Tompkins County Energy Roadmap:

Evaluating Our Energy Resources

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Presentation Outline

Overview

Potential

Scenarios

Recommendations

Motivation for Energy Roadmap

Overview

Isn’t Climate Change a Global Problem?

Overview

What difference will it make to achieve climate goals here in Tompkins County?

- If everyone says that, then no one will move the dial
- Keeps money spent on energy in the local economy
- Creates local jobs – can’t outsource insulating a house
- Reduces pollutants and improves health
- Makes buildings more comfortable
- Increases resilience in the face of a changing climate

Tompkins County 2015 Comprehensive Plan

Overview

Principle

Tompkins County should be a place where the energy system meets community needs without contributing additional greenhouse gases to the atmosphere

Policy

Reduce greenhouse gas emissions to reach a minimum 80% reduction from 2008 levels by 2050 and reduce reliance on fossil fuels across all sectors

What is the Energy Roadmap?

Overview

1. Assesses potential of local renewable energy sources
2. Assesses potential for energy efficiency and demand management to reduce energy demand
3. Identifies scenarios for how both energy demand and greenhouse gas emissions goals can be met in 2050

- Concrete evidence that achieving goals is possible and show paths that could be taken
- Direction for near and long-term local actions

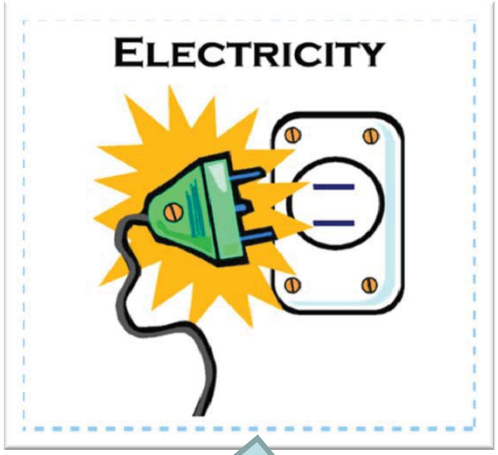
What the Energy Roadmap is NOT

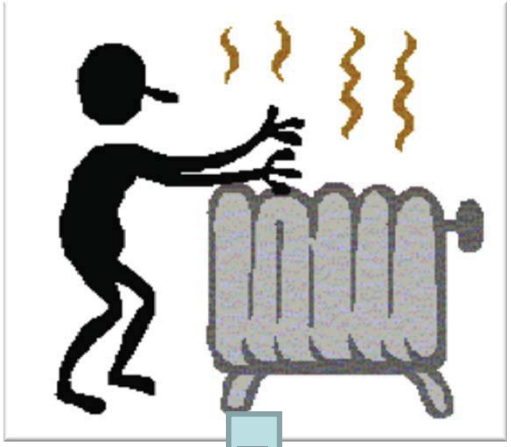
Overview

- Concrete action steps to achieve goals (Energy Strategy)
- An evaluation of all technologies available today – most pertinent
- A guide for solving all of the grid-level issues the nation needs to address to incorporate high amounts of renewables –
  - Utility rate structure, interconnection, energy storage, peak demand, balancing renewable generation, infrastructure limitations, etc.
- A crystal ball that predicts energy pricing and new innovations in technologies and policy developments

