



GNWT RESPONSE

TO THE 2014 NWT ENERGY CHARRETTE REPORT

June 2015

Government of the Northwest Territories



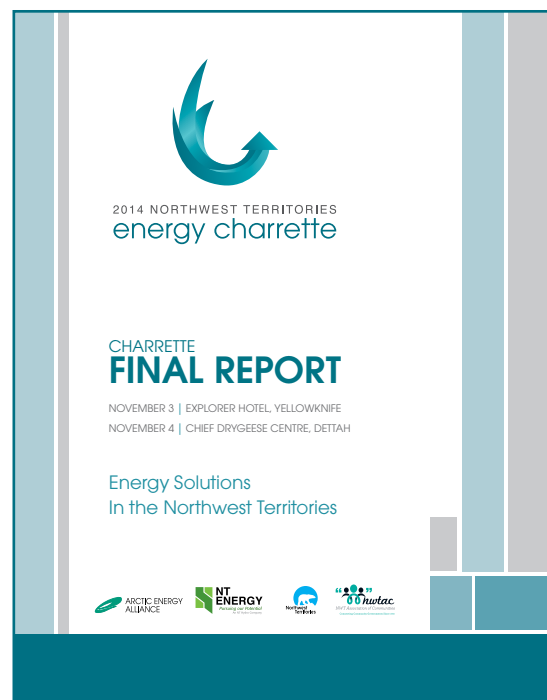
MESSAGE FROM THE MINISTERIAL ENERGY COORDINATING COMMITTEE

On behalf of the Government of the Northwest Territories (GNWT) the Ministerial Energy Coordinating Committee is pleased to present the *GNWT Response to the 2014 NWT Energy Charrette Report*.

In 2012 the GNWT held an Energy Charrette that resulted in the release of the GNWT *Northwest Territories Energy Action Plan* and the Northwest Territories Energy Corporation (NT Energy) *A Vision for the NWT Power System Plan*. Many communities and residents expressed appreciation for the 2012 Energy Charrette and the opportunity to discuss the energy issues and challenges facing our territory.

In response to the concerns of residents over ever increasing electricity costs, as well as the GNWT's decision in 2014 to provide the NWT Power Corporation with a \$20 million subsidy to cushion electricity rate increases due to extremely low water levels at the Snare hydro-electric system, the GNWT decided to hold a second Energy Charrette. The 2014 Energy Charrette was held in Yellowknife and Dettah on November 3-4, 2014 to involve communities, stakeholders and a range of energy experts in another discussion about the future of the NWT energy system.

The results of the 2014 Charrette will help the GNWT re-focus its plans. The discussion focused on community-based solutions and visiting experts made the point that there was 'no silver bullet' to the issues faced by the NWT. Several suggestions were provided, many of which are discussed in the following pages. As we enter the final year of the mandate for the 17th Legislative Assembly, it is clear that the GNWT cannot afford to do everything that was suggested. In addition to the costs associated with low water conditions there were \$55 million spent as a result of a record forest fire season.



With this in mind the GNWT has committed to new initiatives in the short-term, largely from re-focusing existing resources, and identified several initiatives for the consideration of the 18th Legislative Assembly. An increased borrowing limit from the federal government will provide greater flexibility in the future to pursue many of these projects.

The number one objective identified in the 2014 Energy Charrette was to reduce the cost of living. With this in mind the GNWT's short-term actions are focused on supporting residents to reduce their own energy use. We heard at the Charrette that energy conservation and efficiency is the best investment in the long term and that we need to work to transform our energy systems in the long term. This means reducing the use of imported diesel and greater use of local, renewable and alternative forms of energy.

This response to the *2014 NWT Energy Charrette Final Report* reflects changes to the 2015-16 third year of our *2013 Energy Action Plan* and complements existing GNWT direction on energy and climate change issues addressed in the *Northwest Territories Solar Energy Strategy* and the *NWT Biomass Energy Strategy*.

The GNWT recognizes that residents need to be directly involved in discussions regarding the opportunities and unique energy challenges faced in the NWT. This response will provide the basis for transition to the 18th Legislative Assembly and we are confident that the next government will continue the discussion.



Honourable
Robert (Bob) McLeod

Honourable
Michael Miltenberger

Honourable
David Ramsay

Honourable
Tom Beaulieu

EXECUTIVE SUMMARY

Two recent developments involving the estimated capital cost of implementing the transmission expansion component of NWT Power System Plan and an extreme low-water situation on the Snare hydro-electric system prompted the Government of the Northwest Territories (GNWT) to re-consider what else could, or should, be done to make the NWT's energy systems more affordable and sustainable in the long-term.

To gain public input on these matters the *2014 NWT Energy Charrette* was held on November 3-4, 2014 in Yellowknife and DeWah. The results of the discussions were summarized in a *2014 Northwest Territories Charrette Final Report: Energy Solutions in the Northwest Territories*. The Charrette Final Report contained suggestions on actions that could be taken in the short-term (FY2015-16) as well as long-term actions that could be considered by the 18th Legislative Assembly. The GNWT also solicited additional stakeholder comments on the Charrette Final Report.

In discussions at the Charrette, "affordability" was considered to be the most important objective. The other three objectives that ranked near the top of the list included "environment", "economy" and "energy security."

Many Charrette participants recognized that the GNWT has made a number of investments in most areas raised, but that greater progress is required. In recent years, the GNWT has:

- Be more aggressive on energy efficiency and conservation;
- Plan for increased development of small-scale renewable energy projects as the technology improves and costs continue to come down;
- Continue to build on biomass initiatives; and
- Find ways to make use of the excess electrical energy at the Taltson Hydro Facility.

Many Charrette participants recognized that the GNWT has been making a number of investments in most areas raised, but that greater progress is required. In recent years, the GNWT has:

- Substantially increased resources aimed at energy conservation and efficiency, including the establishment of regional offices for the Arctic Energy Alliance;
- The NWT continues to lead the country in the installation of commercial-sized wood pellet boilers and the GNWT is making efforts to expand the biomass supply chain throughout the Mackenzie Valley;
- The GNWT has invested substantially in solar, including the development of a cutting edge solar-diesel-hybrid system in Colville Lake.

In total over the three year period between 2013-14 and 2015-16 the GNWT will have invested over \$31M in energy initiatives under the *2013 Energy Action Plan*. However, there are areas where progress is needed, including the establishment of an operating wind turbine in a NWT community, and finding an economical use for the surplus hydro power in the Taltson system.

The GNWT has used the results of the 2014 Energy Charrette process to re-focus some short-term actions and identify longer term, or transformative projects for the consideration of the 18th Legislative Assembly. The NWT needs to continue to move away from diesel generation.

The GNWT's short-term energy actions for 2015-16 include:

- Consolidation of government energy functions within the Department of Public Works and Services (PWS);
- Continuing to focus on energy conservation and efficiency, through:
 - » Release of a discussion paper on a potential NWT energy efficiency act in the fall of 2015;
 - » Placing greater focus on energy information and awareness, communications, marketing supports for businesses, and engagement with communities in future energy discussions;
 - » Improving the collection of fuel use data at the community level to support community energy planning;
 - » Consider changes to the *Cities, Towns and Villages Act*, allowing municipalities to use local improvement charges to provide loans to homeowners to make energy efficiency improvements; and
 - » Providing additional support for community government energy management.
- Supporting greater use of alternative and renewable energy through:
 - » Encouraging the use of renewable energy in industrial development;
 - » Expanding the biomass supply chain;
 - » Examining the regulatory issues associated with biomass and support for the NWT Biomass Energy Association;
 - » Examining the feasibility of a biomass combined heat and power pilot project;
 - » Establish a clear net metering policy to allow residents, businesses and community governments to feed renewable energy into local electricity grids;
 - » Building on the success of our solar energy initiatives; and
 - » Planning for the development of wind energy in the NWT.
- Undertaking a Yellowknife options analysis to find ways to improve the resiliency and reliability of the electricity system in the North Slave; and
- Assessing the options for using surplus capacity in the Taltson hydro system, including the potential to expand the use of electric heat and to support electric vehicles.

Potential long-term transformative community energy projects include:

- Fort Simpson Liquid Natural Gas (LNG) project;
- Inuvik wind turbine project;
- Taltson transmission line extension to Fort Providence and Kakisa;
- Mini-hydro in Déline;
- Snare transmission line extension to Whatì; and
- Mini-hydro in Łutselk'e.

There are also potential long-term transformative projects aimed at new energy markets. The current hydro systems in the NWT were built through partnerships with industry and, in part, through the vision and investment of the federal government decades ago. Expanding upon this infrastructure legacy would support our economy, provide opportunities for businesses and Aboriginal governments, and has the potential to lower rates for everyone through increased economies of scale. Community-based projects are the focus, but these opportunities will not be ignored:

- A 56 megawatt (MW) Taltson hydro expansion project;
- A 13 MW La Martre River hydro project; and
- A 20 MW LNG project in Yellowknife.

One issue that is not discussed in detail in this response to the *2014 Energy Charrette Report* is the structure of the electricity system. In 2010 the GNWT released *Efficient, Affordable and Equitable: Creating a Brighter Future for the Northwest Territories' Electricity System*. The review was completed by an independent panel drawing upon extensive public consultation that reviewed electricity regulation, rates and subsidy programs to help define the vision for the future of electricity in the NWT. One of the key recommendations from the report was to consolidate elements of the electricity system. The GNWT responded by establishing rate zones, simplifying the system and substantially reducing rates in many communities.

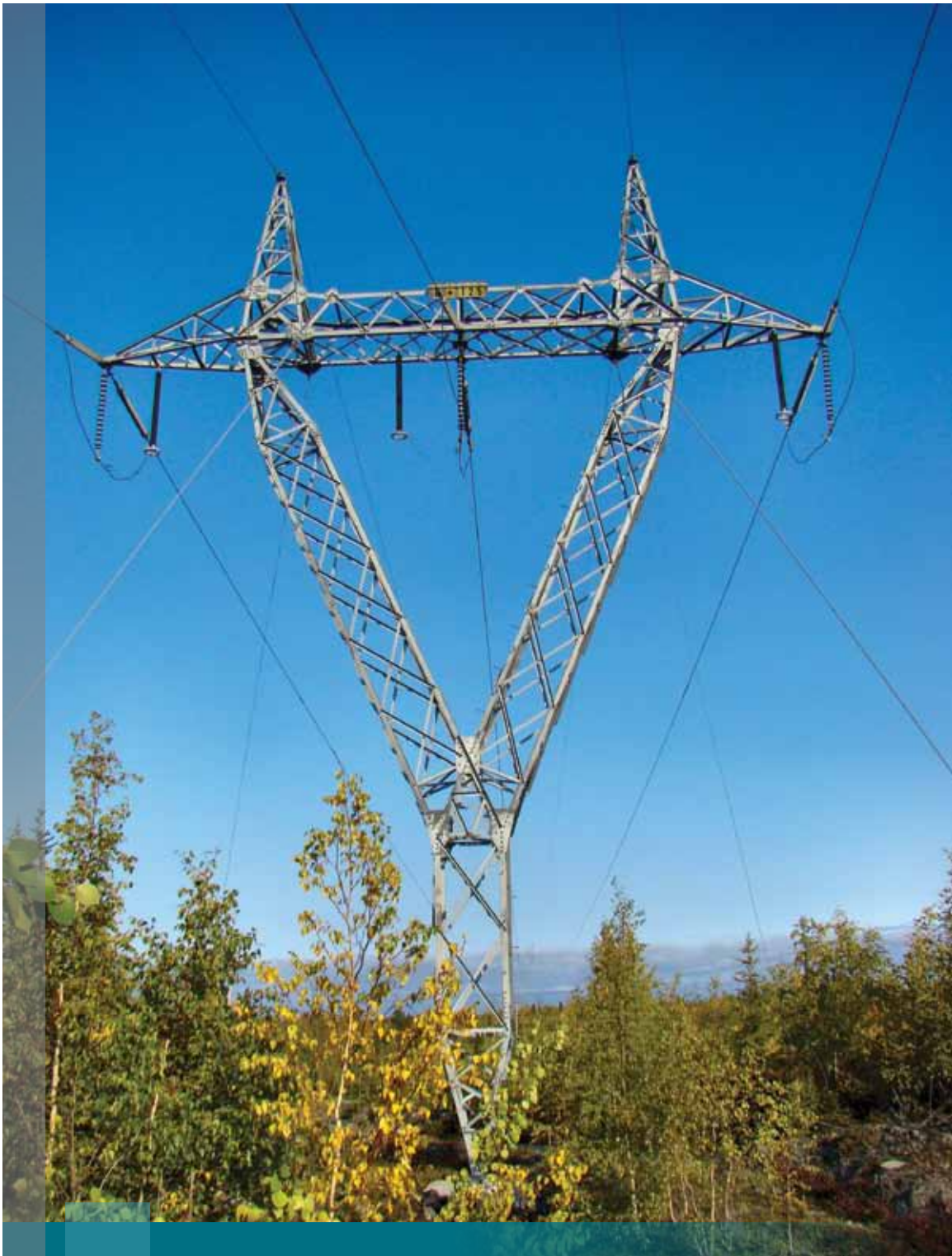
While many questions were raised at the Charrette regarding the potential to further consolidate the system, and whether there would be potential for rate reductions, this is a complex issue that the GNWT is currently working to address. The GNWT decided to release this response now to address many of the suggestions received through the Charrette process. Structural issues will be addressed at a later date.

