



*Community*  
**Roadmap**

---

*to Renewable*  
**Woody Biomass Energy**

**A Step-by Step Decision-Making Tool for  
New Hampshire Communities**

# Agenda:

---

- ***Why a Roadmap?***
- ***What is the Roadmap?***
- ***How to use the Roadmap***



# COMMUNITY BIOMASS ROADMAP



---

***The Roadmap is a decision-making tool to help communities decide if woody biomass heating/cooling is a good choice for their energy future.***

*The*  
***Roadmap***  
*is a detailed plan*

---

- ✓ ***Community gathers information***
- ✓ ***Community evaluates information***
- ✓ ***Community makes decisions***

*Community*  
**Roadmap**  
*to Renewable Woody  
Biomass Energy*



**A STEP-BY-STEP DECISION-MAKING TOOL  
FOR NEW HAMPSHIRE COMMUNITIES**

# Contents

**Introduction to the Community Biomass Roadmap** ..... 9

**Roadmap Decision Tree** ..... 13

**Common Questions (and Answers) about Woody Biomass Heat** ..... 25

**Community Engagement** ..... 33

**Summary Worksheets** ..... 41

▶ **Community Goals** ..... 55

G1. We Have Lower Energy Costs ..... 59

G2. We Are Energy Independent ..... 73

G3. Our Energy is Reliable ..... 85

G4. We Emit Less Carbon ..... 95

G5. We Rely on Renewable Energy Resources ..... 107

G6. We Are Energy Efficient ..... 117

G7. We Have a Strong Local Economy ..... 129

Transition from Community Goals to Evaluate a Biomass Project ..... 139

▶ **Evaluate a Biomass Project** ..... 143

P1. Project Characteristics ..... 149

P2. Building Information ..... 171

P3. Existing Fuel Use ..... 179

P4. Existing Heating and Distribution System ..... 195

P5. Biomass Energy System ..... 203

P6. Biomass Fuel ..... 219

P7. Emissions, Permitting, and Air Quality ..... 241

Transition from Evaluate a Biomass Project to Next Steps ... 250

**Next Steps** ..... 253

**Appendices** ..... 259

A. Amount of Existing Fuel Use Replaced by Biomass ..... 261

B. Combined Heat and Power (CHP) ..... 263

C. Funding Opportunities ..... 265

D. Assumptions ..... 275

E. Blank Tables ..... 277

F. Common Units and Biomass Heating Glossary ..... 303



**Community District Energy:**

The use of a central heating plant to provide heat or combined heat and power (CHP) to multiple buildings using buried pipes to distribute the energy.

