**Bangor Hydro Kiosk**

**Presented to**

**Bangor Hydro Electric Company**

Proposed by

**ASAP Media Services**

University of Maine

May 29th, 2012

**Introduction**

The Bangor Hydro Electric Company is an electricity transmission and delivery company serving 100,000 customers in central and eastern Maine.  As new energy technologies are developed, Bangor Hydro has done its part to educate customers and bring these services to Maine.  Recently, Bangor Hydro has shown interest in furthering the expansion of heat pump systems in its customer base. Though there are multiple types of heat pumps, Bangor Hydro has chosen to focus on both air source heat pumps and geothermal heat pumps. Each operate using different methods, with air source pumps compressing outside air to regulate temperature and geothermal pumps drawing out heat from the ground, but both are more efficient and cost effective than gas and oil systems. Bangor Hydro is working to bring this advantageous technology to the area by educating the general public.

ASAP Media Services was approached by Bangor Hydro to design and fabricate three systems focused on heat pump technology.  The first of these systems, designated as Phase 1 of this project, will begin with the research of air source heat pump technology. Research will primarily focus on the history, science, installation, economics, and environmental impact to accurately inform and mediate understanding of heat pumps. This research will culminate into the design and development of a portable, educational kiosk that will focus on air source heat pump technology. The kiosk will be divided into sections based on the research categories, with each section providing both textual information and interactive activities that focus on the relevant category. Due to its portability, this kiosk can be brought to multiple venues such as high schools and trade shows, giving audiences there an opportunity to learn about air source heat pumps. Completion of Phase 1 will provide a concrete research and design foundation that will be carried over into the other phases.

The second system, also referred to as Phase 2, is the design and development of a web based application located on the Bangor Hydro website. This web application will rely heavily on the research and design of the portable kiosk and will present much of the same information, allowing new users to learn about air source heat pumps and facilitating the continued exploration of returning users. However, the web application will add unique features that primarily focus on presenting Bangor Hydro customers with the tools necessary to approximate the cost of installing and maintaining an air source heat pump in their own home. These costs will be presented both in the short term (installation) and long term (maintaining) and will be compared side by side to their current heating method.

Phase 3 of the project will be the design and development of a permanent kiosk that will be located in a new building being constructed in Bangor. This building will make use of geothermal heat pumps to control temperature, and as such this permanent kiosk will present information regarding geothermal pumps rather than air source. New tools will be developed that will present unique, building-specific information based on data pulled from various meters the building may make use of to determine energy usage and efficiency in real-time. Additional tools could be created based on data such as occupant information and floor plans, turning the kiosk into an incredible resource for both visitors and employees or occupants.

**Phase 1**

The most critical goal of each of the three phases is that users walk away from the experience with a better understanding of heat pump technology. Although the research necessary to facilitate this goal will take place in Phase 1, its impact will carry over into the other phases as well, making it the most crucial part of the project as a whole.

Important aspects of heat pump technology that should be included in order for the phases to accurately inform and mediate consumer decisions are described below. Each of these aspects will be presented individually on both kiosk startup screens and the web application, allowing users to explore sections most relevant or interesting to them. As a whole, these sections will provide the necessary information to educate the public about heat pump technology.

History

The recent explosion of public interest in green technologies brought heat pumps into the limelight as a “new” form of alternative heating. What many people do not realize is that heat pumps have been in existence for close to two hundred years (the first one being developed and built in 1855). The theories behind heat pumps stretch even farther back to the mid 1700’s when the idea of refrigeration was introduced and demonstrated. A History section would not only be an interesting read for many users, it would also reveal possible reasons why other methods of heating are more popular (for example, the appeal in the past of cheap oil), why it is becoming more popular today, and provide a framework for where the industry is headed.

Science

The science involved in heat pump technology is difficult to conceptualize for many people. Indeed, this confusing idea that pulling heat out of the ground can modify a building’s temperature may be one reason why heats pumps are not more widely accepted. Interestingly enough, heat pump technology is based on relatively simple physics, which can be broken up and presented individually to aid in heat pump education. The Science section of the kiosk will present these parts in various, interactive activities, providing all audiences with a better understanding of heat pump technology.

