Energy for the Future

A Discussion Paper on

Energy Policy and Planning

for the Government of the

Northwest Territories

Energy for the Future

Message from the Ministers

The development of energy resources in the Northwest Territories (NWT) will play a critical role in our economy for decades to come. This development will also provide an economic base and the future revenues required for our government, and emerging Aboriginal governments, to deliver services to NWT residents.

Stewardship of our natural environment is close to the heart of many NWT residents. The warm winters we have experienced during the past several years have heightened awareness of the growing impacts of climate change and the global need to reduce greenhouse gas emissions.

A comprehensive NWT Energy Plan will provide the policy framework to guide and support future decisions regarding energy. This discussion paper highlights the key issues that need to be addressed in a comprehensive NWT Energy Plan.

This approach should result in energy development and management that ensures sound environmental management and leaves a lasting legacy of clean, affordable energy for the benefit of all residents of the NWT.

We welcome your comments and assistance as we develop an Energy Plan for the NWT.

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Minister of Industry, Tourism and Investment

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Fundamental energy policy issues need to be addressed in the development of a NWT Energy Plan.

EXECUTIVE SUMMARY

The NWT Energy Plan needs to address some fundamental issues:

Balancing the development of NWT energy resources with the need to ensure sound environmental management.

The development of NWT energy resources is required to provide an economic base for local businesses and revenue streams for northern governments. Northern governments require access to these revenues to provide services as well as invest in long-term sustainable energy solutions for the NWT. At the same time, the importance of the natural environment, especially the need to respond to climate change issues, should be reflected in the approach to energy development and management decisions.

Providing residents with equitable access to affordable power – balancing the need for affordable energy with the principle of true-cost pricing.

Lack of access to affordable energy impacts the cost of living as well as the prospects for economic development in many communities.

The benefits of community-based rates, including sending the correct price signals to residents, and encouraging alternative forms of energy, do not appear to have been realized as residents are subsidized to Yellowknife prices. As well, diesel generation remains the cheapest, most reliable method for power generation in remote communities and continues to fuel most of the heat used in northern buildings.

Energy in the North is a critical service, impacting residents and their local economies – equitable access to affordable power is required.

Ensuring the energy sector is efficient and effective while maintaining public accountability and transparency.

The current Public Utilities Board process for establishing electricity rates is a quasi-judicial public process that is designed to be very transparent. While a public process may be required,

in the face of rising energy costs, opportunities to streamline this process should be examined to ensure it is efficient and reflects current circumstances.

Determining the Appropriate Role for Government

The NWT market is unlike any other outside of Nunavut, with a widely dispersed population, and a lack of economies of scale. Due to the importance of secure, reliable power to NWT communities, the GNWT needs to maintain a direct role in the provision of energy. Options regarding the future ownership and/or corporate structure of the Northwest Territories Power Corporation and the GNWT Petroleum Products Division should be developed for consideration.

Policy Statement

An examination of the above issues results in a proposed Policy Framework with the following Policy Statement and Principles:

The GNWT supports an efficient and effective energy sector that provides reliable and affordable energy to all residents. Consistent with the GNWT Sustainable Development Policy, the GNWT encourages and supports development that demonstrates a strong commitment to sound environmental management and directly contributes to a lasting legacy of affordable energy for all residents.

Principles

1. The GNWT encourages Aboriginal equity positions in energy development projects and will work in partnership with all stakeholders towards sustainable energy solutions for the benefit of all residents.
2. The GNWT will ensure energy development and management decisions support the high quality of the natural environment and biodiversity of ecosystems, recognizing the absolute importance of the long-term protection of these natural systems to economic, social, and cultural well-being of NWT residents.
3. The GNWT, using available fiscal and regulatory tools, will promote the use of renewable energy for industrial developments that contribute to a lasting legacy of affordable and sustainable energy for the benefit of all residents.
4. The GNWT will ensure affordable energy is available for all NWT residents and small businesses at comparable prices.
5. The GNWT will ensure that administrative and regulatory processes related to the provision of energy services for NWT consumers are simply structured and as efficient as possible, while maintaining transparency and accountability.
6. The GNWT will maintain a direct role in the provision of energy services for NWT communities.

Strategic Actions

Focus on Energy Conservation, Efficiency, and Communities

To support this proposed policy framework, the GNWT is considering a number of strategic actions.

In response to high-energy prices, the GNWT initiated an Energy Conservation Action Plan in 2005. Continued actions for 2006/07 and beyond will be developed to provide for:

- A wide range of energy efficiency and conservation measures designed to assist northerners in dealing with the high cost of energy in NWT communities; and
- Support for local initiatives identified through Community Energy Planning.

Address Impacts of Climate Change: NWT Greenhouse Gas Strategy

In addition to energy conservation and efficiency programs, plans and actions aimed at mitigating and adapting to the impacts of climate change are required. Since 2001, the NWT Greenhouse Gas Strategy has provided a framework for a coordinated response to address these issues and a revised Strategy and Implementation Plan will be released in the summer of 2006.

Lead in Efforts to Reduce Diesel Use in favour of Natural Gas, small-scale Hydro, and Other Alternative Solutions

There are a number of energy sources that have potential to reduce the amount of diesel fuel burned in the NWT including small-scale hydro, combined heat/power systems, and renewable energy sources such as biomass (wood), wind, solar, and geothermal energy. The GNWT will lead a pilot project to develop alternative renewable energy supplies that provide long-term environmental and economic benefits.

Simplify the Regulatory (Rate-Setting) System

The GNWT will develop options for simplifying the regulatory process, including the development of options for a rate-zone approach to electricity pricing and streamlining the overall Public Utilities Board process.

Plan for Continued Public Ownership in NWT Energy Sector

The GNWT will need to maintain a direct ownership role in the NWT energy sector. Actions that need to be considered in long-term planning include:

- Examine the potential for the Petroleum Products Division of the GNWT to become a subsidiary of the Northwest Territories Power Corporation; and
- Ensure NTPC is structured appropriately, allowing the company to increase revenues, develop economies of scale, and minimize electricity rates for NWT residents.

Develop a NWT HYDRO Strategy

Hydroelectric power appears to be the key to long-term energy planning for a sustainable energy future for the NWT. Hydroelectric power is renewable, insulated from international fuel price increases, and emission free. Looking forward over the next twenty years, the NWT has the potential to develop an "energy transportation corridor" for the export of energy resources to southern markets.

Conclusion

As the GNWT moves forward with the development of a detailed Energy Plan, there will be opportunities for consultation and discussion with stakeholders, including the proposed Integrated Community Sustainability Planning Conference in the fall of 2006. Also, it should be noted that the Energy Plan will be a living document, with an ongoing process to ensure it reflects the input of residents and current circumstances in the NWT.

