Biomass Combined Heat and Power

An Outreach and Education Strategy For Vermont Hospitals

Prepared by

The Northeast Regional Biomass Program
and
Richmond Energy Associates

For the Vermont Agency of Natural Resources
Department of Forests, Parks and Recreation

July 31, 2007

Disclaimer: This report was prepared under a Cooperative Agreement (# F-CNGPRC07-15) between the Vermont Department of Forests, Parks and Recreation, and the CONEG Policy Research Center, Inc. The comments and views expressed do not necessarily reflect the views or opinions of the State of Vermont, its agencies, or the Center.

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Preface and Acknowledgements

This report provides the insights, findings and recommendations of a study undertaken at the request of the Vermont Department of Forest, Parks and Recreation to examine whether greater use of biomass resources by Vermont's small, rural general hospitals might create an important new demand for biomass fuel in Vermont and an expanded market for low-value wood residues. In order to answer this question, another question had to be asked and addressed: Will small, rural general hospitals consider converting to biomass combined heat and power (BCHP) systems; and if so, under what conditions? The Department also posed a third question: if BCHP systems appear technically and economically feasible for small, rural general hospitals, what type of information and outreach will help hospital officials – board members, administrative executives and facilities managers – best assess the immediate and longer-term implications of greater use of biomass energy in a hospital setting?

The study was conducted by a project team composed of Rick Handley, Director of the Northeast Regional Biomass Program (NRBP*), and Jeff Forward, President of Richmond Energy Associates. Both Mr. Handley and Mr. Forward are acknowledged nationally as biomass experts. Together, they have nearly forty years of experience in the technical, policy, wood supply and procurement infrastructure, and biomass resource issues related to biomass thermal and combined heat and power applications.

The approach selected to address the questions posed above had three core elements:

- A case study to document the actual experiences of one Vermont hospital, the North Country Hospital (NCH), which has installed a BCHP system. As a first-of-its-kind project in Vermont, documentation of the technical benefits and hurdles represented by this demonstration project is important if future projects are to build successfully on the North Country Hospital's experience.
- Interviews with administrative and facilities staff at similarly-sized Vermont hospitals to determine their awareness of and willingness to consider BCHP system.
- General research on the potential type and magnitude of energy and related economic impacts of BCHP for small, rural general hospitals in New England.
- The project team undertook parallel and coordinated activities to develop the BCHP case study and investigate the broader question of hospital potential managers' interest in BCHP systems.

- Richmond Energy conducted multiple interviews with current and former NCH employees, and also undertook site visits at the hospital to document and analyze the process undertaken by the hospital to acquire, install, and operate the BCHP system. Richmond Energy compared the actual experience at NCH with optimal model combined heat and power (CHP) and conducted interviews with CHP experts to determine how the North Country demonstration project could be replicated and/or improved.

- NRBP staff conducted on-site interviews with ten hospital staff at five Vermont hospitals. Staff includes hospital administrators, chief fiscal officers, and facility engineers/managers. Interview questions were developed to identify how managers at small, rural general hospitals generally make decisions on expansion and renovation, staff's current knowledge of biomass and BCHP, any issues related to capital access, and the value of collateral benefits that might be important in selecting BCHP.

The Center wishes to thank the many individuals at the North Country Hospital who so willingly shared their time, expertise and knowledge on the many technical, financial and institutional decisions that resulted in the successful BCHP project. Thanks also go to the many un-named individuals at other Vermont hospitals whose insights on hospital decision-making helped inform the findings and recommendations of this report. However, the findings and recommendations are the sole responsibility of the project team.

The Center is grateful to the Vermont Association Hospitals and Health Systems and particularly, Megan Castongauy, Director of External Affairs, for a letter of introduction to the hospitals that aided the interview process. Finally, the hospital interviews and report production would not have been possible without the assistance of Gretchen Reeser, Energy Research Assistant, and Tom Critzer, Office Manager, of the CONEG Policy Research Center.

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* The Northeast Regional Biomass Program is administered by the CONEG Policy Research Center, Inc.