Installation

Installation of a heat pump system is almost as foreign to consumers as the physics that make them work. Specific installation processes, such as a geothermal, are also incredibly daunting and are a major factor when a homeowner considers what type of heating system to implement. The Installation section of the kiosk will provide an overview of the process by which a heat pump is integrated into a building, presenting the major steps in simple terms with the aid of graphics. This section will be of most help to homeowners who will walk away with a better understanding and be able to see more clearly how the installation of a heat pump will affect their property.

Economics

Of course, the most influential factor of any major purchase is the cost. This is especially true for heat pumps which, when compared to other methods of heating, have a high initial cost. Unfortunately for heat pumps, seeing such a high price tag instantly intimidates many consumers and the idea of installing one is rejected before all of the facts are collected. Thus, the goal of the Economics section is to provide users with both short **and** long term heating system cost comparisons, including maintenance and return on investment figures including notable government rebates. Again, this section will be most beneficial to homeowners as they will be able to compare the cost installing a heat pump to their current method of heating.

Environmental Impact

When compared to other methods of heating and cooling, such as gas and oil, it is clear that heat pump technology is a step above the competitors when it comes to green efficiency. “Going green”, as previously mentioned, has been a primary concern of homeowners’ nation-wide and has been defined as a matter of “national security” in some circles. The combination of these two facts illustrates the benefits of making environmental aspects of heat pumps accessible for consumers. Thus, the Environmental Impact section of the kiosk will provide this information, as well as information pertaining to “green” government initiatives including but not limited to rebates.

**Portable Educational Kiosk**

The information and activities presented in this kiosk will focus on air-source heat pump technology because this type of heat pump will be most heavily marketed to homeowners. open-source programming environments, primarily totouchA kiosk is a platform that allows for interactivity and it is important that this project takes advantage of that. Developing touch activities relevant to the information presented in each module adds a plethora of interactivity to the kiosk that a simple presentation does not accommodate, and as such will provide users with an even better understanding of the heat pumps. open-source programming environments, as well as sets the stage for the web-based application described later on.

Possible Tools and Presentations

Each module will consist of both textual information and interactive media, ensuring that users can explore content instead of just reading through it. This media will take a variety of forms and require the development of a variety of tools. Possible tools and presentations include:

* **Real World Connections ­–** Current heat pump owners would be interviewed to determine what factors motivated them to install a heat pump. These interviews could be presented on the kiosk for interested customers to see.
* **Real-time Comparisons to Other Energy Sources** – This would be a tool where homeowners could get an approximate cost of how much money installing a heat pump would save them each year.
* **Animations** – Animations would present users with visuals that would enhance their understanding of heat pump technology.
* **Simulations** – Users would modify a constructed heat pump simulation to determine how changes in weather and climate may affect it.
* **Interactive Models** – All models presented in the kiosk would be interactive, giving a user the opportunity to explore an aspect of heat pumps in more detail.
* **Manufacturer Finder** – A tool that would help customers find manufacturers and installers of heat pumps in their area. This information will most likely be pulled from Bangor Hydro’s website.

High school students would be one of the key beneficiaries from this portable kiosk. Students with access to this portable kiosk will be exposed to heat pump information in such a way that they can understand and appreciate the results of implementing various energy solutions. With this high level of understanding, students would be encouraged to spread their knowledge to their friends and relatives. Affording these students this sort of information also allows them to continue on into the work force or higher education setting with invaluable information and knowledge that may serve as a foundation in the pursuit of progression and innovation. A dynamic, engaging and kiosk, will present students with critical information through an effective medium that promises to seize attention and embrace a fun, educational experience.

Bangor Hydro has also expressed their desire to put this kiosk on display at various trade shows they attend. Many people who attend these trade shows are closely connected to the alternative energy and heating markets. Among these are contractors and installers that provide heat pump services who may be unsure of the success of a business venture in Maine. Seeing the strong initiative of Bangor Hydro to promote heat pump technology would encourage more of these businesses to open up branches in Maine and create new partnerships as well as showcase Bangor Hydro’s competitive commitment to innovation and sustainable thinking.