The GNWT approach to energy policy should support responsible development, sound environmental management and access to affordable energy

INTRODUCTION AND PURPOSE

The NWT Energy Strategy developed in 2003 provided an initial framework to guide decisions and activities in the NWT energy sector, and outlined some potential actions. The vision, goals, and principles of the Energy Strategy are aimed at responsibly developing NWT energy resources for the maximum benefit of northerners, improving the affordability of energy services in NWT communities, and protecting the environment.

The GNWT is proposing to build upon this work to develop a comprehensive NWT Energy Plan by the fall of 2006. The purpose of this Discussion Paper is to raise key policy issues for discussion, leading to the development of a detailed NWT Energy Plan by:

- Proposing a policy framework to guide future GNWT decisions with respect to the development, generation and use of energy resources in the NWT; and
- Proposing some strategic directions and actions that could support this policy framework. Specific actions are directed towards:
  - containing the rising costs of energy in NWT communities;
  - ensuring sound management of our natural environment;
  - providing all northerners with equitable access to affordable energy; and
  - ensuring that development of NWT energy resources contributes to a lasting legacy of sustainable energy supply.

The key policy questions and choices that need to be addressed to accomplish the above include:

- How do we manage energy development decisions while meeting our commitment to sound environmental management now and in the future?
- What is the most effective way to provide residents of the Northwest Territories with equitable access to affordable power?

- What is the appropriate role of government in the provision of energy services in the NWT?
- How do we foster an energy sector that is efficient and effective while maintaining public accountability and transparency?

The answers to the key policy questions and choices outlined above will provide the basis for a NWT Energy Policy Framework.

It should be noted that this paper is intended to generate discussion - some of the ideas presented represent substantial change in the NWT energy sector. However, in the face of what appears to be a fundamental shift in energy pricing, sourcing and use in Canada and internationally, a wide-ranging discussion regarding the future approach to energy in the NWT is required.

This Discussion Paper and additional background information can be accessed at www.energyplanning.ca, an information website currently under development.

BACKGROUND

The increasing focus on energy issues in the NWT, and at the national and international level is due to a number of factors, including:

- Reliance on oil imports and concerns with security of supply;
- Diminishing conventional natural gas production in the U.S. lower 48 states and the Western Canada Sedimentary Basin;
- The impacts of fossil fuels on the environment;
- The recognition that emerging technologies and renewable energy forms will play a more significant role in meeting future energy requirements; and
- The recent rise in oil and natural gas prices that many analysts agree represent a long-term pricing shift as opposed to a temporary price spike.

To address the key energy policy questions and choices raised, it is important to set the proper context. Below is an overview of more detailed information contained in the appendices to this paper:

- Definition of Energy
- Global and Continental Energy Market
- NWT Energy Resources
- NWT Energy Market and Energy Costs
- Current Role of Government in Providing Energy Services

Definition of Energy

For the purpose of this discussion paper, energy is defined as any form of useable power available in the NWT for the purposes of electricity generation, transportation, space heating, operation of equipment or for export to southern markets.

With respect to transportation, long-term planning is needed to address cost and emission issues. These may be addressed through using more efficient vehicles or modes of transportation,

The development of transportation (highway) infrastructure appears to be the only response that could meaningfully reduce rising transportation costs in the North.

shifting to increased use of renewable fuels and developing more efficient transportation systems. Many of the technologies to achieve these goals are the subject of considerable research but are not sufficiently developed to achieve effective results in a northern environment. Over the short-term, fuel costs can be mitigated through wiser use and purchasing more efficient vehicles. Hybrid vehicles might form part of the solution once the technology is arctic tested and proven to be cost-effective and practical in our northern environment (the GNWT has purchased two hybrid vehicles for testing purposes).

For the foreseeable future, rising transportation costs that negatively impact the cost of living in the North, especially in isolated NWT communities, will only be reduced or contained through the development of NWT highway infrastructure.

Global and Continental Energy Markets

A detailed discussion on this topic is contained in Appendix A. Some key conclusions derived from this analysis include:

- Many industry analysts agree that the recent rise in oil prices likely represents a long-term upward shift as opposed to a short-term market adjustment. Prices will likely come down from recent highs, but given the current global demand and supply balance and the implications of emerging economies such as China and India, crude oil and refined product prices are likely to remain significantly higher than seen during the 1980 through 2004 period, and may well increase.

- While natural gas has historically been a continental market, many analysts suggest that the market will eventually be transformed into a global market due to the growing dependency on imported Liquefied Natural Gas (LNG) in North America, Europe, and other world regions where gas demand exceeds supply. Technological advances in the transportation of LNG, increased demand for natural gas because of its environmental attributes, and depleting gas reserves in many of the industrialized nations are expected to contribute towards this transformation.

- Natural gas prices are linked to a certain extent with the price of oil as many large industrial gas consumers have the ability to "fuel switch" between oil and natural gas.

- As with oil, the recent price increases in natural gas likely represent an upward shift in long-term prices as opposed to a short-term market adjustment.

- International actions to reduce global greenhouse gas emissions will result in fundamental restructuring of economies over the coming decades.

NWT Energy Resources

The NWT is well positioned to expand its role as a secure supplier of energy resources to southern markets. In the short-term, oil and gas resources have strong potential to provide significant economic returns. In the long-term, hydroelectric power could provide renewable energy for future generations. Below are some salient facts regarding NWT energy resources.

- With 447 million cubic meters (2.8 billion barrels) of estimated oil reserves in the Mackenzie Valley and Beaufort Sea, there is significant development potential.

- The National Energy Board estimates economic reserves of natural gas in the NWT at 10.9 trillion cubic feet (Tcf). However, the 2001 report of the Canadian Potential Gas Committee indicates that there are likely remaining marketable reserves in excess of 60 Tcf in the NWT and other estimates place that figure considerably higher.

- The development of the Mackenzie Valley Pipeline would provide the necessary infrastructure to significantly spur exploration activity in the NWT that will likely identify substantial additional economic reserves.

- With over 10,000 megawatts of potential, NWT hydroelectric resources are world class. Current opportunities for development include the Great Bear River, to provide hydroelectric power to the proposed Mackenzie Valley

The nature of the NWT market – and the lack of economies of scale – is the primary factor in high power costs in the NWT.

Pipeline, and expansion of the Taltson River development to provide power to diamond mines. Both opportunities are being explored in partnership with Aboriginal governments.

NWT Energy Market and Costs

The cost of energy is greatest in smaller northern communities where imported petroleum products are used for all energy needs. However, the most significant factor, by a wide margin, is the lack of economies of scale. The actual cost of the fuel makes up only 25% to 35% of the overall cost of providing electricity in remote communities (see Appendix E for a detailed example).