*The*  
***Roadmap***  
*has two main components:*

---

- 1. Establish community goals***
- 2. Evaluate a biomass project***

# COMMUNITY BIOMASS ROADMAP

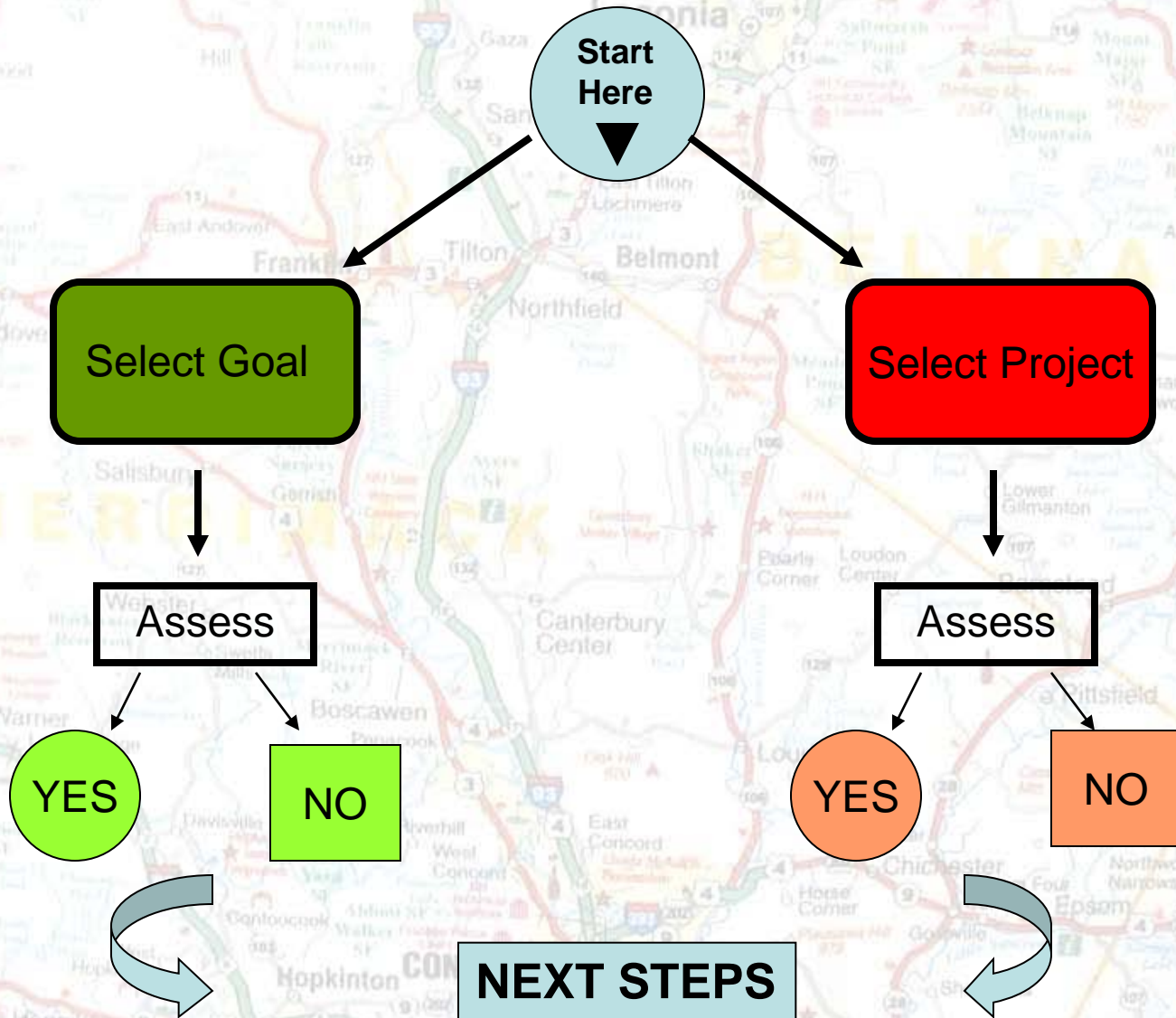
# *Community Engagement*

---





# Roadmap Decision Tree



# Community Engagement

---



- *Makes good use of local expertise*
- *Allows people to gain new information*
- *Allows leaders to gauge community interest*
- *Result is better, well-informed decision-making*

# *Community Energy goals*

---

**May include the following:**

- *We Have Lower Energy Costs*
- *We Are Energy Independent*
- *Our Energy is Reliable*
- *We Emit Less Carbon*
- *We Rely on Renewable Energy Resources*
- *We Are Energy Efficient*
- *We Have a Strong Local Economy*

► We Have Lower Energy Costs

► We Are Energy Independent

► Our Energy Is Reliable

► We Emit Less Carbon

► We Rely on Renewable Energy Resources

► We Are Energy Efficient

► We Have a Strong Local Economy

## ► COMMUNITY GOAL 1

# G1. We Have Lower Energy Costs

**DEFINITION:** We spend less on energy and our energy spending is relatively stable.

### Introduction

Once capital investments are made, biomass fuels used for heating are significantly less expensive than fossil fuels on a cost/Btu basis. Fuel savings cover the cost of capital investments over some period of time. Long-term contracts for biomass can provide stable pricing with little impact from global economic and political events. The price of biomass fuels in the New England area has remained very stable in the last 20 years and is likely to fluctuate much less than the fossil fuel prices.

While biomass fuel pricing tends to be more stable than fossil fuels, the market does still fluctuate. The best way to predict the cost of your biomass fuel is to contact local providers (go to ► [Section P6. Biomass Fuel](#)). In New Hampshire, the average price for biomass in 2009-2010 was approximately \$55 per ton of delivered wood-chips and \$250 per ton of delivered pellets (this is bulk delivery of pellets by truck to silo, bagged pellets are more). You should confirm prices in your area before completing this section. Go to ► [Section P6. Biomass Fuel](#).

If you do not know which building(s) to assess for biomass heat, go to ► [Section P1a. Selecting a Project](#).

