Maine Energy Planning Roadmap
Aligning Energy Challenges with Compatible Policies
March 3, 2017
E2Tech is Maine’s only energy, environmental, and clean technology business and economic development organization.

E2Tech is a catalyst, a change agent, and a resource center that strives to:

1. Promote Maine companies;
2. Support their robust and sustainable acceleration; and
3. Help them compete in national and global markets.
Overview of SEP Program

- The US Department of Energy’s (DOE’s) Office of Energy Efficiency and Renewable Energy’s (EERE’s) State Energy Program (SEP) dedicates a portion of its funding each year to states to advance policies, programs, and market strategies that:
  - Accelerate job creation
  - Reduce energy bills
  - Achieve energy and climate security for the nation.

- Under this initiative, states compete for funding designed to support EERE’s nationally focused initiatives for the fundamental and permanent transformation of markets across all sectors of the economy.
The Governor’s Energy Office will engage private, public, and non-profit stakeholders to develop an Energy Planning Roadmap that advances the state of Maine’s energy, economic development, and environmental goals.

Picture Source: http://geology.com/state-map/maine.shtml
Objectives of Roadmap

Achieve energy and cost savings in the residential, commercial, industrial, and transportation sectors.

Reduce pollution and greenhouse gas emissions.

Support the growth of a robust state and regional energy market and workforce.

Facilitate stakeholder and interagency discussions (electric power sector, natural gas supply and transport, renewable energy, and energy efficiency)

Maine Energy Plan 2015

The Governor’s Energy Office published a comprehensive energy plan update in 2015, which is the starting point for this Roadmap Project.

The plan established 8 different sectors and created policy recommendations for each. These sectors are:

- Residential Thermal
- Commercial and Industrial
- Renewables
- Electricity
- Transportation
- Wind
- Greenhouse Gases
- State Government

http://news.mpbn.net/post/bill-would-reverse-maines-course-wind-power-development#stream/o
2015 Plan Recommendations

- Accelerate progress to lower heating costs in the residential sector
- Reduce pollution and greenhouse gas emissions in residential and transportation sectors
- Consolidate/streamline renewable energy policies to improve their cost-effectiveness and provide market certainty
- Support the growth of innovative technologies
- Continue pursuit of a regional solution to natural gas capacity constraints
- Increase efforts to assist low income households with high energy costs
- Develop plan to pursue cost-effective energy improvements in state government
Goals

Maine’s energy, economic development, and environmental goals:

- Reducing oil use in home heating 30% by 2030;
- Reducing electricity and natural gas consumption 20% through efficiency programs;
- Reducing peak electricity demand of 300 MW by 2020;
- Weathering 100 percent of homes and 50 percent of businesses by 2030.

Phase I - Baselining

- Researching and gathering information on the current state and regional landscape, and the factors that affect it
  - Maine Energy Profile
  - Supply chain & Infrastructure
  - Workforce
  - Competitive market advantage
  - Policies and programs

- Data gathering will rely on work previously done by E2Tech and new work to be performed by E2Tech and consultants.
Phase I - Baselining

Task 1.0 – Steering Committee

Task 2.0 – Baseline Data Development

Task 3.0 – Competitive Advantage and Market Opportunity Analysis

Task 4.0 – National, Regional, State, and Local Energy Policies and Programs
Task 5.0 Set Time Horizons and Regional Development Goals

- Establish the **Maine Energy Planning Roadmap Task Force/Working Groups** with members of the Steering Committee plus representatives from key energy and economic development entities.

- While the **Steering Committee** will provide high-level strategic guidance and advice on the entire project, the **Task Force/Working Groups** will be more focused on specific tasks.
Phase III — Action/Implementation Plan - Roadmap Development

The final phase – roadmap development – will include the following, soliciting input from all levels of the energy sector in Maine.

Task 6.0 – Policy and Strategic Options by Energy Sector

Task 7.0 – Draft Roadmap Preparation

Task 8.0 – Stakeholder Process

Task 9.0 – Final Roadmap and Launch
Deliverables of Roadmap

1. Steering Committee Formation
2. Baseline Data Development
3. Competitive Advantage and Market Opportunity Analysis
4. Review of National, Regional, State, and Local Energy Policies and Programs
5. Set Time Horizons and Regional Development Goals
6. Develop Policy and Strategic Options by Energy Sector
7. Roadmap Preparation
8. Coordinate Stakeholder Process
9. Launch Final Roadmap
Maine Energy Planning Roadmap – Steering Committee and Project Team Members

