

Hanover's 2nd Annual Energy Forum

100% Renewable Energy:

Let's Make It Happen!

April 24, 2019



2nd Annual Energy Forum

Achieving 100% Renewable Energy



- Welcome
- Speakers
 - Julia Griffin – Manager, Town of Hanover
 - April Salas – Director of Sustainability, Town of Hanover
 - Rosalie Kerr – Director of Sustainability, Dartmouth College
 - Yolanda Baumgartner – Co-Chair, Sustainable Hanover Committee
- Q&A
- 7:30 -- Small Group Discussions + Refreshments



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Julia Griffin – Manager
Town of Hanover



2nd Annual Energy Forum

Achieving 100% Renewable Energy



How does Hanover Attain 100% Green Electricity by 2030?

- Town role – create easy opportunities & programs to enable user groups to purchase green power.
- User groups: Residential, Small Business, Large Business, Institutional, Municipal.
- Town has developed 5 part strategy to get to 100% renewable electricity by 2030.



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Residential Green Power Co-op

- Select Competitive Energy Supplier that will offer 12 month rate for green power.
- Residential customers can opt to purchase green power; CES provides power via Renewable Energy Certificates.
- Liberty remains as power supplier and biller.



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Residential Co-op Option B

- Variation on Co-op: Town works directly with Liberty to provide green power option for all Liberty customers.
- Liberty serves 22 communities in NH but offers no green power option.
- Most progressive utilities across the U.S. provide fully green or partially green power options for their customers



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Large User Power Purchase Agreement

- Issue RFP to procure green power for Dartmouth, Town, School District, large business users.
- Goal to lock into competitive electricity rate for 12-20 years.
- Locking into guaranteed rates for a CES supports construction of renewable energy generators in the ISO New England region.



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Solar Options

- Town currently hosts over 140 residential solar systems plus Town, School and College = 1,587 kW.
- Municipal installation of 3 MW currently in planning stage on Grasse Road.
- Community solar committee has targeted development of 4 additional private community solar sites totaling 4 MW.
- Dartmouth College has made significant investment in rooftop solar; pursuing large ground mounted array option as well.



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Town Support of Renewable Energy Business Assistance

- Sustainable Hanover committee engaged in local business outreach regarding available renewable energy grants, credits and loans.
- Public Works Department providing free office space to representative of NHSaves – involved in extensive local business outreach.



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Hanover Resolves to 'Walk the Talk'

- Rooftop solar on HPD, Town Hall, Wastewater; coming to Fire, RWB and DPW.
- Air source heat pumps installed in Town Hall; RWB and Police coming soon.
- Public Safety Building: new insulation, new siding, new windows, new insulated roof coming to Fire this summer.
- LED lighting upgrades in every building; traffic signals, ornamental streetlights.
- Solar parking pay stations.



2nd Annual Energy Forum

Achieving 100% Renewable Energy



April Salas – Director of Sustainability
Town of Hanover

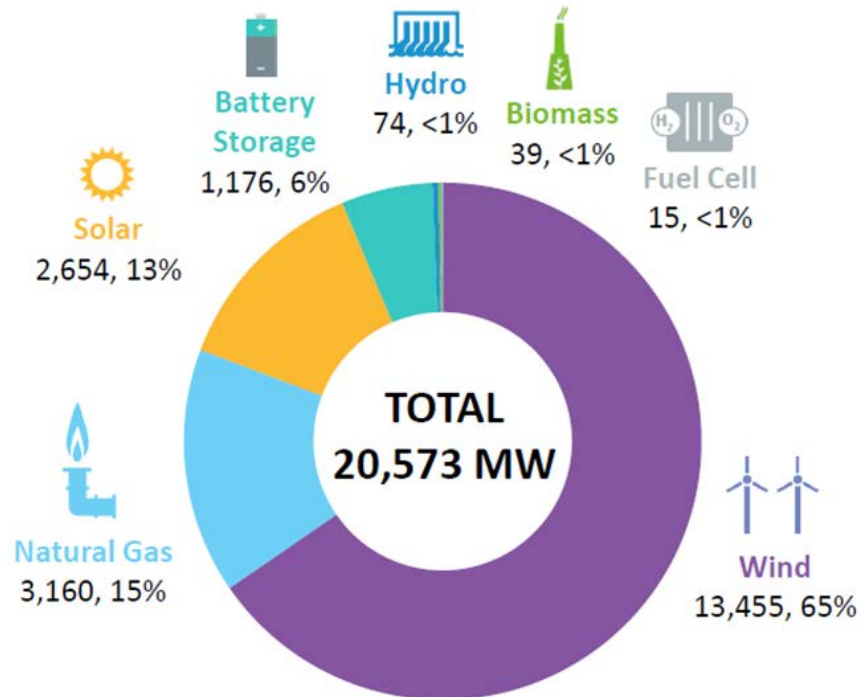


2nd Annual Energy Forum

Achieving 100% Renewable Energy



Proposals by Type



Note: Some natural gas proposals include dual-fuel units (with oil backup); some natural gas, wind, and solar proposals include battery storage; megawatts represent nameplate capacity ratings; megawatts have been rounded.



- Hanover is a part of a larger, New England regional grid that is increasingly transitioning to a less centralized, more renewable energy mix
- Wind and solar comprise 78% of the new proposed resources

2nd Annual Energy Forum

Achieving 100% Renewable Energy

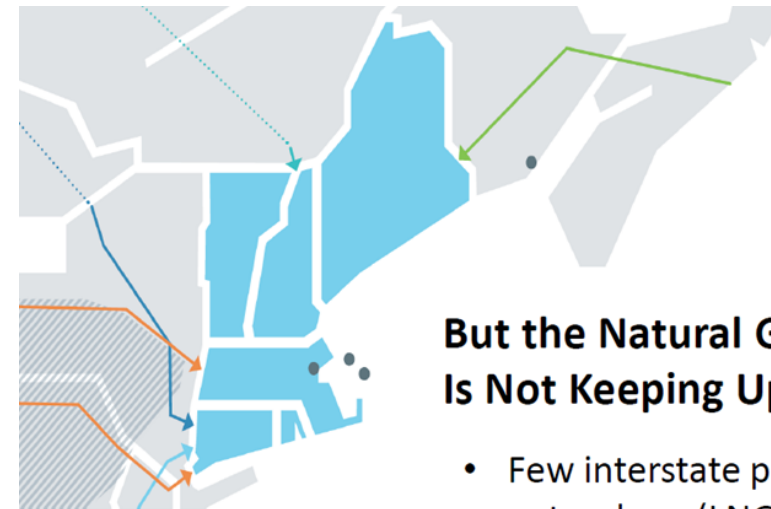


Since 2013, More Than 5,200 MW of Generation Have Retired or Announced Plans for Retirement in the Coming Years

- Include predominantly coal, oil, and nuclear resources
- Another **5,000 MW** of remaining coal and oil are at risk of retirement
- These resources have played an **important** role in recent winters when natural gas supply is constrained in New England

● Closed or Retiring
● Generation at Risk

Source: [ISO New England Status of Non-Price Retirement Requests and Retirement De-list Bids](#); August 17, 2018



— Pipelines
● LNG facilities
▨ Marcellus shale

Source: ISO New England

But the Natural Gas Delivery System Is Not Keeping Up with Demand

- Few interstate pipelines and liquefied natural gas (LNG) delivery points
- Regional pipelines are:
 - Built to serve heating demand, not power generation
 - Running at or near maximum capacity during winter

2nd Annual Energy Forum

Achieving 100% Renewable Energy



Sourcing

Developing local and regional to
New England projects

Social and
environmental benefits

green-e
certified
projects

cost-
effective
renewables

Hanover
town
boundary

Neighboring
town
partnership

ISO-NE
regional
grid

Nationally,
when local
and regional
are not an
option

Addition-
ality

Subtraction-
ality

replicability



2nd Annual Energy Forum

Achieving 100% Renewable Energy



What Values Underpin our Work?

- **Resilient** and healthy community powered by **affordable** and clean **renewable energy**
- We aim for efficient and pollution free electricity, thermal and transportation
- Clean energy related **business opportunities** and living wage jobs
- How we achieve our targets is as important as the vision itself
- Welcome and depend on leadership, ideas and participation from the **entire community**
- Aim to **inspire and assist other communities** to make similar transitions



2nd Annual Energy Forum

Achieving 100% Renewable Energy



We are not alone!

- Clean Energy New Hampshire
- Vital Communities
- Sierra Club of the Upper Valley
- Urban Sustainability Directors Network
- NH Municipal Roundtable Meetings in Concord
- New England Municipal Sustainability Network (NEMS)
- Monthly calls with NH R100 communities
- Businesses, institutions, residents, and more!

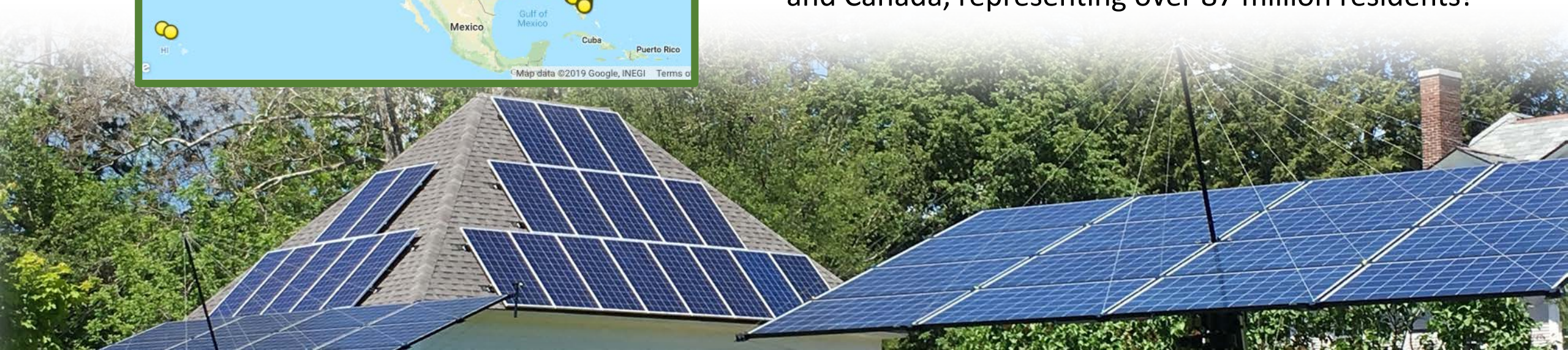


2nd Annual Energy Forum

Achieving 100% Renewable Energy



- ✓ R100 NH Communities - as of Jan 2019 - has grown to 5! Concord, Cornish, Hanover, Plainfield, and Keene (104th city in the US!)
- ✓ USDN – the peer-to-peer network of local government & sustainability professionals – connects us to nearly 200 member cities / counties across the United States and Canada, representing over 87 million residents!