Reducing the high cost of living in the NWT, the need to move away from the use of imported diesel, and the expectation of northerners that we will continue to mitigate the impacts of climate change, are drivers that will shape the future approach to energy in the NWT. On April 14, 2015 Canada's Premiers met in Quebec and issued a Declaration on Climate Change. The GNWT was involved in developing this Declaration and supports the principles reflected in the Declaration. Continued engagement with communities and measuring and reporting on results will be key to achieving the energy future northerners envision.

Contents

MESSAGE FROM THE MINISTERIAL ENERGY COORDINATING COMMITTEE	I
EXECUTIVE SUMMARY	III
INTRODUCTION.....	5
PUBLIC INPUT	6
GENERAL OBSERVATIONS FROM THE CHARRETTE REPORT	7
SHORT-TERM ACTIONS OF THE GNWT	8
Consolidation of Energy Functions within the Department of Public Works and Services	9
Continued Focus on Energy Conservation and Efficiency	10
Release of a Discussion Paper on a Potential <i>NWT Energy Efficiency Act</i>	11
A Focus on Energy Information and Awareness.....	11
Energy Data to Support Community Energy profiles.....	11
Consider Changes to the <i>Cities, Towns and Villages Act</i> to allow Local Improvement Charges	12
Support for Community Government Energy Management.....	12
Continued Focus on Alternative and Renewable Energy	13
Encourage the Use of Renewable Energy in Industrial Development.....	13
Expanding the Biomass Supply Chain	14
Examine Regulatory Issues Associated with Biomass and Support for the NWT Biomass Energy Association	14
Feasibility of Biomass Combined Heat and Power Project.....	15
Net Metering Policy	16
Continued Focus on Solar.....	16
Feasibility of Wind Energy.....	17
Improving the Resiliency of the Electricity System in the North Slave Region	17
Feasibility of Utilizing the Surplus Capacity in the Taltson Hydro Grid.....	18
Transportation.....	19

LONG-TERM OPTIONS FOR THE CONSIDERATION OF THE 18 TH LEGISLATIVE ASSEMBLY	20
Transformational Community Energy Projects	20
LNG for Fort Simpson and other road connected communities ..	21
Inuvik Wind Project	22
Kakisa and Fort Providence Transmission Line (Taltson) Extension	22
Déljine Mini Hydro	22
Whatì Transmission Line (Snare) Extension	22
Łutsek'è Mini Hydro	22
Transformative Projects for New Energy Markets	22
56 MW Taltson Hydro Expansion Project	23
13 MW La Martre River Hydro Project	23
Yellowknife LNG	23
Emerging Energy Alternatives	24
Intermittent Renewables (Solar) plus Energy Storage	24
Fort Simpson Biomass Combined Heat and Power	24
Improving the Resiliency of the North Slave Electricity System	24
North Slave - Wind Turbine	24
North Slave - Bluefish Hydro Expansion	25
 POLICY APPROACH	 26
Portfolio Approach	26
Evaluation and Reporting of Results	26
 CONCLUSION	 29
 APPENDIX A: BACKGROUND INFORMATION ON ELECTRICITY AND HEAT IN THE NWT	 31
Electricity	31
Heating	32
 APPENDIX B: GNWT RESPONSE TO STAKEHOLDER INPUT	 33
 APPENDIX C: SUMMARY OF GNWT RESPONSES TO THE CHARRETTE REPORT	 39



Transmission Line on the Snare Hydro System (Source: GNWT)

INTRODUCTION

The Government of the Northwest Territories (GNWT) held its first NWT Energy Charrette in November 2012 to gather input on the development of the *Northwest Territories Energy Action Plan* and *A Vision for the NWT Power System Plan*. Released in 2013, the Energy Action Plan is a detailed \$31 million plan for GNWT investment in energy programs and projects through to the end of 2015-16. The Power System Plan presented a long-term vision for the development of the NWT electricity system, including the potential expansion of the NWT transmission grid. These plans support and complement GNWT direction on energy and climate change issues addressed in *A Greenhouse Gas Strategy for the Northwest Territories*, the *Northwest Territories Solar Energy Strategy*, and the *NWT Biomass Energy Strategy*.

Since the release of the two plans, two key circumstances have changed. First, feasibility work on the transmission line expansion revealed it would cost well over \$1 billion, which is beyond the financial capacity of the GNWT. Secondly, the costs to provide electricity have continued to escalate. For instance to avoid a potential 13% increase in electricity rates the GNWT took the extraordinary step of committing \$20 million in funding to cover the cost of additional diesel generation in 2014-15.

In light of these developments the GNWT organized its second NWT Energy Charrette, held November 3-4, 2014, to gather public and stakeholder input on how it could re-focus the NWT Energy Action Plan in the short-term (i.e. FY2015/16), and make the NWT's energy systems more affordable and sustainable in the long-term.

The *Northwest Territories Energy Charrette Final Report: Energy Solutions in the Northwest Territories* was released on December 22, 2014. During January and February 2015, the GNWT solicited public comments on the contents of the Charrette Final Report and on energy issues in general. In total seven written submissions were received.

This document presents the GNWT's response to the suggestions contained in the Charrette Final Report as well as stakeholder input solicited by the GNWT on the Charrette Final Report. The document is structured as follows:

- GNWT observations on the *Charrette Final Report*.
- Short-term actions that the GNWT has or will initiate in 2015-16 that respond to the findings of the 2014 Charrette.
- Discussion of the long-term approach for the consideration of the 18th Legislative Assembly.
- An overview of policy issues, including work related to performance measurement, reporting on results, and continued collaborative policy development.
- A conclusion and summary of the revised year-three actions from the NWT Energy Action Plan.

PUBLIC INPUT

Input from the public on energy issues in the NWT has been central to this Charrette process. Members of the public, as well as other stakeholders who attended, provided a diversity of meaningful perspectives and insights. Following the release of the 2014 *Charrette Final Report* in late December 2014, the GNWT solicited further public comments on the contents of the *Charrette Final Report* and on energy issues in general. Written submissions were received from seven organizations:

- City of Yellowknife;
- Joint letter from Yellowknife Condominium Corporations;
- Chamber of Mines;
- Norman Wells Chamber of Commerce;
- Ecology North;
- Northland Utilities; and
- The Pembina Institute.

The GNWT would like to thank respondents for their time and effort in submitting comments and recommendations. The GNWT has considered this input in formulating this Response.

A detailed compilation of the public input received and the GNWT's response to stakeholder submissions as well as all of the suggestions provided in the December 2014 Charrette Report can be found in Appendices B and C.



Public input from participants at the 2014 NWT Energy Charrette (Source: Pat Kane)

GENERAL OBSERVATIONS FROM THE CHARRETTE REPORT

The cost of energy and utility services in the NWT is very high compared to most other regions of Canada. The small scale of the communities, harsh environment and vast distances contribute to this high cost.

Participants at the 2014 Energy Charrette acknowledged that there is no easy answer to the current energy challenges facing the NWT. It was noted that the NWT has a very complicated 68 megawatt system. Vast distances, many isolated community-based systems, and the need to invest in and maintain substantial redundancy make our relatively small system complex.

There was an overall appreciation of the Charrette discussion and a focus on community projects. In discussions “affordability” was considered to be the most important objective. The other three objectives that ranked near the top of the list included “environment”, “economy” and “energy security.”

Many of the ideas generated relate to actions currently underway or that have been previously considered. Other ideas that were discussed include:

- Diesel systems in our remote communities will remain a necessity until storage systems become more efficient in capacity and cost.
- Rising energy costs, environmental concerns and rapid changes in technology are challenging the status quo.
- These changes could exert pressure on the structure, ownership, and regulation of the NWT’s electricity and heating markets.
- The GNWT energy policy framework needs to be designed to address these challenges and be aligned with clear objectives.

The following recommendations were made to address these issues in the short-term:

1. Be more aggressive on energy efficiency and conservation
2. Find ways to make use of the excess electrical energy at the Taltson Hydro Facility
3. Continue to build on biomass energy initiatives in the short-term
4. Plan for increased development of small-scale renewable energy projects

Some long-term energy supply suggestions were also proposed:

- Continue to consider small hydro and/or transmission line build-out where feasible.
- Improve the utilization of waste heat recovery technologies in larger communities where there are economies of scale.
- Develop biomass combined heat and power (CHP) systems.
- Develop district energy systems using waste heat recovery and biomass CHP.
- Develop natural gas in the Beaufort Delta region and/or LNG where feasible.
- Focus on small scale solar and biomass projects for thermal communities.
- Examine potential for using waste to produce energy in larger communities where there are economies of scale.
- Develop new markets for Taltson hydro for heat and charging electric vehicles, for example.

SHORT-TERM ACTIONS OF THE GNWT

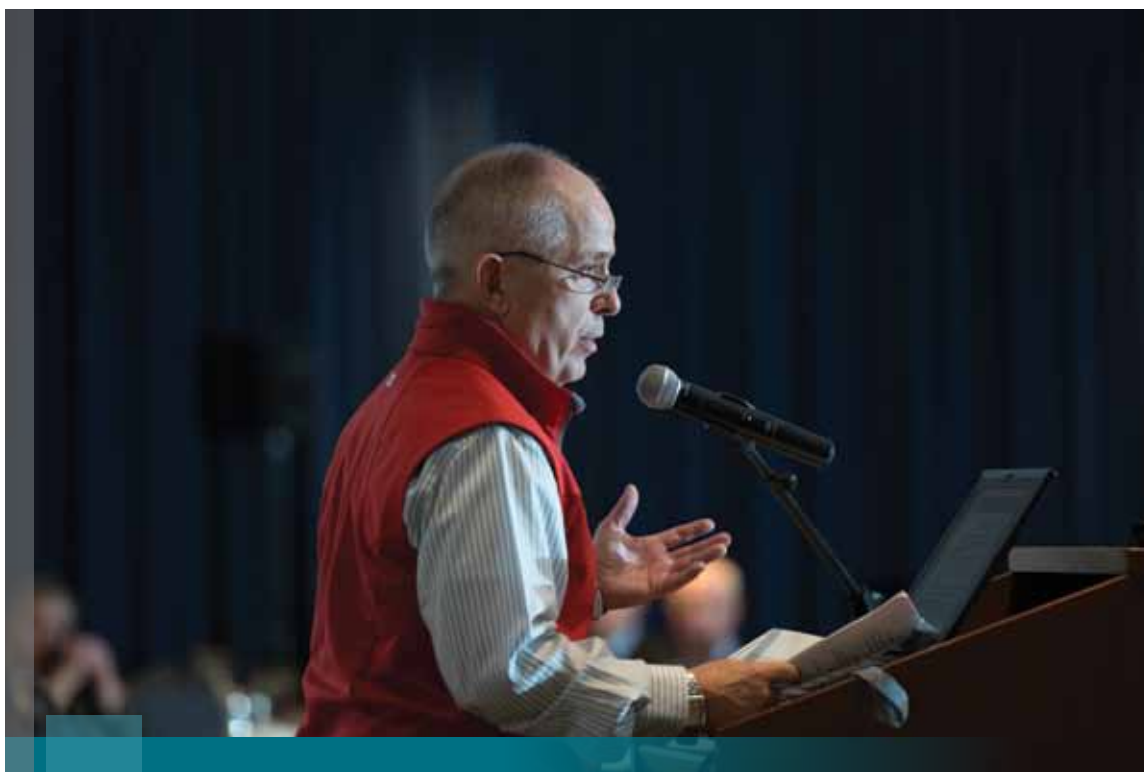
The *Charrette Final Report* provided a number of suggestions including areas to focus on as well as ideas for specific projects. At the start of the 2014 Energy Charrette the Premier and the Minister of Finance indicated that the third and last year (2015-16) of the NWT *Energy Action Plan* could be changed to incorporate ideas from the Charrette.

In early February the Minister of Finance presented the GNWT's 2015-16 budget. Based on the economic outlook and the population growth forecasts the GNWT is projecting that its revenues will remain almost flat for the next five years while expenditure pressures continue to grow. To maintain fiscal responsibility in the transition to the 18th Legislative Assembly, GNWT

departments will be largely working within their existing resources for 2015-16.

Based on the results in the report from the 2014 Energy Charrette, as well as comments received, the GNWT has been making investments in the right areas, but needs to make bigger investments and develop more projects. The short-term actions in the following sections represent the GNWT's immediate commitment to change.

One key issue not addressed is the Structure of the Electricity Sector. This is a complex issue that the GNWT is currently working to address. The GNWT decided to release this response now to address many of the suggestions received through the Charrette process and will issue a position paper on structural issues by the fall of 2015.



Honourable Michael Miltenberger speaking at the 2014 NWT Energy Charrette (Source: Pat Kane)

Following are the actions that will be undertaken in the short term, during the 2015-16 year.

