bank for Energy Efficiency and Renewable Energy</td>
</tr>
<tr>
<td>Support Community Solar Efforts</td>
<td></td>
<td></td>
<td></td>
<td>Expand Climate Planning Efforts with Local Governments</td>
</tr>
</tbody>
</table>
## Clean Energy Program Plan

### Progress on Recommendations:

<table>
<thead>
<tr>
<th>Clean Energy Program Plan</th>
<th>Recommended Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Energy</strong></td>
<td>+ Support the Deployment of Agricultural Renewable Energy</td>
</tr>
<tr>
<td></td>
<td>+ Solar Guidance for Local Government</td>
</tr>
<tr>
<td></td>
<td>+ Support Community Solar Efforts</td>
</tr>
<tr>
<td><strong>Energy Efficiency</strong></td>
<td>+ Support and Grow Commercial and Industrial Energy Benchmarking</td>
</tr>
<tr>
<td></td>
<td>+ Provide Outreach to Wastewater Treatment Plant (WWTP) Operators on Energy</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td>+ Explore Low-Carbon Transportation Options with PENNDOT</td>
</tr>
<tr>
<td></td>
<td>+ Modernize the Alternative Fuels Incentive Grant Program</td>
</tr>
<tr>
<td><strong>Energy Workforce</strong></td>
<td>+ Expand E4 by Providing Resources to assist Changing Workforces</td>
</tr>
<tr>
<td><strong>Climate and Energy</strong></td>
<td>+ Local Government Pooled Procurement of Energy Services</td>
</tr>
<tr>
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Clean Energy Program Plan

Progress on Recommendations:

- **Renewable Energy**
  - Support the Deployment of Agricultural Renewable Energy
  - Solar Guidance for Local Government
  - Support Community Solar Efforts

- **Energy Efficiency**
  - Support and Grow Commercial and Industrial Energy Benchmarking
  - Provide Outreach to Wastewater Treatment Plant (WWTP) Operators on Energy

- **Transportation**
  - Explore Low-Carbon Transportation Options with PENNDOT
  - Modernize the Alternative Fuels Incentive Grant Program

- **Energy Workforce**
  - Expand E4 by Providing Resources to assist Changing Workforces

- **Climate and Energy**
  - Local Government Pooled Procurement of Energy Services
  - Create a Green Bank for Energy Efficiency and Renewable Energy
  - Expand Climate Planning Efforts with Local Governments
## Clean Energy Program Plan

### Progress on Recommendations:

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Clean Energy Program Plan

EPO will endeavor to develop and deliver the recommended program actions contained in the report and retain a future focus in order to achieve success in achieving both short and long-term energy and environmental goals.

- Collaborating with other agencies and organizations
- Considering equity, access, and inclusion and the needs of and effects on vulnerable communities
- Ensuring effective marketing of programs and results
- Conducting program impact assessments
- Creating and using a program tracker
- Integrating energy assurance and resilience in planning efforts
Questions?
• Introduction
  • Approval of June minutes
• Report on letters received from CCAC
• 2021 GHG Inventory Report presentation
  • 2021 GHG Inventory Report discussion
• Public Comment
• Break
• EPO’s Clean Energy Program Plan presentation
  • EPO’s Clean Energy Program Plan discussion
• Dr. Satyapal – Hydrogen Tech. presentation
  • Hydrogen Tech. discussion
• New Business
• Next Steps/Next meeting
2021 Regular Meeting Dates:

- **Tuesday February 23**
- **Tuesday April 27**
- **Tuesday June 22**
- **Tuesday August 24**
- **Tuesday October 26**
- Tuesday December 14