Diesel is presently used all over the world as the most reliable and economic source of power for isolated communities. It is used from Newfoundland to Alaska, in Asia, the Caribbean, and South America. NWT diamond companies such as Diavik Diamond Mines Inc. and BHP Billiton have chosen to power their operations with diesel for those same reasons. However, because of the high cost of fuel they are also evaluating other opportunities such as hydroelectric power and the installation of on-site wind turbines to augment electricity generation.

Current Government Role in Providing Energy Services

The GNWT owns the Northwest Territories Power Corporation (NTPC) which provides electrical generation and/or distribution services to 28 communities through the operation of 20 isolated diesel plants, one natural-gas-fired plant and six hydro plants. NTPC also provides electrical power on a wholesale basis to Northland Utilities Limited (NUL), which distributes electricity in Hay River and Yellowknife. NUL also generates and distributes electricity in Kakisa, Fort Providence, Trout Lake, and Wekweti.

The Petroleum Products Division of the Department of Public Works and Services is responsible for purchasing, transporting, and storing the annual requirements for petroleum products in 15 NWT communities, in accordance with the Petroleum Products Revolving Fund Act (PPRFA).

GNWT ENERGY POLICY

The pace of development in the NWT is expected to increase. To maximize the benefits of the development of NWT energy resources, and to move towards a long-term sustainable energy future for the NWT, a GNWT Energy Policy is required.

The GNWT Sustainable Development Policy broadly outlines the GNWT approach to development, highlighting the interdependence between environmental conservation and economic development. The policy contains a number of principles aimed at maintaining environmental quality and broadly describes the GNWT approach to development including:

The GNWT Sustainable Development Policy broadly outlines the GNWT approach to development, highlighting the interdependence between environmental conservation and economic development.

- The need for conservation commitments;
- The recognition of special values related to the environment;
- The need to take a cooperative approach with neighbouring jurisdictions; and
- The need to recognize Aboriginal claims and incorporate local knowledge in development practices.

There may be an opportunity to be more specific with regard to the approach to development as it relates to a sustainable energy future for the NWT – perhaps a strong policy statement that includes references to the tools that could be used to influence the nature of future development in the NWT. Such tools include fiscal (taxation) measures, socio-economic agreements, and the GNWT approach and support for development in regulatory processes and hearings.

One challenge is the lack of GNWT jurisdiction over NWT lands and resources. A review of energy policies in the western provinces reveals that the tools most used to influence development are royalty provisions and certainty in the environmental assessment and regulatory process. However, while the tools available to northerners may currently be limited, there is still value in clearly articulating northern interests, as they relate to energy, through a clear policy statement.

A strong policy statement reflecting northern interests in the development of NWT Energy Resources will clarify for industry the approach the GNWT will take towards the future development of NWT energy resources. This certainty will improve the ability of all parties, including industry, to operate with clear expectations, to maximize the use of renewable energy and support legacy power projects that benefit all residents.

The NWT Greenhouse Gas Strategy is currently being revised. Many actions in the Strategy will overlap with actions in the Energy Plan, particularly regarding energy efficiency and development of renewable energy sources. Actions under the Strategy and Plan need to be closely linked so that they are complementary.

The development of an energy policy statement, and the principles upon which it is founded, requires a discussion on some fundamental policy questions and choices as mentioned in the Introduction to this paper.

Key Policy Issues

No other jurisdiction has the combination of a wealth of energy resources and such a dispersed, high-cost local market.

As noted, the circumstances and environment surrounding energy development, usage and costs in the NWT is truly unique in the North American context. No other jurisdiction has the combination of vast energy resources and such a small, dispersed market. The NWT will likely be a major exporter of energy, yet the cost of energy in many NWT communities is so high that it substantially impacts the cost of living and the prospects for future economic development. A concerted approach to sustainable energy development in the North is required, one that will be guided by the response to the key policy issues discussed below.

Balancing Development with the Need to Ensure Sound Environmental Management

There is near unanimous consensus amongst climate change scientists that the Arctic is already experiencing the impacts of climate change caused by greenhouse gas emissions from human activities. Climate change impacts in the Arctic are expected to accelerate as global greenhouse gas emissions continue to increase.

The North is unique in that we are experiencing a rapid increase in development yet our environment is sensitive to the impacts of climate change.

Increasing industry activity in the North is having a significant impact on the amount of fossil fuels burned in the NWT and the corresponding increase in emissions to the atmosphere. For example, while over 300 million litres of diesel fuel is burned in the NWT, an estimated 100 million litres of this can be attributed to the diamond mines. As well, the development of the proposed Mackenzie Gas Project and the use of gas-fired turbines to provide compression will likely double or triple the amount of greenhouse gasses produced in the NWT.[1]

This presents yet another unique set of circumstances in the NWT – developing NWT energy resources appears, on the surface, to be hastening the onset of potentially negative consequences of climate change. In this context, some people question why the GNWT should actively promote development of NWT oil and natural gas resources. However, the issue of development needs to be considered on a larger scale. For example, compared to the methods utilized in Alberta's oil sands, NWT oil development does not entail the same degree of environmental impacts, considering that there is already an oil pipeline from Norman Wells to Zama, Alberta. NWT natural gas resources represent a clean-burning fuel that will serve to displace other types of fuel-fired generation such as coal and oil.

In the long-term, diminishing fossil fuel resources, rising prices, and technological advances may increase the use of renewable and alternative energy sources. Until such an energy transformation occurs, the NWT should maximize the benefits of development of our energy resources to:

- Provide economic development opportunities for northerners and potential revenue streams to Aboriginal governments; and
- To enhance government revenues through taxes (and eventually resource revenues) to allow for investments in other long-term alternative and renewable energy solutions for the NWT.

The development of NWT energy resources will provide revenues to emerging Aboriginal governments through potential resource

[1] In 2001, NWT greenhouse gas emissions were 1,750 kilotonnes CO_{2E} which is an increase of over 60% since 1996. Additional detail is provided in Appendix A.

revenues[2] as well as through partnerships and direct Aboriginal equity positions in development. Many of these governments view the need for an economic base and independent revenues as critical in attaining the capacity and autonomy necessary to assume all of the responsibilities as envisioned through Aboriginal self-government. Choosing not to maximize the benefits from development of NWT oil and gas resources is therefore not in the interests of communities, Aboriginal governments, and all northerners. The proposed GNWT position on this matter is captured in the following principle:

1. The GNWT encourages Aboriginal equity positions in energy development projects and will work in partnership with all stakeholders towards sustainable energy solutions for the benefit of all residents.