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Lessons that guide us this year:

- No one size fits all!
- Tapping into technical resources from our member networks
- Importance of establishing and growing partnerships
- Continue to support the ongoing work across the community



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Rosi Kerr – Director of Sustainability
Dartmouth College



Ready for 100



DARTMOUTH
Sustainability Office



Previous
Sustainability
Efforts

2016 – 2017
Sustainability
Planning Effort

Earth Day 2017:
Goals Announced

2017 – 2019:
Food Planning
Energy Transition
Waste Planning
Corps Launch

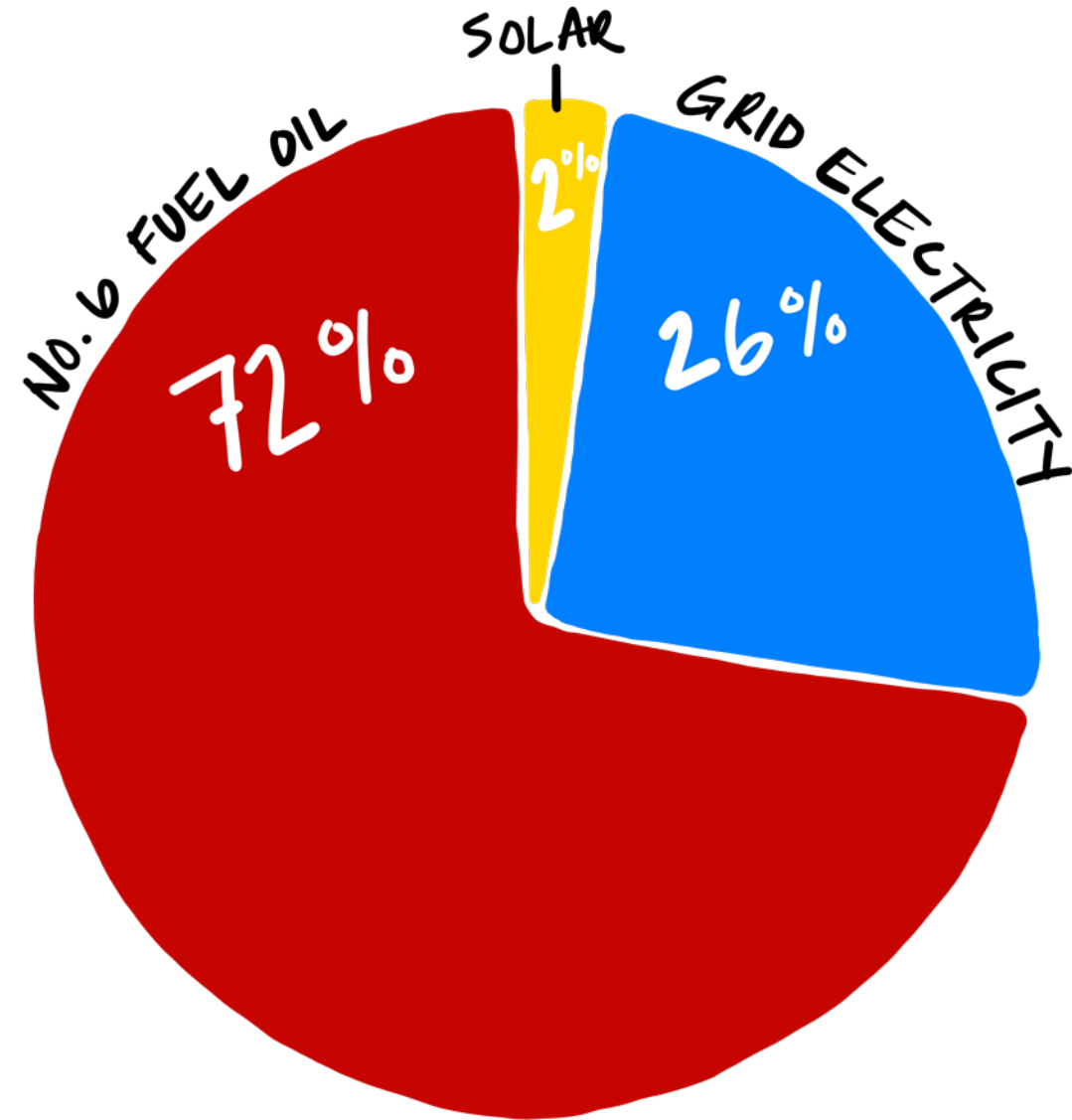
2019:
Energy Transition
Announced

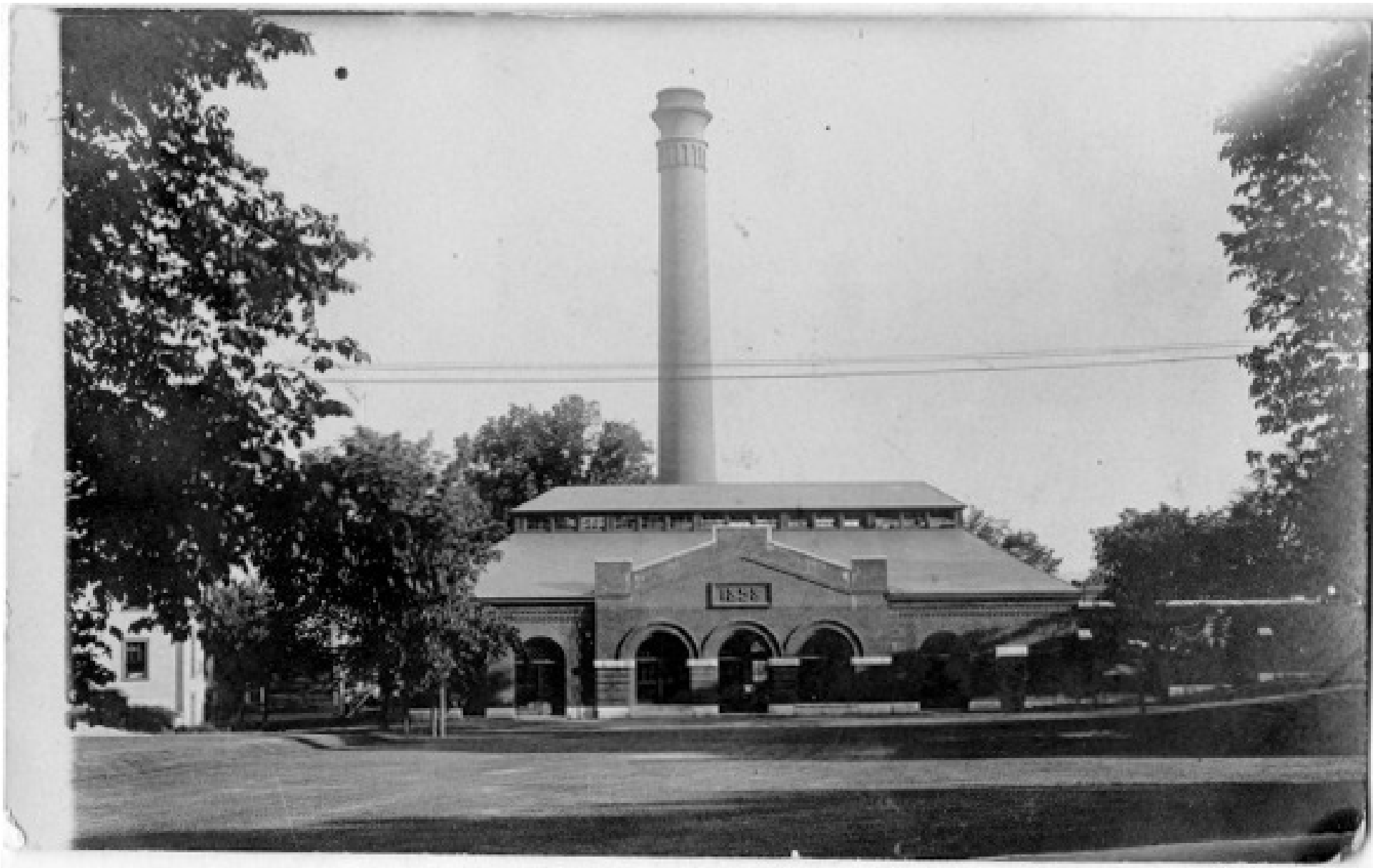
