

RameaReport



The Ramea Wind-Hydrogen-Diesel Energy Project (WHD Project) is located in the town of Ramea on Northwest Island off the southwest coast of the Province of Newfoundland and Labrador, Canada. This is a research and development project that will use wind and hydrogen technology to supplement the diesel requirements of this isolated community.

The RameaReport provides updates on the WHD Project as it progresses towards becoming a fully operational, world-leading wind-hydrogen-diesel integrated system.

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Wind Farm

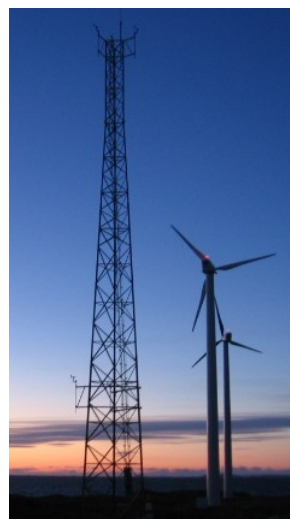
December 14, 2009, marked a significant step for the WHD Project as approximately 20 kilowatts (kW) of power was produced from one of the three new wind turbines. Erected in August 2009, the three Northwind 100B 100 kW wind turbines have since undergone on-site testing and are now ready to be integrated with the other components of the WHD Project. These three wind turbines have a total installed capacity of 300 kW. That's enough capacity, along with the 250 kW from the hydrogen genset, to generate electrical energy for up to 34 homes in Ramea per year.



Northwind 100B 100 kW turbines

More than 10 people were involved in the erection of the turbines which spanned over a 12-day period. In addition, several Newfoundland and Labrador Hydro (Hydro) employees have undergone safety, maintenance and operating training on the turbines.

Meteorological Tower



For the Project, a 40-metre high meteorological tower was installed near the new wind turbines. The tower provides highly-accurate meteorological data such as wind speed, direction, temperature and humidity into Nalcor's Energy Management System to optimally dispatch the different energy sources. This data will be stored on a central server and will be very useful during the research phase of this Project.

In December, the tower was installed by WesTower Communications and Tiller Engineering completed the final inspection.

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Focus on Safety

Hydrogen Safety

Like gasoline and natural gas, hydrogen is a fuel that must be handled appropriately. The characteristics of hydrogen are different (just like gasoline differs from natural gas) and a number of its properties are advantageous with regard to safety, such as it disperses quickly when released into the atmosphere. Hydrogen can be used as safely as other common fuels used today when guidelines are observed and users understand its behaviour.

Hydro has experience working with hydrogen at its Holyrood Generating Station. While Hydro does not produce hydrogen at this facility, the company stores it and uses it for cooling the three large generating units. The Holyrood plant has operated for the past 40 years without a single safety incident related to the use and storage of hydrogen.

Once the hydrogen system is commissioned, Nalcor will provide first-responder training. This training will provide the volunteer fire fighters with the information required to effectively respond to an emergency situation at the new facility. The focus will be on the use of the first-responders' gas control panel and using the thermal imaging camera.

One unique feature about hydrogen is that it burns with an invisible flame. A thermal imaging camera is a specialized camera which is used to detect and display an otherwise invisible hydrogen fire.



The DRÄGER UCF® 1600 camera will be used for the WHD Project

Project Update

Hydrogen Electrolyser

Another major milestone for the WHD Project was achieved on December 12, 2009, with the first production of hydrogen. Hydrogen is created by the electrolyser through the process of electrolysis; this involves using water and electricity to create oxygen and hydrogen gases. Oxygen is released into the atmosphere while hydrogen is stored in high-pressure cylinders to be used as an energy supply.



Hydrogen storage tanks

The hydrogen electrolyser was delivered to Ramea in June 2009. On-site commissioning of the hydrogen electrolyser and associated classroom/hands-on training was completed in December 2009. The next steps for the Project team are to mechanically interconnect the electrolyser to the storage tanks which is planned for February 2010, and then undertake commissioning of this equipment in March.