Greenhouse gases mix freely into the atmosphere where they contribute to climate change. It does not matter where emissions come from; they all contribute to the global problem of climate change. For this reason, global actions are required to reduce global emissions. The Government of the Northwest Territories supports global actions to address climate change.

Global actions are required to reduce global greenhouse gas emissions.

The importance of the natural environment to northerners should be reflected in the approach to energy development and management decisions.

2. The GNWT will ensure energy development and management decisions support the high quality of the natural environment and biodiversity of ecosystems, recognizing the absolute importance of the long-term protection of these natural systems to economic, social and cultural well-being of NWT residents.

Recognizing the need to encourage investment in alternative or renewable energy solutions that will contribute to long-term affordable and sustainable energy solutions, the following principle is also proposed:

[2] The successful completion of devolution and resource revenue sharing negotiations will provide a share of resource revenues to Aboriginal governments to provide government services directly to their citizens, and in some cases, possibly the general public.

3. The GNWT, using available fiscal and regulatory tools, will promote the use of renewable energy for industrial developments that contribute to a lasting legacy of affordable and sustainable energy for the benefit of all residents.

It should be stressed that the above principles are only proposed at this point. The potential policy implications will be a focal point of discussions as the NWT Energy Plan is developed.

Balancing the Need for Equitable Access to Affordable Power with the Principle of True-Cost Pricing

Power rates are currently set on a community basis in the NWT. This results in residential rates that range from a low of 12 cents per kWh to a high of 266 cents per kWh. Residential customers pay around 20 cents per kWh on the first 700 kWh of consumption per month because the Territorial Power Subsidy Program (TPSP) pays the difference between the community rate and a TPSP base rate (representative of the rate in Yellowknife). Above 700 kWh residents must pay the community-based rate.

Commercial rates range from 8.7 to 237 cents per kWh. The commercial TPSP program does not result in the same one rate zone treatment for commercial customers as enjoyed by residential customers. The subsidy program for commercial customers provides rate relief on the first 1,000 kWh of consumption per month, and only to very small non-government commercial customers.

It is suggested here that all northerners should benefit from these legacy infrastructure projects and that energy should be available to all northerners at reasonable rates.

There is a philosophical issue that needs to be considered. If energy is recognized as a critical service to NWT residents and businesses, why do some northerners enjoy far lower rates than others? The answer is in part, the economies of scale of larger centres, and in part the benefits from past mining developments and federal government investments that left a legacy of hydroelectric power in the North and South Slave regions of the NWT. It is suggested here that all northerners should benefit from these legacy infrastructure projects and that energy should be available to all northerners at reasonable rates. The high commercial rates in some communities particularly impact the cost of living and the prospects for economic development.

Community-based rates were instituted to ensure public awareness of the true costs of energy services, and to encourage the potential use of alternative energy forms.

Based on 2,000 kWh/month, the costs to local business in the NWT currently range from $175 to over $5,000. Average costs in most diesel communities range from $1,200 to $1,400.

Community-based rates were instituted to ensure public awareness of the true costs of energy services, and to encourage the potential use of alternative energy forms. Unfortunately, the system is extremely complex and when combined with a subsidiary program became ineffective. On both fronts, it can be argued that this rationale has not had any meaningful effect on the high-cost of energy in communities as:

- Residents are subsidized to Yellowknife prices;
- In many communities, governments are the largest customer;
- Diesel generation is still utilized in remote communities, as it is the cheapest and most reliable form of generating electricity.

If some evidence of meaningful benefits of community-based rates does exist, these benefits should be measured against:

- The administrative costs to the entire sector resulting from such an approach;
- The impacts on the cost of living; and
- The impacts on businesses and the prospects for economic development.

If there is agreement that all residents and northern businesses should have equitable access to affordable power, the following principle would apply:

4. The GNWT will ensure that affordable energy is available for all NWT residents and small northern businesses at comparable prices.

For a GNWT Energy Policy to reflect the above principle, a substantial amount of work and consultation is required. There are three tools that are theoretically available to government to design a system that reflects this principle:

i) **Increase GNWT Subsidy Programs** – this could accomplish the objective but would be prohibitively expensive, and is not generally used by jurisdictions as it amounts to subsidizing the over-all cost-of-service with tax revenues that could otherwise be directed towards essential services such as health and education.

ii) **Utilize the Tax System** – as done in other jurisdictions, the government could establish a "hydro levy" and utilize these funds to equalize the rates and distribute the legacy hydro benefits to other communities. This approach is somewhat similar to the 'water rental' approach used by many jurisdictions in Canada – for example Manitoba and Ontario have water rental rates of about 0.3342 cents/kWh generated and British Columbia's is approximately 0.5 cents/kWh. However, the tax system is a blunt tool that can have other unintended or negative consequences – such as increasing the costs for the development of new hydro to service large-scale industrial customers.

iii) **Develop a Rate Zone Approach** – this option is utilized by most jurisdictions. Previous attempts to implement a rate zone approach in the NWT were controversial due to the proposed rate increases in some hydro communities. Some of these rate increases were substantial – in Fort Smith, the power rates would have nearly doubled. However, if the government is to be committed to the principle as described above, options that include administrative savings from a simplified approach, phased increases in hydro communities, and perhaps a revised GNWT/NTPC dividend policy could be examined.

Ensuring an Efficient and Effective Energy Sector While Maintaining Public Accountability and Transparency

A small, fragmented, high-cost market such as the NWT requires as much efficiency as can be achieved while ensuring that the interests of the public are protected. However, is a complex, public, quasi-judicial regulatory process required, or can the public interest be protected through a third party auditing of utility operations and expert advice? Many jurisdictions have found the

latter to be the case. Combining a formula-based approach, third party expertise, and Cabinet approval might streamline the process and result in substantial savings in administrative costs and legal fees.

It should be noted that the Public Utility Board (PUB) serves an important function in reviewing utility operations and rates, ensuring that costs built into the rate base are reasonable. Any alternative would require a clear, unbiased process to ensure that rate setting process is open to public scrutiny. If, after review and discussion it is determined that some form of the existing PUB is required, opportunities to streamline the process should be examined. In addition to establishing a rate zone approach, a rate of return formula, and allowing for rate increases based on items such as fuel increases and inflation could streamline the process. While establishing rate zones as previously discussed may represent one step, perhaps it is time to review how the electricity sector is regulated and examine some options that could result in savings. This approach should be ongoing, and is represented in the principle below.

5. The GNWT shall ensure that administrative and regulatory processes related to the provision of energy services for NWT consumers are simply structured and as efficient as possible, while maintaining a process that is publicly transparent and accountable.