Earth Day
April 22,
2019



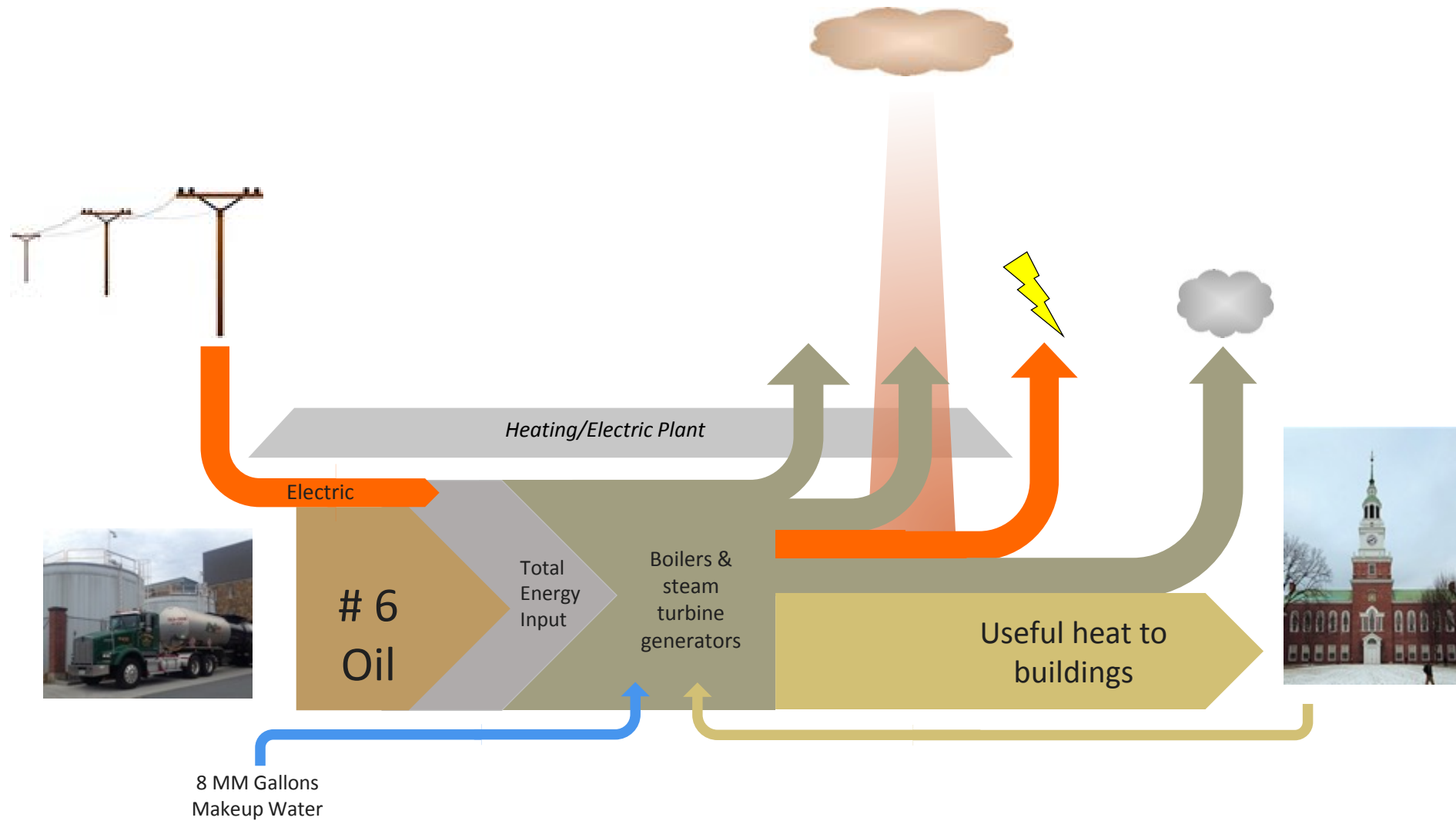
Two Year Update

DARTMOUTH'S ENERGY CONSUMPTION 2018





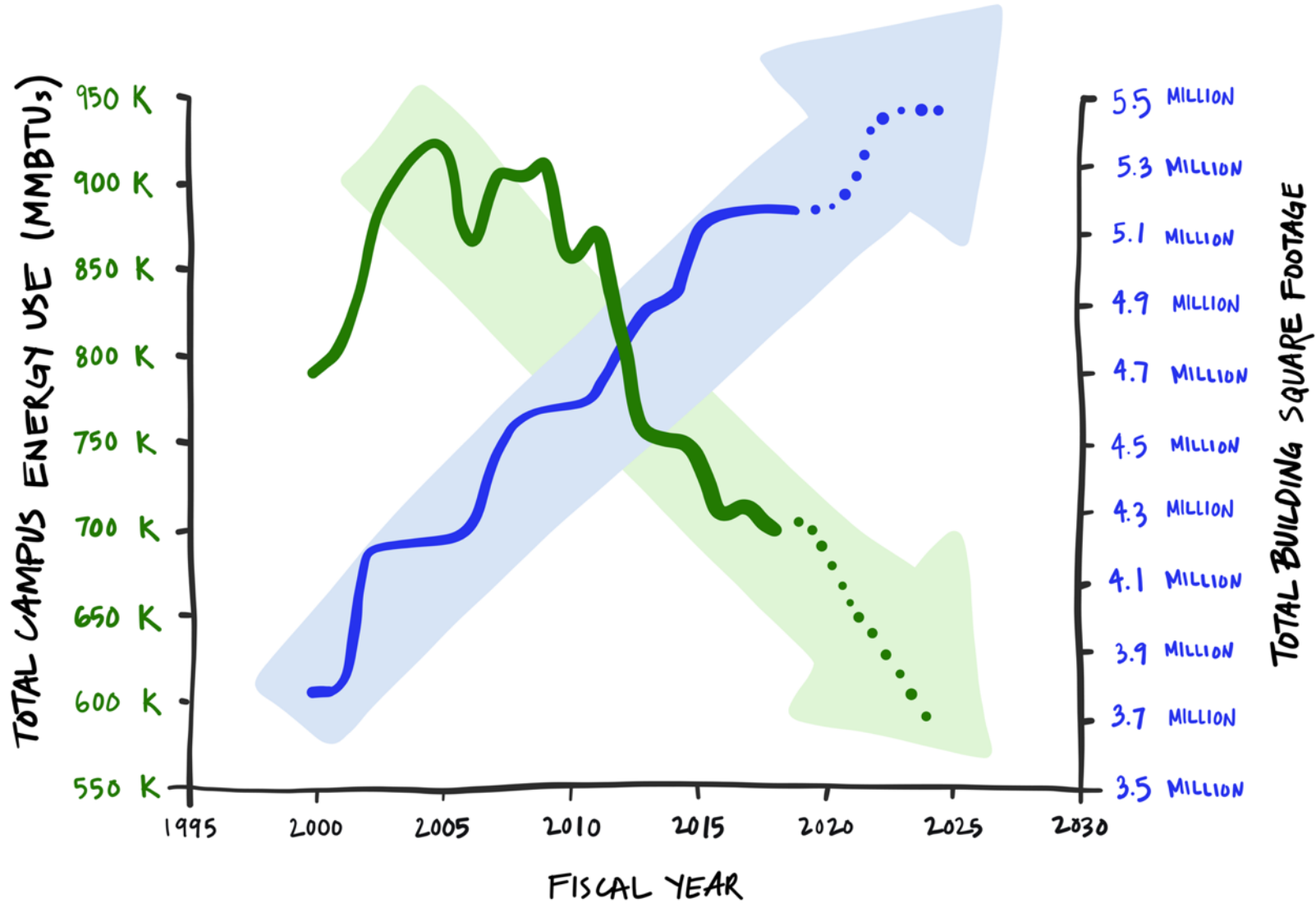
1896



55-65% Net
Efficiency

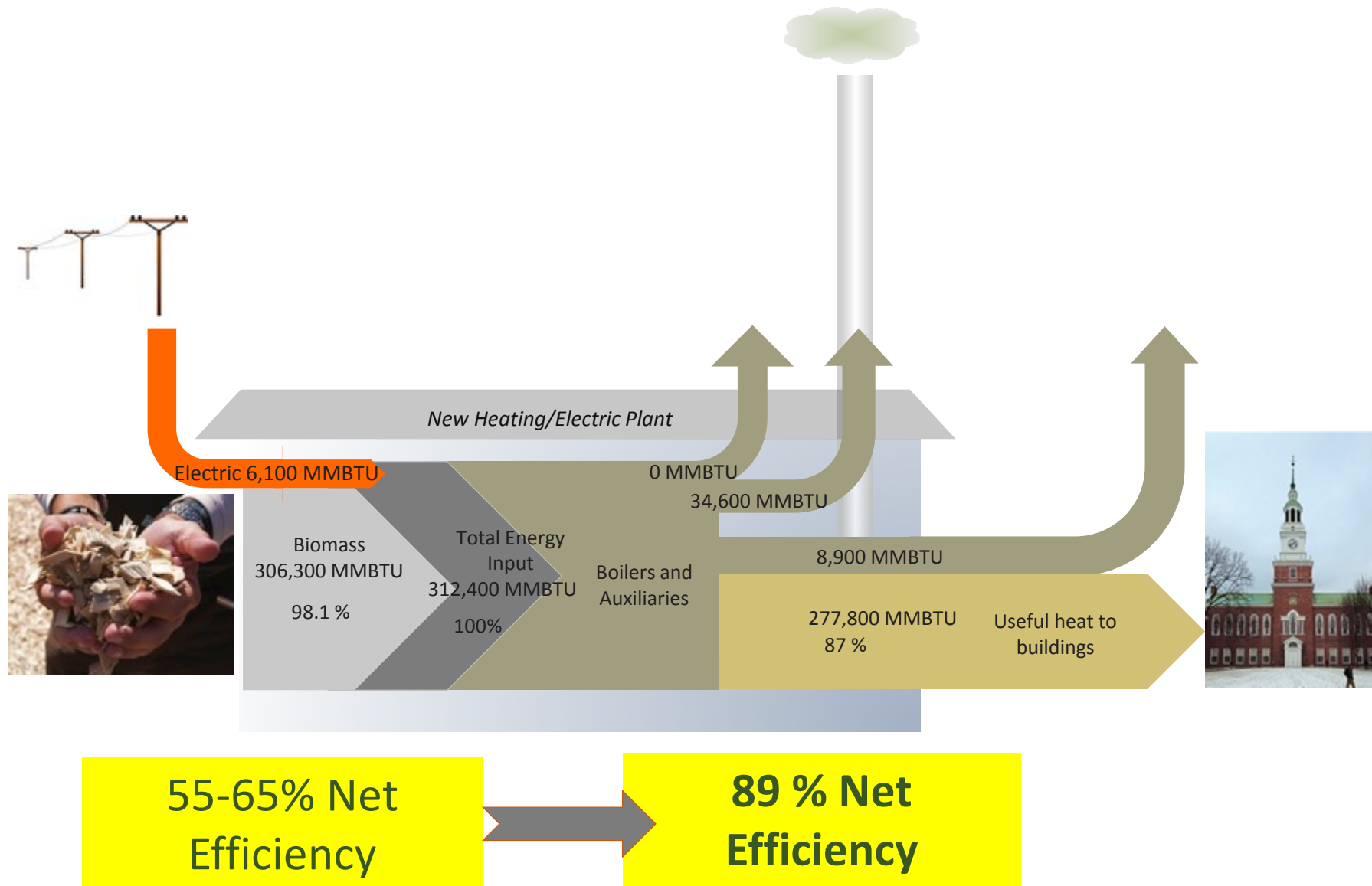


TOTAL ENERGY USE VS. CAMPUS GROWTH



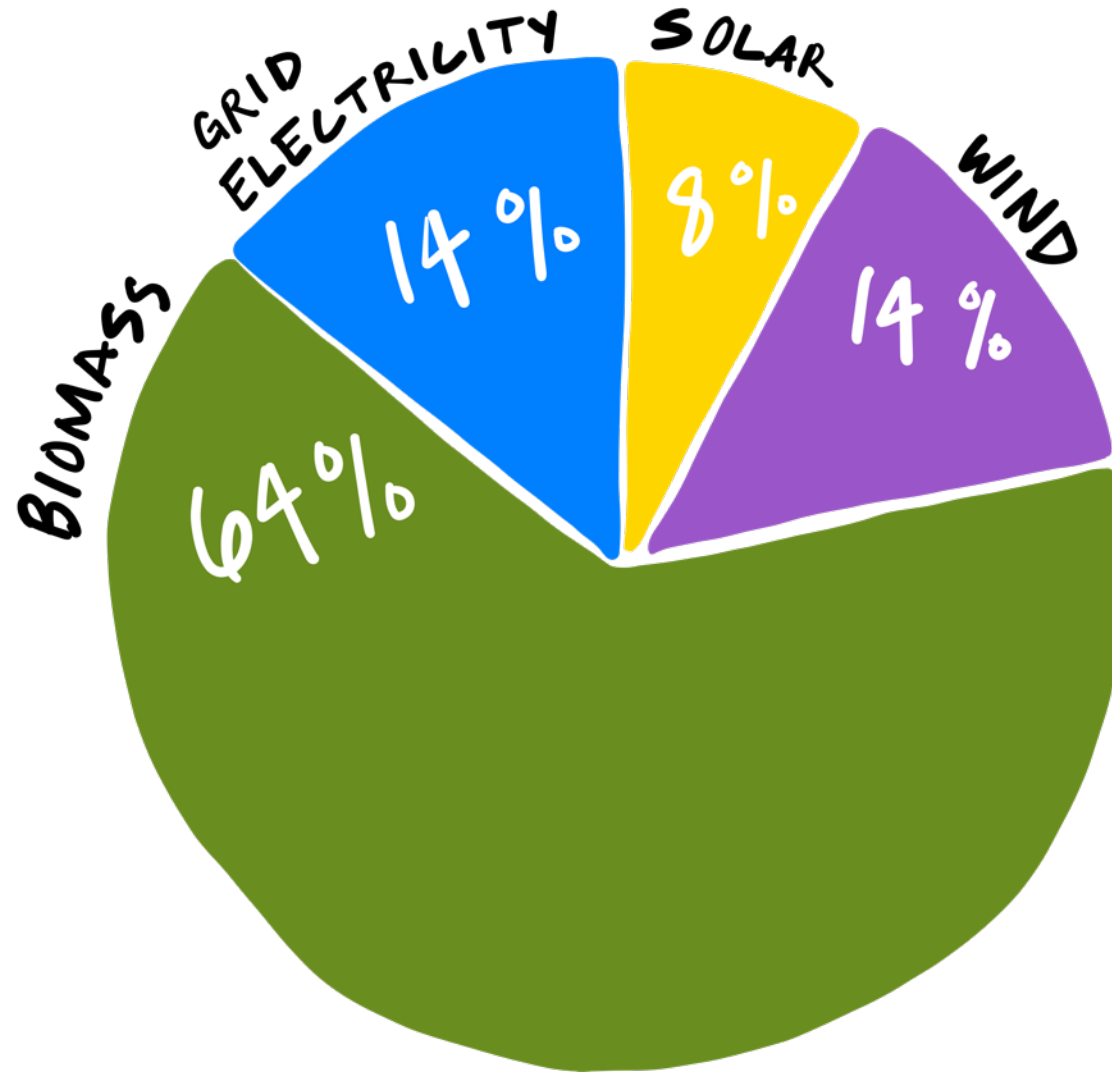






	SCENARIO 1 Business as Usual	SCENARIO 2 Buildings & Distribution Only	SCENARIO 3 Biomass HW + Conversions	SCENARIO 4 non-combustion
Capital Cost	Lowest	Medium	High	Highest
Construction Impact	Lowest	High	Highest	Highest
O&M Costs	High	Better	Lowest	Medium
Fossil Fuel Burned	Highest	Better	Lowest	Lowest
Energy Price Volatility	High	High	Low	Medium
Energy Supply Chain Impact	Worst	Worst	Best	Medium