What Creates GHG Emissions

Overview





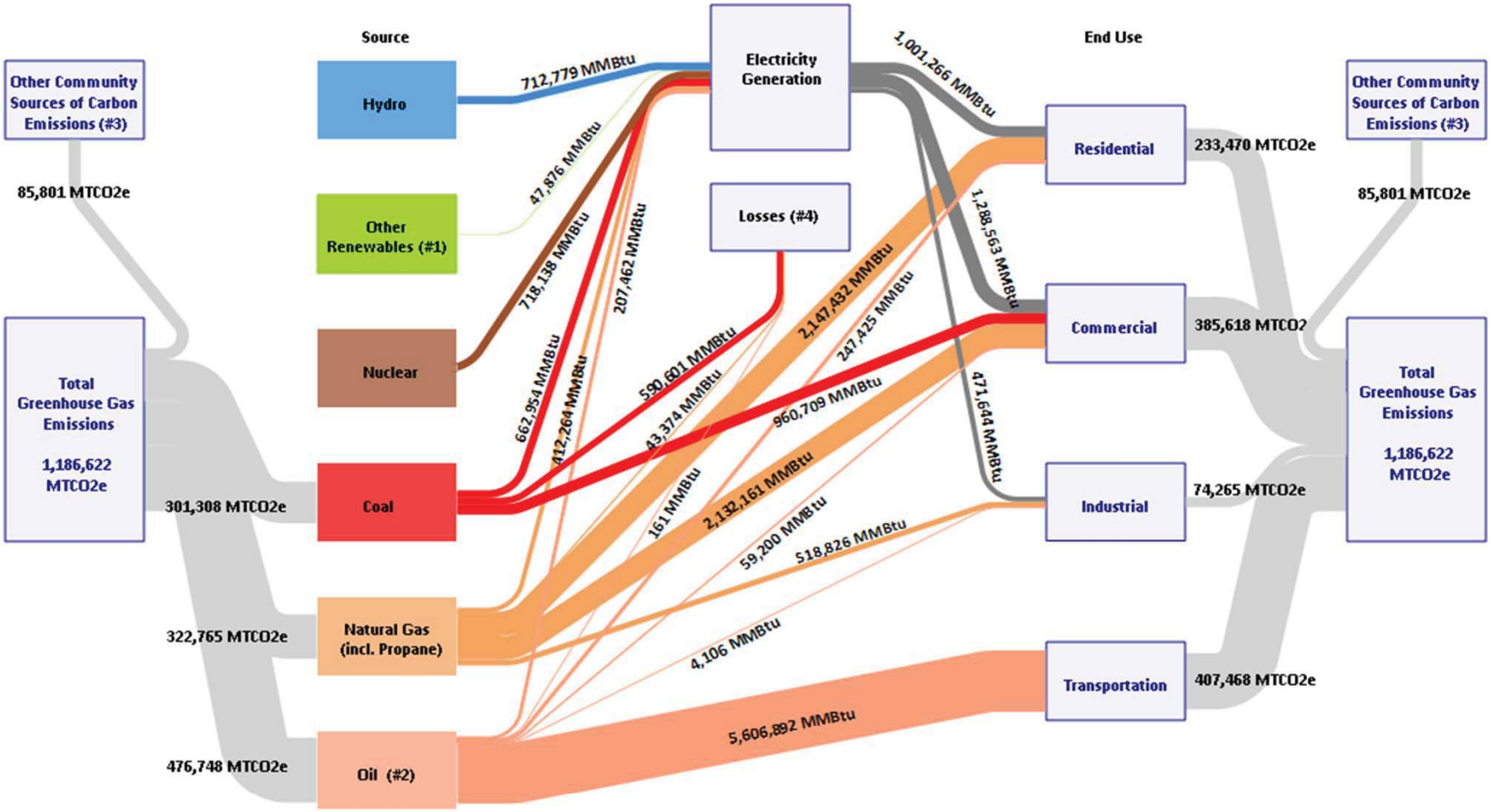
Grid- Nat Gas, Coal

Nat Gas, Oil, Propane

Gasoline, Diesel

GHG Emissions

2008 Tompkins County Energy Flow and Greenhouse Gas Emissions



Data Sources:
Energy use by sectors and greenhouse gas emissions sources from Tompkins County 2008 GHG Emissions Inventory, developed using the 2009 version of ICLEI's Clean Air Climate Protection (CACP) software. Electricity fuel sources used for Tompkins County 2008 GHG Emissions Inventory is EPA eGRID Profiler, Year 2005 eGRID Subregion Resrouce Mix, NPCC Upstate NY: Nuclear 27%, Hydro 26.4%, Coal 21.5%, Natural Gas 15.5%, Oil 7.8%, Biomass 1.2%, Other Fossil Fuel 0.4%, and Wind 0.1%. Energy use of Cornell University is accredited to the Department of Energy & Sustainability and the Department of Facilities Management under the Cornell Infrastructure Properties and Planning.

Notes:
#1. Other Renewables include solar, wind, biomass, and geothermal energy sources.
#2. Oil includes heating fuel, diesel, gasoline, motorcyde gasoline, and transit bus diesel.
#3. Other Community Sources of Carbon Emissions include Waste (41,792 MTCO2e), Agriculture (43,996 MTCO2e) and Groton Electricity Use (13 MTCO2e).
#4. Energy losses in the conversion from fossil fuel to electricity and/or thermal energy.