Private versus Public Sector: The Appropriate Role for Government

As discussed earlier, the most significant factor in providing affordable energy to NWT communities is the lack of economies of scale. Outside of Nunavut, the NWT market is unlike any other. Southern jurisdictions that do have some of the challenges of widely distributed diesel generation are able to off-set those costs with an increase to rates in larger centres that is so small as to go unnoticed. Southern markets are also large enough for the theory of competition bringing efficiency to the electricity sector to have merit – but encouraging competition in the small, fragmented market of the NWT will only serve to further erode economies of scale. As well, in most southern jurisdictions regulation has been streamlined. Rates are generally established utilizing regional or province-wide rate zones, and large utilities

have the flexibility to provide affordable power and still make investments in alternative energy solutions. None of these conditions exist in the North.

While most southern jurisdictions are moving towards privatization, is this a realistic option for the Northwest Territories, given the unique nature of our market?

The sale of NTPC, perhaps to Aboriginal interests or to a large utility company may bring some benefits. A large utility company would have some economies of scale, would be able to leverage other assets, and may have more ability and flexibility to invest in emerging technologies. While a strong regulatory process could arguably protect the short-term rate-setting interests of northerners, it may not be in the long-term interests of northerners to turn over an essential service to the private sector. For example, the current rate of return earned by NTPC is either re-invested in the company or paid out in dividends to the GNWT to partially offset the costs of the Territorial Power Subsidy Program. At least a portion of the guaranteed profits earned by a large southern-based utility company would flow back to investors.

Further fragmentation of the electricity market or turning over service responsibility to a large utility company is likely not in the long-term interests of NWT residents.

Finally, there would likely be a need for new structures within the GNWT if a privatization initiative were undertaken. The private sector is driven by profits on a project-by-project basis with a shorter term outlook that may conflict with the public interest. Issues such as converting communities to natural gas and pushing for long-term sustainable energy solutions such as hydro rarely originate in the private sector. While the existing NWT hydroelectric facilities were built largely for mining operations, some would not have been built without a federal investment and a long-term vision.

6. The GNWT will maintain a direct role in the provision of energy services for NWT communities.

Building on the preceding discussion, a GNWT Energy Policy framework is required to guide future decisions with respect to the development of NWT energy resources as well as an efficient and effective energy sector to ensure northerners benefit from affordable energy that is required for a sustainable northern economy. On the following page is a proposed framework.

Energy Policy Statement

The GNWT supports an efficient and effective energy sector that provides reliable and affordable energy to all northerners. Consistent with the GNWT Sustainable Development Policy, the GNWT encourages and supports development that demonstrates a strong commitment to protecting the northern environment and directly contributes to a lasting legacy of affordable energy for all northerners.

Principles

1. The GNWT encourages Aboriginal equity positions in energy development projects and will work in partnership with all stakeholders towards sustainable energy solutions for the benefit of all residents.
2. The GNWT will ensure energy development and management decisions support the high quality of the natural environment and biodiversity of ecosystems, recognizing the absolute importance of the long-term protection of these natural systems to economic, social and cultural well-being of NWT residents.
3. The GNWT, using available fiscal and regulatory tools, will promote the use of renewable energy for industrial developments that contribute to a lasting legacy of affordable and sustainable energy for the benefit of all residents.
4. The GNWT will ensure that affordable energy is available for all NWT residents and small northern businesses at comparable prices.
5. The GNWT will ensure that administrative and regulatory processes related to the provision of energy services for NWT consumers are simply structured and as efficient as possible, while maintaining transparency and accountability.
6. The GNWT will maintain a direct role in the provision of energy services for NWT communities.

PROPOSED STRATEGIC ACTIONS

There are a number of strategic directions and actions that can be taken to support the proposed NWT Energy Policy Statement and Principles. Over the coming months, and based on discussions with stakeholders, the following can be more fully developed through the NWT Energy Plan:

A. Focus on Energy Conservation, Efficiency, and Communities

B. Address Impacts of Climate Change: NWT Greenhouse Gas Strategy

C. Lead in Efforts to Reduce Diesel Use in favour of Natural Gas, small-scale Hydro, and Other Alternative Solutions

D. Simplify the Regulatory (Rate-Setting) System

E. Plan for Continued Public Ownership in the NWT Energy Sector

F. Develop a NWT HYDRO Strategy

A. Focus on Energy Conservation, Efficiency, and Communities

An effective Energy Plan starts with energy conservation and efficiency. Ideally, communities are directly involved in managing their own energy future through Community Energy Planning.

There is generally unanimous agreement among those in the energy field that energy conservation and efficiency initiatives provide the most meaningful response in the short-term to rising energy prices. Attempts to subsidize are often very expensive, difficult to design and target, send the wrong price signals to the market, and do not represent a sustainable long-term solution. An effective Energy Plan starts with energy conservation and efficiency. Ideally, communities are directly involved in managing their own energy future through Community Energy Planning.

As an immediate response to rising energy prices, the GNWT announced an **Energy Conservation Action Plan** (ECAP) in November 2005 to encourage energy conservation and efficiency in all sectors. Many of these initiatives were aimed at directly supporting northerners while others were intended to reduce costs to the government and ensure that the GNWT is leading by example with regard to energy management.

A detailed description of these programs and their intended results is posted to the GNWT website at www.nwtenergyplanning.ca.

Energy Conservation Action Plan for 2006/07

Many of the initiatives in the 2005/06 plan will be proposed for continuance in 2006/07. The results of the 2005/06 ECAP need to be considered as well as additional actions based on input from northerners. The GNWT is proposing to sponsor a an Integrated Community Sustainability Planning Conference in the fall of 2006 and this is seen as a prime opportunity to discuss the results of current initiatives and planned initiatives for the 2006/07 year.

Two areas of support currently being considered for enhancement in 2006/07 include:

- Support for Energy Saving Investments; and,
- Support for Community Energy Planning

Support for Energy Savings Investments

Support for loan programs to assist residents in making energy-saving investments is a program in place in many jurisdictions. Manitoba has had variations of such a program since 1960, administered through Manitoba Hydro. While there are currently rebate programs in the NWT to assist with purchasing energy-saving technology, such as an energy efficient furnace, these systems cost in the range of $4,000 - $5,000. Even though the pay-back can occur within five to seven years, it is often difficult for some households to access that amount of discretionary cash.

Direct support to homeowners with energy efficiency upgrade loans for furnaces might be one new initiative to assist northerners in meeting rising energy costs. There are a number of complicating factors, not the least of which is finding qualified professionals to install a new furnace in some NWT communities. Details on how such a program might work in the NWT will be developed over the coming months.