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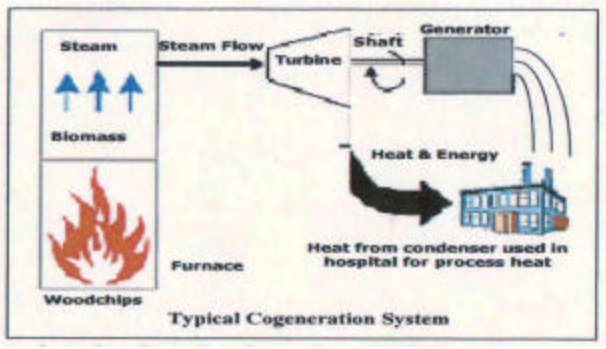
Introduction

In 2002, the North Country Hospital (NCH) in Newport, Vermont implemented a plan to install a biomass cogeneration system. The biomass system has created interest among biomass proponents in Vermont, particularly at the Department of Forests, Parks and Recreation (DFPR), as a potential element in "The Vermont Model." This model seeks to expand forest management and the health and sustainability of Vermont's forests through a number of actions, including the use of low-value wood residues and forest thinnings for energy. Combined heat and power (CHP) systems such as the one at North Country Hospital could create an important new demand for biomass fuel in Vermont and an expanded market for low-value wood residues.

Combined heat and power, or cogeneration, is the on-site generation of electricity and the recovery of useable heat from that generation. The recovered heat is used for space heating, cooling, cooking, cleaning or other uses. By design CHP is intended to improve energy efficiency, reduce total emissions, and save money for a facility. Federal agencies such as the U.S. Department of Energy and the U.S. Environmental Protection Agency have long stated that hospitals are excellent candidate sites for CHP due to their 24/7/365 operation and demand for electricity and thermal energy. Logically, biomass CHP (BCHP) would result in similar energy, economic and environmental benefits to hospitals and create additional forest and community benefits by increasing market-based incentives for forest management and creating local jobs.



This project had three related objectives: first, document the process by which the North Country Hospital implemented its BCHP; second, interview other Vermont hospitals to understand the "drivers" and hurdles to BCHP; and third, develop an outreach and education

strategy that can address key questions about BCHP in a small, rural general hospital setting and can be delivered in the most effective manner.

This project was intentionally limited to small, rural general hospitals. Large general hospitals, such as Fletcher Allen Health Care (Fletcher Allen) or Rutland Hospital, could use BCHP technology but, because of their size and location in urban areas, these larger hospitals would require very specific assessments. This project hypothesized that small, rural general hospitals are likely to share similar characteristics regarding interest in and feasibility of BCHP and benefit from a generalized outreach and education program. Underlying the project was an unstated question: Would BCHP help lower operation costs for small, rural general hospitals and contribute to their long-term viability?

A successful biomass combined heat and power project at one rural Vermont hospital is not – by itself – sufficient to create interest and demand from other hospitals for additional BCHP projects. A successful BCHP project should be complemented by relevant information targeted to the key hospital decision-makers in the appropriate context. An effective outreach strategy must address the most important questions and concerns of the target audience (small, rural general hospitals), and the outreach campaign must be delivered in an assessable and accepted forum or format.

Hospital Interviews: Insights on the Challenges

The hospital interviews were designed to better understand how hospital staff make capital investment decisions; the importance of energy costs relative to the overall budget; the knowledge and interest of hospital staff in BCHP; trusted sources of information for these hospitals; methods used by hospitals to finance capital projects; and other external forces that could affect decisions relative to a BCHP system.

All Vermont hospitals are non-profit corporations and each has a board of directors drawn from the surrounding community. Based on the interviews, hospital boards at small, rural hospitals appear to weigh heavily the recommendation of the hospital administrator. Within each hospital, a team approach to working cooperatively on assessing capital projects was evident. All staff (administrators and facility managers) seems to recognize and appreciate how difficult it is to raise capital and the need to make hard decisions – "if it isn't broke, we can wait to fix it."