Building Comfort	Lowest	High	High	High
System Efficiency	Lowest	Medium	High	Highest
Carbon Footprint	Highest	Better	Low	Lowest
Operational Resiliency	Medium	Medium	High	Lowest

DARTMOUTH'S ENERGY CONSUMPTION 2025?





ENERGY

Learn about our transition to biomass, explore energy data and see how we're doing in comparison to our goals.

[EXPLORE ENERGY PROGRESS](#)

WASTE & MATERIALS

Understand the changing landscape of waste, learn about the challenges Dartmouth faces in reducing waste and explore our current waste streams.

[EXPLORE WASTE PROGRESS](#)

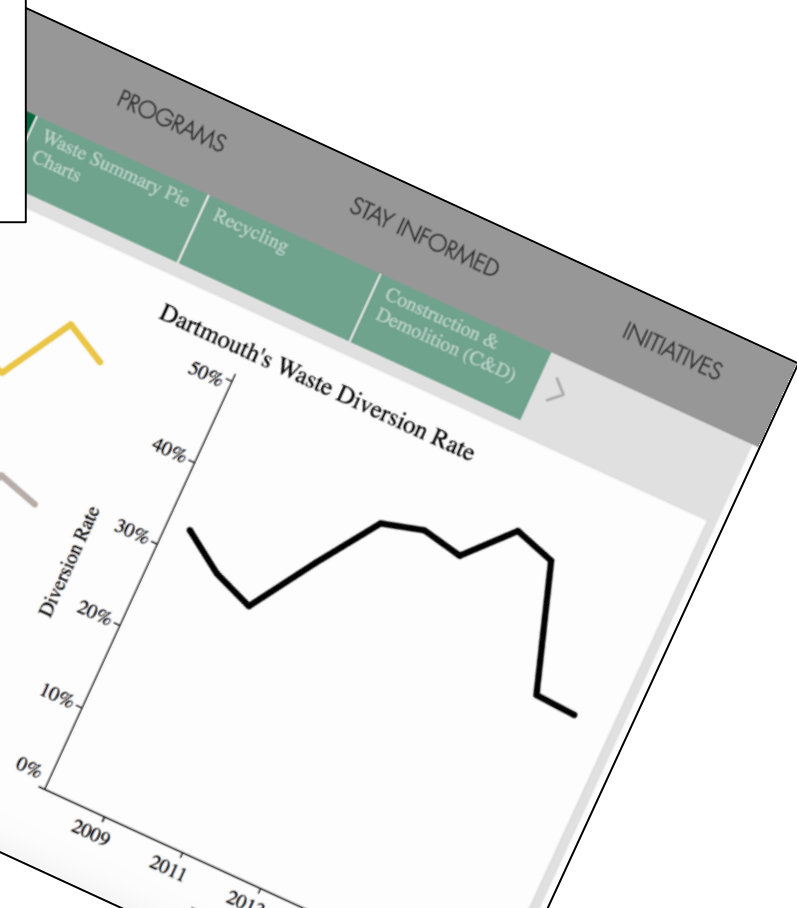
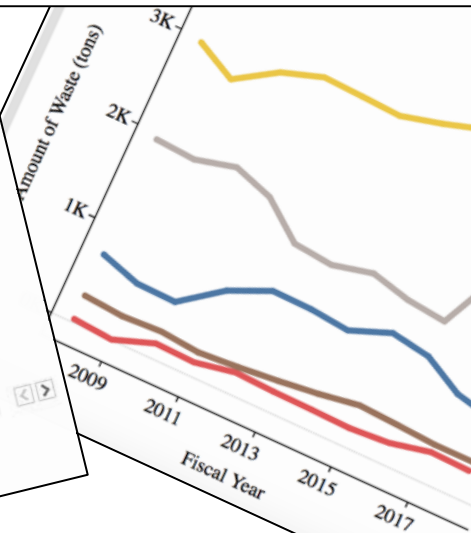
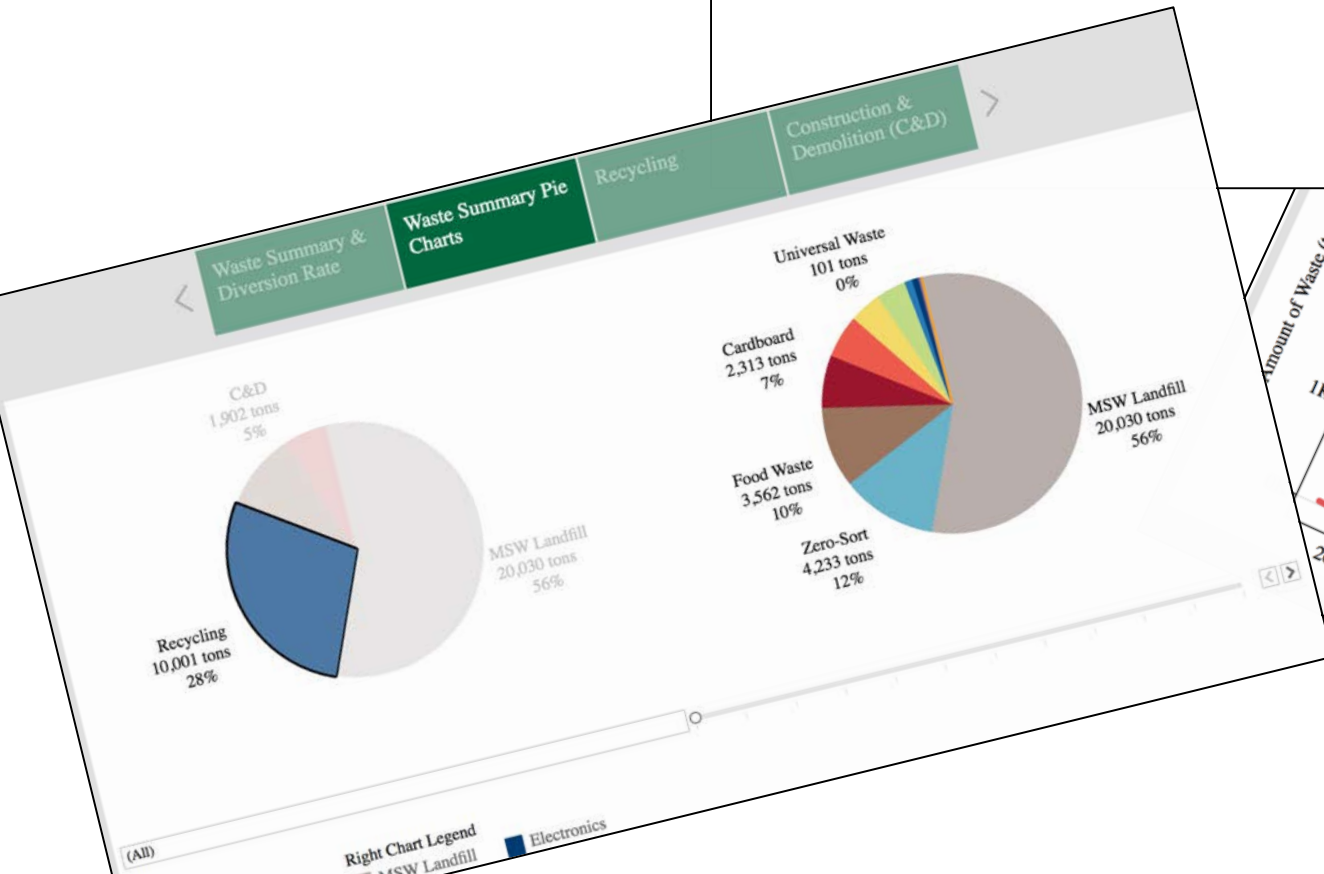
WATER

See how and where Dartmouth consumes water.