Community Energy Planning

Community energy planning (CEP) is an approach to developing an understanding of how a community uses energy, how much fuel it requires to meet its energy needs, how a community can reduce energy consumption, and to examine the options available to develop local energy sources to meet future energy requirements. Public meetings and discussions at the local level can help identify viable energy projects, build knowledge and capacity and increase the level of direct involvement by community governments and residents in managing their own energy future.

In 2002, the Wha Ti First Nation and Charter Community Council partnered with Ecology North and the Pembina Institute to develop its Community Energy Plan.

In 2002, the Wha Ti First Nation and Charter Community Council partnered with Ecology North and the Pembina Institute to develop its Community Energy Plan. Through the active involvement of local leadership, establishment of an Elders Steering Committee and training of local youth, the Wha Ti CEP was completed in June of 2004 with assistance from the Arctic Energy Alliance[3] and funding from GNWT and the Government of Canada. The Wha Ti CEP report includes summaries of the outcomes of the community consultation, the results of the energy demand and energy alternatives assessments, and the identification of the players involved in making energy decisions in Wha Ti.

The Arctic Energy Alliance has developed a capacity to support other communities in developing their own energy plans. Funding for these activities in the past has been provided through grants from the Government of Canada supplemented through contributions from the GNWT. The GNWT intends to identify funding for 2006/07 to ensure that the Arctic Energy Alliance can continue to assist communities to develop their own plans.

Recently, under the Gas Tax Agreement signed with the Government of Canada, every NWT community will need to complete an Integrated Community Sustainability Plan (ICSP) within five years, including Capital Investment Plans and Community Energy Plans. An ICSP Conference is being planned with the NWT Association of Communities and the AEA for the fall of 2006, with a full day devoted to community energy planning.

[3] In 1997, GNWT departments and agencies pooled their resources to form the Arctic Energy Alliance (AEA). The Alliance now provides a major focal point for energy conservation and efficiency advice for communities, business and government departments. The AEA has also evolved into a significant delivery agent for national energy efficiency programs offered by Natural Resources Canada.

The Conference will also encourage communities to share experiences and ensure that communities are not developing their CEPs in isolation. Effective energy planning needs to draw upon best practices as well as consider the energy environment in the NWT as a whole. For example, if communities wanted to examine energy supply options or alternatives for their community, it should be done with all available information at hand, including consideration of the supply alternatives being considered by other communities, and initiatives related to the long-term supply outlook of the GNWT.

Proposed Actions / Policy Direction

- Develop an Energy Conservation Action Plan for 2006/07 that provides for:
  - a wide range of energy efficiency and conservation measures designed to assist northerners in dealing with the high cost of energy in NWT communities; and
  - support for Community Energy Planning initiatives, based on input from NWT communities.

B. Address Impacts of Climate Change: NWT Greenhouse Gas Strategy

The production and consumption of petroleum fuels have always been a cause of concern for the environment because of air, land and water pollution that can occur without well–developed operating plans and procedures. In recent years, however, the combustion of petroleum fuels has become of much greater concern, as they are the principle source of greenhouse gas emissions that cause climate change.

In the North, warming temperatures over the past few decades have melted permafrost, affecting building foundations, all-weather roads and other infrastructure. The operational seasons for ice-roads are also becoming less certain. Overall uncertainties about weather forecasts are affecting planning and travel on the land. Warmer temperatures are causing the extent of sea ice to

shrink. Seasons and precipitation patterns are changing. Overall, these changes raise uncertainty about how northern plants, animals and ecosystems will respond.

Historically the North has been defined by cold temperatures. The warming trends that have been experienced recently are expected to accelerate because global emissions of greenhouse gases continue to rise. A warmer environment will bring some pleasant changes but it will also bring changes that require costly adaptation efforts.

Given these potential impacts on the North, it will be important for the NWT to contain the growth of greenhouse gasses as much as possible and it is clearly in the interests of the NWT to lead by example when it comes to reducing greenhouse gas emissions.

NWT GHG Strategy

The NWT Greenhouse Gas Strategy was initially developed in 2001 to coordinate the NWT's response to the federal government's climate change implementation plan as it developed.

The NWT Greenhouse Gas Strategy was initially developed in 2001 to coordinate the NWT's response to the federal government's climate change plan as it developed. It supports local, national and international efforts to reduce global emissions. A stakeholder review of the strategy in March 2005 indicated that it provides a good beginning but requires fine-tuning to better coordinate GHG reduction and control activities in the NWT. An updated Strategy is being developed and will be released by the summer of 2006.

Key to the success of the GHG Strategy is support for energy efficiency and conservation as previously discussed and renewable energy initiatives that reduce emissions. The ECAP not only represents initial actions in response to rising energy prices, it also represents continued actions for a Greenhouse Gas Strategy. As stated in the introduction to this paper, energy and the environment are inextricably linked, and efforts need to be coordinated.

Other actions and initiatives will also be reflected in the Greenhouse Gas Strategy. Work needs to be done to understand the impacts of climate change and how citizens and industries in the North can best adapt to those changes. For example, permafrost degradation now occurring may have long-term consequences for infrastructure needs for exploration,

development and transportation. The GNWT believes that the research work required to identify impacts and plan for adaptation to the impacts of climate change should occur in Canada's north.

Proposed Actions / Policy Direction

An updated NWT Greenhouse Gas Strategy and Implementation Plan will be released by the summer of 2006.

C. Lead in Efforts to Reduce Diesel Use in favour of Natural Gas, small-scale Hydro, and Other Alternative Solutions

The approach of the recently elected Federal Government will need to be considered in the GNWT response to climate change issues.

Reducing diesel use in the North will require efforts directed towards space heating requirements (over 200 million litres), diesel generation utilized by mining developments (100 million litres) and for communities (15 million litres). Utilization of hydroelectricity has the greatest potential to reduce large quantities of diesel use (up to 100 million litres if NWT diamond mines were converted to hydro). As well, other renewable or alternative energy systems can play a meaningful role in reducing diesel use.

However, due to factors such as cost, reliability, and our harsh environment, little success has been made to date in the application of alternative forms of energy to replace the need for diesel generation in remote locations. Given that GNWT financial resources are limited, investments need to be strategic, focusing in the areas that have the most potential to reduce the quantities of imported diesel fuel.

Converting industrial developments to renewable hydroelectric power is one proposal that the GNWT and some Aboriginal governments are supporting (see "Develop a NWT HYDRO Strategy" later in this paper). Another opportunity may be the conversion of some Mackenzie Valley communities from diesel to natural gas for power and space heating requirements if the Mackenzie Valley Pipeline proceeds. Below is a discussion on this and other potential opportunities to reduce diesel generation in the North.