Competing Demands for Capital Investment

Although none of the five hospitals appear to have a defined strategic plan or timetable for expansion, each indicated a need to expand facilities to support new patient services. Expanding patient services is seen as a key to long-term viability of the hospital. These expansions include adding conditioned (heat and cooling) space, improving efficiency, and obtaining new equipment and services such as long-term care and rehabilitation services. Space is needed for outpatient services, long-term care, diagnostic services, and specialty services (e.g., dialysis, chemotherapy, and rehabilitation centers), as well as additional patient rooms. Older hospitals that had double or quad rooms are changing to private rooms to accommodate the expectations of today's hospital patient. One hospital official said, "Today's patient wants a hotel room with medical

care." In the context of these expansions, will the hospital administrators and facility managers consider biomass combined heat and power?

While BCHP systems may save significant energy dollars for hospitals, these systems are capital intensive. Funds must be invested upfront in equipment to achieve long-term energy savings and price stability, but small, rural hospitals do not have access to large amounts of cash. Funding is received through payments for treatment, community fund-raising, and bonds. Large capital projects, such as a major expansion or a new BCHP system, would most likely be bonded. Vermont hospitals have access to funds from a pool of bonds which reduces transaction costs, but with very thin "profit margins," they are reluctant to go into debt.

No hospital can develop, or have developed on its behalf, a new health care project without issuance of a Certificate of Need (CON) by the Commissioner of the Department of Banking, Insurance, Securities, and Health Care Administration. The CON is required for any construction, development, purchase, renovation, or other establishment of a health facility, or any capital expenditure by or on behalf of a health care facility, for which the capital expenditure exceeds $1,500,000. Typical BCHP projects that would include new boiler, steam turbine, generator, and new buildings to house the equipment and fuel storage, would exceed $1,500,000 threshold for a CON.

Energy and Environmental Benefits

If hospitals can realize broader benefits, as well as energy savings from BCHP, what impact does this information have on the administrator/board's interest and decisions? Several additional benefits of BCHP were described in the interviews to assess whether hospital management would factor in such perceived benefits as increased energy reliability and security, demand management and reduction, local economic impacts, reduced greenhouse gas emissions (GHG), and community and staff interest in "green" initiatives. All the hospital staff interviewed

indicated a commitment to renewable energy and environmental improvement. As community hospitals, they expressed a need to reflect the values of the community, but this value is tempered with the reality of cost. The broader community and hospital staff appear to influence the level of interest in renewable energy and reduced greenhouses gases. Each hospital had some program to reduce toxics (such as mercury) and, where possible, to incorporate efficiency projects (efficiency received mixed support). One hospital administrator remarked that the return on efficiency programs from Efficiency Vermont was less than what the hospital paid in assessment on their utility bills. Another hospital administrator commented that the method for hospital reimbursement does not reward efficiency. Another countered that efficiency is important in demonstrating the hospital's commitment to keeping costs down. Most of those interviewed indicated a desire to support community enterprise and to purchase products locally when practical. This interest did not reflect an awareness of the potential for job creation associated with BCHP.

Staff at the five hospitals were aware of the North Country Hospital biomass project, but this awareness of biomass as a fuel does not appear to translate directly into interest in BCHP. However, one hospital has been actively considering BCHP for at least two years. Most of those interviewed did not consider on-site electric generation or interconnection as a "show-stopper." Typical biomass issues did come up, such as fuel storage, truck traffic, maintenance, and emissions. Air quality permits and the views of Vermont's air quality regulators also were raised. Larger hospitals must file an annual emissions budget with the State and pay fees based on their air emissions. At least one hospital was concerned that biomass fuels, and specifically particulate emissions, would cause a significant increase in fees. [Note: Any source of emissions that generates greater than five tons of emissions per year is required to submit an annual accounting and fees are paid to the State based on this accounting.]