Achieving the 80% Reduction

Overview

Start

1,186,622 MTCO2e (2008)

Improve energy efficiency in buildings, lighting, appliances

Move from grid-supplied electricity generated outside of Tompkins County to local renewable generation

Move from natural gas to heat pumps and biomass heating

Move from gasoline-powered to electric cars and light trucks and reduce the number of miles driven

End

237,324 MTCO2e (2050) -80%

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Approach to Quantifying Potential

Potential

- Tried to be conservative in our assumptions about feasibility
- Used sound methodology and defensible numbers
- Thorough review by Steering Committee

All detailed topic chapters are included in the Energy Roadmap, available online at tompkinscountyny.gov/planning/energy-climate

Summary of Resource Potential

Potential

	Energy Resource	% of 2008 Electricity Demand	% of 2008 Thermal Demand
Renewable Supply	Wind	327%	n/a
	Solar	303%	n/a
	Micro-Hydro	90%	n/a
	Biomass	n/a	59%
Demand Reduction	Building Efficiency: Heating Portion	n/a	54%
	Building Efficiency: Electrical Portion	50%	n/a
	New Construction to Code	n/a	19%

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Scenarios

- ***Scenario A – Business as Usual***
- Scenario B – Mixed
- Scenario C – All Electric
- Scenario D – Maintaining Half of 2008 Natural Gas Use

All Except for “A” meet goal of 80% reduction from 2008 levels by 2050

Major Assumptions Applied to All Scenarios

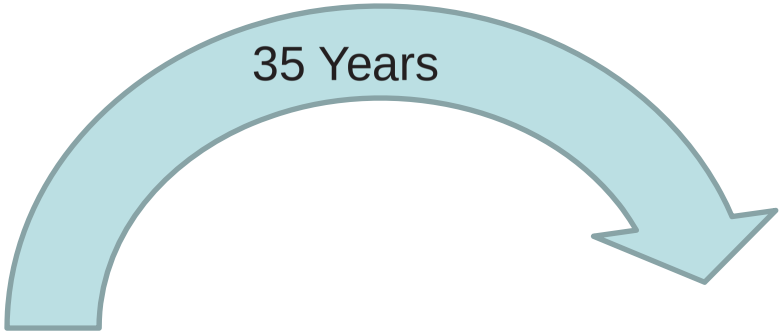
Scenarios

- Only account for direct emissions, not life cycle
- No change in weather patterns included
- Analysis is for a static point in time, 2050, not points along the way, and not how quickly to achieve emissions reductions
- Emissions from waste and agriculture remain constant
- Do not include emissions from air or rail travel
- Costs of actions to achieve scenarios are not factored into scenarios, but are identified in challenges in each topic chapter
- Electricity, Heat and Transportation use projected growth rates of 33-34% (2008-2050) based on Census and EIA estimates

Scenario A
“Business as Usual”

Timeframe for This Analysis

Scenarios



Baby Tyler in 2015

Tyler in 2050

Scenario A: Business As Usual

Scenarios

In 2015, Tyler's family is likely to:

- Live in a house heated by natural gas
- Get electricity from a grid powered by nuclear, hydro, natural gas and coal
- Live in the suburbs or country and drive to work in Ithaca
- Drive a vehicle that gets about 20 miles per gallon of gasoline

In 2050, Tyler's family is likely to:

- Live in a house heated by natural gas
- Get electricity from a grid powered by more renewables than in 2015
- Live in the suburbs or country and drive to work in Ithaca
- Drive a vehicle that gets about 55 miles per gallon of gasoline

. . . but they may not be smiling

Scenarios

Scenarios

- *Scenario A – Business as Usual*
- **Scenario B – Mixed**
- **Scenario C – All Electric**
- **Scenario D – Maintaining Half of 2008 Natural Gas**

Guiding Assumptions

Scenarios

- Achieve goal of 80% reduction from 2008 levels by 2050
- Utilize local resources given reasonable assumptions
  - 50% solar potential
  - 20% wind potential
  - 20% micro-hydro potential
  - 80% of lighting and appliance efficiency potential
  - 50% building energy efficiency potential
  - 25% reduction in VMT (growth in centers, transit, carpooling)
- Balance needs of environment, economy and equitable society

Scenario B
“Mixed”

Scenario B (Mixed) - Compared to BAU

Scenarios

In 2050 BAU, Tyler's family is likely to:

- Live in a house heated by natural gas
- Get electricity from a grid powered by more renewables than in 2015
- Live in the suburbs or country and drive to work in Ithaca
- Drive a vehicle that gets about 55 miles per gallon of gasoline

In 2050 Mixed, Tyler's family is likely to:

- Live in a house heated by heat pumps or biomass
- Get electricity from locally produced solar or wind
- Live in one of the villages or the City of Ithaca
- Have a 50% chance of driving an electric vehicle or walk, bike or take the bus

Scenario C
“All Electric”

Scenario C (All Electric) - Compared to Mixed

Scenarios

Key Differences Between All Electric and Mixed

- No natural gas, compared to 10% of 2008 levels in Mixed
- No gasoline, compared to 50% in Mixed
- Electric heat pumps and electric cars increase electricity demand
  - Exceeds renewable limits of 20-50% of potential
  - Requires 2x more grid power than Mixed
- No direct burning of fuels could improve health