Consolidation of Energy Functions within the Department of Public Works and Services

The responsibility for energy policy and planning, energy project development, conservation and efficiency, and alternative energy solutions has historically resided in a number of GNWT departments and agencies. In response to the desire for a greater focus on projects, effective April 1, 2015, the GNWT consolidated energy functions under the Department of Public Works and Services (PWS). This allows for more coordinated development of energy policy and a more focused approach to the development of energy programs and projects. Having energy policy and programs under a single Minister also enhances accountability to the Members of the Legislative Assembly.

During the transition the Premier will continue to hold responsibility for new energy initiatives. This will ensure continuity

for the life of the 17th Legislative Assembly. It is important to note that energy issues are cross-cutting and that many departments will still play an important role with respect to energy in the NWT, including:

- The Department of Transportation will continue to focus on energy issues through their Green Light initiative and their Transportation Strategy;
- The NWT Housing Corporation will continue to implement energy efficiency and renewable energy into their public housing units;
- The Department of Environment and Natural Resources will continue with their focus on climate change and mitigating the impact of our energy use on the environment; and
- The Department of Industry, Tourism and Investment will continue to manage NWT oil and gas development and lead strategic energy issues at the national and international level.



Input during the Charrette Discussion Group Sessions (Source: Pat Kane)

Continued Focus on Energy Conservation and Efficiency

At the 2014 Energy Charrette a number of presenters and participants suggested that the GNWT needs to invest more in energy efficiency and conservation measures with a focus on the thermal communities as a means of helping customers lower their energy usage and bills.

The GNWT recognizes that energy conservation and efficiency is often the best investment that can be made to reduce energy bills and mitigate the impacts of our energy use on the environment. The 17th Legislative Assembly has made substantial investments into energy efficiency, mainly through programs delivered by the Arctic Energy Alliance (AEA). This includes the establishment of AEA regional offices to better support communities.

The GNWT has enhanced its culture of energy conservation in its operations and buildings. Through the Capital Asset Retrofit Fund, which allows for reinvestment of building energy savings, the GNWT is now saving an estimated \$1.5 million in energy costs annually. As well, the current *Energy Action Plan* has provided \$700,000 per year to invest in energy savings for public housing.

The GNWT will continue to promote energy conservation and efficiency. In response to suggestions identified at the 2014 Energy Charrette, resources will also be directed towards the following priorities:

- Release of a discussion paper on an NWT energy efficiency act;
- Encourage the use of renewable energy in industrial development;
- A focus on energy information and awareness;
- Compilation of energy data to support community energy profiles;

Arctic Energy Alliance

The AEA was established in 1997 and has grown to a \$3.2 million organization with offices in Inuvik, Norman Wells, Fort Simpson, Whati, Hay River and Yellowknife. The GNWT funds nearly the entire AEA budget, allowing for a number of programs across the NWT, including the:

Energy Efficiency Incentive Program – provides incentives for residents to invest in energy efficient products;

Commercial Energy Conservation and Efficiency Program – aimed at helping businesses make energy conservation and efficiency investments;

Alternative Energy Technology Program – supports residents and communities in making investments into renewable energy sources such as solar; and

Energy Guide for Houses which provides funding to assist homeowners and businesses to complete energy efficiency audits.

See: www.aea.com

- Release of a discussion paper on changes to the *Cities, Town and Villages Act* and the use of local improvement charges to support residential energy efficiency improvements; and
- Support for community government energy management.

One limitation experienced in the NWT is the collection of comprehensive and timely energy data, including energy trends, energy supply and demand details at various scales, costs and pricing, and information on such things as greenhouse gas emissions. This limitation has hampered efforts to develop reliable community energy profiles and community energy plans.

This issue of energy data availability is partially due to difficulties in obtaining fuel data from the numerous private fuel suppliers that operate in the NWT, as well as data management across numerous GNWT departments and agencies, which should improve significantly once the GNWT completes the consolidation of its energy functions under PWS.

Release of a Discussion Paper on a Potential NWT Energy Efficiency Act

In the current NWT Energy Action Plan, the GNWT indicated it would investigate the challenges and opportunities involved in developing and implementing an energy efficiency act in the NWT.

The GNWT will develop a discussion paper that will investigate the case for an NWT energy efficiency act. The paper will investigate what other jurisdictions are doing in Canada and elsewhere, common practices for regulating energy efficiency, the potential scope and nature of an energy efficiency act, enforcement, and other issues to ensure an energy efficiency act is right for the NWT.

The discussion paper will be released in the fall of 2015.

A Focus on Energy Information and Awareness

The GNWT has heard from many communities and residents that there was a sincere appreciation for holding the Energy Charrettes in 2012 and 2014, which allowed people the opportunity to learn more about their local energy systems and what opportunities there are for the future.

Comments from the 2014 Energy Charrette demonstrate that the GNWT needs to make greater efforts to involve residents and communities in discussions regarding local energy systems. The more people are informed, the better understanding they have regarding the challenges of energy in the north as well as what they can do to reduce their use and manage their own costs.

The Arctic Energy Alliance plays a key role in energy information and awareness. With the consolidation of energy functions within Public Works and Services, the new Energy section will work with the Alliance and build on these efforts. Increased promotional and information campaigns will enhance energy literacy in the NWT and provide communities and residents with the information they need to reduce their energy use. Improved access to energy efficiency marketing material directed towards NWT businesses will be another key objective. An ongoing communications strategy will be developed for the consideration of the 18th Legislative Assembly that will answer two questions posed at the 2014 Charrette: "What happens between Energy Charrettes? How are communities involved?"

Energy Data to Support Community Energy profiles

There are currently gaps in community level energy data, including detailed energy demand and end-use statistics, costs and pricing, and greenhouse gas emissions.

This energy data gap has been addressed for GNWT operations but not yet for communities. The key factor relates to difficulty in obtaining fuel data from the numerous private fuel suppliers that operate in the NWT. Without this data it is difficult to develop reliable community energy profiles and therefore community energy plans. Better data will lead to improved and better informed planning and project feasibility studies especially at the community level.

It should be noted that in communities served by the Department of Public Works and Services detailed community data is already available. To ensure there is a community energy database for all communities the GNWT will be developing a system using the current fuel tax collection processes. The GNWT believes that local fuel providers will cooperate to support their communities in this initiative.

Consider Changes to the *Cities, Towns and Villages Act* to allow Local Improvement Charges

There was discussion at the 2014 Energy Charrette regarding the financing of energy efficiency improvements by residents. While energy efficiency improvements are often the best investment residents can make, not everyone is in a financial position to make the investment.

One idea proposed is to revise the *Cities, Towns and Villages Act* (CTV Act) to enable tax-based communities to use a Local Improvement Charge (LIC) to help support homeowners, and potentially businesses, invest in energy efficiency improvements. This would allow a property owner to access low-cost long-term financing from the municipality and tie the repayments to the property through property liens and charges on the property tax bill. If a property-owner sells their property in the future any remaining loan balance transfers with the property to the new owner.

This concept is supported by the NWT Association of Communities (NWTAC), and the City of Yellowknife as well as the Pembina Institute. These groups have been

working to define what an LIC energy efficiency program would look like. The City of Yellowknife released a report on the potential for this program in the spring of 2015.

The GNWT participates on the Yellowknife Community Energy Planning committee and has been following this work closely. The Department of Municipal and Community Affairs is planning a review of the *CTV Act* during the 18th Legislative Assembly. The GNWT will work with the NWTAC to develop a proposal for changes to the *CTV Act* that would allow for a LIC energy efficiency program, for the consideration of the 18th Legislative Assembly.

Support for Community Government Energy Management

While the GNWT has invested substantially in making energy efficiency improvements for government buildings, there is substantial potential for energy efficiency upgrades in community government buildings. In 2014 the NWTAC retained the AEA to deliver energy audits of forty-six community government buildings in 8 communities.



2014 NWT Energy Charrette (Source: Pat Kane)

AEA identified two hundred and forty actions the community governments could undertake that would pay for themselves in less than 5 years. Many of the recommendations made in the energy audits were similar across all communities and had a relatively low-cost with quick paybacks.

A total investment of \$1,000,000 spread over the 8 communities is estimated to save 130,000 liters of oil, 300,000 kilowatt hours (kWh) of energy and \$400,000 a year.

To overcome barriers to action such as lack of available contractors or capacity, AEA, with assistance from NWTAC, designed a project to help with the logistics and training involved in implementing a few of the recommendations in the audits.

Communities cover the cost of the materials, labour, shipping and travel for the contractor(s), providing access to a vehicle for the contractor(s) during the installation, and provide a person to assist the contractor(s) during working hours when they are in town.

Due to the success of this pilot project, and in recognition of the need to support community governments in maintaining and upgrading their assets, the GNWT has re-profiled internal funding in 2015-16 to ensure continued support to community governments for energy efficiency retrofits.

Continued Focus on Alternative and Renewable Energy

For many years the GNWT has recognized the need to reduce imported diesel with local, renewable and alternative energy sources. This has been achieved through biomass and solar projects, as well as incentive programs to support residents and businesses in making their own alternative energy investments. While there has been success, Charrette participants clearly signalled that they would like to see greater progress. Some immediate responses of the GNWT are discussed below and include further investment in biomass, solar, and work that will lead to the first community wind project in the NWT. In the long-term transformative projects are required and these are discussed in the next section.

Encourage the Use of Renewable Energy in Industrial Development

During the 2014 Energy Charrette renewable portfolio standards for industry were suggested. The GNWT will not impose rigid renewable energy targets on resource developments. As seen by the 9.2 megawatt wind farm at the Diavik Diamond Mine, enforced government standards are not required to encourage companies to invest in renewable energy as companies are already motivated by high cost of fuel.

The GNWT currently uses the regulatory and environmental assessment process to ensure that companies consider the use of renewable energy. The GNWT agrees that renewable energy assessments should be included as part of the baseline studies done for environmental impact assessments to determine whether there is a payback period less than the overall project life.



Sample of Wood Pellets (Source: GNWT)

Expanding the Biomass Supply Chain

It is estimated that \$150 million is spent in the NWT every year to heat homes and buildings. Charrette participants noted that more needs to be done to increase the use of biomass for heat and electric heat from surplus hydropower in the South Slave region.

Since 2006 the GNWT and private sector businesses have been working to increase the use of biomass heating – predominately wood pellets – to replace fuel-fired heating systems. These efforts have been very successful and have generated significant energy savings for many residential, commercial and institutional customers. The NWT is now recognized as a leader in Canada in the installation of commercial-scale biomass heating systems.

Increasing the availability of biomass energy in the NWT is a priority, as reflected in the NWT Biomass Energy Strategy. GNWT projects establish the demand for a community wood pellet supply, thereby enabling community access and supporting the expansion of a local biomass supply chain.

In 2014-15, three pellet boilers were installed and used at the Mackenzie Mountain School, at the airport terminal building, and at the airport maintenance garage in Norman Wells. A pellet boiler at the Deninu School in Fort Resolution is waiting to be started, and in 2015-16 pellet boilers will be installed at the schools in Tulita and Fort Good Hope.

To date the GNWT has installed nineteen biomass boilers in communities throughout the North Slave, South Slave, and Deh Cho regions. Continuing this expansion throughout the Mackenzie Valley will help reduce the use of oil and save energy costs.

The participants at the Charrette also noted that the NWT should be working to develop its own local biomass supplies, rather than importing wood pellets from British Columbia or Alberta.

The GNWT will be supporting the wood pellet manufacturing industry in the NWT, primarily through an agreement to purchase made-in-the-NWT wood pellets, once an NWT based project is operational. The GNWT has also supported the establishment of forest management agreements required to establish harvesting rights to the forest product required for a wood pellet operation. The GNWT will continue to look for ways to expand the biomass supply chain in the NWT.

Examine Regulatory Issues Associated with Biomass and Support for the NWT Biomass Energy Association

In 2014 the NWT Biomass Energy Association (BEA) prepared a discussion paper, entitled *Barriers to Biomass Energy Installations in the NWT*, to document its concerns regarding a perceived lack of understanding by regulatory and permitting agencies and a lack of technical guidelines specific to automatic feed pellet boiler systems. Other concerns raised included inconsistent treatment of pellet boiler systems by insurance companies and a need to monitor and control the quality of wood pellets being supplied to the NWT.

The NWT BEA and PWS have had preliminary discussions about these issues and recognize that government and the private sector can work together to help address some of these barriers, including supporting the development and adoption of national standards for biomass fuel and heating equipment.

Through the Arctic Energy Alliance the GNWT will support the efforts of the NWT BEA including support for efforts at the national level to ensure national standards reflect the latest developments and technology in the biomass energy sector.

Charrette participants also proposed that regulations related to access for fire-killed trees could be streamlined. Following the extensive forest fires experienced by the NWT in summer 2014 there are significant amounts of useable fire-killed trees that could be harvested as biomass fuel.

The GNWT's wood harvest permitting process is found in the Forest Management Act and related regulations. This legislation does not discriminate between living and dead trees and the same permitting process must be followed for both in 2015-2016. Recommendations on the need for streamlining the harvest permitting process arising from the 2014 Energy Charrette are welcome input.