The ability to operate the hospital off the grid for a long period of time was attractive to some hospitals and not to others. One official commented on the need to care for all the acute health

care needs of the community, particularly if services at larger hospitals (such as Fletcher Allen or the Dartmouth Medical Center) were unavailable. Another stated, "We would never experience a protracted outage of power because we are on a main road." However, the ability to generate electricity and to participate in utility-sponsored demand reduction programs through Central Vermont Public Service (CVPS) were viewed as positive. It should be noted that a BCHP system that can function independent of the grid is more costly than a system that operates in tandem. Due to wood storage space constraints, hospital BCHP systems would typically be able to operate approximately one week, and would also be dependent on trucks (passable roads and diesel fuel) for continued supply.

Vermont hospitals use primarily fuel oil and propane. Only two counties in Vermont have natural gas. All of the hospitals in this study have diesel generators for emergency back-up. Those that use propane as a boiler fuel have separate storage for diesel fuel for the emergency generator. The hospitals that use fuel oil for boilers could tie-in the boiler fuel to run the diesel generator in an emergency. The "front end" of biomass systems – biomass availability, storage handling and truck traffic – prompted most of the questions. Hospital staff also questioned how state air quality regulators would evaluate BCHP and whether biomass would impact emission budgets and payments.

To better understand how to design and deliver a BCHP outreach and education program, hospital staff were asked how they currently get technical and policy information. Technical, financial and policy information is obtained in a variety of ways. Hospital administrators meet monthly in a forum through the Vermont Association of Hospitals and Health Systems (VAHHS). This forum could be an appropriate vehicle to introduce general information on the benefits of biomass cogeneration, but it is not designed for technical issues. A number of sources provide technical information related to buildings and technology. To varying degrees, these include trusted consultants, such as architect and engineering firms, as well as contractors for information on building upgrades, new construction, and equipment. Many of the hospital

facility personnel are members of such organizations as Vermont Health Care Engineers Society www.vhes.org and the New England Health Care Engineers www.nehes.org.

The North Country Hospital Interviews and Site Visit

In 2002, NCH undertook a significant redevelopment project that added 28,614 square feet of conditioned space. NCH originally proposed a heating plant upgrade that included BCHP equipment, but the State Health Care Authority indicated the overall project was too expensive and encouraged the hospital to explore for ways to scale back the project. To reduce costs, the hospital dropped the biomass project and went ahead with the original addition. However, the addition incorporated an oversized boiler room that could accommodate future biomass equipment, and a location where a chip storage bin (with adequate truck access), could be built adjacent to the oversized boiler room.

In 2005, the hospital installed a wood-chip boiler, steam turbine, and generator. The cost (less than $1,500,000) did not require a state Certificate of Need (CON). If the cost had been higher, or had been part of a larger more expensive renovation, a CON would have been necessary. The project also did not need an Act 250 permit since it was considered a modification of an existing mechanical system rather than a new project. The new biomass boiler did require an air quality permit from the Agency of Natural Resources Air Quality Division. The hospital has retained two of its existing oil boilers as back-up to the biomass boiler, and these existing oil boilers operate about an hour a day. This allows adequate time to service the biomass boiler and keeps the fuel oil boilers in good operating condition.

In the initial plan, two 200 boiler horsepower (BHP) wood-chip boilers were to be installed in separate locations, leaving one oil-fired 200 BHP boiler as back-up and for supplemental heat. However, hospital staff determined that it would be too expensive to have two decentralized wood-chip boilers. The final decision was to keep one relatively new 200 BHP oil-fired boiler; add a new 500 BHP wood-chip-fired boiler in a new boiler room; and continue to use a 30 year

old 250 BHP oil-fired boiler in a remote boiler room. The wood-chip boiler carries 90-95 percent of the hospital's year-round heat load. The oil boilers provide back-up – a critical capability since a hospital must have 100 percent redundancy.

The 500 BHP wood-chip boiler is significantly oversized for the NCH facility. Since the hospital wanted 100 percent redundancy and maximum electrical production, the wood-chip boiler was sized to be equivalent to the existing oil-fired capacity, and the turbine was sized for the maximum output of the wood-chip boiler. However, the wood-chip boiler has not yet reached maximum capacity. This size boiler is capable of producing 12,000 pounds per hour (pph) of steam and operates most efficiently at 10,000 – 12,000 pph. However, NCH typically runs the boiler at around 3,000-5,000 pph of steam in the winter (depending on heat load) and it runs 6,000-8,000 pph in the summer (depending on the cooling load from the absorption chiller). An alternative and possibly more efficient system would have been one 250 BHP wood-chip boiler and a turbine sized to the output of the smaller boiler. This could have saved in equipment costs and the wood-chip boiler would have operated closer to its peak efficiency more frequently.