- Jim Atwell – Sevee & Maher
- Robert Dorko – Sappi
- John Ferland – Ocean Renewable Power Company
- David Flanagan – Formerly CMP
- Kenneth Fletcher – Town of Winslow
- Judy Gates – Maine Department of Transportation
- Ben Gilman – Maine Chamber of Commerce
- Jeff Marks – E2Tech
- Angela Monroe – Governor’s Energy Office
- Jeff Packard – Alodyne
- Alan Richardson – Emera Maine
- Tim Schneider – Public Advocate
- Richard Silkman – Competitive Energy Services
- Lisa Smith – Governor’s Energy Office
- Eric Stinneford – AVANGRID/CMP
- Michael Stoddard – Efficiency Maine Trust
- Jeff Thaler – University of Maine
- Claudette Townsend – Dead River
- Erle Townsend – Maine Department of Environmental Protection
- Peter Vigue – Cianbro
- Thomas Welch – Former MPUC Chair
- Brian Whitney – Maine Technology Institute
New England & Maine
Electricity Generation & Prices
Average Retail Price of Electricity, Maine

Cents/KWh

Source: EIA
Electricity Prices, New England, May 2016

Source: EIA
Net Electricity Generation, Maine, 2010-2015

Source: EIA
Utility-Scale Electricity Generation, Maine, 2015
Percent of Total Generation

- Wind: 10%
- Solar: 30%
- Geothermal: 26%
- Hydro: 34%
- Biomass: 26%
- Non-Renewable: 34%

Source: EIA
This represents the percentage of electricity a state generates from clean sources. The focus for this indicator is on broader production of renewable, low-carbon electricity, which includes hydropower and biomass. Net generation totals from hydro, biomass, wind, solar, and geothermal are combined and this sum is then reported as a percentage of total state electricity generation, using preliminary EIA data for the year 2015. Due to the EIA reporting methodology, generation data does not include output by any installation of less than one-megawatt capacity.
New England & Maine Electricity Consumption & Productivity
Energy Consumption by End-Use Sector, Maine, 2014

Source: EIA
Natural Gas Consumption, All Sectors, Electricity & Useful Thermal Output, Maine

Source: EIA
New England Energy Efficiency
Efficiency Maine Programs
Annual MWh Savings, 2004-2015

Figure 4.2-1: Efficiency Maine Programs Annual MWh Savings (2004–2015)

Source: Efficiency Maine Triennial Plan 2017-2019
American Council for an Energy-Efficient Economy (ACEEE) Scorecard

- Ranks states on their policy and program efforts
  - 2015 Focused on improving energy efficiency in homes, businesses, industry, and transportation systems
- Recommends ways that states can improve their energy efficiency performance
  - Utility and public benefits programs and policies
  - Transportation policies
  - Building energy codes and compliance
  - Combined heat and power (CHP) policies
  - State government–led initiatives around energy efficiency
  - Appliance and equipment standards
- Provides an annual benchmark of the progress of state energy efficiency policies and programs
American Council for an Energy-Efficient Economy (ACEEE) Scorecard
Clean Tech Leadership Index

Data-based comparison of all 50 states among 70 technology, capital, and policy indicators

<table>
<thead>
<tr>
<th></th>
<th>Maine Score</th>
<th>Maine Ranking</th>
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</thead>
<tbody>
<tr>
<td>Technology</td>
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<tr>
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<td><strong>Overall</strong></td>
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</table>
Clean Tech Leadership Index: Top 10 Technology Ranking

The Technology category tracks the progress of states’ deployment across three subcategories:

- **Clean Electricity** (renewable energy generation, energy storage, fuel cell deployment)

- **Clean Transportation** (use of electric vehicles, hybrids, plug-in hybrids, biofuels, natural gas vehicles, charging/fueling infrastructure)

- **Energy Intelligence & Green Building** (green building projects, smart grid deployment, grid modernization, efficient energy use)

The three subcategories are weighted equally.
Data Findings-Electricity Prices & Generation

- **Findings**
  - Maine’s RPS requires at least 30% of electricity sales from renewable resources, while a separate RPS requires new renewable resources to supply 10% in 2017.
  - More than 5/6 of Maine is forested and forest products are both a major energy-intensive industry and a major biomass resource.
  - Hydroelectric dams and biomass account for 9/10 of Maine’s renewable electricity generation and more than ½ of Maine’s total electricity generation.
  - Wind produced 1/10 of net electricity generation, with on-shore and off-shore wind goals calling for increasing amounts.
  - Solar is starting to make progress, but is hampered by net billing changes.
Findings

- In 2015, 2/3 of Maine’s net electricity generation came from renewable resources, primarily hydro and biomass. Another ¼ was generated by natural gas. The rest comes from wind and oil, with less than 1% produced by coal and solar.

- The industrial sector produces more than 1/5 of Maine’s net electricity generation, the highest of any state except Louisiana.

- Maine restructured its electricity industry in 2000 and allows retail electric competition.
Data Findings-Electricity Consumption & Productivity

**Findings**

- Maine’s natural gas consumption per capita is about 60% of the national average.
  - Natural gas consumption is:
  - Decreasing for electricity.
  - Increasing for thermal output across all sectors.

- About 1 in 20 households use natural gas as their primary heating fuel.
  - Constraints on pipeline delivery capacity have led to price spikes during winter demand peaks, when residents/businesses compete with electricity generators for available supply.

- Maine has the most energy-intensive economy in New England.