The Department of Environment and Natural Resources commissioned a report on the energy value of fire killed wood in the NWT with results expected in the spring of 2015. As well, the GNWT is actively surveying wood availability in the burned areas to allow for timely identification of the best areas to harvest useable forest fire residuals and will make this information available. This information will support timely access to fire-killed trees.

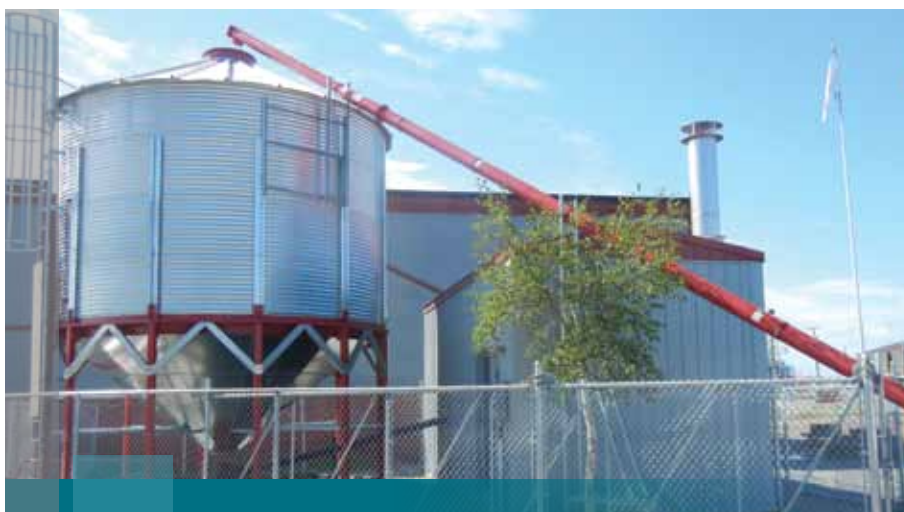
Feasibility of Biomass Combined Heat and Power Project

Participants in the 2014 Energy Charrette had a strong interest in the potential for biomass combined heat and power (CHP) to potentially reduce the cost and emissions of energy in the NWT. The idea behind biomass CHP is to use wood biomass waste instead of fossil fuels to generate electricity as well as heat at the same time. The heat could be used for district heating.

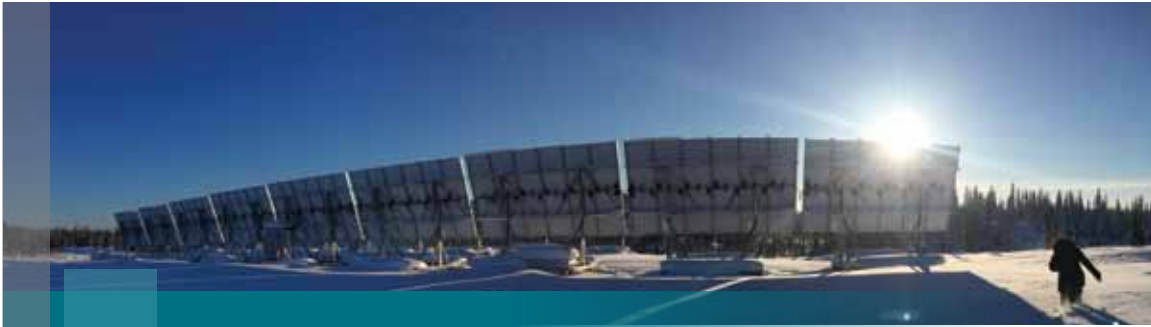
Given the strong interest and the success of the biomass heating programs initiated by the GNWT, research on CHP is being updated to consider the latest developments in the technology.

Preliminary results of this work indicate that the cost of biomass is critical for an economic CHP plant and that a very large heat market is needed to support the business case and be cost competitive with diesel.

With the potential establishment of a biomass supply chain inside the NWT projected biomass costs could be reduced to a point where projects become economic. Further work to define the biomass supply chain and access to the harvestable resource in the local area is needed to establish a business case. All of this work will be compiled for the consideration of the 18th Legislative Assembly including information on a potential biomass CHP pilot project.



Pellet silo at Elizabeth MacKenzie Elementary School in Behchoko, NT (Source: GNWT)



Solar PV installation in Colville Lake, NT (Source: GNWT)

Net Metering Policy

In January 2014, the NWT Public Utilities Board (PUB) approved the implementation of a net metering program by electrical utilities in the NWT. The program allows residential or business electricity customers who install small renewable energy generators to feed into the electricity grid and accumulate energy credits monthly for any excess electricity they produce over what they use. These credits can then be used against future months when their usage exceeds their production.

There are some aspects of the net metering program that some felt should be addressed to better encourage the installation of renewable energy technologies. A key issue was the need for long-term policy certainty to ensure that net metering programs will not be cancelled in the future, which would impact the economics of investments.

In response, on April 10, 2015, the GNWT issued rate policy guidelines that directed the PUB to:

- Allow municipal governments to be eligible for the program;
- Amend guidelines to establish some certainty with regard to how long the net metering program will be in existence; and
- Amend guidelines to limit the size of the installations to 15 kilowatts to ensure that the program is accessible to as many residents and businesses as possible.

Continued Focus on Solar

The 2012 *NWT Solar Energy Strategy* outlines steps and actions to help make solar energy an integral part of the NWT's energy mix. In recent years the decreasing cost of solar photovoltaic systems has resulted in an increase in the number of grid-connected systems being installed.

A key pilot project scheduled for completion in 2015-16 by the Northwest Territories Power Corporation (NTPC) is a combined solar-diesel-battery system in Colville Lake. This project will include 135 kilowatts of solar, and for the first time include battery storage to help maximize the renewable energy usage.

The Alternative Energy Technologies Program administered by the Arctic Energy Alliance will continue to provide an avenue of support for residents and businesses to install their own solar energy. As well, PWS is initiating a smart metering project in Jean Marie River to ensure both customers and the utility have better real-time data on electricity demand, and to support the use of distributed renewable energy with a view towards developing a solar array for that community.

The Northwest Territories Housing Corporation has been allocated \$700,000 through the *NWT Energy Action Plan* for 2015/16 that is mostly being used to install solar PV on new and existing buildings.

The GNWT developed the first large-scale solar array in Fort Simpson in 2011. Current work will be completed during 2015-16 and planning for new projects will continue and be presented to Members of the 18th Legislative Assembly.

Feasibility of Wind Energy

Wind energy is an active area of interest especially with successful projects such as the Diavik Diamond Mine wind turbine installation showing that there are now technologies that have proven track records in the North.

Inuvik has some promising wind locations. Monitoring is complete at Storm Hills and was found to have an excellent wind regime. Wind monitoring will continue at an alternative location closer to Inuvik where preliminary monitoring has found good wind speeds. Feasibility work will be completed during 2015-16 for a wind project in Inuvik.

Wind monitoring work will be undertaken in the Yellowknife/Snare region in 2015-16 to gather data and to examine cold weather 'inversion layers'. Certain geographic features and taller turbine structures may be used to find higher wind speeds despite what is generally considered a poor wind regime. Preliminary work on wind in the Yellowknife region will be included in the Yellowknife options analysis discussed further below.



*Diavik Diamond Mine Wind Farm
(Source: Diavik Diamonds Inc.)*



Snare River Hydro (Source: NTPC)

Improving the Resiliency of the Electricity System in the North Slave Region

Many charrette participants expressed concerns over the long-term reliability of power in the Snare hydro system. This issue was a point of discussion as all were aware of the occurrence of extreme low water conditions on the Snare River hydro system during 2014-15. Resiliency in the context of an electricity system is the ability to withstand stresses such as severe weather and supply failure, and results in increased reliability.

Developing a large capital intensive project to add electrical generation capacity to address one low water year in a 12 year cycle is not likely cost effective and would increase electricity rates. In normal years the Snare system has enough hydro power to cover power requirements year-round, except for short peak periods during the coldest months in the winter.

Looking ahead there is an issue with continued reliance on the existing diesel generators at the Jackfish station in Yellowknife. There are two 5 megawatt diesel generators that are 50 years old and are nearing the end of their life and options to replace these must be developed. Options should also consider the potential

to expand the system if a new market or power load can be added to the system in the form of a resource development project. Existing hydro systems in the North and South Slave were developed through partnerships with industry, and the power loads of new industry would drive any material expansion of existing systems. With a new industrial load new systems could be developed with no impact on current rate payers and could potentially result in lower electricity rates through improved economies of scale.

In 2015-16 the *NWT Energy Action Plan* reflected funding to undertake a feasibility study for the addition of capacity through liquefied natural gas (LNG). The GNWT will re-profile this funding to a Yellowknife options analysis to look at a range of potential power options. These options include an LNG generating station in Yellowknife, a capacity addition to the Bluefish hydro station, which is served from a different watershed than Snare, upgrades to the Jackfish diesel plant to increase capacity and improve efficiencies, a 10 MW battery system that could store 15 minutes of reserve energy (recharged by the hydro system), biomass CHP, and wind energy from the North Slave area outside of Yellowknife. The results of this work will be presented to the 18th Legislative Assembly and an option will be chosen that improves reliability in the North Slave region while ensuring as minimal an impact on rates as possible.

Feasibility of Utilizing the Surplus Capacity in the Taltson Hydro Grid

The Taltson hydro generating station is located about 64 kilometers north of Fort Smith on the Taltson River. It has 18 MW of generating capacity and provides power to Fort Smith, Hay River, K'at'l'odeeche First Nation, Fort Resolution and Enterprise via some 200 km of transmission lines.

One of the short-term actions identified during the 2014 Energy Charrette was to find ways to use the approximately 50% excess yearly capacity available on the system. Ideas put forth included electric heating and charging of electric vehicles in the South Slave region. There was also a suggestion that the GNWT could issue a Request for Proposals (RFP) to see what ideas the private sector may have.

In response, the NWT Power Corporation recently issued letters to government customers in Fort Smith and Fort Resolution to gauge their interest in electric heating. To support NTPC and respond to the 2014 Energy Charrette suggestion, the GNWT has provided funding to NTPC to complete studies on if transmission and distribution system upgrades would be needed to distribute additional power, as well as the upgrades and associated economics of retrofitting buildings to use electric heating.

Once these studies are complete, the GNWT will have a much better understanding of the costs to provide customers in the South Slave with electric heating, the prospective electric heating price that would apply, and the simple payback that customers could expect.

Depending on the study outcomes for electric heating in the South Slave these conversions could use all of the available surplus capacity on the Taltson system. However, if it turns out that some surplus remains, it is worth exploring the expanded use of electric vehicles, which could be charged in off-peak periods.

The GNWT, working with NTPC, will develop a report on the economics of using the surplus power in the Taltson system for electric heating, and for electric vehicles, in the South Slave region, for release in the fall of 2015.



2015 Chevy Volt (Source: Arctic Energy Alliance)

Transportation

Fossil fuel use for transportation purposes accounts for a significant amount of the NWT's annual fuel consumption and contributes about 30% to the NWT's annual greenhouse gas emissions.

Within the context of finding ways to use the surplus electrical energy of the Taltson system, there is an interesting electric vehicle demonstration project now being conducted by the Arctic Energy Alliance. The AEA has leased a 2015 Chevy Volt, has installed a charging station at its Yellowknife office and has put about 2,000 km on the vehicle. A data logger is tracking the vehicle's performance and monthly reports are posted on the AEA web site (www.aea.nt.ca/research/electric-vehicle). A final case study will be completed after the 18-month lease has expired.

Should the AEA electric vehicle demonstration project prove successful, there may be a business case for the expanded use of electric vehicles in the South Slave region where there is excess hydro capacity.

LONG-TERM OPTIONS FOR THE CONSIDERATION OF THE 18TH LEGISLATIVE ASSEMBLY

Affordable, reliable and sustainable energy solutions are the focus of long-term planning and investment in the NWT's energy system. There are a number of proven technology options available today that can reduce our reliance on diesel. While the cost of some options are reducing (such as solar), most require substantial government subsidies to ensure that affordability is not impacted for residents and communities. The long-term goal is to develop transformative energy projects in NWT communities that will relegate diesel generation to back-up supply status.

There are three kinds of energy projects that should be considered in planning for the future:

- **Transformative Community Energy Projects:** community scale projects that fall in the 0.250 – 9 MW range that deliver clean sustainable energy to help displace diesel as the primary source of power. As heard at the Charrette, community-based projects will be the prime area of focus for the GNWT.
- **Transformative Projects for New Markets:** projects that are too large for all but the largest communities and fall in the 10 - 50 MW range and generally require a new or emerging energy market, such as an industrial customer. These projects are approaching the scale required to build a solid business case for development.

- **Emerging Energy Alternatives:** A number of emerging technologies exist in other parts of the world that have yet to be proven in remote northern applications. These renewable energy technologies may evolve over time to become primary options for many of our remote communities.

All of these options will be packaged for the consideration of the 18th Legislative Assembly. In most cases further investments will be needed to reduce project risks and to refine the high level business case estimates that are provided below.

