



UNIVERSITY of NEW HAMPSHIRE
COOPERATIVE EXTENSION

Wood Energy in NH

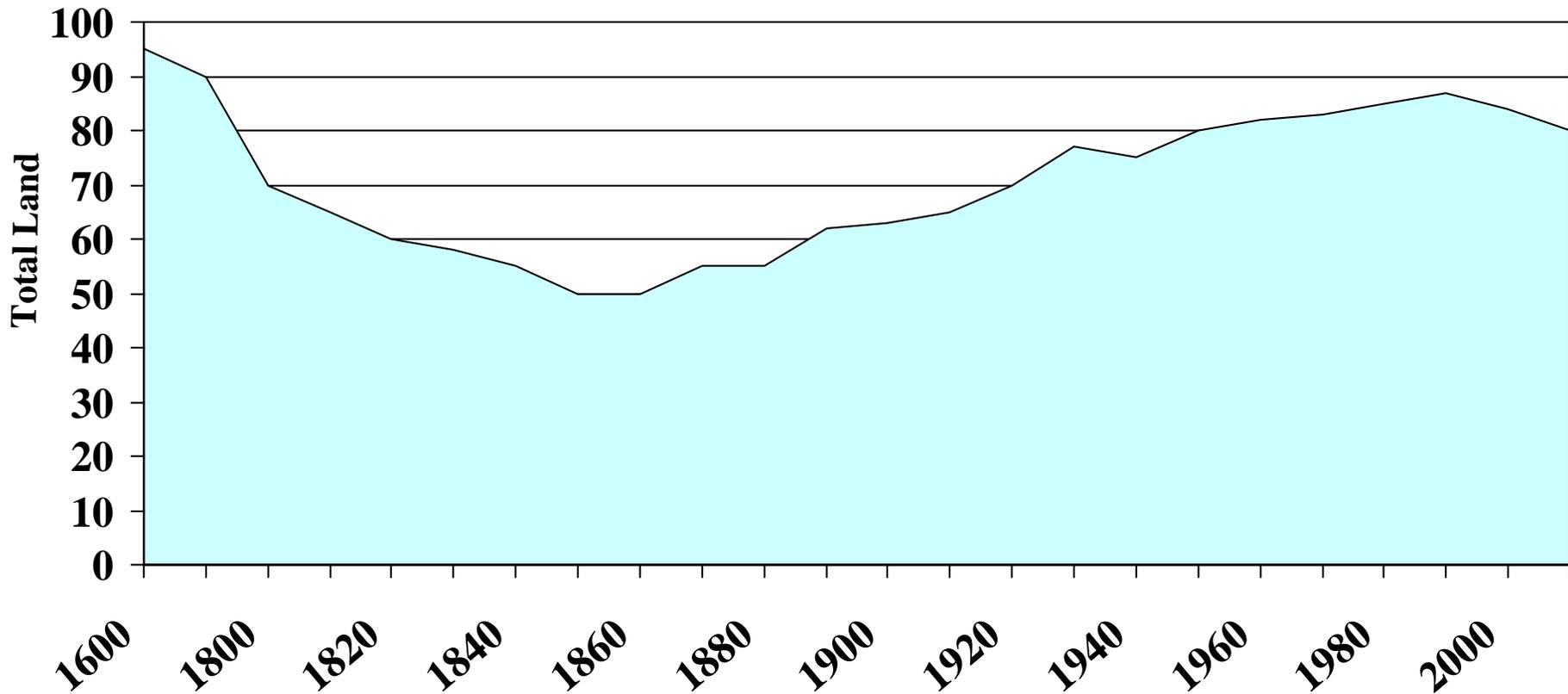
Community
Roadmap
to Renewable
Woody Biomass Energy