Hydrogen Genset

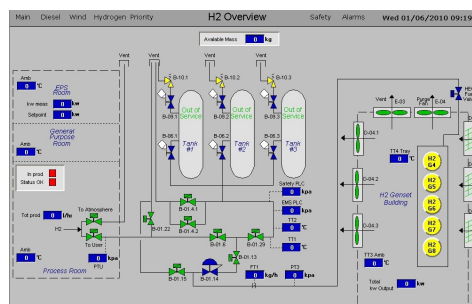
The hydrogen genset is enclosed in a semi-circular galvanized steel building located next to Hydro's diesel plant which provides protection from harsh weather conditions. In December 2009, Penney Industrial completed the



Building which houses the hydrogen genset

installation of the genset, related electrical equipment and all associated wiring. Hydro also completed mechanical work associated with exhaust piping, and various exhaust and purge fans.

Mechanical interconnection is scheduled for February 2010 with commissioning to start in April of this year. Once the hydrogen system is interconnected to the other equipment, Nalcor will provide first-responder training to the community fire department at the Project site.



Computer screen image of the hydrogen control system

reliable delivery of energy to homes and businesses in Ramea. The EMS is the computer system which dispatches each piece of equipment associated with the WHD Project. The EMS was designed and is being built by Hydro and Nalcor Energy will retain all intellectual property rights to this critical piece of software.

Energy Management System

The Energy Management System (EMS) will provide all automatic control and monitoring of the wind turbines, hydrogen electrolyser, hydrogen genset, hydrogen storage, and diesel plant to ensure safe and

Environment

Bird Monitoring Program

When the WHD Project was released from environmental assessment Nalcor Energy was required to complete a post-construction bird monitoring program. In February, 2010 Nalcor will issue a Request for Proposals (RFP) for a comprehensive bird monitoring program in Ramea. Nalcor consulted with the Canadian Wildlife Service (CWS) to ensure it incorporated all the necessary requirements for bird monitoring in its RFP.

The bird monitoring program will encompass the area around the three new wind turbines and select control points. The results will add to the understanding of how certain bird species interact with wind turbines in coastal environments.

The two-year monitoring program will include: bird surveys, to determine bird use of the area; and carcass searches, to determine bird mortality. It is expected that the bird monitoring program will be completed and evaluated by CWS by the summer of 2012.

Awards

Ramea Receives Community Involvement Award

Congratulations to the Town of Ramea for receiving Tidy Town's 2009 Community Involvement Criteria Award. The Town achieved the highest score in the Community Involvement Criterion. This award honours citizens' involvement in projects for the betterment and enjoyment of the whole community.



Members of Ramea's Town Council receiving their award at the 2009 Tidy Towns Ceremony in Gander, Nov'09.

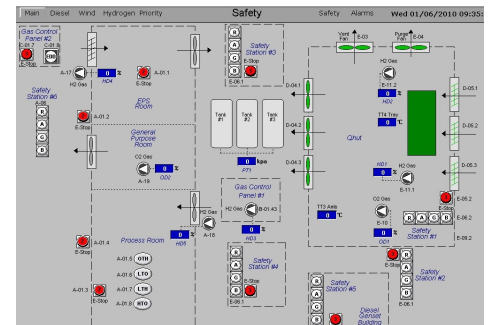
Project Update

Energy Management System (continued)

The EMS software programming is expected to be completed in February 2010 and commissioning is scheduled to commence by the end of the month.

System Integration

The first component of the System Integration work is the connection of the cables and piping that link the wind, hydrogen and diesel equipment together. The second component is the Safety Instrumented System (SIS). The SIS consists of five safety stations that monitor the entire hydrogen system and will alert the operators of any problems with the equipment. In addition to the SIS there are numerous safety controls designed into the hydrogen mechanical system such as pressure regulating and relief valves and a specifically-designed vent stack.



Computer screen image of the safety control station

Programming of the SIS was completed in January 2010 and commissioning and training is scheduled to start shortly. The mechanical interconnection of the hydrogen components is scheduled for February of this year.

4160V Switchgear

The electrical switchgear interconnects all new equipment to the existing diesel plant 4160V bus. The switchgear provides Hydro with the ability to isolate the new equipment from the existing equipment if any problems occur on the system. The final commissioning of the switchgear was completed in December 2009.