### IN THIS SECTION

- G1a. Existing Fuel Costs
- G1b. Estimated Fuel Cost Savings
- G1c. Estimated Fuel Cost Savings with a District Biomass System Owned and Operated by an Independent Entity
- G1d. Payback / Life-Cycle Costs
- G1e. Stability of Fuel Pricing
- G1f. Summary

### G1a. Existing Fuel Costs

Complete the following table to determine the existing fuel costs for each building being evaluated for a biomass heating system:

#### Instructions: Existing Fuel Costs

- COLUMN 1:** List each building that will be affected by the biomass project.
- COLUMN 2:** List the type of fuel(s) currently being used to heat each building. (For more detailed information on collecting fuel use/cost data, go to ▶ P3. Existing Fuel Use).
- COLUMN 3:** Identify how much of each type of fuel you are using per year. Check if the fuel used for heating includes fuel for domestic hot water (DHW). If the fuel used for heating does not include DHW, get the estimated consumption of fuel for DHW from the building owner/maintenance staff and add it to your Current Annual Usage. If no estimates are available add 11% of the fuel consumption for space heating for DHW. Annual Usage for Heat \_\_\_\_\_ x 11% = DHW. (Add this to Current Annual Usage for heat) in column 3.
- COLUMN 4:** Identify how much you are paying (per gallon, kWh, etc.) for each type of fuel.
- COLUMN 5:** Multiply column 3 by column 4 to determine the average annual cost of each type of fuel.
- COLUMN 6:** Multiply current annual usage (column 3) by 15% (see Appendix A for an explanation of this number) to identify how much of your existing fuel sources you will be using after the biomass energy system has been installed.
- COLUMN 7:** Multiply column 6 by column 4 to determine the average annual cost of non-biomass fuel you will need with the proposed biomass system.

#### G1a. EXISTING FUEL COSTS

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7
Building	Type of Fuel	Current Annual Usage	Current Average Price	Average Annual Cost	Average Usage with Biomass System	Average Annual Cost with Biomass System

#### G1a EXAMPLE. EXISTING FUEL COSTS

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7
Building	Type of Fuel	Current Annual Usage	Current Average Price	Average Annual Cost	Average Usage with Biomass System	Average Annual Cost with Biomass System
School	Fuel Oil	100,000 gallons	\$2.50	\$250,000	15,000 gallons	\$37,500
Town Hall	Propane	8,000 gallons	\$2.00	\$16,000	1,200 gallons	\$2,400

### G1f. Summary

Complete the summary table below with information from preceding tables in section G1. (Columns with the shaded background in preceding tables show which information should be transferred to the summary table.)