Transformational Community Energy Projects

Charrette participants were mainly focused on the community scale opportunities. A snapshot of transformative community energy projects with a ready market for power is provided below. These include a range of technologies such as wind, grid expansion, liquefied natural gas and mini hydro solutions. These projects have been studied to a variety of levels starting from the conceptual stage through to the tender ready stage where projects could proceed to environmental permitting and construction relatively quickly if funding was secured.

Timelines for projects considered here are expected to range from 1 - 5 years to gather the information needed to secure permits and proceed to construction. Some regional and community projects have been studied to the feasibility or tender ready level, such as a transmission line extension of the Snare or Taltson transmission systems, and could proceed to construction relatively quickly.

Combined these projects would require a significant government subsidy in order to maintain existing electricity rates. Below is a table that ranks projects in terms of affordability and diesel displacement per government dollar invested. The amount of government contribution is defined by the

level of funding required for a project to proceed with no increase to electricity rates. Divide the government contribution required by the lifetime amount of diesel displaced, to calculate the government subsidy for each litre of diesel displaced, presented below for comparability purposes.

COMMUNITY	PROJECT	PROJECT	POPULATION	COST	GOV'T SUBSIDY	LIFETIME **DIESEL	GOV'T COST TO DISPLACE
		Size	Affected	Estimate	Required	Displaced	Diesel
		(MW)		(millions)	(millions)	(millions)	\$/L
Fort Simpson	LNG*	1.2	1,250	\$10-12	None	51	\$0
Inuvik	Wind Turbine	7.0	3,400	\$25-30	\$2-5	59	\$0.03-0.08
Fort Providence & Kakisa	Taltson T-Line Extension	1.0	850	\$30-40	\$10-15	50	\$0.20-0.30
Deline	Mini-Hydro	1.0	600	\$30-40	\$10-15	40	\$0.25-0.38
Whati	Snare T-Line Extension	0.5	500	\$30-40	\$15-20	24	\$0.63-0.83
Łutselk'e	Mini Hydro	0.5	300	\$30-35	\$20-25	23	\$0.87-1.09
TOTAL				155-197	57-80	247	

* Liquefied Natural Gas (LNG) is a fossil fuel that would displace diesel in favour of natural gas. LNG scores high on affordability but is non-renewable.

** Assumptions: LNG, Wind - 25 year life; Transmission line extension, mini hydro – 50 year life

LNG for Fort Simpson and other road connected communities

A preliminary investigation of potential LNG sites in the communities of Fort McPherson, Fort Simpson and Fort Liard indicated that Fort Simpson may provide the best business case for the next small scale LNG project. Work is underway to assess the technical feasibility of building a small scale LNG storage and gas generation plant at Fort Simpson which would rely on trucked LNG. Natural gas is a cleaner burning fossil fuel than diesel and the landed cost of natural gas is expected to provide a price advantage to diesel in the long-term. Tuktoyaktuk may also be a viable candidate for LNG once the highway is completed from Inuvik.



LNG Storage Facilities in Inuvik (Source: GNWT)

Inuvik Wind Project

A wind monitoring station at Storm Hills near Inuvik confirmed that the location has excellent wind potential. A secondary wind site at “The Inuvik High Point” closer to the community is also being studied and shows promise. A business case considering site location and access will be developed that incorporates the costs and benefits for both options. A 7 MW wind farm could displace 59 million litres of diesel over a 25 year project life.

Kakisa and Fort Providence Transmission Line (Taltson) Extension

Extension of the Taltson transmission system from Hay River to Kakisa and Fort Providence is an opportunity to displace diesel generation and take advantage of surplus power that is available at the Taltson facility. This would convert two communities to clean hydro power from diesel forever. In 2013 the GNWT conducted a pre-feasibility study to develop cost estimates and details of the project. The project would be relatively easy to construct due to the existing highway which makes logistics and construction access much easier. Environmental impacts are expected to be less significant along the highway than for projects crossing an undisturbed area. The project would require a significant government subsidy to prevent rate increases but would displace 50 million litres of diesel over an assumed 50 year life.

Déline Mini Hydro

The GNWT has supported the Deline Land Corporation (DLC) to investigate the feasibility of building a 1.2 MW diversion type hydro project on the Great Bear River using very low head (VLH) technology. VLH technology is unproven in remote northern conditions, but if feasible could be an option for a number of other NWT communities. The GNWT is waiting for the results of the study and a third-party review of the technology and project design may be warranted. The project could displace 40 million litres of diesel over a 50 year life.

Whatì Transmission Line (Snare) Extension

The Snare system has surplus energy in normal water years that could easily meet Whatì's electricity needs. Constructing a 65 kilometre transmission line extension from the Snare system would displace diesel generation with clean hydro power and reduce the environmental impacts and greenhouse gas emissions. It is estimated that the project could displace 500,000 litres of diesel annually or 24 million litres over a 50 year life. The diesel plant would be maintained for back-up.

The community of Whatì and the Tłı̄chǫ Investment Corporation (TIC) are strong supporters of the project. The proposed transmission line would pass the proposed 13 MW Lac La Martre Falls hydro site (discussed below) and would have capacity to transmit power from this plant, should the customer base emerge to warrant building it.

Łutsel'è Mini Hydro

A small scale hydro diversion project could be located on the south side of the Snow Drift River approximately 14 km from the community. A short penstock and powerhouse would be constructed at the base of second rapids. The initial turbine size would be 500 kilowatts (kW), but the facility could include space to double capacity to 1 MW if needed. This is a proven technology that does not present any unknown operational risks. The project could displace 23 million litres over a 50 year life.

Transformative Projects for New Energy Markets

While community-based projects are the focus, preparing for potential opportunities is an area that can't be ignored. There are a number of transformative renewable power projects that could be built if a customer base emerges. Increasing the customer base improves upon economies of scale and has the potential to lower rates for everyone.

56 MW Taltson Hydro Expansion Project

Exploring ways to develop Twin Gorges and eventually the Taltson River basin could provide economic development opportunities, and stabilize or reduce electricity rates for Aboriginal governments, communities and businesses in the South Slave region for generations to come. The Taltson Hydro Expansion remains the most advanced hydro opportunity in the NWT. The challenge is finding the power market or customer base to justify the significant investment needed to build and finance the expansion and associated transmission lines. This project would cost hundreds of millions of dollars to build.

13 MW La Martre River Hydro Project

The GNWT worked with the Tłı̨chǫ Investment Corporation (TIC) to complete a feasibility study for the development of a hydro facility at the falls on the La Martre River. The study concluded that a 13.2 MW facility would generate enough revenue to support a \$140 million investment. The snare system has surplus energy in normal water years and won't require additional power for at least 5 years, based on current growth projections. It is the best positioned hydro project in the North Slave to provide

industrial scale power and is the next logical place for hydro power to be added to the existing snare system once needed.

Yellowknife LNG

New industrial loads in the vicinity of the snare system could be served by extending the existing 115 kilovolt (kV) transmission system out to resource development customers and utilizing the roughly 30 gigawatt hour (GWh) (3-4MW) of annual excess hydro (in normal water years) to supply them. Additional natural gas generation in the range of 20 MW would be needed to add a typical industrial customer and maintain sufficient redundancy on the snare system. LNG generation has proven to be a viable and cost effective alternative to diesel generation in Inuvik. LNG could be used to enhance redundancy in the snare system while optimizing the use of hydropower for new customers and avoiding diesel consumption in favour of cleaner burning natural gas. Preliminary costs are in the range of \$50 Million. Additional costs for connecting new customers to the snare system via a transmission line spur would be borne by the end user. Natural gas is not renewable, but it is preferable over diesel and could help with affordability and energy flexibility in the interim.



Construction of sub-station infrastructure by the Northwest Territories Power Corporation (Source: NTPC)

Emerging Energy Alternatives

A number of emerging technologies exist in other parts of the world that have yet to be proven in remote northern applications. These renewable energy technologies may evolve over time to become primary options for many of our remote communities but more study is needed to evaluate reliability, affordability, environmental benefit and cost.

Intermittent Renewables (Solar) plus Energy Storage

Colville Lake will become the first remote community in the NWT to have high penetration renewables, largely due to the battery system. The project will be operational in the coming year. The high penetration renewable demonstration project consists of integrating 135 kW of solar photovoltaic (PV) and 200 kWh batteries into a diesel generating power plant with an installed capacity of 350 kW. It is anticipated that during the summer months the solar PV system will be able to supply the entire town's load for most of the day. The project is an opportunity to build capacity in the operation and maintenance of a hybrid system and to evaluate the potential to replicate the project in other NWT communities. The cost of battery storage and expected shelf life continues to improve and could dramatically increase the business case for high penetration wind and solar integration in diesel communities.

Fort Simpson Biomass Combined Heat and Power

Preliminary results of the work indicate that the cost of harvested biomass is critical for an economic combined heat and power (CHP) plant and that a very large heat market is needed to support the business case. The heat market would require the development of a district heating system that is much larger than the system in place today in Fort Simpson in order to distribute the heat to large buildings in the area. Based on initial estimates, wood chips would need to be made available locally at or below \$100 per bone dry tonne in order to be cost competitive with diesel.

Improving the Resiliency of the North Slave Electricity System

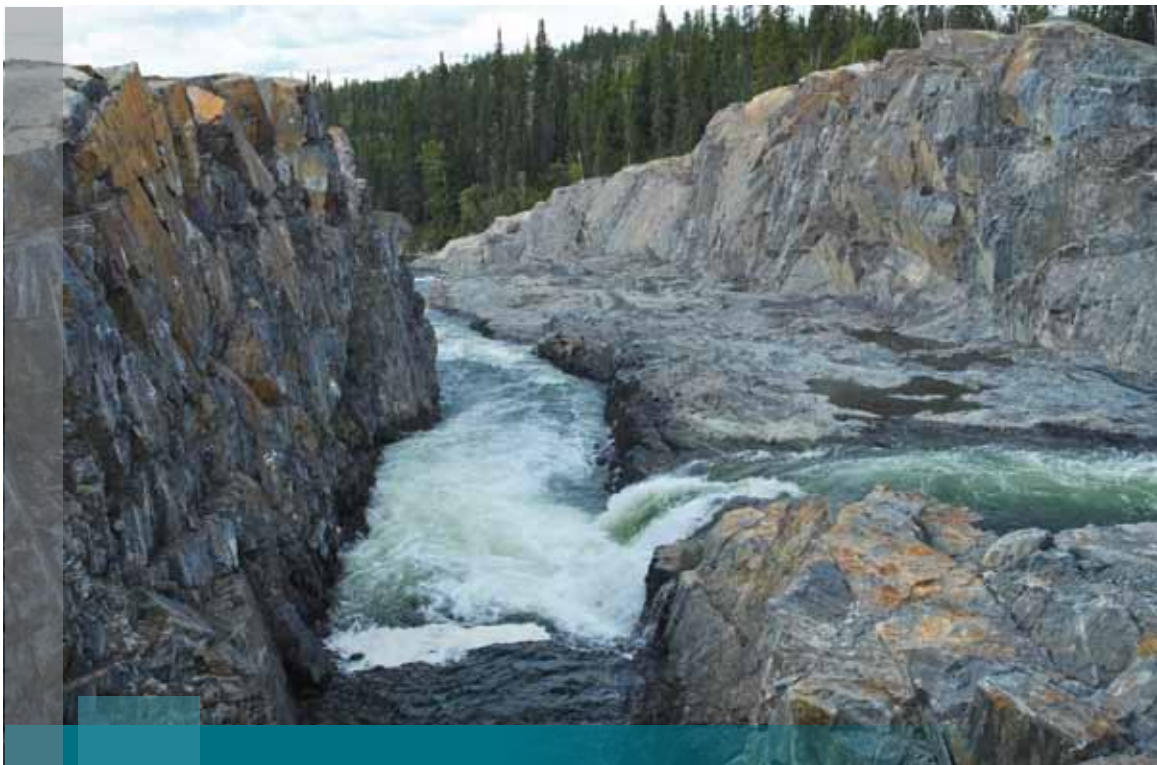
As mentioned in the short term actions section of the report, resiliency in the context of an electricity system is the ability to withstand stresses such as severe weather and supply failure, and results in increased reliability. Wind and our most viable hydro sites need to be part of the longer-term options that are considered.

North Slave - Wind Turbine

Two sites with good wind energy potential of 2-6 MW have been identified north of Yellowknife that could be tied into the Snare transmission system. The closest site is Berry Hill at roughly 15 kilometres north of Yellowknife and has good access. A 6 kilometre transmission line would be needed to tie into the existing Bluefish hydro line west of Prosperous Lake. The second site at 'CN' Hill at roughly 140 kilometres northwest of Yellowknife near the Snare transmission line is expected to have a stronger wind regime but more challenging construction logistics. A distribution line of 4 kilometres would be needed to tie into the existing snare hydro line. A business case will be developed for both options along with two years of wind data and the benefits of integrating wind into the hydro system.