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

New Hampshire is 84% Forested



Trend of Forest Land Cover in New Hampshire 1600-2010



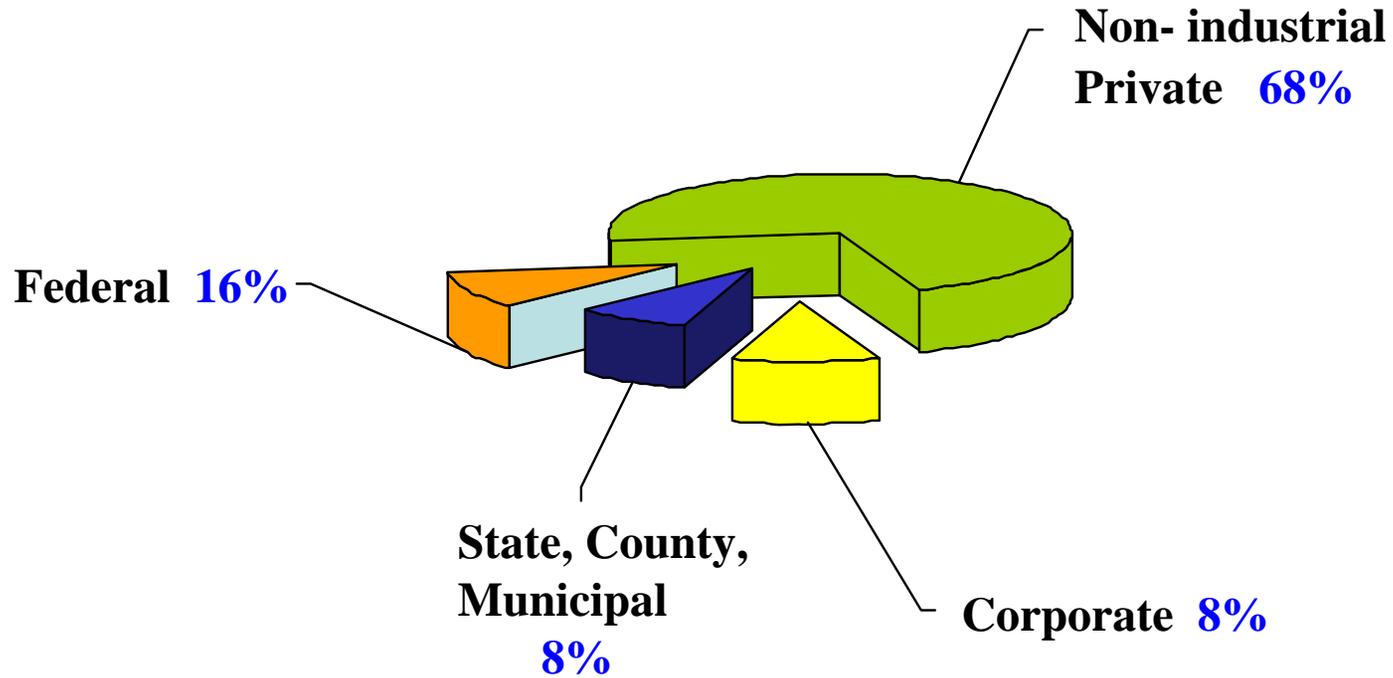
Source: UNH Cooperative Extension







New Hampshire Forest Ownership



Source: USDA Forest Service



KEEP CLEAR
20 FEET
MINIMUM

KEEP CLEAR
20 FEET
MINIMUM

4250

Products from the Timber Harvest

- Logs

Veneer Logs

Sawlogs

Pallet Logs

Pulpwood (\$2-4/ton)