The NCH cogeneration system was designed to run the boiler at maximum output, produce as much electricity as possible, and reject the excess heat with a rooftop heat exchanger fan unit. When the cogeneration system became operational, the boiler consumed substantial additional fuel with only a marginal gain in electrical production. When the rooftop heat exchanger unit failed soon after start-up, hospital staff decided against replacing it and instead, changed how the system is operated. In its current configuration, the turbine and electric generator only operate when steam demand is adequate. At 3,000 lbs of steam, the turbine will only put out 30-40 KW of electrical capacity. The highest steam demand occurs in the summer to run an absorption chiller. During a site visit last winter, the project team observed that on a cold Vermont winter day (about -5 degrees Fahrenheit), the boiler was only operating at about 3,800 lbs of steam per

hour. On a warm summer day visit, the boiler was observed operating at over 7,000 lbs of steam. At 7,000 lbs of steam the turbine will produce over 100-150 KW.

In 2005, when an aging central electric chiller plant needed replacement, the decision to consider the absorption chiller technology was easy, since the hospital had considerable excess steam capacity in the biomass boiler. The $578,000 investment in the absorption chiller was considered as a normal equipment replacement project rather than a fuel switch. The switch in chiller technology – made possible by the ready availability of steam – is expected to generate an annual savings on $68,000 in cooling costs. The hospital is in the process of evaluating additional steam loads that may be added to the wood chip boiler, such as sterilizer equipment and dryers in the laundry facility. However, staff does not want to sacrifice operational efficiencies for the sake of energy savings. For example, if converting the dryers to steam increases the drying time, then their interest declines. Staff is considering an experiment to convert one dryer to determine the operational impact before switching other dryers.

Staffing requirements must also be factored into consideration of a BCHP system. Well-trained and experienced staff is important, even though the State apparently does not require a stationary engineer to operate a high-pressure boiler. North Country Hospital acted as its own general contractor when installing the biomass cogeneration system, and used hospital personnel to oversee construction. The first year of operation required a full time technically competent person to work out initial system shakedown issues. In the cost/savings analysis developed as part of the initial project evaluation, $45,000 was budgeted for a full time master plumber. However, in the second heating season, the system has been on-line, and the time required to oversee its operation has been reduced to 0.5-0.75 full-time equivalent position.

North Country Hospital works very hard to keep the BCHP system working to its maximum potential. The CHP and the absorption chiller system are more complex than a heat-only system, but these elements also add significantly to the savings. The system's vital functions are checked

frequently to ensure that it is operating efficiently, cleanly and at capacity. With a trained experienced person responsible for overseeing daily operation, maximum output from the system is anticipated. Based on this project and interviews with CHP experts, the project team concludes that a biomass-fueled steam turbine cogeneration system does not add significant additional staffing costs over an oil, propane or natural gas steam system. In addition, based on the interviews with multiple hospitals, the project team also concludes that hospital engineering staff is typically very comfortable with on-site electric production and operation of large steam boilers.

The original expectations for NCH wood fuel procurement and costs turned out to be incorrect but not fatal to the economics of the project. Hospital officials expected a secondary wood products mill, located virtually across the street from the hospital, to be the primary supplier of wood fuel. With minimal transportation costs, wood fuel costs were expected to be very low (e.g., $10/ton). In reality, the hospital must obtain its fuel from a variety of sources, and it has been unable to obtain a firm multi-year contract for chip delivery from any supplier. As a result, supply issues occur frequently. Several truckloads are used weekly and multiple phone calls may be needed to find adequate supply at any given time. Most truckers prefer a fixed price contract, so the hospital found it was much easier to pay a fixed price per truckload. Variable cost contracts (with separate trucking fees and weight costs) were less expensive, but harder to manage. The hospital also perceives a tradeoff between chip quality and overall cost management. The higher quality chip ensures less maintenance on the boiler, but it typically costs more. Staff has decided to use a lower quality chip and spend more staff time on maintenance.