[EXPLORE WATER GOALS](#)

Dartmouth College Waste Report

FISCAL YEAR 2018





2nd Annual Energy Forum

Achieving 100% Renewable Energy



Yolanda Baumgartner – Co-Chair
Sustainable Hanover Committee



2nd Annual Energy Forum

Achieving 100% Renewable Energy



SUSTAINABLE HANOVER – ENERGY SUBCOMMITTEE

Yolanda Baumgartner (Co-Chair)

Stowe Beam

Barbara Callaway

Judi Colla (Co-Chair)

Tony Daigle (Director of Facilities,
SAU70)

Julia Griffin (Town Manager)

Mike Hillinger

Rob Houseman (Director, Planning)

Josh Hotvet

Laura Hutchinson (D '19)

Peter Kulbacki (Director, Public
Works)

Robin Kaiser

David McManus

Honor Passow

Dennis Robison

Marjorie Rogalski

April Salas (Sustainability Dir.)

Heidi Trimarco

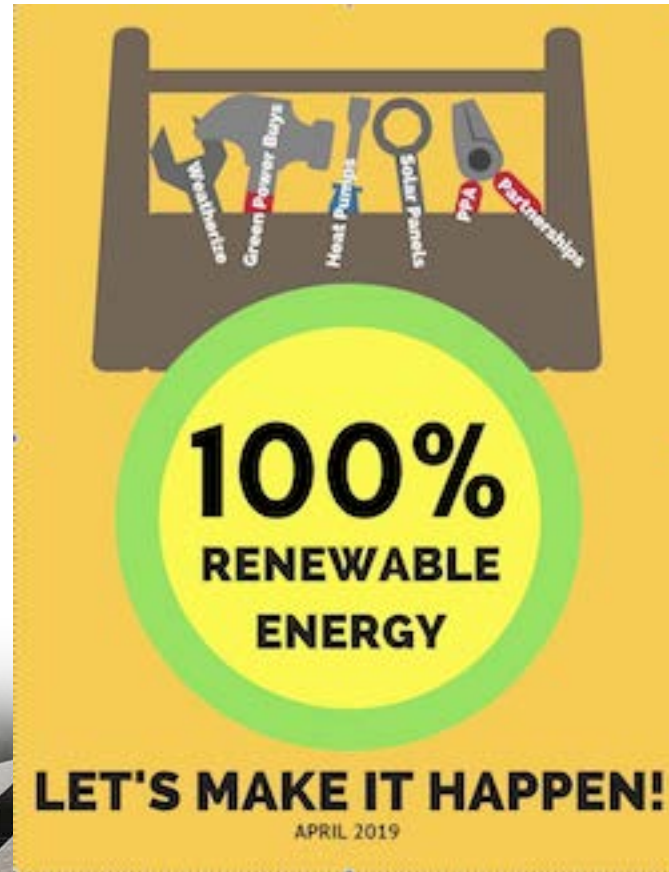
NEIGHBORHOOD ACTION GROUP

Barbara Callaway , Lyn Swett Miller, Rebecca Paquette, Sarah Young



2nd Annual Energy Forum

Achieving 100% Renewable Energy



2nd Annual Energy Forum

Achieving 100% Renewable Energy

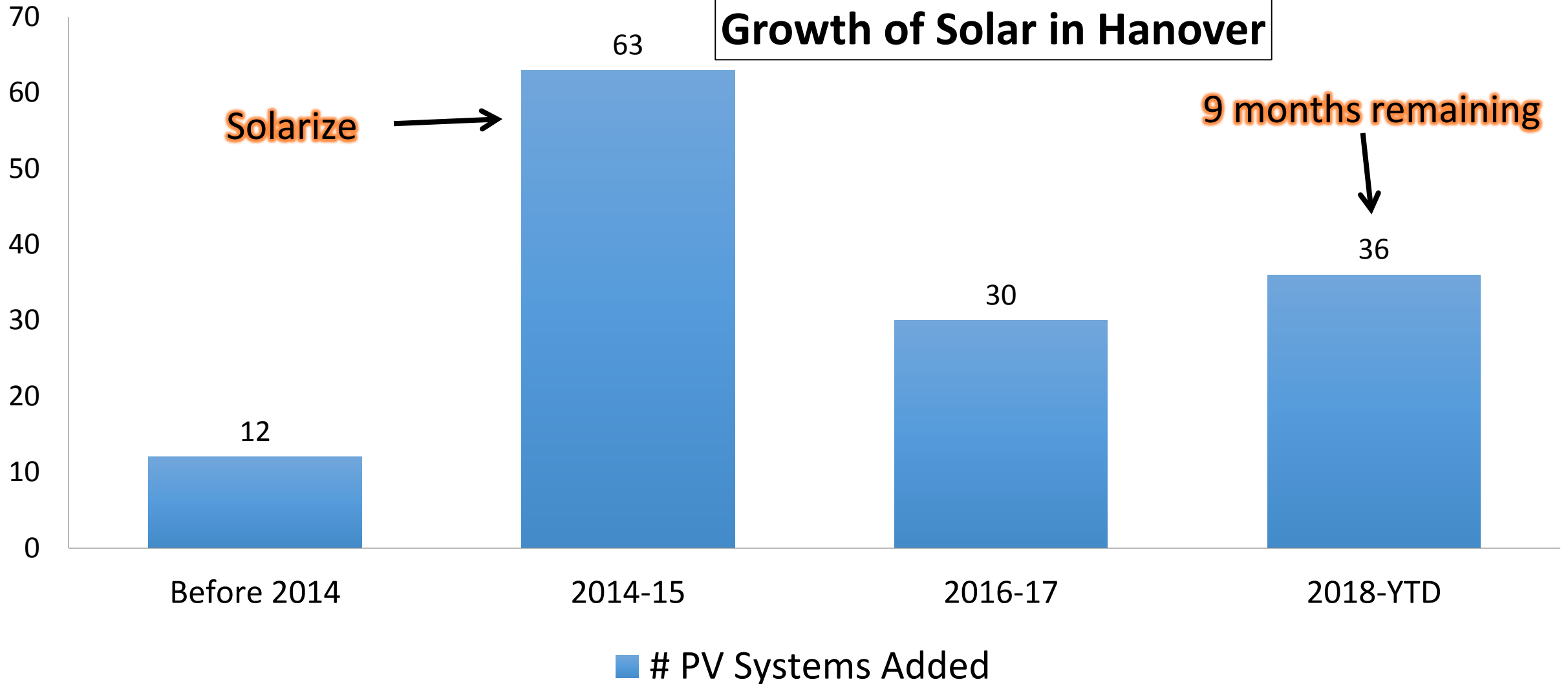


Growth of Solar in Hanover

Solarize



9 months remaining



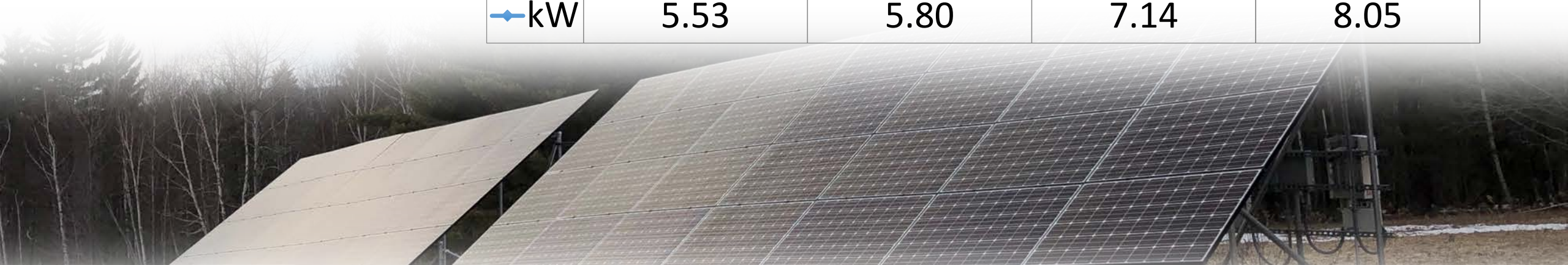
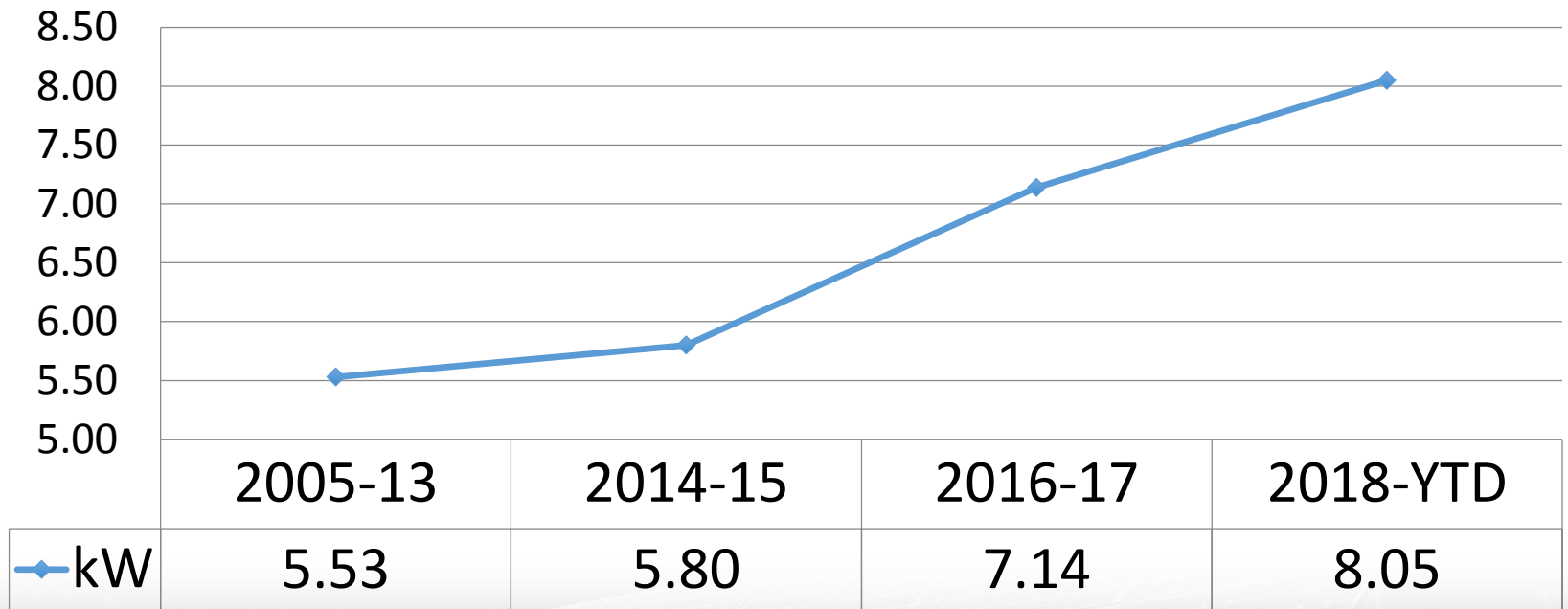
2nd Annual Energy Forum

