CTECH Living Lab
--Transportation Innovations for Carbon-Neutral Cornell

2017 Sustainability Leadership Summit

H. Oliver Gao
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Vision—Multimodal Easy Electric Transit (ME$^2$ Transit)

Shared use of on-demand mobility service by smart electric fleet of flex size and dynamic routing
Approach

- Alternative vehicle options for transition: alternative fuel/energy sources and technologies for transportation
- Multimodal Mobility-on-Demand Service and EVs
- Information for better-informed decisions: users as well as service providers
Data and Model?
Demand, Network, Operations

- Cornell
- Ithaca
- Tompkins
Action Items, Plan, Partners

- Behavior and Demand Analysis
- Technical Design (Software and Apps)
- Network Design and Operations Management
- Mechanism Design (Incentives, etc.)
- Infrastructure, finance
- Other
CTECH Living Lab Student Teams/Projects

- **Why Target Transportation?**
  Jared Hibshman, CTECH Living Laboratory Student Project Coordinator

- **Biodiesel Engine Feasibility Project**
  Gregory Brumberg and Manisha Kunala of Engineers for a Sustainable World: Biofuels

- **Electric Vehicle Charging Stations**
  Srajal Raizada, Apurti Marodia, Srajan Shetty, Bakulesh Singh, and Simon Yu

- **Electrifying Cornell Fleet**
  Nilesh Deshpande, Ye Lin Kim, JD Paff, and Daniel Sachs

- **Optimization of Cornell EV Rental**
  Yue Wang

- **Mini Electric Shuttle System**
  Zelin Linghu, Yingqing Chen, Ran Gao, Siran Jia, and Chenxi Yang

- **Simulation, Modeling, and Optimization Tools for Transit Network Design**
  Robert Gurnee
2016 Cornell Ithaca Campus GHG Emissions
2016 Cornell Ithaca Campus GHG Emissions
Comparing Investments

- Earth Source Heat with Biomass Peaking and Wind/Water/Solar
  - Estimated Capital Costs:
    - $250M with outside investment
      - 1500 $/ton GHG reduced
    - $700M with no outside help
      - 4000 $/ton GHG reduced
## Comparing Investments

<table>
<thead>
<tr>
<th>Emissions Category</th>
<th>Allowed Capital for 1500 $/GHG (Million $)</th>
<th>Allowed Capital for 4000 $/GHG (Million $)</th>
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</thead>
<tbody>
<tr>
<td>Mobile Combustion</td>
<td>5</td>
<td>13</td>
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<tr>
<td>Commuting</td>
<td>42</td>
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<tr>
<td>Air Travel</td>
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<td>120</td>
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<tr>
<td>Total Transportation</td>
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