Conversion of NWT Communities to Natural Gas

In 2001, the Government of the Northwest Territories (GNWT) commissioned a report and the development of economic feasibility models on the potential for conversion of some communities to natural gas (completed by Ontrack Engineering).

This study is now being updated, as there is a great deal of new information with respect to the technical aspects and proposed routing of the Mackenzie Valley gas pipeline. Also, with the rising cost of energy in today's markets, the economic conditions have changed. The update will provide an opportunity to make adjustments / improvements to ensure that the models consider the complete business case for the conversion of some Mackenzie Valley Communities to natural gas.

The most significant challenge with respect to gas conversion for local communities is (again) the lack of economies of scale.

The most significant challenge with respect to gas conversion has to do with the economies of scale. Both distance from the Mackenzie Valley Pipeline and the size of the local load will be determinants of whether it would be feasible to develop a natural gas solution to local energy needs.

Even if gas were used for both power generation and home heating purposes the demand would be relatively small. This and the relatively high capital costs to install the necessary depressurization and distribution facilities would likely lead to a fairly high cost of service.[4]

Another key challenge exists with replacing or supplementing existing diesel infrastructure with gas generation. The costs for diesel generators are amortized over time and someone would have to pay these costs if the assets were going to be replaced before the end of their useful life.

A relevant example is the situation a few years ago when the Ft McPherson generating plant burned down. If gas were available when NTPC had to replace those generators, the natural gas option would likely have been feasible. Now, with new

[4] The Mackenzie Valley pipeline is designed to operate at 2,600 psi. That pressure is much higher than required to supply gas to a community. With a small power plant in the community gas pipeline the pressure would need to be in the 45-300 psi range depending on the type of equipment.

generators, it would be more difficult to replace or supplement this generation with natural gas without adding to the rate base for community power costs.

If the conditions do not currently exist to make the conversion of some communities to natural gas feasible, it should be kept in mind that if the pipeline is completed in 2011, by 2013 or 2015 the conditions for conversion could be different, therefore making some conversions feasible. This type of question highlights the importance of long-term energy planning.

District Heating and Combined Heat and Power (CHP) Systems

While power generation utilizes about 30% of the energy content in diesel, using the residual heat can capture an additional 30% to 40% of this energy. NTPC uses this heat to warm its own power plants - in Fort MacPherson a district heating system uses this heat to warm nearby public buildings and it lowered community heating fuel use by 12%. Diamond mines currently utilize this system as the cost savings in transporting and storing fuel provides the basis for the investment.

Combined Heat and Power (CHP) Systems are an emerging technology that produce both heat and electricity. NTPC has installed natural gas fired units in the Inuvik Recreation Centre. Diesel fired units are also being developed but are not yet commercially available.

Alternative Energy Sources

Alternative renewable energy sources have the potential to play a role in meeting a portion of NWT energy requirements in the years to come. Generally, experience in the North has shown that the economics of alternative energy sources are marginal when compared to diesel generation over short-term horizons. However, while there may not be strong economic savings, the environmental costs are lower as less diesel is burned. The examples discussed below all hold some promise of displacing fossil fuels, reducing environmental costs, and saving money over the long term if fossil fuel costs continue to rise.

- **Small-Scale Hydro**

Large hydroelectric developments have the potential to address what is clearly the largest challenge in providing reliable, affordable energy in the NWT - economies of scale. This is further discussed in Developing NWT Energy Resources later in this paper.

There is some potential in the NWT to develop small hydro facilities, about 1 MW of capacity, on the La Martre (Wha Ti) and Snowdrift (Lutsel K'e) Rivers. While such developments can reduce environmental costs by nearly eliminating diesel generation in these communities, the economic cost of energy in these communities would dramatically increase unless the projects are subsidized. For reliability, diesel generators would still have to be maintained, and the small loads in these communities make it difficult to justify an additional investment in mini-hydro facilities on a purely economic basis. However, if other sources of funding can be secured, such as through the federal government's climate change initiative as discussed earlier, such projects may be able to proceed with no substantial increase in local energy rates. This type of project may also be one that the GNWT can partially subsidize with a direct contribution to the capital costs.

- **Biomass (wood)**

While residents in many parts of the Territories already use wood, there is the potential to significantly increase the use of wood for heating in the NWT.

Wood is a local source of energy for space heating and, with technological advances, wood-burning stoves are now far more efficient than what was available in years past. While residents in many parts of the Territories already use wood, there is the potential to significantly increase the use of wood for heating in the NWT. The Department of Environment and Natural Resources has worked with many communities to develop harvest plans for sustainable woodlots.

There are a number of challenges with regard to increasing our reliance on wood. For example, a large share of the wood-burning stoves in the NWT are more than 10 years old and should be upgraded to the more efficient technology available today. Moreover, there is very little firewood for sale on the market;

most consumers harvest their own supply. Also, the firewood industry is small and not highly mechanized, which keeps unit costs high.

Increasing the demand for wood by converting large institutional and commercial buildings to wood heating could stimulate the forest industry in the NWT, increase mechanization, and drive prices down. This could provide new economic opportunities such as cutting and selling wood. Expansion and development of this commercial industry opportunity will require accurate forestry inventories to establish sustainable harvests on the appropriate scale. Preliminary investigation into a wood-fuelled district heating system has been initiated for Fort Simpson.

Wood biomass has the potential to provide electricity as well as heat in fairly large cogeneration applications. However, the NWT does not have large forestry operations that produce sufficient stockpiles of wood-waste. The economics of wood-fuelled cogeneration are hampered by the need to harvest and transport the wood fuel.

- **Solar Energy**

Solar energy has several forms including Passive Solar, Active Solar thermal and Photovoltaics (PV). Passive Solar has to do with the location of and design of buildings so that they can take maximum advantage of the solar heat gain that occurs during sunshine hours.

Solar hot water heaters operated with conventional energy backup systems have potential to significantly reduce energy consumption for hot water heating.

Active Solar Thermal systems collect heat from the sun using various types of collectors and transfer it to the interior of a building, hot water tanks, swimming pools, or space heating system using hydronic or air transfer systems. One type of system that has been applied in a few buildings in the NWT uses the sun's warmth to heat fresh air as it is being drawn into a building's air handling system.

Active solar thermal collection can also be used to heat water. Conventional hot water heating is one of the highest energy costs of a typical household. Solar hot water heaters operated with conventional energy backup systems have potential to significantly reduce energy consumption for hot water heating. The payback period in relation to the cost of the investment is

generally within ten years. The GNWT (ENR, Housing Corp and AEA) has initiated pilot projects to measure real costs and savings from residential solar hot water systems in a number of communities.