Achieving 100% Renewable Energy



Residential
Systems Are
Getting Bigger

Average new system size (kW)



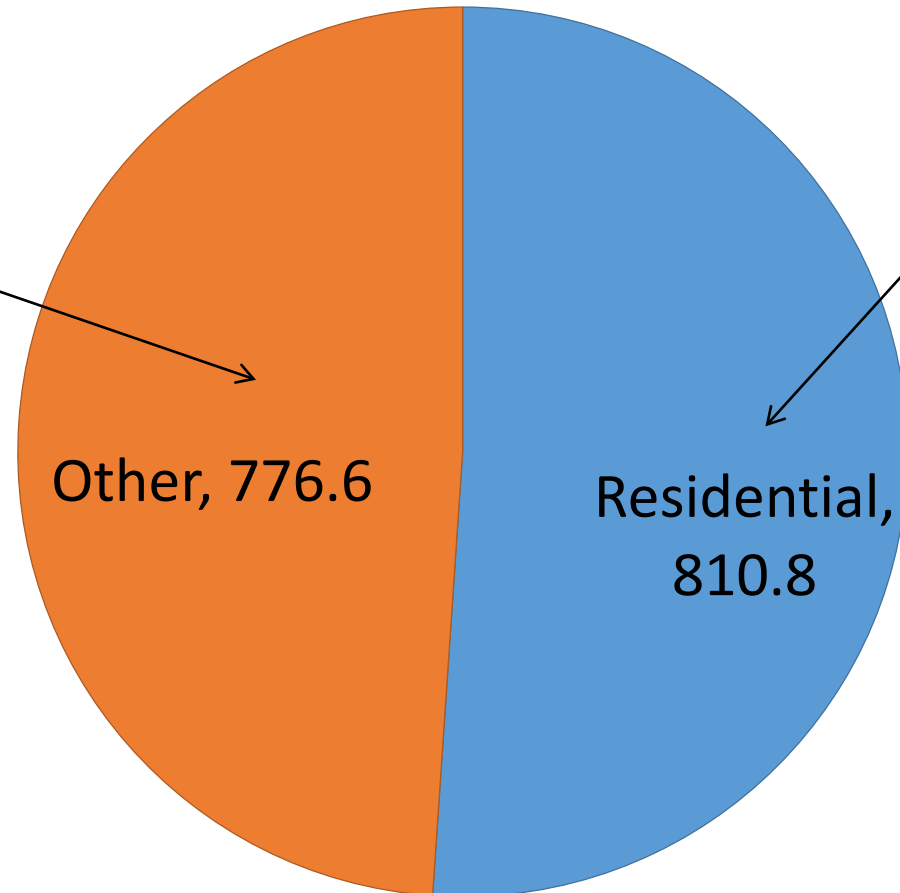
2nd Annual Energy Forum

Achieving 100% Renewable Energy



Solar Generation by Sector (kW)

Systems:
13 Dartmouth
2 Town
1 Schools



125 residential solar systems

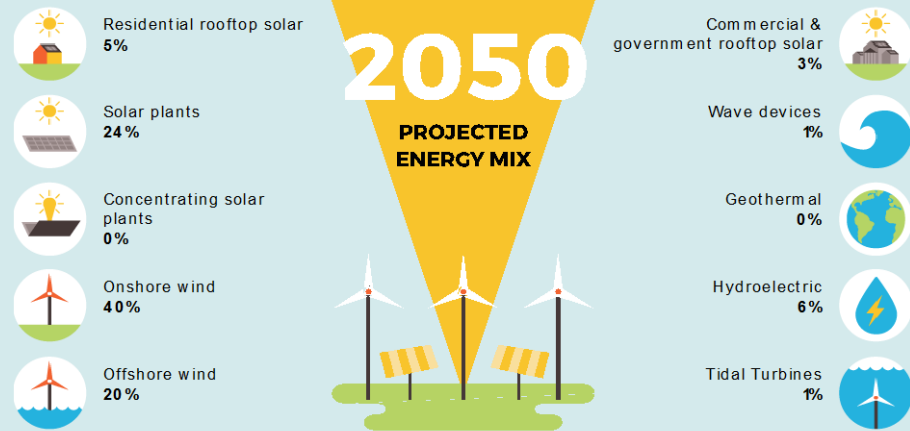
6% of Hanover's 2,146 single detached houses are generating solar electricity.*

**Housing count from 2014 US Census.*

Total = 1,587 kW

100 % HANOVER

A vision for the transition to 100% wind, water & solar energy



40-Year Jobs Created

Number of jobs where a person is employed for 40 consecutive years



Construction jobs: **86**



Operation jobs: **44**

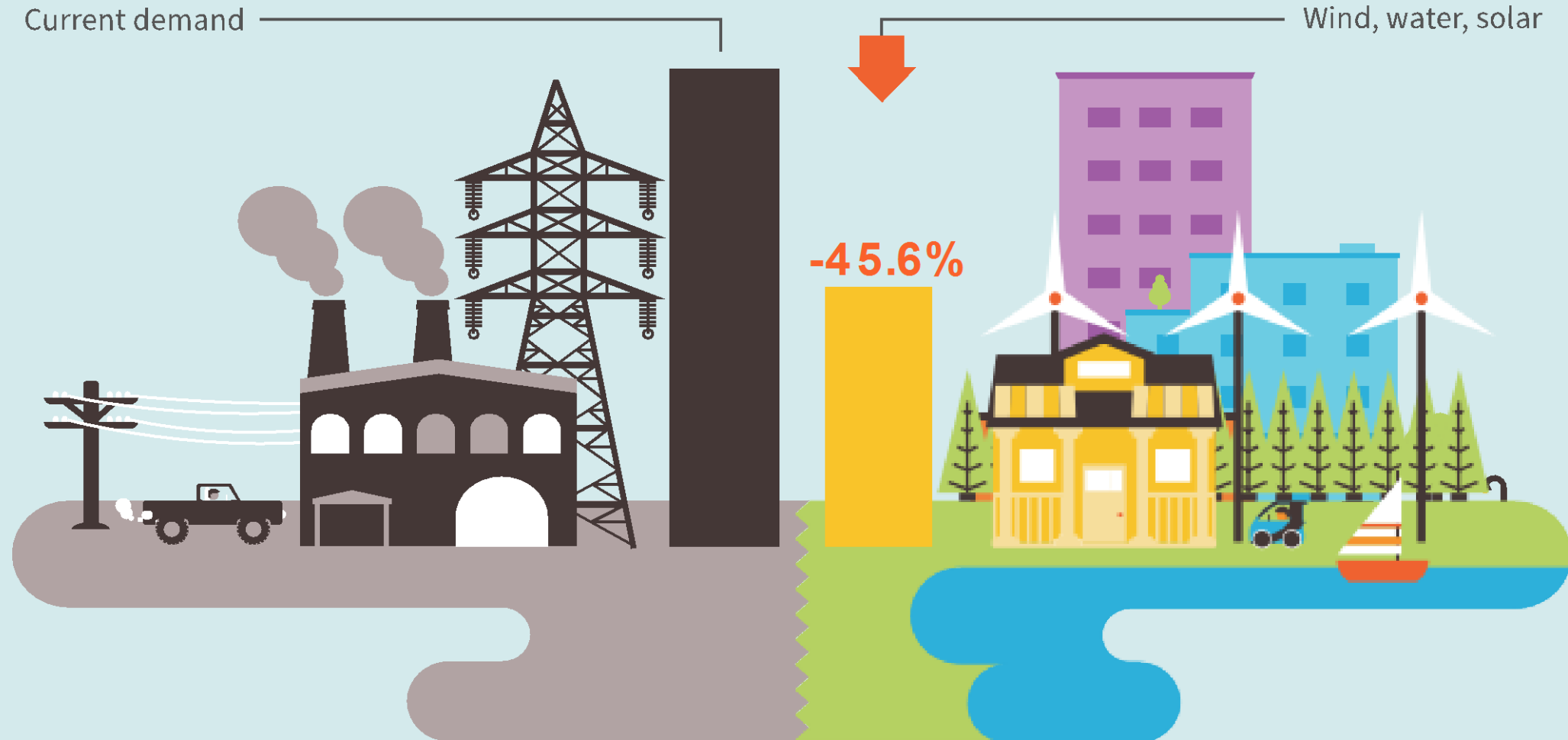
Reducing Energy Demand

Improving energy efficiency and powering the grid with electricity from the wind water and sun positively reduces the overall energy demand.