North Slave - Bluefish Hydro Expansion

The Bluefish hydro site supplies electricity to the North Slave Snare transmission system. A new 7 MW turbine could be installed in place of an existing 3.5 MW unit to expand generation capacity. The expansion would help stabilize the electrical system and increase the Snare system redundancy by increasing the capacity within a separate watershed and separate transmission line. However the additional capacity is currently not needed in normal water years when the Snare system is fully operational. Bluefish represents the next logical place to source clean hydropower for a small load increase to the snare system.



Bluefish Commissioning Spillway (Source: NTPC)

POLICY APPROACH

Many of the initiatives presented in this document will require policy and planning work. This includes work towards a potential energy efficiency act for the NWT, potential changes to the *Cities, Towns and Villages Act*, direction to the public Utilities Board, as well as the overall direction to be taken by the GNWT on energy policy. One major pending issue is the structure of the electricity sector in the NWT and the role of public and private ownership in the system.

The GNWT will do the research and analysis on this issue and provide recommendations for consideration of the 18th Legislative Assembly on options to proceed. Having an efficient, reliable, and affordable electricity system in the NWT is of critical importance in terms of the cost of living, economic development and environmental protection.

Portfolio approach

The GNWT will continue to actively engage the public and stakeholders on energy policy issues. Input from the public is invaluable when plotting future direction. We will work with the public, stakeholders, the Public Utilities Board, community and Aboriginal governments, industry as well as the NWT Power Corporation, amongst others, to ensure we get the policy right.

Evaluation and Reporting of Results

The GNWT will provide regular public updates on its progress in implementing the energy initiatives in this response to the 2014 Energy Charrette.

During the 2014 Energy Charrette, participants were asked to consider several draft energy objectives and indicate which of the objectives they felt were most important. While there was a general sentiment that all of the objectives were important and should be reflected in the GNWT's energy planning and investment decision-making, most participants were willing to express a preference.

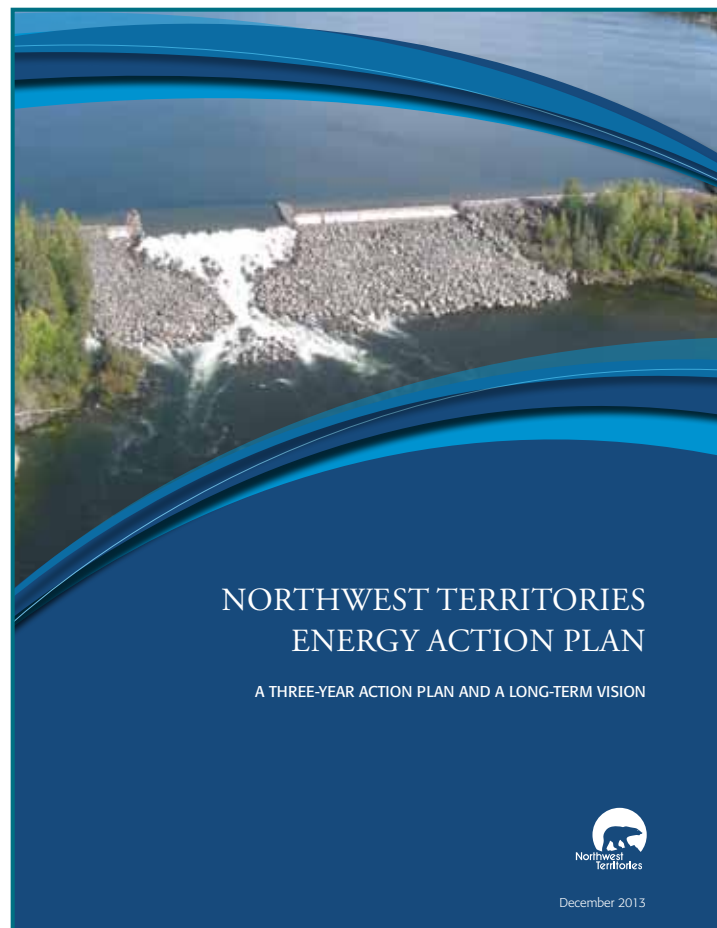
Overall "Affordability" was generally considered the most important objective, with three other objectives "Environment", "Economy" and "Energy security" ranked closely behind.

The GNWT agrees with the ranking suggested by the Charrette participants and strives to make energy investment decisions that satisfy as many of these objectives as possible.

The GNWT also recognizes that to properly use these energy objectives in planning or evaluating future energy projects and initiatives, more work is needed to operationalize the objectives and ensure that existing energy programs, projects and policies are consistent with, and able to meet, these clearly stated objectives and priorities.

Work was completed by the GNWT in 2014 to develop energy objectives that will be used for energy performance measurement, as detailed below.

As noted there are presently gaps in the GNWT's ability to readily gather and analyze energy-related data and information. Once the consolidation of the energy functions within PWS is complete and a robust energy data collection system has been developed, it is expected that the GNWT will be in a much stronger position to track the performance of its energy investments and share this data with community governments.



ENERGY INITIATIVE EVALUATION FRAMEWORK		
OBJECTIVE	SUB-OBJECTIVE	MEASURE
Affordability	Minimize community energy expenditures	Project payback based on community savings
		Lifetime community \$ saved per \$ invested
		Primary Beneficiary (residents/business/local government)
	Minimize GNWT operating costs for government assets	Project payback based on GNWT savings
		Lifetime GNWT \$ saved per \$ invested
Reduce requirement for GNWT energy subsidies	Lifetime reduction in subsidy per \$ invested	
Environment	Minimize GHG emissions from energy use and production	Lifetime GHG reduction
		\$ invested per tonne of lifetime GHG reductions
	Minimize the environmental footprint of energy use and production	How does this investment reduce the risk of fuel spills, reduce noise in the community or reduce air pollution?
Economy	Keep economic benefits in the NWT	NWT impact in \$ per total \$ invested (includes local labour, materials)
Energy Security	Improve electricity system reliability	How does the investment improve system reliability?
	Reduce community vulnerability to future price escalations.	Reduction in imported, purchased energy per \$ invested (MJ/\$)
		How does the investment add to diversity in community energy mix?

CONCLUSION

The results from the 2014 Energy Charrette, and stakeholder input, provide a diversity of meaningful perspectives and insights on the future of the energy system in the NWT. The GNWT is undertaking many of the actions suggested by stakeholders and participants in this charrette process, and will proceed with a series of additional short and long-term actions.

In the short-term the GNWT will re-focus the third year activities under its Energy Action Plan in order to address the results of the Charrette. A summary of these short-term actions can be found in the following table. The GNWT has identified a series of mid-to long-term transformational actions that could be pursued over the next 2 to 5 years at the community level across the NWT. These projects will require significant government subsidies to be economic and to ensure rate stability.

Finally, the GNWT has identified some potential energy projects that could be initiated over the longer-term to meet future markets. Leveraging the requirements of industry would support our economy, provide opportunities for businesses and Aboriginal governments, and has the potential to lower rates for everyone through increased economies of scale.

Reducing the high cost of living in the NWT, the need to move away from the use of imported diesel, and the expectation of northerners that we will continue to mitigate the impacts of climate change, are all drivers that will shape the future approach to energy in the NWT. Continued engagement with communities and wise strategic investments in energy infrastructure will be key to achieving the energy future northerners envision.

SUMMARY OF RE-FOCUSED YEAR THREE OF THE NWT ENERGY ACTION PLAN

DEPT	2015-16 ENERGY INITIATIVES	BUDGET
ENERGY SUPPLY		
Hydro		
PWS	Water Monitoring / NWT River System Inventory	\$50,000
Biomass		
PWS/AEA	Biomass Energy Programs delivered by the Arctic Energy Alliance (AEA)	\$175,000
Solar		
PWS	Solar Photovoltaic Electricity Generation in Colville Lake and Smart Metering in Jean Marie River	\$625,000
Wind		
PWS	Wind Energy Feasibility (Inuvik and Yellowknife)	\$225,000
Natural Gas		
PWS	Liquefied Natural Gas (LNG) Conversion in the Thermal Zone	\$150,000
Innovation		
PWS	Energy Resiliency / Energy Options in the North Slave System	\$175,000
PWS	Community Renewable Energy Fund (CREF) to support Renewable Energy Projects in Communities.	\$100,000
PWS/AEA	Alternative Energy Technologies Program (AETP)	\$310,000
PWS/AEA	Electric Vehicle Demonstration Pilot Program	\$15,000
ENERGY SUPPLY SUB-TOTAL		\$1,825,000
ENERGY CONSERVATION AND EFFICIENCY		
PWS/AEA	Core Funding for the Arctic Energy Alliance (AEA)	\$1,413,000
PWS/AEA	Energy Efficiency Incentive Program (EEIP)	\$300,000
PWS/AEA	Commercial Energy Conservation and Efficiency Program (CECEP)	\$200,000
PWS/AEA	EnerGuide Program	\$150,000
PWS/NTPC	Light-Emitting Diode (LED) Streetlight Conversion Project	\$400,000
PWS/AEA	Support to Community Governments for Energy Efficiency Retrofits	\$200,000
PWS	Identify Power Plant Residual Heat Projects - Organic Rankine Cycle (ORC) Generators	\$100,000
ENERGY CONSERVATION AND EFFICIENCY SUB-TOTAL		\$2,763,000
GNWT LEADERSHIP		
PWS	Capital Asset Retrofit Fund (CARF) for GNWT Assets	\$3,000,000
Finance/ NWTHC	Energy Efficiency Upgrades for Public Housing	\$700,000
ECE/PWS	Biomass Heating Systems in Tulita and Fort Good Hope	\$1,000,000
GNWT LEADERSHIP SUB-TOTAL		\$ 4,700,000
TOTAL		\$9,288,000

APPENDIX A: BACKGROUND INFORMATION ON ELECTRICITY AND HEAT IN THE NWT

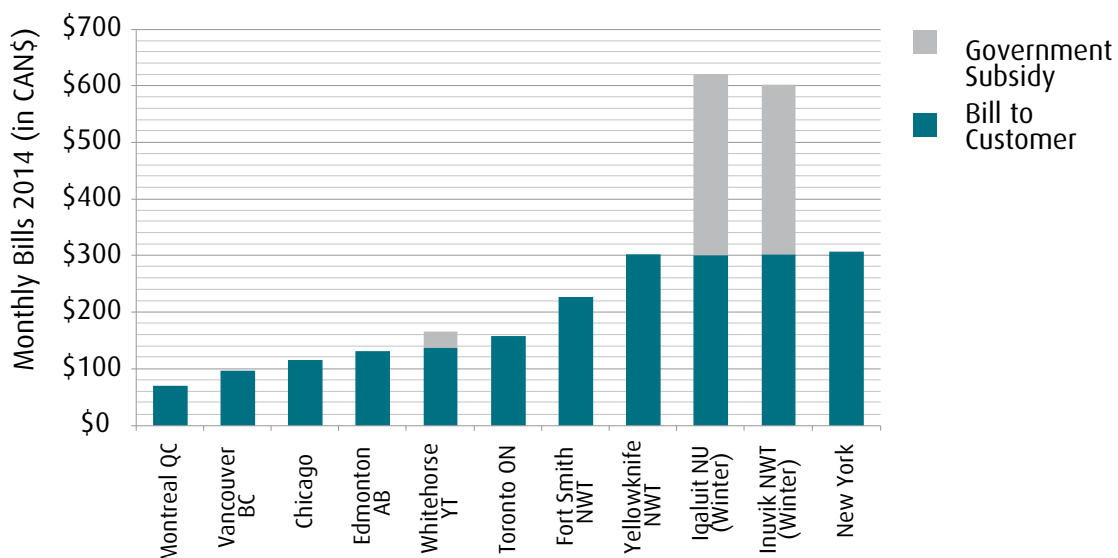
Electricity

On an annual basis, the peak demand for electricity in the NWT (not including industrial loads) is approximately 68 megawatts (MW) and the annual energy use is about 350 gigawatt-hours (GWh). In normal water years, the Snare and Taltson hydro electrical grids, with diesel back-up, provide about 70% of the electricity used annually. Thermal communities with diesel-generated power make up about 22% of the annual total. The recent conversion of Inuvik's power plant to use liquefied natural gas represents that last 8% of the mix.

Some of the key points about the NWT electricity system include:

- In hydro communities about 40% of the retail rate for electricity is due to the capital costs;
- In thermal communities the cost of the diesel fuel is the largest cost component in the retail rate for electricity at about 47%;
- Without the benefit of interconnected transmission grids the ability to use renewable energy technologies to displace diesel fuel consumption in thermal communities is limited to 20% - 30% penetration levels unless expensive battery storage is installed;
- The avoided cost of diesel power ranges from about \$0.24/kWh to \$0.32/kWh depending on the price of oil (\$50/barrel to +\$100/barrel).

Average electricity bills for residential customers in the Northwest Territories are much higher compared with other major cities in North America.

