Carbon Neutral Highway Corridor

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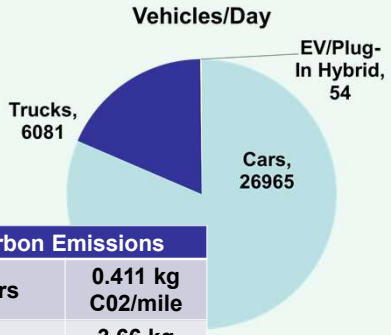
Introduction

- **Ray C. Anderson Corridor:** 18 miles of I-85 highway between Lagrange, GA and the GA-AL border
- Purpose: work with The Ray Foundation to suggest plans to make the corridor **carbon neutral**
  1. **reducing carbon footprint**
  2. **offsetting carbon emissions**
- Main plans being researched:
  utilize large areas of highway land along right-of-ways and medians to produce low carbon energy as
  1. biomass-based fuels
  2. solar electricity

ArcGIS©

- Geographical information system that displays relevant features on one map
- Same climatic factors throughout the stretch of this highway
- Significant factors include trees, land use, and property issues
- Facilitates decision making

Electric Car Demand



Carbon Emissions	
Cars	0.411 kg C02/mile
Trucks	3.66 kg CO2/mile

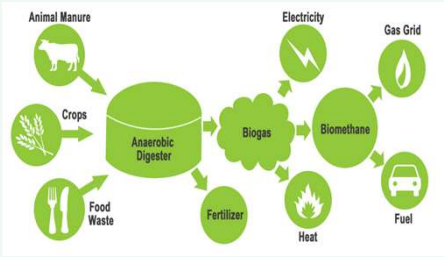
- Current limitations: range and charging infrastructure
- Full charge time by DC charging technology: 20-40 minutes
- Adding chargers on the highway
  1. reduce gasoline consumption
  2. pollution

Biodiesel

- Planted biomass on either side of the highway converted to biodiesel
- B. Carinata seeds show great potential due to their high oil content
- Potential for annual generation: 5.43 x 10^6 MJ of energy

Bio-Gas

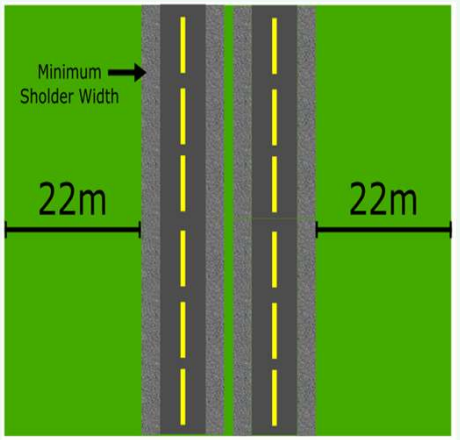
- Switchgrass grown along highway to take CO_2 out of the air
- Anaerobic digestion of switchgrass produce renewable methane (biogas) at Lagrange landfill
- 180-270 m^3 of methane gas per tonne of grass produced
- Methane from biogas can `be used like conventional natural gas and fed to natural gas infrastructure in place at landfill.



Solar Capacity and Systems

- Average solar insolation in Lagrange: 4.43 kWh/m^2/day
- Challenges: tree shade and required land area.
- Solutions: using the right-of-ways, exit ramps, and open areas near the intersections with 2 systems:
  1. standard photovoltaic (PV)
     - Fixed position of arrays in the southward direction
  2. concentrated solar power
     - Structure of sun trackers and parabolic mirrors focusing light on a long tube filled with fluid
     - Generated steam used for bioprocesses

Solar Panel Land Usage



Lessons Learned

- Solar projects in OR, OH, MA and biomass projects in UT, NC
- Successful projects:
  1. safety, location, smooth operations
  2. minimal maintenance and security incidences
  3. strong leader
  4. maintained flexibility and planned for extra time
  5. maximized all forms of communication and educated the DOT staff

Future Work

- Determining more specific estimates of potential, locations, and costs
- Studying impact of more electric cars
- Developing suggestions for PV recycling and decommissioning