Reducing Energy Demand

Improving energy efficiency and powering the grid with electricity from the wind water and sun positively reduces the overall energy demand.

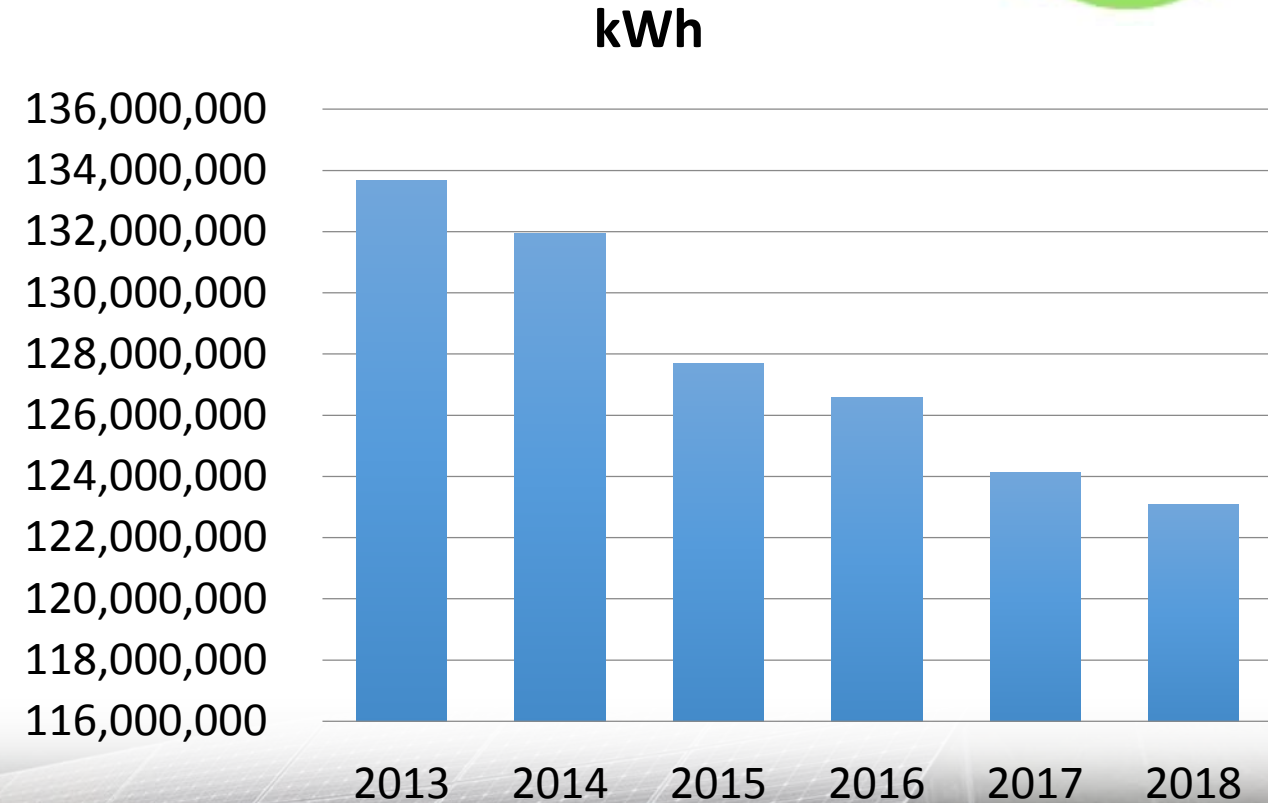


2nd Annual Energy Forum

Achieving 100% Renewable Energy



Town-Wide Electricity from Grid:
8% decline from 2013 to 2018



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Efficiency Savings on Main Street

Simplified Lighting Incentive Program

- Pilot Project with NHSaves/Liberty
- Incentives up to \$5,000
- Interest-free on-bill financing up to 5 years
- Simplified application process
- Project coordinator based in Town Hall office

Significant reduction in kWh, dollars, emissions



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Try LEDs in your home or office

Borrow this kit from Howe Library.

Check out LED brightness and color.

Includes floodlights, 3-way, track, and candlelabras.



Kit developed with the generous assistance of Mike Campbell, Hanover Hardware Store.

2nd Annual Energy Forum

Achieving 100% Renewable Energy



LEDs: Lower costs, Lower emissions

- 15W LED replaces 100W Incandescent bulb
 - Kilowatts used: 16 kWh vs 110 kWh
 - Electricity Savings: \$15*
 - Carbon emissions reduced by 145 pounds**
- Current LEDs are cheaper, offer more choices, and better quality lighting than earlier
- LEDs have expected usage life of 25 years.
- LEDs have no mercury, can be recycled at the Lebanon Recycling Center.

**Based on usage of 3 hrs/day, 365 days/year at 16¢ per kWh*

***From EPA Greenhouse Equivalencies Calculator*



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Climate solutions depend on community, collaboration and cooperation. At the end of the day, every solution in Drawdown is initiated and promoted by groups of people forming new and perhaps unlikely alliances.

Paul Hawken, *Drawdown*

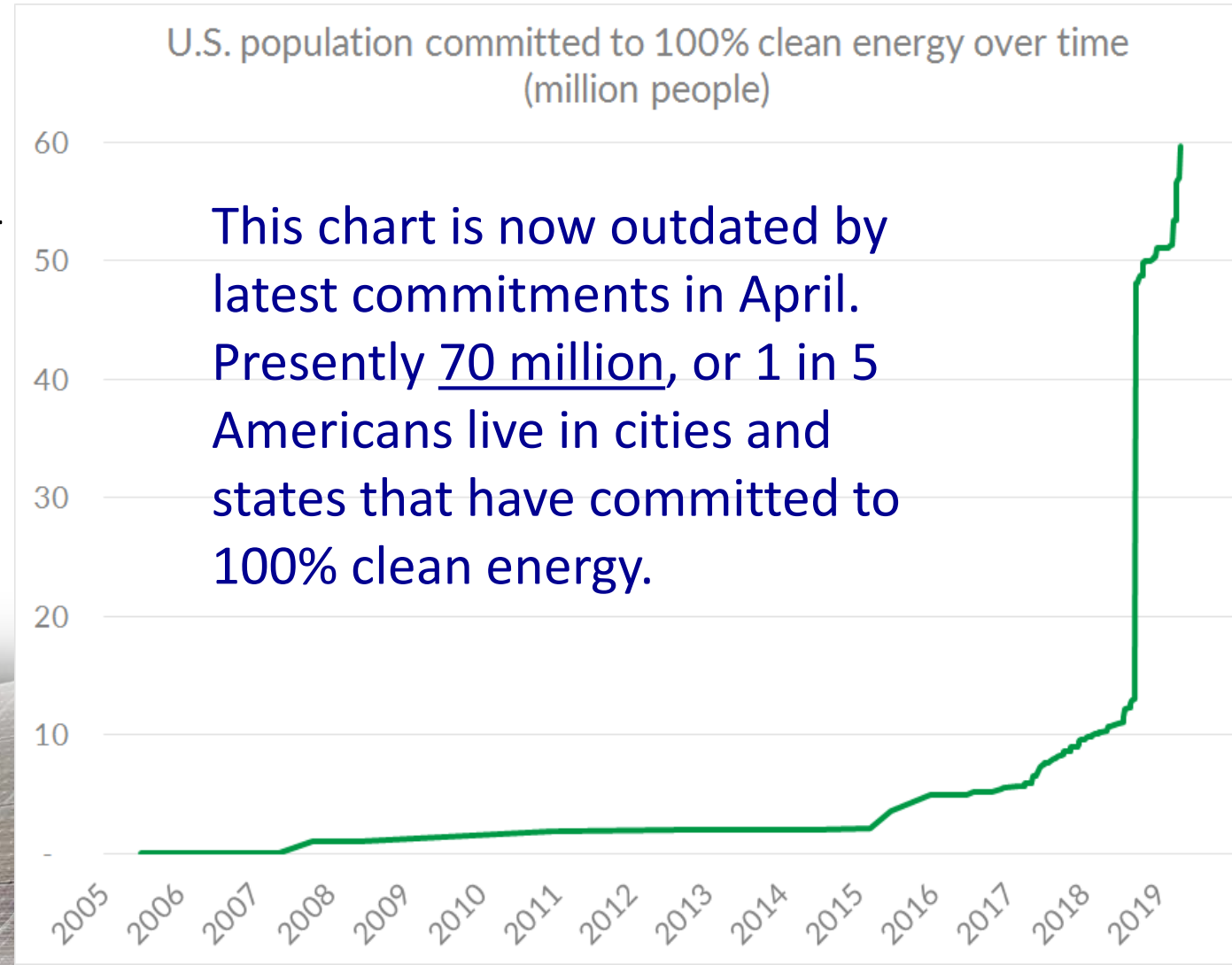


2nd Annual Energy Forum

Achieving 100% Renewable Energy



Ready for 100 Update:
Momentum is off the chart -
literally!