Wood fuel costs have been much higher than originally projected (up to $40/ton). During the same period of rising wood fuel prices, fuel oil prices increased from $1.00/ gallon to over $2.00/gallon. However, while wood fuel prices have increased at a faster rate than oil, the

hospital actually experienced an increase in the net present value of the project, since the cost of wood on a Btu basis is much lower than oil.

Based on their experience, NCH facility managers have developed insights on characteristics of effective supply and management systems. For example, a standard chip specification that includes moisture content, species, and other characteristics would be helpful. The biomass wood-chip boiler should be designed with a wood supply in mind, and the operator should be prepared to develop a strategic system to manage the wood supply for cost and steady supply. Biomass users could benefit from assistance in managing the wood chip fuel supply market. A satellite chip depot might help with supply issues.

The NCH system would have benefited from greater automation and a better control and data collection system that could support operational decisions based on real time data. A data management system was installed in 2006; a year after the wood chip system became operational. However, this system, which provides modest trending data, is only a marginally useful tool for maximizing energy production and savings. At this point, significant costs would be incurred to upgrade the current software.

Findings and Recommendations

This project was designed to examine three hypotheses:

1. Small, rural general hospitals may be a distinct subset in the Vermont biofuels market – if BCHP systems can be shown to provide economic and related benefits to the hospital and the larger community which it serves.

2. If BCHP can be shown to lower overall operational costs for this type of hospital in Vermont, these systems may contribute to the long-term viability of these community hospitals.

3. If small, rural general hospitals share sufficiently similar management, costs and decision-making characteristics, then a carefully designed general education and outreach program on BCHP may be effective with this category of potential biomass users (i.e., a specific outreach-education program would not have to be designed for each individual hospital).

Findings: A Potential Biomass Market Opportunity

This assessment did not find that lower-cost biomass fuels are likely to contribute to the North Country Hospital's long-term viability. However, it has yielded several insights that suggest the conditions under which small, rural general hospitals might convert to biomass-based energy systems. These findings provide the insights for the project teams' recommendations.

Link Between Hospital Expansion and Operational-Economic Viability of BCHP:
The NCH case study suggests an important link between hospital expansion and the operational and economic viability of BCHP in these facilities. Expansion typically means new equipment

and new conditioned space, with additional or replacement boilers and expanded powerhouses. In short, the replacement and/or expansion process is an ideal opportunity to implement BCHP systems.

Elements for Successful Candidate Sites: Hospitals are typically considered nearly ideal sites for cogeneration due to their thermal and electrical load and 24/7/365 operations. However, this study finds that a number of other factors can influence the likelihood of hospital officials' interest in biomass based energy systems and a successful conversion. These additional factors (described in Appendix C), include plans for facility renovation or expansion, existing fuel use, site configuration, access to wood fuel, facilities staff competencies, access to affordable capital, and a strong internal champion knowledgeable about the biomass systems and its benefits.

Informational Assistance to Hospital Officials: This study suggests that hospital officials will need ready access to information on BCHP technical, policy, and wood supply and procurement infrastructure issues that is appropriate to the specific operational and facility design characteristics of these facilities. They will also benefit from insights on how BCHP systems relate to the health-care and environmental regulatory environment in which they operate. Any outreach program should guide a hospital in weighing the barriers relative to the long-term benefits when determining if BCHP is an investment that will pay dividends for the specific facility.

A General Education-Outreach Program Is Feasible for Vermont's Small, Rural Hospitals

Most of the small, rural general hospitals in Vermont share commonalities that make a general outreach on BCHP possible. Nearly all the hospitals meet the minimum requirements for candidate sites; are considering expansion of services and facilities; have a desire to control costs; and reflect the community's interest in renewable energy. In addition small rural general hospitals do not have large engineering staffs, and are accustomed to seeking technical guidance from trusted advisors outside their respective facilities. An appropriately structured outreach

program that includes technical, policy, and financial information could be beneficial to nearly all rural general hospitals in the State.

