Setting a goal for CO_2 reduction in Town operations

Presented by Richard Hopkins for the Middlebury Energy Committee,
Howard Widelitz chair

September 8, 2020 Updated Nov 18

The Energy Committee is asking the Selectboard to set a measurable target for CO_2 release by Town operations

- The Energy Committee would like to see the Town adopt a goal for a specific % reduction in CO_2 emissions by a specific date.
- Original proposal in February 2020 was for 80% reduction in 8 years
- The Committee has learned a lot from Town department heads and others in the meantime, and done some additional analysis.
- The Committee envisions that it would be charged with measuring CO_2 emissions each year to assess progress toward the goal.

Original approach

- Electrify everything!
  - Convert all building heat to cold-climate electric heat pumps
  - Convert all cars, pickups and SUVs to electric vehicles
- Leave diesel vehicles alone for now
- Make no new investments in fossil-fuel burning equipment or vehicles

- Assumes Green Mountain Power will succeed in making its delivered electricity carbon-free within the 8-year timeframe (it is already close)

But….

- Most diesel vehicles can be converted to 20% biodiesel quickly, but can’t be operated on 100% biodiesel under their warranties
- So reducing diesel use by 60% depends on replacing diesel vehicles on their replacement dates with electric or fully biodiesel compatible vehicles

Follow-up – acting as though the 80% in 10 years target is already in place

- Pending contract amendment for WWTP engineering contract to estimate GHG impact and electrical generating capability of recommended anaerobic digester path
- Pending contract to assess police station building for heat pump conversion
- Pending commitment to buy new storage tank for 20% biodiesel to support spring demonstration of B20 fuel for at least one vehicle.

Big picture of where our CO_2 comes from now

- Gasoline-powered vehicles: 153 tons
- Diesel-powered vehicles: 146 tons
- Electricity: 377 tons
- Building heat (natural gas, propane, fuel oil): 244 tons

- Total: 920 tons

Reducing CO_2 from gasoline -- strategies

- Compared to standard gas-powered vehicles:
  - Buy more fuel-efficient gas-powered vehicles – savings of ~10-20%
  - Buy hybrid gas-electric vehicles -- savings of ~40%
  - Buy plug-in electric vehicles – savings of ~ 70%
  - Buy electric vehicles – savings of 100%
- Install rapid-start technology in gas-powered vehicles to prevent fuel use during idling
- Reduce miles driven

Reducing CO_2 from diesel -- strategies

- Buy electric replacement vehicles as they come on the market
- Use 20% biodiesel fuel for all trucks instead of standard fuel as soon as possible
- Replace diesel vehicles with electric or 100% biodiesel vehicles as they need to be replaced
- Reduce miles or hours operated

Reducing CO_2 from electricity -- strategies

- **Town does not need to do anything!**
- Green Mountain Power already has a low carbon content to its delivered power, about 208 pounds of CO_2 per MWh
  - New England regional average is 3 to 4 times as high
- Vermont's Renewable Portfolio Standard requires utilities to get to 97% renewable by 2032
- "GMP is committed to being 100% carbon free by 2025 and 100% renewable by 2030"

- Town investments in efficiency of electric use should be evaluated mainly on their financial return to the Town.
- All electrical generation and use have some environmental costs, beyond CO_2

Reducing CO_2 from building heat -- strategies

- Convert buildings to cold-climate heat pumps or renewable methane as the existing heat systems wear out (assume 20 years) or buildings are replaced/rebuilt
  - Assuming GMP CO_2 goes to zero, Town could reduce heating CO_2 by 49% by 2025 by eliminating fossil fuel use for heat at library, police station, teen center and WWTP buildings 1 and 2.
  - Getting to 80% reduction in fossil fuel use requires waiting till 2036
  - Getting to 100% reduction in fossil fuel use requires waiting till 2038
- Convert buildings to cold-climate heat pumps as above plus move some dates -- and expenditures -- forward

Building particulars

- Ilsely Library needs to replace badly aging fossil fuel system -- cold-climate heat pump system already recommended
- Police station heating system is in need of review and replacement.
  - Energy Committee to hire consultant to make recommendations on how and roughly how much it would cost to replace with heat pumps compared to 'conventional' approach
- We have an opportunity to heat WWTP buildings 1 and 2 using methane generated by an anaerobic digestion system for the waste stream.
  - This methane would otherwise be released to the atmosphere – potent greenhouse gas
  - Big net reduction in GHG: much less methane, less CO_2
  - Incremental cost of adding methane capture is thought to be small.
- Teen center building is also ripe for investments in efficiency and replacement of propane heating system.

Building conversions – cost considerations

- Across all buildings, operating cost (monthly bills) about the same before and after conversions to electric heat pumps
  - Monthly costs go down a little from fuel oil costs, unchanged from propane, up a little from natural gas – highly dependent on future fossil fuel and electricity prices, as well as on efficiency of replacement equipment
- We assume the incremental cost of installing cold-climate heat pumps compared to replacing fossil-fuel equipment is small
- Moving replacement dates forward to achieve CO2 reduction goals would move costs forward
- Maintenance costs not factored into this assessment

How to get to 80% reduction in fossil fuel? One path forward

- 80% reduction would be 736 out of 920 tons of CO_2
- Electricity CO2 goes to zero – save 377 tons
- Gasoline usage down by 60% -- save 90 tons
- Diesel usage down by 60% -- save 88 tons
- Building heat down by 60 % -- save 146 tons
- Technology improvements 4% -- save 35 tons

- Total savings: 736 tons

How to get to 80% reduction in fossil fuel? One path forward

- 80% reduction would be 736 out of 920 tons of CO_2
- Electricity CO2 goes to zero – save 377 tons 2025
- Gasoline usage down by 60% -- save 90 tons 2028
- Diesel usage down by 60% -- save 88 tons 2030
- Building heat down by 60 % -- save 146 tons 2030
- Technology improvements ~4% -- save 35 tons 2030

- Total savings: 736 tons

Proposed Town goal

80% reduction in CO_2 generation from fossil fuel by 2030