PLANNING PITTSBURGH’S PATHWAY
REDUCING CARBON EMISSIONS AND INCREASING ECONOMIC DEVELOPMENT VIA DECARBONIZATION
WE MUST MOVE FORWARD IN THREE AREAS: LOCAL, STATE-LEVEL, AND INSTITUTIONAL ADJUSTMENTS TO SUPPORT DECARBONIZATION

Adapt our cities to include more resilient and cleaner infrastructures.

Help our state transition its electricity usage to meet Paris agreement targets.

Ensure our citizens are knowledgeable and informed on their carbon footprint and energy consumption, including greening our transport in PA.

Make sure our governments help to lead by example and provide the support needed to monitor, revise, and improve upon the path to decarbonization.

Figure 3: Adaptation, mitigation, and adaptive capacity

Adaptation
- Change in land use, relocation
- Emergency & business continuity planning
- Upgrades or hardening of building and infrastructure
- Residential programs promoting adaptation

Mitigation
- Seal Buildings
- Green Infrastructure
- Energy conservation and efficiency
- Renewable energy
- Sustainable transportation, improved fuel efficiency
- Water and Energy Conservation
- Smart Growth
- Capture and use of landfill and digester gas
- Carbon sinks

Health programs

Source: Kelly, 2015
Pennsylvania is suggested under the CPP to reduce its emissions by 29 million tons, or 24 percent below 2012 levels, by 2030

- This represents a 33% reduction in CO2 from 2005 levels
- PA is nearly halfway there - we cut emissions by 16% from 2005-2012
- 38% of PA’s electricity generation came from nuclear power, 36% from coal, and 22% from natural gas in 2011; however, coal went down (so did CO2!)
- Hydropower, wind, and solar make up roughly 4% of all other power

- Pennsylvania will need to build 4,370 MW of wind capacity and nearly 6,400 MW of solar capacity including almost 2,000 MW of rooftop solar on homes and businesses to meet the CPP goals; therefore a large portion of our goals depends on the state’s energy shift
- PA has Renewable Portfolio Standard Policies: 18% requirement by 2021
- PA also has Solar/Distributed integration requirements including 0.5% PV by 2021
WHEN LOOKING THEREFORE AT THE STATE OF PA’S EMISSIONS PROFILE, AND PITTSBURGH’S ENERGY CONSUMPTION WE CAN BEGIN TO ESTIMATE THE EMISSIONS FOOTPRINT FOR EACH SECTOR

<table>
<thead>
<tr>
<th>Sector</th>
<th>Residential Carbon Footprint</th>
<th>Commercial Carbon Footprint</th>
<th>Industrial Carbon Footprint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>222,641*</td>
<td>567,517*</td>
<td>48,020*</td>
</tr>
</tbody>
</table>

*Measured in co2/mmbtu
BUILT ENVIRONMENT ENERGY CONSUMPTION

TOTAL NON-RESIDENTIAL BUILDING FOOTPRINT
223M ft²

TOTAL ELECTRICITY CONSUMPTION
4,147,331 MWh

AVERAGE ENERGY USE INTENSITY
145 kBtu/ft²

BREAKDOWN OF SQUARE FOOTAGE OF NON-RESIDENTIAL BUILDINGS

- Office, 27.2%
- K-12 and University, 18.2%
- Hospitals and Healthcare, 11.8%
- Hotels, Hospitality, and Leisure, 10.7%
- Retail, 12.2%
- Other Non-Residential, 6.2%

Source: Siemens, 2019
### Heat Production

<table>
<thead>
<tr>
<th>BAT Time</th>
<th>1st Generation</th>
<th>2nd Gen</th>
<th>3rd Gen</th>
<th>4th Gen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal, steam, boilers, some CHP</td>
<td>Coal and oil-based CHP and some heat-only boilers</td>
<td>Large-scale CHP, distributed CHP, biomass and waste, or fossil fuel boilers</td>
<td>Low temperature heat recycling and renewable sources</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integration with Electricity Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP as heat source</td>
</tr>
<tr>
<td>CHP as heat source</td>
</tr>
<tr>
<td>CHP as heat source, some electric boilers, and heat pumps in countries with temporary electricity surpluses. Few CHP's on spot markets.</td>
</tr>
<tr>
<td>CHP systems integrated with heat pumps and operated on regulating and power reserve markets as well as spot markets.</td>
</tr>
</tbody>
</table>

### Source:
DISTRICT VS CITY?

Who bears the burden?
Comparing case-study model with Danish district model

Baselining the neighborhood and estimating demand profiles (now and future)

Investigating governance mechanisms against SDG goals

Source: Uptown EcoInnovation District
Economic Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCOE Discount Rate</td>
<td>4%</td>
</tr>
<tr>
<td>Net Tax Factor</td>
<td>1.17</td>
</tr>
<tr>
<td>Calculation Rate</td>
<td>4%</td>
</tr>
<tr>
<td>VAT</td>
<td>5%</td>
</tr>
<tr>
<td>Distortion Loss</td>
<td>20%</td>
</tr>
<tr>
<td>Net Price Index</td>
<td>0.70%</td>
</tr>
<tr>
<td>Long-Term Loan Rate</td>
<td>4%</td>
</tr>
<tr>
<td>Short-Term Loan Rate (debt)</td>
<td>2%</td>
</tr>
<tr>
<td>Short-Term Loan Rate (profit)</td>
<td>0%</td>
</tr>
</tbody>
</table>

Easy access to data and information in regards to energy consumption related to home, business, and buildings.

Report, monitor, communicate consumption data.

Identify the best technical efficiency changes or BAT at the local level for citizens.

Support the upfront capital gap required for deployment.
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