Firewood

- Chips

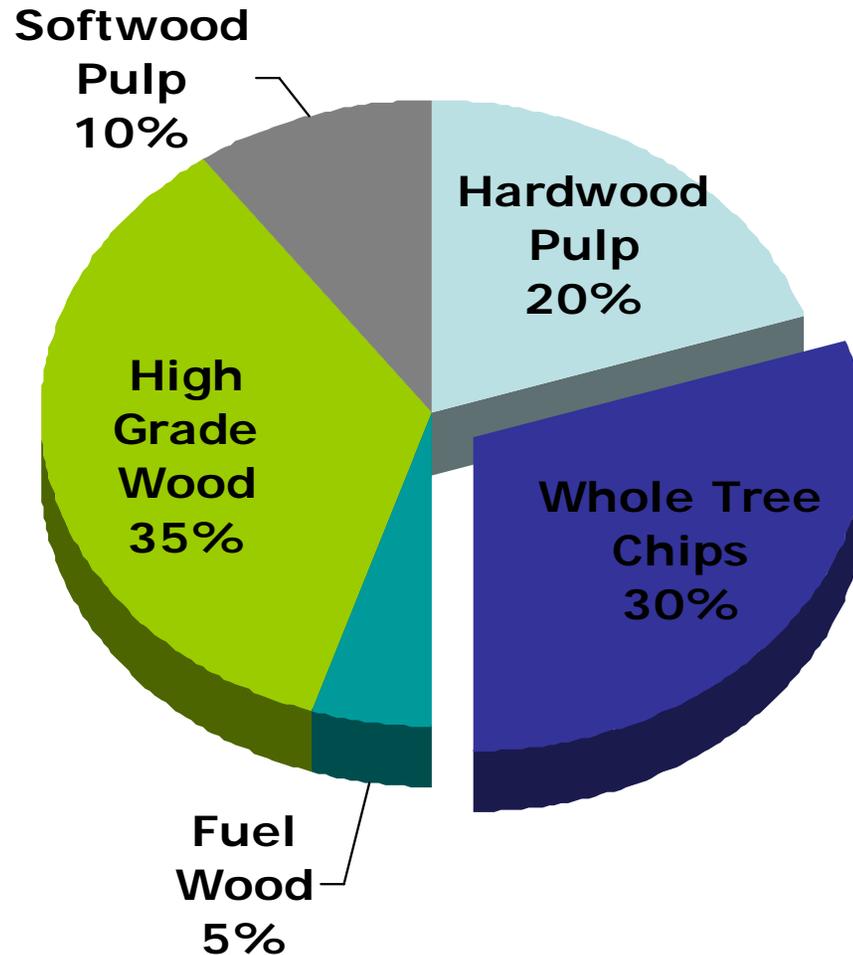
Pulp grade chips - clean chip, no bark or branches

Biomass chips: (stumpage \$1-2/ton)

Whole-tree - contains bark, branches, leaf matter

Bole - contains bark, only bole of the tree

Products from the Forest



2008 Harvest Information

County	Harvest #	Whole Tree Chips Tons	Pulpwood Tons	Fuelwood Tons	Sawlogs 1000 board ft.
Belknap	230	61,530	35,025	6,677	10,212
Carroll	394	138,775	115,222	6,833	22,790
Cheshire	313	51,825	47,820	12,578	15,566
Coos	350	187,105	429,385	9,583	63,122
Grafton	602	198,413	165,944	14,733	29,827
Hillsboro	324	83,906	25,697	9,583	22,613
Merrimack	432	157,102	55,960	14,601	22,339
Rockingham	244	82,677	17,063	6,769	10,087
Strafford	167	45,685	32,266	4,620	7,344
Sullivan	238	111,924	48,999	9,589	17,408
Totals	3296	1,118,942	973,381	125,917	221,308

Information source: NH Dept. of Revenue Administration

Number of Harvests per County

County	2000	2002	2004	2006	2008
Belknap	244	213	202	192	230
Carroll	436	349	372	322	394
Cheshire	355	321	339	306	313
Coos	379	313	367	314	350
Grafton	667	533	597	521	602
Hillsboro	497	378	377	375	324
Merrimack	571	484	494	441	432
Rockingham	262	248	251	207	244
Strafford	172	112	145	113	167
Sullivan	264	258	283	238	238
Total	3847	3209	3427	3056	3296

Source: NH Dept. of Revenue Administration



NH's Wood to Energy Plants

<u>Plant</u>	<u>MW</u>	<u>Tons</u>
Alexandria	15	225,000
Hemphill, Springfield	13.8	208,000
Bridgewater, Bridgewater	15	229,000
Pinetree, Tamworth	20	286,000
Pinetree, Bethlehem	15	227,000
Whitefield, Whitefield	13.8	187,000
PSNH, Portsmouth	50	450,000
	143	1,812,000 Tons

Nearby:

Rygate Power, Rygate VT	20	250,000
Sappi, Westbrook, ME		400,000

Other low-grade wood consumers:

New England Wood Pellet		150,000
Paper chip producers (4 stand alone)		600,000





35











BROCK

RESERVED
PARKING


RESERVED
PARKING


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

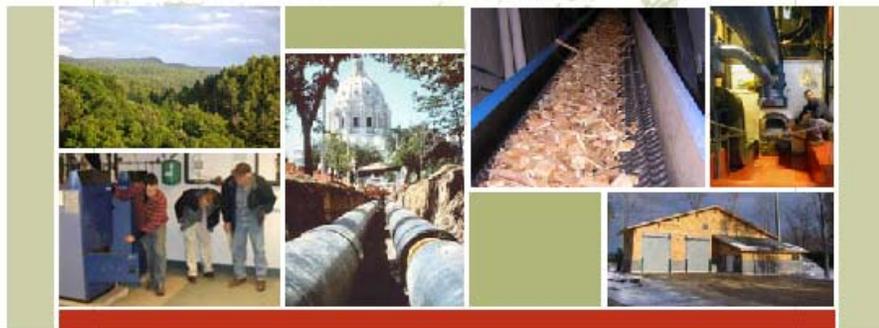


The Roadmap is a decision-making tool to help communities decide if woody biomass heating/cooling is a good choice for their energy future.