Scenario D
“Maintain Half 2008 Natural Gas Use”

Scenario D (Half Nat Gas) – Compared to Mixed

Scenarios

Key Differences Between Half Natural Gas and Mixed

- 50% natural gas, compared to 10% in Mixed
- No gasoline, compared to 50% in Mixed
- Using high-emitting resource requires more in other areas:
  - Building efficiency must increase from 50% to 80%
  - Nearly all electricity must be from local renewables because of emissions associated with grid
- Requires solve methane leaks from transmission/distribution

Summary of Future Energy Scenarios

Scenarios

Scenarios	BAU	All Electric	Mixed	Half Nat Gas
% of 2008 Natural Gas Usage Maintained	164%	0%	10%	50%
% of Heating Demand Met by Local Renewables (including heat pumps & biomass)	0%	72%	67%	29%
% of Projected Energy Demand Provided by Efficiency Improvements (in all three sectors)	4%	25%	25%	31%
% of Transp Demand Met by Light-Duty EVs	0%	71%	36%	71%
% of Electricity Demand Met by Local Renewables	3%	49%	63%	71%
% of MTCO2e Reduction	**31%**	**80%**	**80%**	**80%**

Presentation Outline

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Energy Roadmap Steering Committee

Recommendations

Martha Armstrong, TC Area Development	Tony Ingraffea, Cornell Civil & Enviro Eng
Peter Bardaglio, Black Oak Wind, TCCPI	Tim Mount, Cornell Applied Econ & Mgmt
Scott Bochenek, Iberdrola USA	Gay Nicholson, Sustainable Tompkins
Carol Chock, TC Legislature	Bob Pass, NYSEG
Linda Copman, Cornell Climate Action Plan	Leslie Schill, Cornell Facilities Services
Brian Eden, EMC Energy Committee	Ken Schlather, Cooperative Ext. Tompkins
Nick Goldsmith, City/Town Ithaca	Ian Shapiro, Taitem Engineering
Jerry Goodenough, Cayuga Power Station	Lew Durland, Ithaca College

Recommendations – Reducing Demand

Recommendations

By 2050, we should:

- Achieve a 35% reduction in energy use in **existing buildings** through retrofits and upgrades
  - 2/3 from thermal energy (sealing, insulation)
  - 1/3 from electrical efficiency (lighting, refrig)

- Construct **new buildings** that are extremely energy efficient
  - Aim for 70% reduction in energy use increasing to net zero by 2030

- Hold **vehicle miles traveled** at ~2008 level, despite increases in population

Recommendations – Transitioning to Renewables

Recommendations

- Reduce **natural gas** use by at least 50% from 2008 levels

- Reduce demand for **grid electricity** generated by centralized power plants or sources outside of Tompkins County by at least 24% from 2008 levels

Recommendations – Transitioning to Renewables

Recommendations

- Develop at least 50% of the identified **solar** energy production potential
  - One way this could be achieved is by doing all of the following:
    - 1 in 4 urban homes install a 4 kW system
    - 1 in 2 suburban and rural homes install a 7 kW system
    - 30% of commercial, institutional, industrial roof areas install PV
    - 944 MW of PV farms on 4,720 acres (1.5% of County's land area)

Recommendations – Transitioning to Renewables

Recommendations

- Develop at least 20% of identified **wind** energy production potential.
  - ➢ One way this could be achieved is by doing all of the following:
    - Installing 300 medium-scale 500-KW turbines
    - 20 large-scale 2.3-MW turbines

Recommendations – Transitioning to Renewables

Recommendations

- Develop up to 50% of identified **biomass** energy production potential.
  - ➢ One way this deployment could be achieved is by doing all of the following:
    - Managing 36,700 forest acres for sustainable biomass
    - Planting 15,600 acres of inactive ag/grasslands in energy crops
    - Managing 12,900 acres of crop/forage land for sustainable crop residue

Recommendations – Transitioning to Renewables

Recommendations

- Develop at least 20% of identified **micro-hydro** energy production potential
  - Could be achieved by installing 60 micro-hydro 300 kW systems

Recommendations – Transitioning to Renewables

Recommendations

- Transition 50% of light-duty vehicles from gasoline to **electric**
  - Estimated 33,500 vehicles, from 67,000 that may be on the road in 2050

Recommendations – Set Goals &Track Progress

Recommendations

- Set interim GHG emissions goals for 2020, 2025, 2030 and track progress
- Every 2 years review scenarios and update as necessary
- Semi-annually convene stakeholders to evaluate progress, opportunities and barriers to achieving recommendations
  - Particular focus on equitable distribution of positive and negative impacts

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Complete Energy Roadmap available at
http://tompkinscountyny.gov/planning/energy-climate