The proposed sections of this phase (along with individual production times) are listed below:

**Research**

* ASAP will need to research heat pump technology independently as well as with help from Bangor Hydro to ensure the accuracy of information presented on the kiosk/web (approx. 100 hours)

**Conceptualization**

* This includes designing a layout for the kiosk, determining what and how information should be provided within each module, and designing touch activities specific to each module (approx. 175 hours)

**Development**

* Creating the content and interfaces that will be presented in each module and developing the interactive, touch activities associated with the kiosk. Once those activities are prototyped and approved, single-touch versions will be developed to accommodate the web application (approx. 400 hours)

**Testing**

Each module will be user tested after completion to ensure ease of use and success at conveying information (approx. 35 hours)

**Phase 2**

In Phase 2, a web-based application will be created, allowing Bangor Hydro customers to experience the portable kiosk activities from their home computer. Because the kiosk will be brought from venue-to-venue by Bangor Hydro and/or kept in a fixed position in their lobby, there is a strong chance that many consumers will never get to experience it. Through a web application, any Bangor Hydro customer will have access to the kiosk modules. In addition, users who have already experienced the kiosk will be able to revisit the information online at their own convenience.

A new tool will be added to the web application that will give customers an approximate cost for installing and maintaining a heat pump in their home. Customers using this tool will enter relevant home information along with their current energy use and costs (usage and cost can be pulled from an existing Bangor Hydro database). These values are entered into an equation that determines approximate short (installation) and long (maintenance, usage) term costs if the home was fitted with a heat pump. This information can be compared to other heating and energy methods, culminating in an impactful tool for Bangor Hydro customers.

The audience for this web application will be Bangor Hydro customers, primarily the customers that own heated homes. Homeowners are always on the look out for choices they can make that will improve their quality of life. Many times, these decisions are financially driven and revolve around saving money both in the long and short terms. With the help of the proposed web application, these homeowners would be able to determine the approximate costs associated with installing a heat pump in their home. They could then compare these short and long-term costs with their current method of heating to determine the best course of action. Regardless of the conclusions drawn by these homeowners, the demonstration of Bangor Hydro’s commitment to innovation and alternative energy will have a positive, lasting effect on customers.

The proposed sections of this phase (along with individual production times) are listed below **(This estimate does NOT include the necessary heat pump research that is covered in Phase 1)**:

**Research**

* Bangor Hydro will work with ASAP to research the kinds of data and equations necessary to calculate and compare different methods of heating

(approx. 30 hours)

**Conceptualization**

* This includes designing the layout and functionality for the comparison tools as well as determining how the comparisons will be presented (visualizations, text, etc.) (approx. 75 hours)

**Development**

* Creating the interface, functionality, and presentation tools (approx. 120 hours)

**Testing**

Each module will be user tested after completion to ensure ease of use and success at conveying information (approx. 15 hours)

**Phase 3**

Later this year, construction will be completed on a building in Bangor that utilizes geothermal heat pumps for it’s heating and cooling. A permanent kiosk will be installed in this building’s lobby with similar sections as the ones described in Phase 1, although the content presented will focus on geothermal heat pumps. Additional tools will allow users to view the building’s current energy usage and savings over time by pulling data from the building’s meters and other gauges in real-time. Other possible building-specific tools, depending on what kind of technologies are installed, are described below:

* **Live Area Temperature Control** – The energy required to keep an empty area at a consistent temperature of seventy degrees is much different than if the same area was full of people. Using heat sensors, temperature could be analyzed in real-time and automatically maintained through out the day, cutting down on energy costs. This information could be displayed on the kiosk in the form of heat maps as well as numeric visuals presenting thermostat readings alongside what temperature the area “feels” like.
* **Area Specific Energy Use** – Different areas of a building use varying amounts of energy depending on the purpose and amount of occupants. Using real-time building data from meters, a tool could be created that displays area-specific energy usage including but not limited to water and electricity. This information could be mapped onto a building floor plan according to the area where the data is coming from. This tool would give owners a sense of where the most energy is being used and would give occupants an incentive to cut their energy use.
* **Similar Building Comparison** – Organizations that strive to be “green” in today’s society are held in high regard. This building plans to demonstrate its desire to be “green” by using geothermal heat pumps as its primary heating and cooling method, a method that sets it apart from many buildings in the area. To demonstrate the green efficiency of this building, a tool could be developed that compared its energy costs and emissions to similar local buildings. This sort of tool would present this building as a model for the future in the public eye and encourage other buildings to adopt “green” alternatives to their current heating method.