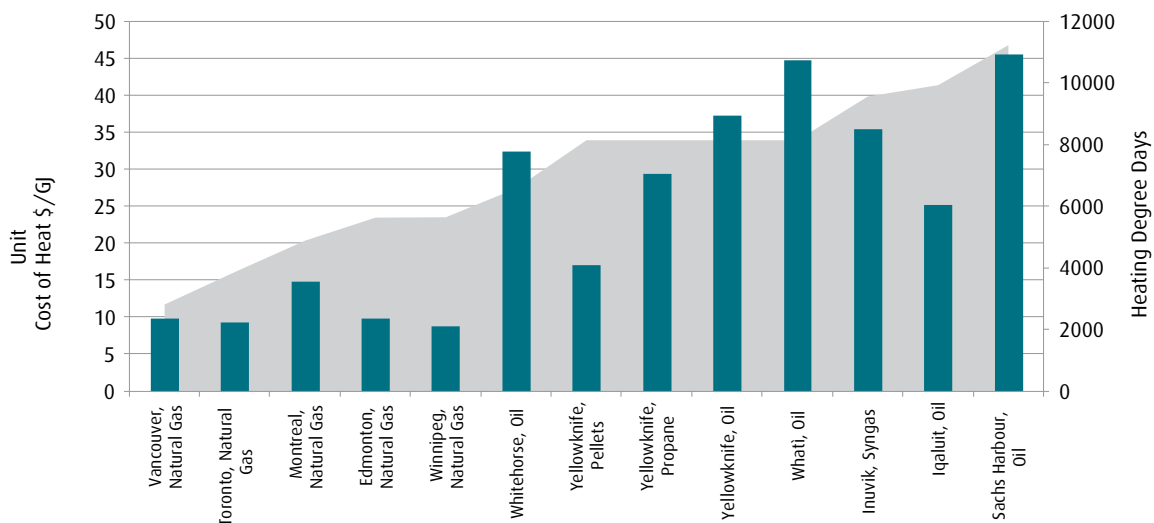


Heating

The NWT's heating market is estimated to be in the range of \$150 million per year, depending on the prices for heating fuels. The GNWT's investments in biomass heating systems in GNWT buildings have helped support a growing biomass market and business opportunities. As a result, the NWT is leading the country in the installation of commercial-scale biomass heating systems. Biomass heating, which can be used for residential, commercial or institutional buildings, can provide energy cost-savings up to 25% compared to fuel oil-heating systems. While recognizing the successes to date, Charrette presenters and participants made several suggestions, including:

- Further expanding biomass supply and distribution arrangements to support biomass heating conversions in communities not connected to the all-weather highway system;
- Exploring the use of biomass for combined heat-and-power (CHP) systems and/or district energy systems; and,
- Developing the NWT's forest resources to provide local biomass supplies, rather than importing wood pellets from southern suppliers.

Heating is a substantial portion of the energy requirements in the NWT and residents pay some of the highest costs to heat their homes in Canada as seen here. This figure also shows how the high cost is further exacerbated by the increased number of days that heating is required, known as heating degree days (HDD).



APPENDIX B: GNWT RESPONSE TO STAKEHOLDER INPUT

The GNWT's responses to the stakeholder input received on the 2014 NWT Energy Charrette Final Report are outlined below.

1. City of Yellowknife

The City suggested that there needs to be a focus on the other objectives, not just on affordability, and that care needs to be taken in weighting these objectives. As well the budgets allocated for energy actions will need to be increased to address the magnitude of the territorial affordability issue. The City also pointed out that condominiums do not fit the classification of residence or business of existing energy conservation and efficiency programs. Tremendous economies of scale could be achieved in Yellowknife.

GNWT Response:

- The GNWT agrees that all the energy objectives are important. While there was a focus on affordability at the Charrette, the GNWT's energy investment decisions attempt to achieve an appropriate balance among all four of the energy objectives discussed at the Charrette;
- For 2015/16 the GNWT does not have the fiscal resources to significantly increase the budget allocation for energy initiatives and investment. Looking forward the 18th Legislative Assembly will need to determine an appropriate budget for all energy actions, including the objective of improving energy affordability; and,
- The issue of energy programming for condominiums is addressed in item 2 on the following page.

2. Joint Letter from Six Yellowknife Condominium Corporations

Condominium Corporations are not-for-profit organizations but are being treated as commercial energy users when trying to access the GNWT energy programs delivered through the Arctic Energy Alliance, which isn't feasible. According to the submission the ability to leverage assistance from GNWT programs as a non-profit organization would provide savings and tremendous benefits as condominiums are more energy efficient than detached dwellings and a single investment can create positive impacts for multiple dwellings reaching a larger segment of the population at the same time. A condominium complex may provide opportunities for combined heat and power or solar installations.

GNWT Response:

- The GNWT understands the concern being raised and will consult with the Arctic Energy Alliance to investigate what options may exist to make it easier for condo corporations to access the GNWT energy programs delivered by the AEA.

3. Chamber of Mines

The Chamber pointed out that a micro-nuclear option was not included in the 2014 Charrette Report and suggested that Yellowknife is an ideal location as a test site for micro-nuclear (battery) technology – there is a need for power, infrastructure is in place and resources are readily available. Former industrial sites, such as reclaimed mines, could become future sites of nuclear power generation. Advancing the technology could put Yellowknife and the NWT on the map as a leading site for research in this area. Next steps would include discussions with the City of Yellowknife to investigate funding options.

GNWT Response:

- The GNWT actively follows developments in energy generation technologies and is aware that there have been recent advancements in micro-nuclear power systems. As discussed briefly at the Charrette, research is ongoing, although application of this technology is still likely 10 years away due to commercialization and regulatory issues;
- Given the NWT's energy challenges, the GNWT's focus is on current solutions. However, if an opportunity did arise, along with sufficient external sources of funding, where the NWT could serve as a test site for research in this area, the GNWT would solicit public input in their assessment of the opportunity.

4. Norman Wells Chamber of Commerce

The Norman Wells Chamber of Commerce suggested that serious consideration be given to establishing a single rate zone for the NWT that would provide a much needed balance in power costs and provide relief to the thermal communities. The Chamber also suggested that the potential for hydro generation on the Bear River needs to be fully investigated and a transmission line down the Mackenzie Valley needs to be included in the study of a Mackenzie Valley Energy, Transportation and Communication Corridor announced by Premier McLeod in January 2015.

GNWT Response:

- As part of the 2010 GNWT Electricity Review, the GNWT took a number of steps to reduce NTPC's underlying cost structure and allow the establishment of rate zones (rather than community-based rates). As a result, the non-government rates in many small communities were reduced from the \$0.80 - \$0.90 per kilowatt-hour range to about \$0.50 / kWh. This was done pursuant to the principle that "all communities should have a comparable level of access to affordable power".
- In past years the GNWT completed preliminary investigations to assess the potential for developing 150 MW of hydro-electric capacity at the St. Charles Rapids site on the Bear River to supply the Mackenzie Valley Pipeline with power. Without an identified customer able to buy all (or most) of the available energy under a long-term power purchase agreement, there is no business case for proceeding with this large-scale development.
- The Terms of Reference for the Mackenzie Valley Energy, Transportation and Communication Corridor Study have already been established. During the current phase the study is focusing mainly on transportation, oil and gas and communications. Transmission lines could be considered in a subsequent phase, should this plan proceed.

5. Ecology North

Ecology North suggested spending less time and money studying large energy projects and instead place more emphasis on smaller projects and policy direction in order to reduce the cost of energy. There is no one solution, but there should be a more community-focused approach concentrating on renewable energy, conservation and education. Energy conservation and efficiency are the best ways to save and more education is needed to establish a culture of energy conservation and efficiency in order to affect behavioural change. Communication surrounding conservation and efficiency could be improved. More renewables need to be added to the mix, especially when communities are looking to upgrade or replace existing infrastructure. The excess power from the Taltson Grid should be fully utilized which would provide a platform for electric cars and electric space heating.

Suggestions for the GNWT to consider in the short-term include: looking at community energy plans, developing a mini-hydro system, harmonizing capital plans, developing an energy network, encouraging water and sewer conservation, and developing a system for evaluating and reporting on energy programs and projects.

GNWT Response:

- The GNWT is focusing on community level solutions, especially in the thermal communities. In the short-term, there will be emphasis placed on energy conservation and efficiency, greater focus on energy information and awareness, and communications and engagement with communities. The GNWT will also be supporting greater use of alternative and renewable energy through biomass projects, net metering guidelines, continued focus on solar projects, and the development of a wind project in the NWT.

6. Northland Utilities

In response to comments made during the Charrette, Northland (NUL) noted that, as a regulated utility, its costs and rates are tested through an arms-length, transparent public process administered by the Public Utilities Board. As well, NUL is concerned that there are inequities in how rates are set and suggested different methods for sharing transmission and distribution costs on the Taltson system between NTPC and NUL customers.

NUL proposed several initiatives to lower electricity rates for NWT consumers, decrease reliance on diesel, increase investment and use of renewable 'green' energy and create new markets for NWT electricity. These included:

- Conversion of diesel generators to liquefied natural gas (LNG) or bi-fuel. A feasibility study is required to examine technical issues and economic benefits of this type of initiative;
- Continue to investigate the feasibility of using biomass in localized district energy systems (for heating);
- Continue to explore community-based renewable energy generation projects. Work with Aboriginal partners to identify and invest in projects that are technically and economically feasible; and,
- Use a GNWT/ATCO/Aboriginal joint venture to develop large-scale NWT hydroelectric opportunities.

GNWT Response:

- The GNWT recognizes and understands the structure of the electricity system, the role of the PUB as well as how electricity rates are established.
- The GNWT does not agree that there are inequities in how rates are set, specifically in regard to the methods used to share transmission and distribution costs on the Taltson system between NTPC and NUL customers. Current rate zones were established under the 2010 electricity review process, which NUL participated in.
- The GNWT notes that NUL suggested some general ideas (related to the use of LNG, biomass and renewables and the use of joint ventures with ATCO and/or Aboriginal partners). If NUL has specific project, joint venture or feasibility study ideas for the GNWT to consider, written proposals should be prepared and submitted as a basis for further dialogue.

7. Pembina Institute

The Pembina Institute noted that the idea of using local improvement charges to enable homeowners and municipalities to do energy retrofits and other local projects that can increase energy efficiency and reduce energy use was not included in the Charrette Report.

Pembina also noted that the Charrette Report did not include the suggestion by Dr. Marlo Reynolds to get to 20% solar power generation in all thermal communities. Finally, Pembina urged the GNWT to conduct a study to assess the lifecycle benefits/costs, environmental impacts, assumptions etc. regarding the use of LNG before considering a switch to this fuel type.

GNWT Response:

- The GNWT will consider the idea of revising the Cities, Towns and Villages Act (CTV Act) to enable tax-based communities to use a Local Improvement Charge (LIC) to help support homeowners (and potentially businesses) invest in energy efficiency improvements. This concept is supported by the NWT Association of Communities (NWTAC) and the City of Yellowknife is actively working to define an initial LIC program targeting 100 homes. The GNWT participates in the Yellowknife Energy Committee, is aware of the LIC issue, and is open to looking at options.
- The GNWT will ensure that solar power generation is considered in small communities. The Colville Lake solar/diesel/battery system is a good example of what can be done in the NWT and the NWT Housing Corporation will be investing \$700,000 in solar panels on public housing.
- The GNWT has undertaken analysis on the environmental impacts of LNG. Early results indicate that GHG emissions are reduced relative to the use of diesel fuel and work on this issue will continue into the 18th Legislative Assembly.

APPENDIX C: SUMMARY OF GNWT RESPONSES TO THE CHARRETTE REPORT

Energy Charrette Proposal or Comment	GNWT RESPONSE OR POSITION
SHORT TERM ACTIONS: Be More Aggressive on Energy Efficiency and Conservation	
Complete a Discussion Paper on an Energy Efficiency Act.	The GNWT is in the process of developing this discussion paper. The paper will investigate the challenges and opportunities in developing and implementing an energy efficiency act in the NWT. The Discussion paper will be released in the Fall of 2015.
Minimize additional diesel generation in the Snare system due to low water conditions.	Short-term plans being investigated to reduce the use of diesel generation in the Snare system include the integration of wind energy, the potential for LNG, biomass CHP, and batteries, for example. The GNWT will initiate an analysis to look at the options in 2015-16. In addition to this the GNWT will focus more on energy efficiency information and awareness, as well as energy management. The current low water levels being experienced in the Snare system are a one-in-twelve year event, and it would likely not be cost effective to plan new supply given the infrequency of the need. In the last 10 years more than 95% of the electricity in the Snare system was produced through hydro and this most recent year is an outlier.
Enhance promotional and information campaigns, enhancing 'energy literacy'.	As discussed in the short-term actions section of this report, the GNWT will be substantially enhancing efforts in this area. Energy literacy and community outreach have been identified as key priorities for the GNWT energy functions being consolidated within the Department of PWS.
Continue to focus on support in thermal communities.	The GNWT understands the importance of focusing on thermal communities and many of the actions in the short and long-term sections of this report directly support these communities. The GNWT, through the Arctic Energy Alliance (AEA), has established regional offices to provide better energy efficiency and conservation programs and supports to thermal communities. The AEA has successfully piloted a program, in cooperation with the NWT Association of Communities, to make energy efficiency improvements to municipal buildings. The GNWT will continue this successful initiative in 2015-16.