BCHP Systems for Vermont's Small Rural Hospitals Have Potential for Energy Savings and Biomass Market Opportunity. At least two of the five hospitals in this study expressed serious interest in BCHP, and (as noted above), nearly all of Vermont's rural hospitals meet the minimum requirements as candidates for BCHP. If hospital officials at these hospitals were to receive appropriate informational assistance on technical, policy, and wood supply and procurement infrastructure support, it is conceivable that up to five hospitals might implement BCHP over the next five years. If this switch to BCHP should occur, the resulting conversion from fossil energy to renewable biomass could save 1,000,000 gallons of fuel oil, 3,165,000 KWh of electricity, and create a market for 15,000 to 20,000 tons of wood chips annually. Such savings in fuel oil and expanded market for low-value wood are equivalent to Vermont's current school wood energy program, a successful program that has taken nearly twenty years and significant public financial support to develop. The potential fuel savings that could be generated by five small, rural general hospitals switching to BCHP is nearly equivalent to the 1.3 million gallons of fuel oil displaced by the State of Vermont through its current use of wood and biodiesel.

Recommendations

Based on the hospital interviews[1], the project team considered several potential outreach and education options.

[1] Hospital interviews focused on current level of interest in BCHP, method of obtaining technical information related to facilities operations, project financing, and the collateral benefits of BCHP, such as providing reliability and security.

- A single one-time outreach, such as a presentation by CHP experts at an existing forum of hospital engineers or administrators, is not likely to be adequate for both the range and specificity of information needed.

- A website with appropriate information may be an easy, efficient way to deliver information, but is not likely to be effective with hospital officials, and is therefore not recommended. Hospital officials indicated that web-based information was like "drinking from a fire hose."

- Hospital officials – administrators and facility managers/engineers – are most likely to benefit from comprehensive and on-going support in several areas. These include:

    - An objective source of technical information on such topics as system layout, procurement, performance, equipment options, and operational requirements;
    - Information on a range of financing options, including bonds, available sources of renewable energy funding, municipal leasing, and "off-budget" financing such as third party build-own-operate companies;
    - A cohesive state policy or strategy that can cut across multiple state agencies to address related programs dealing with health care, energy reliability and security, the environment, and economic development; and
    - State initiatives for the development of a reliable wood fuel supply infrastructure.

A Proposed Outreach Plan

The Project team proposed the following multi-phased outreach plan.

Coordinated State Policy and Regulatory Voice: The Department of Forest, Parks and Recreation (DFPR) should seek the creation – at the highest possible level within state

government – of a state working group whose members are drawn from all relevant state agencies that have a potential role in regulating or approving a hospital biomass-energy project. While DFPR may initiate this working group, its creation and mission statement could result from a gubernatorial initiative or an interagency Memorandum of Understanding to ensure that all appropriate agencies participate as full partners. The working group could ultimately could be led by another agency or possibly be led by a designee from the Governor's office. The working group should be tasked to evaluate potential state actions that can encourage adoption of BCHP in hospitals while simultaneously meeting the needs and objectives of both the hospitals and state agencies. One potential focus for the working group is the full range of emissions impacts of BCHP, including the reduction in greenhouse gases and the improved efficiency of BCHP that might be credited to emission fees. The working group could address the potential benefits of demand reduction and load shedding attributed to on-site, non-diesel generation, power generation in transmission-constrained areas, energy security and diversity benefits, and economic development benefits.

Continuous Source of Technical Information: DFPR, as the leader on biomass energy use in state government, should consider establishing a point of contact (POC) that has the capability to provide preliminary and accurate information that addresses the range of questions on BCHP that are likely to arise as Vermont hospitals become more aware of the potential for biomass energy. Many of these questions are simple and preliminary in nature and can be readily answered. Others may be more complex and require more detailed follow-up or referral to other resources. Failure to address questions in a timely and technically adequate manner could delay or discourage hospital officials' interest in biomass.