2nd Annual Energy Forum

Achieving 100% Renewable Energy



Q&A





2nd Annual Energy Forum

Achieving 100% Renewable Energy



Prize Drawing

Black & Decker 40V Cordless String Trimmer



2nd Annual Energy Forum

Achieving 100% Renewable Energy



- Thanks to
 - RMS Middle School and SAU 70
 - Neighborhood Action Group
 - SHC committee and town staff that support and contribute to this work



2nd Annual Energy Forum

Achieving 100% Renewable Energy



- Thanks to the Poster Presenters:

- Co-op Food Stores
- Hanover Friends Meeting House
- Hanover Parks and Recreation
- LED Design & Defiance Electric
- Neighborhood Action Groups
- NH Saves & Liberty Utilities
- RMS 7th Grade
- Robin Kaiser and Peter Gish
- St. Thomas Episcopal Church
- Twin Pines Summer Park
- UK Architects



2nd Annual Energy Forum

Achieving 100% Renewable Energy



- Small Group Discussion + Refreshments
 - Energy Efficiency: Mike Hillinger, David McManus, April Salas, Sol Diamond
 - Residential Solar: Robin Kaiser, Lyn Swett-Miller, Erzo Luttner
 - Community Solar: Josh Hotvet, Marjorie Rogalski, Heidi Trimarco

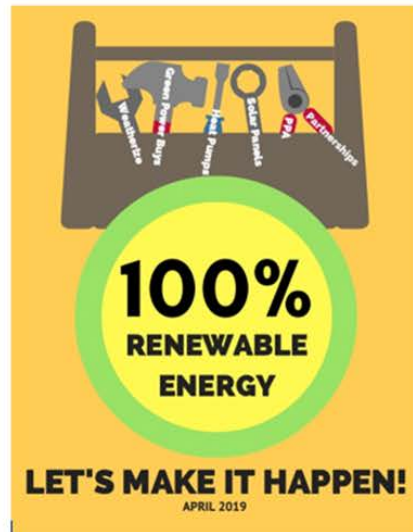


2nd Annual Energy Forum

Achieving 100% Renewable Energy

100%
RENEWABLE
ENERGY

- Stay up to date until next year's forum:
 - <https://www.hanovernh.org/sustainable-hanover-committee>
- Our new quarterly newsletter
- Annual Summary Report



Sustainable Hanover – Energy Subcommittee 2nd Annual Ready for 100 Forum April 24, 2019 Background

In May of 2017 Hanover residents showed up at Town Meeting in record numbers to make history. They voted overwhelmingly to transition to 100% renewable energy by 2030 and for heating and transportation by 2050. In so doing, they became the first municipality in our country to choose a sustainable future by popular vote. Sustainable Hanover—a new committee established in 2018—exists and the Sustainable Hanover Energy Subcommittee is here to support, encourage the community in efforts to achieve these goals.

Guiding Principles

- 1. We envision Hanover as a healthy and healthy community powered by affordable and clean renewable energy.
- 2. The production and distribution of electricity, heating and cooling of buildings, and modes of transportation are efficient and carbon-free.
- 3. Thoughtful development leads to sustainable neighborhoods, flexible and adaptable buildings and they are designed to support the automobile.
- 4. Clean energy related business opportunities and language jobs help our families and community thrive.
- 5. How we achieve this vision is as important as the vision itself. We value relationships and are committed to an accessible, inclusive, and equitable process for both getting to and maintaining our vision.
- 6. We welcome, in that spirit, open, honest, respectful, and participation from everyone throughout the town.
- 7. Hanover recognizes and values other communities to make other transitions in order to enable the vision.

Strategy for Increasing Green Electricity

A primary goal of our first year was to understand the various options available to produce and source green electricity. In Year 2, with help from consultants, we have developed a portfolio of four options which together will move all sectors of our community. The sectors are residents (R), small businesses and non-profits (SBNP), the Town (T), large organizations (LO), and Dartmouth College (DC). The portfolio will change over time as more efficient opportunities emerge.

1. Private rooftop or ground-mounted solar (R/SBNP, T, LO, DC)

In 2018 Hanover voters passed a solar leasing ordinance allowing rate payers for residents to install private solar systems. Through an established program and the "tax-free" status of the lease, the Subcommittee has developed "word of mouth" opportunities for residents who are interested in solar to speak with those who have installed. As of March 2019, Hanover's installed solar capacity is 1,387 kW, up from 558 kW the year prior. This represents 1.41 solar installations of which 125 are residential, 13 are on the Dartmouth campus, 2 are town owned, and one is the solar maker at Hanover Middle School.

2. Community solar (R/SBNP)

The Subcommittee has been working on options for community solar. Having received a Town order solar feasibility study on a town property and a follow-up workshop on financing and ownership of solar, we suggest Article 14 on the 2019 Town Meeting agenda. This article gives the town the right to enter into a private purchase agreement for solar installation on town property which is a cost effective to do so. We also have a solar that is building ways to develop community solar on privately owned land. This year will be working out to Hanover residents who have interest in solar to host, subscribe and/or invest in a community solar project.

3. Retail renewable energy through a cooperative buying group (R/SBNP)

A Subcommittee team is working with consultant 3D Energy to develop a non-friendly, affordable option for residents, small businesses and non-profits to buy certified green electricity. Candidates have asked for the option when the popular Green House Challenge was discussed in 2017 because it electricity supply changed ownership and prices. This is an expensive option for members of the community who source their own solar system.

4. Large Scale Purchase Power Agreements (T, LO, DC)

The Town and Dartmouth College are working together to develop a Power Purchase Agreement for the supply of green electricity for our community's largest electricity users. Our goal is to lock in competitive electricity rates for a multi-year period to support installation of renewable energy generation in the SO New England region.

In reviewing green electricity options, the Subcommittee adhered to the following guidelines:

- 1. Focus on the big picture
- 2. Consider economic, environmental and social outcomes
- 3. Source renewables from proven certified projects
- 4. Give priority to new rather than existing projects
- 5. Favor local (i.e., within Hanover or neighboring towns) and regional projects (within ISO-New England)
- 6. Support the Town's lead by demonstrating its commitment to renewable energy with local and visible projects
- 7. Provide opportunities to educate and increase awareness
- 8. Increase resiliency within the community
- 9. Source natural projects in high carbon locations that local and regional projects are not viable options
- 10. Consider repurchasing, demonstrating that renewables are for all communities
- 11. Share our knowledge with the community, New Hampshire, region, and nation

Strategy to Increase Energy Efficiency

Energy efficiency is key to achieving our 100% renewable energy goals. The complex topic of efficiency involves, but is not limited to, such things as standards and policy, design, building materials, monitoring, maintenance, appliances, lighting, personal habits, transportation options, and transportation infrastructure options. Our efforts this year have focused on efficient lighting opportunities for small businesses, nonprofits and residents.

We are partnering with Liberty Utilities in a pilot project called the SmartLighting Initiative (SLI) program which began in February. SLI is designed for small businesses, nonprofits and municipal activities to improve their lighting efficiency to lower electricity bills, reduce maintenance and provide better quality lighting. SLI provides incentives, various free on-site training and a streamlined application process for program participants. Key to its successful launch is Liberty program coordinator Andrew Smith, who is providing a close liaison for his work both several days a week.

We are also encouraging residents to switch to LED bulbs as an easy "low hanging fruit" way to lower energy use and cost. In partnership with Hanover Library, we are offering a LED light kit with an assortment of commonly used LED bulbs. Residents will be able to borrow the kit to learn about LED lighting and see how they can work in their home energy. Looking ahead, we are planning a SmartHouse campaign with 3D Consultants for residents to improve home comfort and lower heating and cooling costs.

SUSTAINABLE HANOVER - ENERGY SUBCOMMITTEE

Thomas Desautels, Co-Chair - thomasd@grail.com

Jack Cole, Co-Chair - jackc@grail.com

Steve Grant - sggrant@grail.com

Tim Dugan - timdugan@grail.com

Mike Hildner - mhildner@grail.com

John Hovine - jhovine@grail.com

Robert Koller - rkoller@grail.com

David Robinson - drob@grail.com

Devin Hopkins - devinh@grail.com

April Suter - april.suter@hanovernh.org

Jack Coffey - jackcoffey@grail.com

Julia Griffin - julia.griffin@hanovernh.org

John Housman - john.housman@hanovernh.org

Laura Hutchinson - laura.hutchinson@hanovernh.org

Steve Kowalski - stevek@grail.com

Steve Kowalski - stevek@grail.com

Steve Kowalski - stevek@grail.com

Steve Kowalski - stevek@grail.com

Frequently Asked Questions

What were the goals committed to in the vote? Our members were present at Hanover town meeting on May 8, 2017. To see if the Town will vote to join the "Ready for 100 Action" campaign, thereby committing to a goal of 100% renewable

renewable sources of electricity by 2030 and renewable sources of fuel for heating and transportation by 2050. Joining the "Ready for 100 Action" campaign implies that the Town of Hanover will lead the community in actions designed to help meet emissions, businesses and residents transition to 100% renewable sources of electricity and fuel use. The Town has begun by investing in energy efficiency and renewable electricity generation for Town facilities and will follow by understanding in vehicles and heating systems fueled by renewable sources."

Who is required to meet the goals of 100% renewable electricity by 2030 and transportation and heating/cooling by 2050? Hanover is required to meet these goals. However, the Energy Subcommittee is committed to work towards these goals with all residents and Hanover's geographic boundaries that meet government, schools, businesses, organizations, residents, and Dartmouth College.

What energy sources qualify as "renewable"? We are using the U.S. Environmental Protection Agency's definition of renewable energy – an "energy resource that is replenished over short periods of time and is not depleted faster, wind, geothermal, low impact hydro, wave power, biomass" (<https://www.epa.gov/energy/energy-efficiency-100-renewable-energy>).

Does the renewable energy need to be generated locally here in Hanover? No. We welcome achieving these goals through a portfolio of renewable energy sources with generation here in Hanover being an important component. Conversion of energy infrastructure, such as offshore wind on the New England seacoast and certified renewable energy credits, will be part of the mix.

How does land use planning fit into these goals? The Energy Subcommittee wishes to preserve our beautiful scenery and use resources, including the land, judiciously. It is encourage others to do likewise as we work toward these goals together.

Is resiliency – that is the ability of our energy systems to bounce back from storms and other disruptions – part of achieving our goals? The Energy Subcommittee and Town are using resilience as one criteria for reviewing and selecting potential energy projects. We support other efforts to do likewise as we work toward these goals together.

How much will this cost? The Energy Subcommittee and Town are using base production and affordability as criteria for reviewing and selecting potential energy projects. Our members will be influenced by a large number of factors, including, but not limited to, energy efficiency, technology, community, how costs have increased due to the use of clean energy over the last decade. Energy transitions are a process, not a one-time event. We are already benefiting from sharing our experience with and learning from other municipalities both nationally and regionally. The new finding our transition as well as differences in our respective journeys and we both hoping and being inspired by others.

Is Hanover trying to be a model community? Yes, we are not alone. As of March 2019, over 110 municipalities throughout the country have adopted these goals. Hanover was the first town in New Hampshire to do so and the first in the country to do so by popular vote. Four other New Hampshire municipalities – Portland, Concord, Concord, and Dover – have made similar commitments and even more are exploring interest. We are already benefiting from sharing our experience with and learning from other municipalities both nationally and regionally. The new finding our transition as well as differences in our respective journeys and we both hoping and being inspired by others.

For more information, visit our website at <https://www.hanovernh.org/sustainable-hanover-committee>

To sign up for news through the Town Newsletter, go to <https://www.hanovernh.org/newsletter>

2nd Annual Energy Forum

Achieving 100% Renewable Energy



Thanks for coming!

100% Renewable Energy: Let's Make It Happen!