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**

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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:

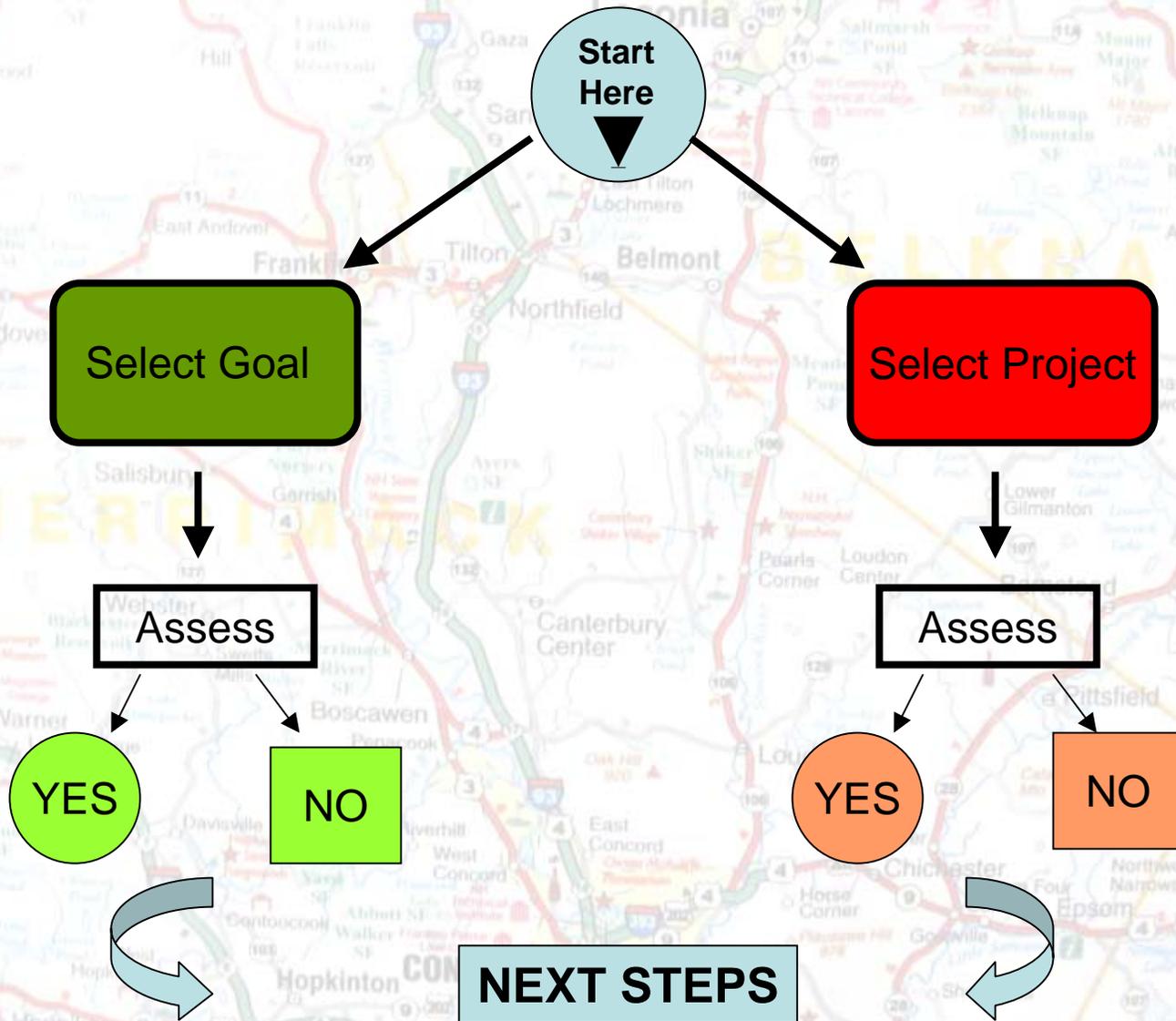
- 1. Establish community goals***
- 2. Evaluate a biomass project***