The information necessary to create these tools could be accessed live from the building and presented in real-time through the kiosk.

Information not related to energy usage could also be presented through this kiosk. For example, a detailed floor plan could be displayed that shows various sections or departments of the building. This could include a list of employees or occupants in each section as well as their job title and job description. The kiosk could also provide information regarding the general purpose of the building as well as any upcoming events that may be taking place there. The amount of features the permanent kiosk could provide is seemingly endless, and is only limited by what sensors and meters are installed in the building and a developer’s imagination.

Visitors to this new building would benefit greatly from the many tools that this permanent kiosk could provide. Through general information, such as the building’s purpose, mission, and upcoming events, visitors could immediately get a sense of their surroundings and the sort of opportunities that the building affords them. Also, when presented with a screen full of dials and meter visualizations, visitors would begin to ask questions about how geothermal heat pumps work and the benefits they provide (questions that the same permanent kiosk could help answer). This knowledge would instill a sense of pride in visitors for having such a forward-thinking building in their local community, and encourage them to take advantage of the building as much as possible.

Various groups of employees and/or occupants of this new building would also benefit from a permanent kiosk. Owners of the building would have complete control over what kind of information is presented on the kiosk, allowing them to keep the most important information up to date. Workers who maintain and monitor the geothermal heat pumps would have an effective visualization of real-time processes within the building, allowing them to monitor the building efficiently as a whole as well as study specific areas to determine better ways to save energy and money. Other employees/occupants could use this kiosk to compare their area of the building against the other areas. This comparison could lead them to make better energy usage decisions if their area uses more energy, or could encourage them to spread their techniques of conserving energy if their area uses a small amount of energy.

The proposed sections of this phase (along with individual production times) are listed below **(This estimate does NOT include the necessary heat pump research that is covered in Phase 1)**:

**Research**

* ASAP will work with building management to determine what type of meters, sensors, and other technologies are available to pull data from. ASAP will also research what types of general tools will be ideal for this type of permanent kiosk

(approx. 60 hours)

**Conceptualization**

* This includes designing the layout and functionality of the new tools as well as how they are presented to the user (approx. 125 hours)

**Development**

* Creating the interface, functionality, and presentation tools (approx. 200 hours)

**Testing**

Each module will be user tested after completion to ensure ease of use and success at conveying information (approx. 30 hours)

**Timeline and Cost Analysis**

**Phase 1 Timeline**

The proposed phase, if all previously mentioned features are designed and implemented with visual styling, will take approximately 710 hours to complete. ASAP Media Services' hourly rate is $35. A breakdown reflecting the above estimate is as follows:

**Phase 1 Cost Analysis**

|  |  |  |
| --- | --- | --- |
| **Section** | **Hours x Rate** | **Total** |
| Research | 100 hours x $35/hour | $3,500.00 |
| Conceptualization | 175 hours x $35/hour | $6,125 |
| Development | 400 hours x $35/hour | $14,000.00 |
| Testing | 35 hours x $35/hour | $1,225.00 |
| **Total Cost** | **710 hours x $35/hour** | **$24,850.00** |

In the proposed strategy, Bangor Hydro will work with ASAP to establish a firm understanding of heat pump technology and the effects that attributes of buildings have on heating and cooling potency. ASAP will design layouts and interfaces for the comparison tools, as well as determine what and how information and results should be presented. Content and interfaces will then be developed based on the designs, and specific interactive activities for each module will be created and prototyped. At the completion of each stage of prototyping a section, its status will be sent to Bangor Hydro for review and alteration. Additionally, ASAP and Bangor Hydro will meet bi-weekly for status updates to discuss progress.