Network Communications System

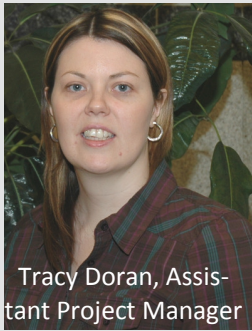
The communication network system's main function is to relay protection and control data to ensure the reliable operation of the WHD system. The communications system consists of network equipment; optical fiber and copper linking the diesel plant, new wind turbines, electrolyser, hydrogen genset, Safety Instrumented System and the meteorological tower. The new equipment allows Hydro to gain access to this remote site from its Energy Control Centre and Network Management Centre in St. John's; similar to other generation assets on the provincial electricity grid. A wireless radio link is also present providing communications between the Ramea diesel plant to Frontier Power's wind farm. The network communications system was placed in service in January 2010.

Technology Video Promotes WHD Project

A new video showcases Newfoundland and Labrador as a world leader in energy innovation through its ground-breaking work on the wind-hydrogen-diesel research and development project in Ramea.

Nalcor Energy worked with the Department of Natural Resources (DNR) to develop *Newfoundland and Labrador: Innovation in Renewable Energy*. The video premiered during the 2009 Energy and Mines Ministers' Meeting held in St. John's in August 2009. The video can be viewed at: www.nr.gov.nl.ca/nr/

Meet the WHD Project Team



Tracy Doran, Assistant Project Manager

I joined the WHD Project team in the fall of 2009 and I've learned at least one new thing every day. After our last team meeting I sat down with some of the team and asked them to reflect on their experience working on this unique project.

Tim Manning is responsible for the hydrogen system and he identified some of the challenges he's overcome to get the system approved for operations. He explained that it's these challenges that make his work so interesting. "It's great to work on something that's completely new – it forces me to think outside the box." EMS designer John Flynn echoed Manning's sentiment. "The most interesting thing about working on this Project is learning about new technologies and gaining experience in the renewable energy sector," said Flynn.

The team has learned a lot about the importance of teamwork especially as it applies to working in remote locations. Howard Richards, Project Manager, highlighted the importance of planning ahead and to adapt to working in a remote location noting that up-front planning is critical to the success of a project like this. Paul Murphy, Electrical Engineer, agrees. "The most interesting thing about working on this Project is the daily challenges of working with new technologies

in a remote location," added Murphy.

Mike O'Brien is responsible for the Project's telecommunications infrastructure and is excited about working with the technologies. "It's new to us and that makes it interesting and challenging at the same time."

A lot of changes have occurred in Ramea since the first Project meeting on March 30, 2007. Three new wind turbines are now part of the skyline, the hydrogen system will soon be commissioned, design is complete on the EMS and we're gearing up for implementation.



Back L-R: Jim Gillingham, Protection & Control; Tim Manning, Mechanical; Paul Murphy, Electrical; Trent Carter, Environment. Front L-R: John Flynn, System Planning/Protection & Control; Mike O'Brien, Telecontrol; George Lundrigan, Civil; and Howard Richards, Project Manager. Missing: Tracy Doran, Assistant Project Manager; John Furlong, Properties; Hughie Ireland, Regulated Operations; and Karen O'Neill, Communications.

Project Schedule and Major Milestones

Construction is complete with the conclusion of the electrical services contract and the installation of the telecommunications equipment. The next three months will be busy with commissioning activities as outlined in the target schedule below. Once commissioning is completed and the Project is placed in service, the Project team will transition to the operations phase of the Project. Nalcor's Business Development team is working on an operations plan which includes specific objectives and strategic initiatives around safety, environment, business excellence, community and people. More details on the operations plan will be provided in the next edition of the RameaReport.

Activity	January		February				March				April				May				June			July					
	24	31	7	14	21	28	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25
Construction Work Completed																											
Equipment Commissioning																											
EMS Commissioning																											
Integrated System Commissioning/WHD in Operation																											
Operation Time																											

WHD Project in the News

With construction on the Project concluding and commissioning activities ramping up, there are lots of people interested in learning more about the Project. It has been featured in newspaper and radio interviews, as well as the annual CEATI conference in Chattanooga, Tennessee and the International Wind-Diesel conference in Ottawa. Most recently a half-page article was in The Telegram, the province's largest daily newspaper, and interviews on CBC Radio highlighted the progress of the Project. Nalcor will continue to bring attention to this world-class Project as it moves into operations.

In the Next Issue

Over the next few months the Project team will be working on: commissioning results, providing updates on operations plan, and planning for the Opening Ceremony and annual partner meeting.