- Maine has the highest per capita energy usage in New England due to:
  - Industrial consumption.
  - Transportation consumption.
  - Heating.
Data Findings-Energy Efficiency & Heating

• Findings
  ▫ Efficiency Maine programs are successfully reducing energy use in Maine homes and businesses.
  ▫ 2/3 of Maine households use fuel oil as their primary heating source.
    • Maine is particularly vulnerable to distillate fuel oil shortages and price spikes during the winter months.
  ▫ Maine does not produce or refine petroleum.
  ▫ Maine receives more than half its petroleum products via marine ports in southern Maine.
    • Canada is the dominant supplier.
    • Proposals to bring in more oil via pipeline face environmental opposition and legal challenges.
Data Findings - Transportation

- **Findings**
  - Maine’s largest end-use for energy is transportation.
  - Maine has fewer alternative fuel vehicles per capita, and very little infrastructure for alternative fuel vehicles.
    - Electric
    - Natural Gas
    - Biofuels
Data Findings-Innovation

• **Findings**
  ▫ Maine is the national leader in biomass generation.
  ▫ A 2014 MTI report found that the alternative energy cluster is one of the fastest growing, with job gains of 12% from 2007 to 2012.
  ▫ The clean energy sector:
    • Has higher than average wages.
    • Is growing faster than other technology sectors.
    • Is positioned to flourish under the right conditions.
  ▫ The overall growth of cleantech has outpaced the overall Maine economy.
  ▫ Maine businesses are expanding and expect positive growth in the future.
  ▫ At the same time, Massachusetts (2), Vermont (3), Connecticut (8), Rhode Island (12), and New Hampshire (16) are all doing better.
Maine Basic Policy Overview
<table>
<thead>
<tr>
<th><strong>Maine Policy Indicators</strong></th>
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<tbody>
<tr>
<td>Renewable Portfolio Standard</td>
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<td>Energy Efficiency Resource Standard</td>
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<td>State Renewable Fuel Standard</td>
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<td>Climate Action Plan</td>
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<td>GHG Reduction Target</td>
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<td>Membership in Active Cap and Trade Market</td>
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<td>Low Carbon Fuel Standard</td>
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<td>Residential Building Energy Policy</td>
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<td>PACE Legislation</td>
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<td>Third-party Ownership of Renewables</td>
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<td>Maine Policy Indicators</td>
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<td>Community Choice Aggregation</td>
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Supply Chain Database (baseline development)

- Under a separate project, E2Tech has been developing a comprehensive database of the environmental, energy, and clean technology sectors in Maine.
Supply Chain Database

- Will characterize energy firms and assets by key variables such as age, size in revenues and employment, location, products and services.

- Help pinpoint areas of strength and opportunities to fill in gaps in the supply chain.

- Provide a **geographic map** of the sector.

- Increase sales contacts, uncover new supply opportunities, and **demonstrate Maine’s expanding energy supply chain capabilities** nationally and globally.
## Competitive Market Advantage

<table>
<thead>
<tr>
<th></th>
<th>Abundant Resource</th>
<th>Patented Technology</th>
<th>Research Centers</th>
<th>Established Manufacturing Capacity</th>
<th>Ease in Distribution</th>
<th>Supported Start-ups &amp; Businesses</th>
<th>Strong Local Market</th>
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<td>Biomass-Fuel</td>
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Potential Areas of Focus

Innovation & Economic Development- Energy Technologies, Products, and Services

Implementation of Energy Innovation (including energy storage, CHP/DG, grids)

Thermal/ Heating

Transportation

Regional Approaches Energy Procurement

Integration of other energy plans/activities

http://www.solaromaha.com/solar_thermal.html
Consideration of Other Energy Plans/Efforts

1. Efficiency Maine Triennial Plan
2. Maine PUC Natural Gas Capacity
3. Net-energy Billing
4. Biomass & the Forest Product Industry
5. New England Clean Energy RFP
6. Multi-State Offshore Wind Project
7. Wind Energy Assessment
8. Energy Assurance and Emergency Management
9. Others?
Maine Energy Policy

Proposed Standards for Assessing Energy Policy:

➢ Conversion Efficiency
  ➢ The rate at which btus of energy are converted into $$ of goods and services
  • Proposed Measure - Gross State Product per btu of energy consumed (GDP/btu)

➢ Production Efficiency
  ➢ The cost to produce, deliver and consume a btu of energy
  • Proposed Measure - Amount of btus of energy consumed per dollar spent on energy (btu/$)

➢ Externality Efficiency
  ➢ The amount of GHG emissions created per btu of energy consumed
  • Proposed Measure - Amount of btus consumed per ton of GHG emissions created (btu/GHG)
Conversion Efficiency

Real GDP per mmbtu

Source: Competitive Energy Services
Externality Efficiency

BTUs per LB of CO₂

Source: Competitive Energy Services
Thank you!

Please feel free to contact Jeff Marks with questions at jeffmarks@e2tech.org.