**Phase 2 Timeline**

The proposed phase, if all previously mentioned features are designed and implemented with visual styling, will take approximately 240 hours to complete. ASAP Media Services' hourly rate is $35. A breakdown reflecting the above estimate is as follows **(This estimate does NOT include the necessary heat pump research that is covered in Phase 1)**:

**Phase 2 Cost Analysis**

|  |  |  |
| --- | --- | --- |
| **Section** | **Hours x Rate** | **Total** |
| Research | 30 hours x $35/hour | $1,050.00 |
| Conceptualization | 75 hours x $35/hour | $2,625.00 |
| Development | 120 hours x $35/hour | $4,200.00 |
| Testing | 15 hours x $35/hour | $525.00 |
| **Total Cost** | **240 hours x $35/hour** | **$8,400.00** |

In the proposed strategy, Bangor Hydro will work with ASAP to establish a firm understanding of the data and equations necessary to calculate and compare different methods of heating. ASAP will design layouts and interfaces for each module and the kiosk as a whole, as well as determine what and how information should be presented for each module. These layouts, interfaces, and presentation tools will then be developed based on the designs. At the completion of each stage of prototyping a section, its status will be sent to Bangor Hydro for review and alteration. Additionally, ASAP and Bangor Hydro will meet bi-weekly for status updates to discuss progress.

**Phase 3 Timeline**

The proposed phase, if all previously mentioned features are designed and implemented with visual styling, will take approximately 415 hours to complete. ASAP Media Services' hourly rate is $35. A breakdown reflecting the above estimate is as follows **(This estimate does NOT include the necessary heat pump research that is covered in Phase 1)**:

**Phase 3 Cost Analysis**

|  |  |  |
| --- | --- | --- |
| **Section** | **Hours x Rate** | **Total** |
| Research | 60 hours x $35/hour | $2,100.00 |
| Conceptualization | 125 hours x $35/hour | $4,375.00 |
| Development | 200 hours x $35/hour | $7,000.00 |
| Testing | 30 hours x $35/hour | $1,050.00 |
| **Total Cost** | **415 hours x $35/hour** | **$14,525.00** |

In the proposed strategy, Bangor Hydro will work with ASAP to establish a firm understanding of heat pump technology and the effects that attributes of buildings have on heating and cooling potency. ASAP will design layouts and interfaces for each module and the kiosk as a whole, as well as determine what and how information should be presented for each module. Content and interfaces will then be developed based on the designs, and specific interactive activities for each module will be created and prototyped. At the completion of each stage of prototyping a section, its status will be sent to Bangor Hydro for review and alteration. Additionally, ASAP and Bangor Hydro will meet bi-weekly for status updates to discuss progress.

**Conclusion**

ASAP Media Services will assist Bangor Hydro in effectively disseminating heat pump information to Bangor Hydro’s costumers through the development of a kiosk and web application. Users will be able to easily access and interact with modules to explore facets of heat pump technology such as history, physics, installation, economics, and environmental impact. This capacity will increase costumer energy awareness and improve customer-relations as well as promote a solid understanding of the information at hand to future customers. It will also encourage the use and promotion of the heat pump to those already working and established within the industry.

By working to empower consumers with the necessary tools to understand and explore energy information, Bangor Hydro has demonstrated its commitment to its costumer base in numerous ways including, but not limited to, anticipating the future of energy consumption. ASAP Media Services shares Bangor Hydro’s forward-looking perspective regarding technology and is excited to partner with Bangor Hydro to assist with its goal of exploring and building the future of technology to both design and realize the world of tomorrow.

Sincerely,

ASAP Media Services

**Agreement**

Original graphical elements created by ASAP specifically for the application becomes property of Bangor Hydro once payment has been delivered. ASAP shall retain ownership rights of interactivity designs and reserves the right to reference and reuse source components (void of Bangor Hydro’s styling, data, or information otherwise) in future projects.

We hereby agree to these terms, conditions and scope of work between ASAP and Bangor Hydro concerning research and development of the kiosk and web application.

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Date Mike Scott Date

Bangor Hydro ASAP Media Services