Hospital officials currently rely upon other hospitals (through the respective professional associations), contractors, or architectural and engineering (A&E) firms. However, since BCHP is a distinct subset of combined heat and power, reliable and complete information is not always available from these sources. Because so few BCHP installations currently exist, contractors and

A & E firms often have little or no experience with these systems. Technical information will need to be imparted directly to the hospitals and as well as to the contractors and A & E firms that work with the hospitals. With its 25-year association with the Northeast Regional Biomass Program and access to public and private biomass expertise, DFPR has the ability to link hospital officials and their trusted advisors to in-state and national biomass experts, address technical questions, and build in-state BCHP knowledge within the professional associations and firms.

One outreach model is the single point of contact within state government, similar to the service provided for many years to schools before the establishment of the energy coordinator at the Vermont Superintendents Association or the Biomass Energy Resource Center. This model is most appropriate for addressing the initial questions about BCHP systems and wood supply systems. Another model to provide hospital officials with timely and up-to-date access to the full array of information on BCHP systems is through a technical advisor or group of advisors who are identified by the State and agree to address questions raised by hospital officials or professional firms. DFPR would need to determine the type and level of technical competency required of the advisors; whether the advisors are limited to state employees or may include external professionals who agree to provide the information; whether the service is provided free of charge; and if technical information is available on demand or within a reasonable time period. Since the outreach will cover technical, financial, and policy questions that could affect professional advice and investment decisions made outside state government, the decision on where the initial POC will reside is an important consideration.

Outreach to Hospitals: Once the internal tasks are completed – selecting an outreach model, creating the POC, and establishing a state working group – introductory meetings with the Vermont Hospital Engineers Society and the New England Hospital Engineers Society should be held to inform these groups of the availability of technical support on BCHP. In addition, similar outreach should be made through the Vermont Association of Hospitals and Health Systems to alert the hospital administrators that a comprehensive program of technical, policy, and financial

informational assistance has been established for hospitals in support of BCHP. As part of this outreach initiative, the State's POC unveils its comprehensive package of resources for biomass combined heat and power. The North Country Hospital case history is an initial document to be provided to these groups, and it could be supplemented with additional information and insights about the North Country Hospital experience contained in this report.

Technical Assistance: The DFPR should open discussions with appropriate organizations, such as the U.S. Department of Energy Combined Heat and Power Center, regarding their availability to conduct preliminary pre-feasibility analysis on biomass systems at little or no cost to a hospital. In addition, DFPR should consider discussions about the potential for co-location of BCHP at hospital sites with such energy suppliers and BCHP providers as Central Vermont Public Service, Green Mountain Power, and Vermont Public Power Supply Authority, as well as organizations and/or private for-profit companies that build, own, and operate BCHP facilities.

Biomass Fuel Markets: The DFPR can work with biomass fuel providers to create a more stable and reliable biomass fuel market in the State. One opportunity is to explore the potential for cooperation among schools, hospitals and electric generation plants to help develop fuel markets. One model is the current working relationship between Forests and Parks and the Vermont School Association.

Financing Mechanisms: Discussions with the state Department of Economic Development and the Department of Banking, Insurance, Securities, and Health Care Administration should be undertaken in two areas: the availability of funds from state bonds, and the Certificate of Need process. The State could consider the feasibility of other funding options for BCHP, such as Community Renewable Energy Bonds (CREB). One option to examine is the potential to create a pool of bond funds through the CREB program specifically dedicated to hospital BCHP projects. In addition, the Certificate of Need process – as it affects a hospital's decision on energy use/production systems – might be less arduous if the State were to take a more holistic

perspective on the use of biomass fuels, and to consider the full environmental, economic and stability/reliability benefits of BCHP in the unique hospital setting rather than simply view BCHP as an added expense to a project.

Appendices

(Provided under separate cover)

Appendix A: Case Study Brochure

Appendix B: Facility Energy Use and Production – Overview and Comparison

Appendix C: Biomass CHP in Hospitals – Elements for Candidate Sites

Appendix D: BCHP Potential in Vermont and New England