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*

► 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

► 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



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

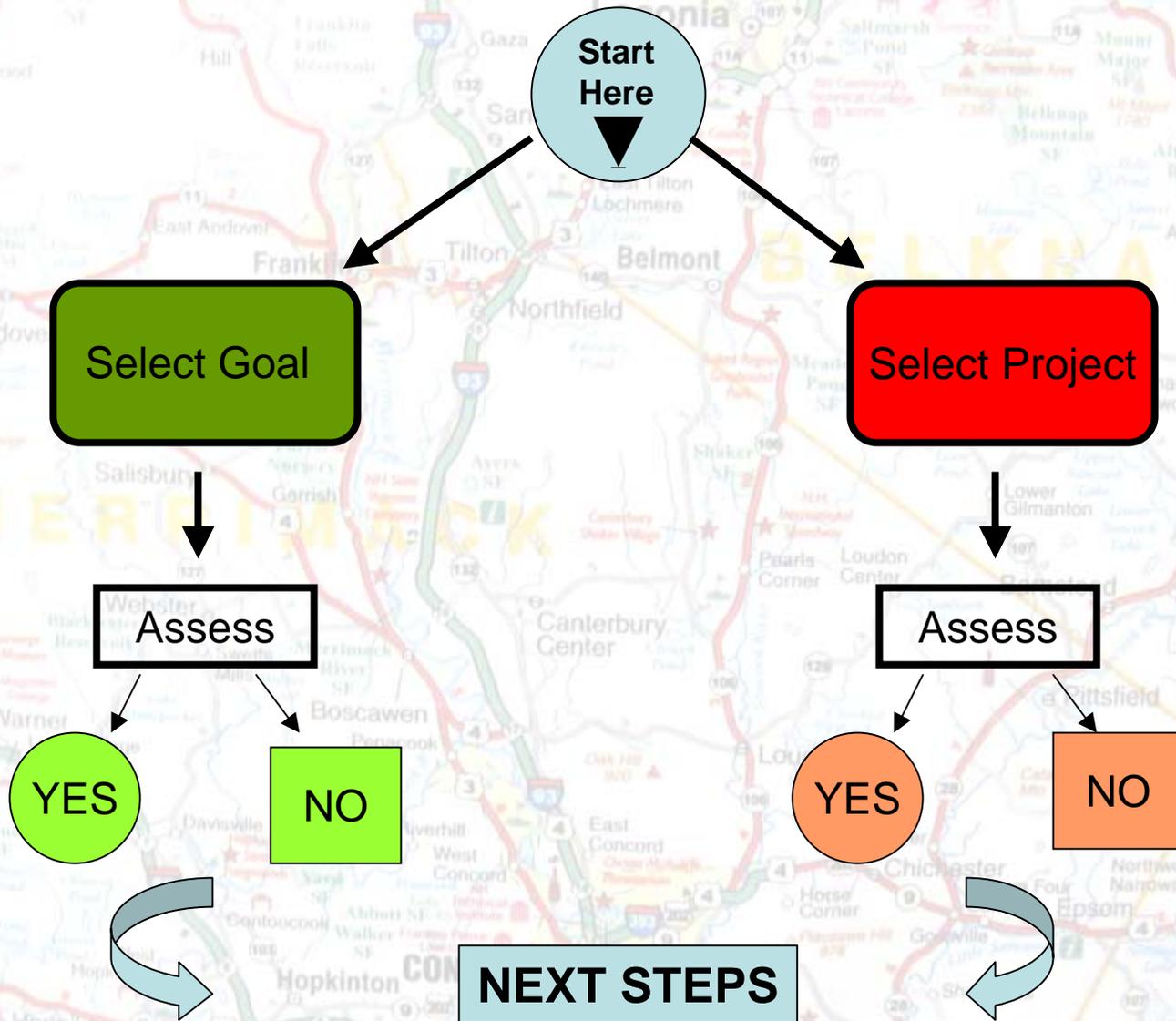
Complete the summary table below with information from preceding tables in section G1. (Columns with the shaded background in preceding tables show which information should be transferred to the summary table.)

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.