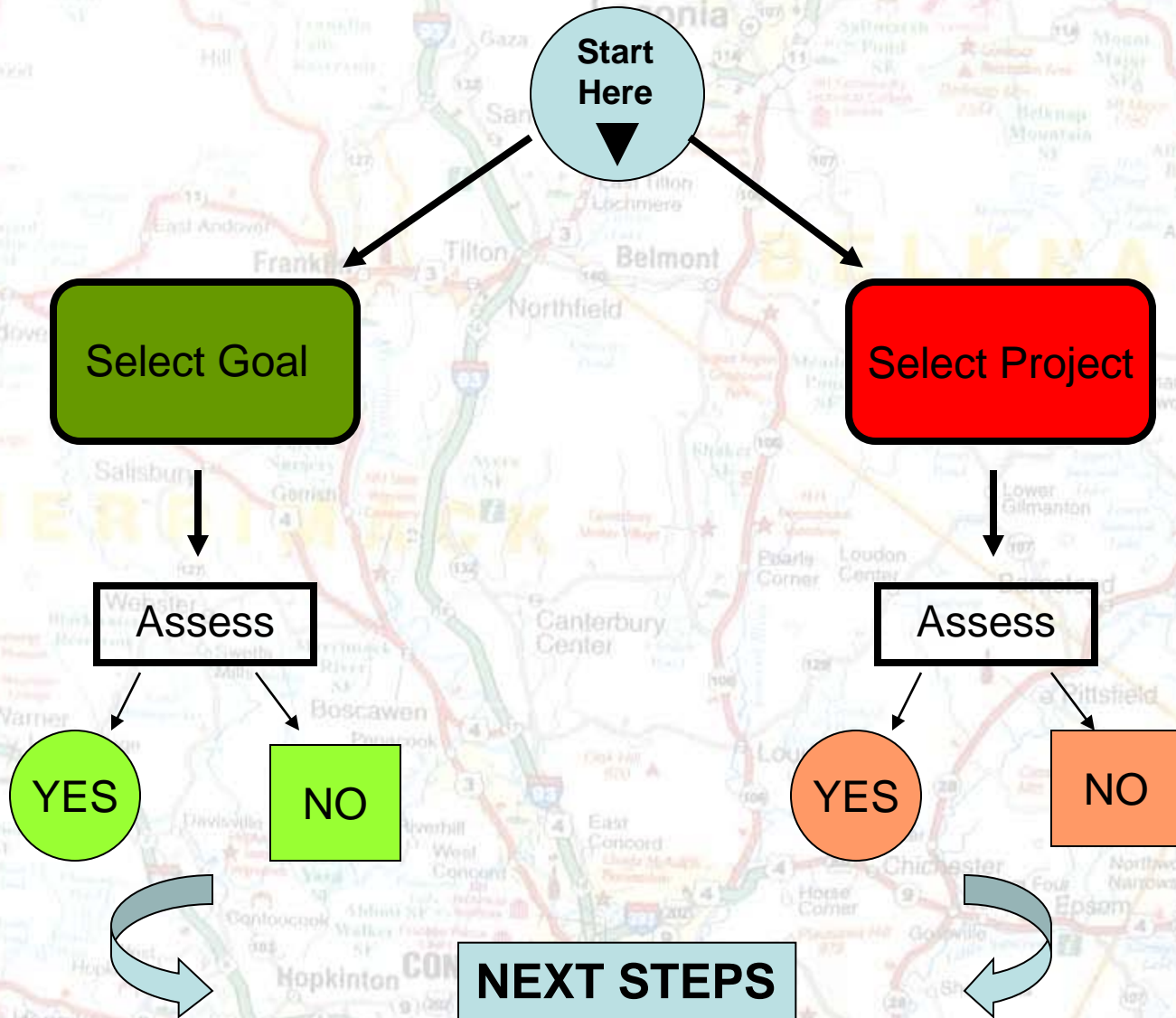
#### G1f. LOWER ENERGY COSTS SUMMARY

Building	Current Annual Fuel Costs	Estimated Annual Fuel Costs with Biomass	Estimated Annual Fuel Savings with Biomass	Pay-Back Period	Price Stability (G1e)

The cost of wood-chips used for heating fuel tends to increase more slowly and has historically been much more stable in price over the past two decades than fossil fuels.



# Roadmap Decision Tree



# ***Biomass Project Evaluation***

---

- *Project Characteristics*
- *Building Information*
- *Existing Fuel Use*
- *Existing Heat & Distribution System*
- *Biomass Energy System*
- *Biomass Fuel*
- *Emissions, Permitting & Air Quality*



► Project Characteristics

► Building Information

► Existing Fuel Use

► Existing Heating and Distribution System

► Biomass Energy System

► Biomass Fuel

► Emissions, Permitting, and Air Quality

## ► EVALUATE A BIOMASS PROJECT 1

### P1. Project Characteristics

Biomass energy systems can be used at multiple scales and in multiple types of projects. The *Roadmap* will help communities understand the characteristics of biomass energy systems for a single building, multiple buildings with individual biomass boilers, and district heat systems (one heating plant for multiple buildings).

**NOTE:** Combined heat and power (CHP) projects are found to be not as cost effective as the heating only projects with the present policy and incentives framework. It is recommended that the community should consider heating projects initially. The *Roadmap* does not analyze CHP projects. If the community continues to be interested in a CHP system, this can be evaluated in the pre-feasibility study (see ► **Next Steps**). For more information on CHP, see ► **Appendix B Combined Heat and Power**.

#### IN THIS SECTION

- P1a. Selecting a Project
- P1b. Biomass Heat for a Single Building
- P1c. Building Ownership (Single Building)
- P1d. Biomass Heat for Multiple Buildings
- P1e. Defining a Multi-Building Area for District Heating System
- P1f. Community District Projects
- P1g. Campus / Multi-Building Projects with Single Owner
- P1h. Identifying your Multi-Building Area – Anchor Loads
- P1i. Building Ownership (District / Campus Heat)
- P1j. Heating and Cooling / Chilling Projects

## Next Steps

Following completion of the *Roadmap*, if you determine that your community has a biomass project that is likely to be viable and wish to move toward implementation, a range of public outreach and education, community capacity, technical work, financing, and logistical issues will need to be addressed. In this section, these major categories of implementation are outlined. Communities will need internal capacity and staffing and one or more development partners to move forward effectively.

### IN THIS SECTION

- NS1. Pre-Feasibility Study and Fuel Supply Assessment**
- NS2. Resource Assessment**
- NS3. Community Outreach & Education**
- NS4. Formal Commitment and Leadership Entity**
- NS5. Development Partners**
- NS6. Financing**
- NS7. Selection of Engineers and Vendors**

### *Additional Implementation Considerations for District Heating System*

- NS8. Ownership Model for District Heating System**
- NS9. Community Outreach & Subscription Process for District Heating System**



# *Community* **Roadmap**

---

*At the end of the journey, a community will have a pretty good idea of whether it makes sense to pursue one or more biomass projects.*