SHORT TERM ACTIONS: Make Use of Excess Generation Capacity at the Taltson Hydro Facility	
Electric heating and electric vehicles in the South Slave Region should be considered. The cost of upgrades and potential uses require study.	The GNWT has previously investigated the idea that the Taltson surplus could be used as an incentive and provide power to secondary processing facilities in the Pine Point area or could be used in a generation and transmission line proposal to provide renewable power to NWT diamond mines. As these proposals have been delayed, the GNWT agrees that the Taltson surplus should be utilized to the extent possible. NTPC has recently issued letters to government customers in Fort Smith and Fort Resolution to gauge interest in converting to electric heating systems. A study on required system upgrades is underway.
The GNWT should consider issuing a Request for Proposals (RFP) for renewable energy supply to determine ideas that the private sector may have.	The GNWT has identified a number of renewable energy options as reflected in the short and long-terms options sections of this report. NTPC has previously issued an RFP seeking proposals to supply electricity in the NWT and was unsuccessful. As new technologies emerge and economics improve the GNWT will consider an open RFP.
SHORT TERM ACTIONS: Continue to Build on Biomass Energy Initiatives	
Implement a policy to support harvesting fire killed trees.	As outlined in short-term actions in this report, access to fire-killed trees is the same as access to green or live trees. There are no specific regulatory procedures around fire-killed trees beyond the normal personal and commercial use permits, and licenses that are subject to normal consultation requirements. The GNWT is actively surveying wood availability in the burned areas to allow for timely identification of the best areas to harvest forest fire residuals and will make this information available.
Further expand regional/community biomass supply and distribution channels.	The GNWT is currently completing the installation of wood pellet boilers in Norman Wells and will install new wood pellet heating systems in Tulita and Fort Good Hope in 2015-16. Future expansion plans will be developed for the consideration of the 18 th Legislative Assembly.
Develop a biomass combined heat and power project.	Initial work has been done on the potential for a CHP system in Fort Simpson and improving the reliability of power supply in the North Slave. The GNWT will continue to monitor developments in CHP technology. A key issue is the establishment of a reliable biomass supply chain. Realistically, such a local supply chain is about two years away from being fully established. The feasibility of biomass CHP depends upon the price of feed-stock and the availability of a suitable district heating market. The GNWT has installed biomass and district heating in Yellowknife, Hay River, Fort Resolution, Normal Wells, and Fort Providence.
Address existing regulatory barriers to the installation of biomass heating systems (some felt that the existing regulations related to biomass installation are out of date)	The GNWT believes that the NWT regulatory environment should be progressive in support of biomass. The GNWT is working with the NWT Biomass Association to review existing regulations, with a particular focus on harmonizing NWT regulation to the national standards, if appropriate.

SHORT TERM ACTIONS: Continue to Build on Biomass Energy Initiatives continued	
Increase financial support for the installation of biomass heating.	The GNWT believes that the financial support provided to businesses and homeowners is already substantial. Financial support is available through the Energy Efficiency Incentive Program (EEIP) and the Alternative Energy Technologies Program (AETP). The EEIP provides a rebate to a maximum of \$700 for pellet stoves. The AETP provides a rebate to a maximum of \$5,000 for biomass home heating appliances and \$15,000 for commercial clients installing biomass heating appliances. Client feedback suggests satisfaction with the rebate amounts.
Enhance technical support for installing biomass heating systems in thermal communities	The GNWT recently established regional offices of the Arctic Energy Alliance intended to provide communities with a source of technical support and advice in managing their own energy use.
SHORT TERM ACTIONS: Increased Development of Small-scale Renewable Energy Projects	
Focus on solar technologies as the costs are rapidly reducing.	The GNWT's Solar Strategy reflects the government's commitment to expanding the use of solar to reduce our reliance on diesel power. The GNWT has seen the reduction in solar costs first hand. The cost of the 100 kilowatt Fort Simpson solar installation was in the range of \$11 per watt in 2012. Recent experience suggests costs may be as low as \$7 per watt installed today.
An exploratory RFP may help identify partners or result in new ideas.	There was substantial discussion during the Charrette regarding the potential of the private sector to provide renewable energy to communities at a rate below that of the cost of diesel in thermal communities - currently in the range of 32 cents per kilowatt hour. It was also noted that the GNWT has heard from a number of potential suppliers over the years that have stated they could provide renewable power at that rate without requesting government subsidies. No potential suppliers have emerged to date. The GNWT will discuss with NTPC the potential for issuing an exploratory RFP.
	Small power loads with a lack of economies of scale, the cost of qualified personnel to run the renewable energy systems, higher than average transportation, construction, and overhead costs, and the need to generate a reasonable profit, have historically provided challenges to private sector proponents wishing to sell renewable power to the local utility.

SHORT TERM ACTIONS: Examine Potential Benefits on Increased Private Sector/Community Involvement and Investment in Energy

<p>Opportunity to provide participation in ownership of local and/or regional energy projects.</p>	<p>If communities can supply power at the marginal cost of generation (32 cents in our diesel communities), with renewables for example, there would appear to be no compelling reason for any objections and the GNWT would entertain fully developed proposals.</p> <p>However, as reflected in a number of GNWT energy publications including the 2007 Energy Plan, the 2010 Electricity Review, and in the current Energy Action Plan, the GNWT does not believe there is a case for communities to own and operate their local diesel plant and distribution system.</p> <p>Some communities may see local ownership of these assets as a local economic development opportunity. As pointed out during the Charrette, there are benefits to crown ownership. For example Crown utilities do not pay taxes, have access to low cost borrowing, and from the 2010 Electricity Review, do not collect a rate of return in high cost thermal communities. Ownership of the local diesel plant and distribution system may not be what many communities truly desire. Communities may want to own the infrastructure and collect a guaranteed rate of return, but many may not be interested in receiving the service calls at 4:00 a.m. when the power goes out or the responsibility for emergency response systems due to tragic events such as when the power plant in Fort McPherson burned down in January 2004.</p>
----------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

SHORT TERM ACTIONS: Other Suggestions

<p>Establish a clear policy on net metering.</p>	<p>The GNWT has issued policy direction on net metering that will allow the PUB to establish net metering criteria that provides for greater long term certainty while ensuring the costs to the system are transparent.</p>
<p>Provide improved training opportunities for people in smaller and more isolated communities to service and repair infrastructure.</p>	<p>The AEA has five regional offices that work one-on-one to assist and deliver tailored guidance to individuals. The AEA Regional staff coordinate with other AEA professionals and experts to ensure people are provided the training and assistance needed. The AEA supports communities with biomass scoping and feasibility work and delivers information sessions on the effective and safe burning of wood for heating purposes. The AEA also organizes and hosts workshops and delivers other special training including wood energy technology transfer training combined with wood/pellet stove replacement projects, solar PV maintenance workshops and chimney replacement projects.</p>

SHORT TERM ACTIONS: Other Suggestions continued	
Formalize a relationship with the Canadian High Arctic Research Station (CHARS).	The GNWT actively participates in an information sharing committee chaired by CHARS and including representatives from the Yukon and Nunavut. As well, the GNWT is contributing to the development of a 'State of Energy in the Arctic' report. As discussed at the Charrette, CHARS is intending to develop some cutting edge energy technology projects and the GNWT will continue to stay involved and consider further formalizing the relationship as the construction of the CHARS in Cambridge Bay continues.
LONG TERM ACTIONS: Energy Efficiency	
Implement an <i>NWT Energy Efficiency Act</i>	As noted above, a Discussion Paper will be released in the Fall of 2015.
LONG TERM ACTIONS: Energy Supply	
Continue to consider small hydro and/or transmission line build-out (where feasible).	The GNWT has undertaken detailed mini-hydro work in Łutselk'e on the Snowdrift River and emerging technology work in Déline on the Great Bear River. Generally, the results have been similar; a mini-hydro system would cost in the range of \$30 million, with each requiring a \$20 million subsidy to ensure no increase in electricity rates. Detailed work was also completed on a proposed transmission line extension to the community of Whatì. Costs for this project came in at nearly \$35 million, with the project requiring a subsidy in the range of \$25 million to be economic. The approach to these projects is discussed further in the long-term actions section of this report.
Improve the utilization of residual heat recovery technologies.	There are currently residual heating projects in Fort Liard, Fort McPherson, Whatì, and Gamèti. Assessments have been done for projects in other locations, including Ulukhaktok and Inuvik. The economics for these projects are challenging. For example, the Fort Liard project cost \$2.4 million and required a subsidy of nearly \$2 million to be economic.
Develop district energy systems.	District energy systems at a community scale require piping through the community, making the economics very challenging. Small, 'clustered' district energy systems can work. The GNWT operates clustered district heating systems in Hay River, Fort Smith, Behchokò, Yellowknife, and Fort McPherson.
Develop natural gas (Beaufort Delta region) and/or LNG where feasible.	The development of LNG electricity generation depends on having a large enough market for the power. The GNWT encourages private sector resource development companies in developing NWT resources but does not become involved directly in the financing and construction of mines or oil and natural gas extraction. We would welcome fully developed proposals for LNG in thermal communities if the cost per kWh is less than the marginal cost of diesel per kWh. The GNWT did develop the LNG facility and supply chain to supply LNG in Inuvik for electricity generation.

LONG TERM ACTIONS: Energy Supply continued	
Focus on small scale solar and biomass projects.	As reflected in short and long-term action in this report, the GNWT will continue to place a substantial focus on solar and biomass.
Examine potential for using waste to produce energy (in larger communities where there are economies of scale).	The GNWT participates on the City of Yellowknife Energy Committee and is aware that the City is interested in examining the feasibility of this technology to reduce the waste in the Yellowknife landfill. The GNWT will continue to work with the City and if there is a role for the GNWT to support the City, a proposal will be developed for the consideration of the 18 th Legislative Assembly.
Develop new markets for Taltson hydro.	While the focus of discussions at the Charrette was on local and community-based projects, the GNWT will continue to look for opportunities to develop larger, transformative projects.
LONG TERM ACTIONS: Policy	
Set targets for NWT's use of local and renewable energy sources.	The NWT Solar Strategy has set targets of 20% average annual summer load for solar in the NWT. It should be noted that this target is aspirational because there is a substantial cost to installing renewable energy systems in communities.
Deployment of smart grid technology.	NTPC is installing smart meters on selected buildings in Jean Marie River in 2015/16. The meters collect detailed load and time data on individual buildings. The information can be used to improve diesel dispatch and assist with renewable energy integration on an isolated grid. Smart meters are the first step in developing a smart grid, where communication technologies are used to automatically gather and act on information about the behavior of suppliers and consumers to improve the efficiency, reliability, economics and sustainability of the production and distribution of electricity. Investigating and integrating suitable smart controllers and demand response devices is planned for 2016/17.
LONG TERM ACTIONS: Other Suggestions	
Develop an Energy Heritage Fund.	<p>The GNWT has already established a Heritage Fund. A Heritage Fund was created August 1, 2012 with the passage of Bill 10 Northwest Territories Heritage Fund Act. The Heritage Fund legislation establishes a trust fund as a long term investment fund into which surplus funds may be transferred at the discretion of the Legislative Assembly. These funds can include government revenues from mining as well as energy development.</p> <p>The Legislative Assembly receives an annual report on the performance of the Heritage Fund. The legislation includes a requirement for the Legislative Assembly to conduct a review after ten years of the provisions and operations of the Northwest Territories Heritage Fund Act, including recommendations on how to seek public input and advice on expenditures from the Fund.</p>

LONG TERM ACTIONS: Other Suggestions continued	
Mandate renewable energy projects for mining projects.	<p>The GNWT will not impose rigid renewable energy targets on resource developments. As seen by the 9.2 megawatt wind farm at the Diavik Diamond Mine, government legislation is not required to encourage companies to invest in renewable energy. Companies are already motivated by high cost of fuel.</p> <p>The GNWT currently uses the regulatory and environmental assessment process to ensure that companies consider the use of renewable energy. The GNWT agrees that renewable energy assessments should be included as part of the baseline studies done for environmental impact assessments to determine whether there is a payback period less than the overall project life.</p>
Implement time of use pricing and metering for electricity.	<p>The structure of the NWT electricity system with very small, isolated grids powered with an overcapacity of variable diesel generators, means that there would be very little to be gained with implementing time of use pricing. Time of use pricing can work in southern jurisdictions because if enough people run their dishwasher or other appliances at 3:00 a.m. impacts on the electricity grid during peak hours are reduced.</p>
Use of technical and community level advisory committees to work on energy actions.	<p>The GNWT has established regional offices of the Arctic Energy Alliance in the last few years to provide better support to communities as well as engage communities in a dialogue on how communities can manage their own energy use and costs. As well, as demonstrated by the Energy Charrettes held by the GNWT in 2012 and 2014, there is a concerted effort to have communities more involved in energy policy discussions and the identification of actions that the GNWT can take with regard to energy generation and use in the NWT.</p>

Energy Policy and Planning Division
Department of Public Works and Services
Government of the Northwest Territories
P.O. Box 1320
Yellowknife, NT X1A 2L9

nwtenergy@gov.nt.ca

[**www.nwtenergy.ca**](http://www.nwtenergy.ca)