Photovoltaic (PV) systems create electricity from the sun's energy. PV systems can be built in any size and used for different types of applications. The costs are almost totally related to the initial cost of the PV system, since there are no operating or maintenance costs of significance. However, although the cost of solar PV technology is generally dropping, the initial cost can be prohibitive to the average electricity consumer. Moreover, PV technology is limited because without battery or other types of storage the energy is available only when the sun is shining.

Costs and payback for solar PV systems need to be assessed in NWT to determine the potential for appropriate applications.

There are a number of grid connected pilot projects under way in the NWT that ENR, NTPC, AEA and various other partners have initiated to begin studying the application and economics of this technology. Solar PV is proven technology, the limitation with it is the seasonal availability of power and how that integrates into existing electricity systems.

- **Wind**

Wind turbines may represent an opportunity to reduce reliance on diesel fuel for power generation. The costs of harnessing wind energy have declined significantly since the 1980s, but there remain a number of challenges.

There have been various wind power installations in the NWT over the years but these have been few in number and generally only for the purpose of servicing a single building in an off-grid environment. In 2001 a 60 kW wind turbine in Sachs Harbour was damaged during maintenance procedures and has since been removed from that location. At present, there are no utility-owned wind generators in service anywhere in the NWT.

The NWT's wind resource is thought to be the greatest in extremely isolated settings such as along the coast of the Arctic Ocean and the Arctic islands. Wind monitors are being used in the High Arctic communities of Sachs Harbour and Paulatuk to measure the wind resource and assess the feasibility of installing wind generators that could be tied into the community grids. Wherever the wind resource is confirmed to be adequate, there will be opportunities to test the application of integrated wind-diesel energy systems, reducing the amount of diesel fuel that is required.

- **Geothermal Energy**

Circulating fluids underground well below the frost line can be an efficient means of taking advantage of heat energy stored below the earth's surface. In the North one would generally have to go further underground to harvest this form of energy than further south. Moreover the rocky surface that prevails near Yellowknife and throughout much of the North would make this impractical for heating small buildings on an individual basis. However, geothermal heating may be available from abandoned underground mine shafts which are already well below the earth's surface.

Looking forward, technological advancements and rising oil and natural prices should continue to make such alternative energy sources increasingly attractive. The GNWT will need to monitor the potential of emerging technologies in order to keep abreast of developments, and should take a leadership role in coordinating selected alternative energy pilot projects.

Proposed Actions / Policy Direction

- Complete feasibility study and gather input from Mackenzie Valley communities regarding the potential for the conversion of some communities to natural gas for heating and/or electrical generation purposes. Determine the conditions that would need to exist to make such conversions feasible in the long-term.

- Evaluate promising technologies and lead the development of an Alternative Energy Pilot Project.

A small, fragmented, high-cost market such as the NWT requires as much regulatory efficiency as can be achieved while ensuring that the interests of the public are protected.

D. Simplify The Regulatory (Rate-Setting) System

As discussed earlier, a small, fragmented, high-cost market such as the NWT requires as much regulatory efficiency as can be achieved while ensuring that the interests of the public are protected. Two specific actions include the simplification of electricity rates through development of a rate zone approach and the examination of opportunities to streamline the PUB process. Undertaking this exercise would not require a great deal of study as these questions have been considered in the past. The largest challenge is developing the options and ensuring the implications of each are clearly communicated and understood by all stakeholders.

Simplification of Electricity Rates: A Rate Zone Approach

Past attempts to bring these issues before the public for discussion and consideration resulted in resistance from "hydro communities" that would experience rate increases, some substantial, based on the rate proposal as it was constructed at the time. However, there are other options that could make the transition to a simplified rate-setting process less painful. If efficiencies can be gained through reducing administrative and regulation costs, combined with a phased approach and adjustments to the Territorial Power Subsidy Program, rate increases in most hydro communities may be relatively minor. Alternatively, two rate zones – one for hydro, one for diesel communities – might provide a solution amenable to all concerned.

Eliminate or Streamline the Public Utilities Board (PUB) Process

As noted earlier, any alternative to the PUB would require a clear, unbiased process to ensure that rate setting process is open to public scrutiny. Options to streamline the process could be developed. In addition to establishing a rate zone approach, a rate of return formula, and allowing for rate increases based on items such as fuel increases and inflation may streamline the process.

Proposed Actions / Policy Direction

- Develop options for the simplification of the regulatory process for utility rates, including a rate-zone approach to electricity rate setting and the options for a streamlined Public Utilities Board process.

E. Plan for Continued Public Ownership in the NWT Energy Sector

A public role in the energy sector is required in the NWT due to the dispersed nature of the market. Since the public will continue to play a key role in the provision of energy services in the NWT, again, the objective remains to be as efficient as possible and maximize the value to the residents of the NWT.

Developing an Energy Plan that looks forward over the next 20 years requires a discussion of the options available for the continued GNWT role in the energy sector.

GNWT Role in the Delivery of Petroleum Products in the NWT

The Petroleum Products Division of the GNWT ensures that fuel services are available to the general public in communities not served by private companies. Under the legislation consumers are charged only "Recoverable Costs". These include the costs to PPD of the product, freight and transportation costs to the particular community, contractor commissions, evaporation losses, salaries, operation and maintenance expenses, and all federal and NWT taxes.[5] What are not included, and therefore obscures the extent of the subsidy, are the costs of inventory financing, costs of capital (fixed and mobile assets), and certain free services. The long-term direction regarding GNWT involvement in petroleum products distribution should be examined in developing a NWT Energy Plan.

One reason that PPD has been able to mitigate prices to some degree involves contractual arrangements to provide fuel services to NTPC and on occasion, to exploration companies (on request).

[5] In recommending retail fuel prices the PPD calculates product cost on a blended basis, based on the volume-weighted average of the cost of fuel still in storage and the cost of new product supply.

This effectively gives PPD more buying power in the marketplace and expands its revenue base, allowing for a lower amount of overhead cost per unit sold.

There appear to be three options available with regard to the long-term role and direction of PPD:

- Maintain the status quo;
- Implement full-cost pricing and actively encourage the private sector to move into existing markets (recognizing that few if any markets are likely to become privatized in the short or medium term);
- With oil and gas exploration on the rise in the NWT, examine the possibility of establishing PPD as a subsidiary of NTPC and direct this entity to actively seek out new business related to fuel services, enabling PPD to charge full-cost for retail sales and profit on large scale fuel services.

Relevant points for context in examining the mentioned options include:

- PPD has pursued privatization initiatives in the past, with little success. The current GNWT position is that if the private sector enters the market place and offers PPD fair market value for fuel delivery infrastructure, PPD will turn operations over to the private sector.
- PPD's largest customer is government (GNWT, Boards and Agencies, Municipal and federal governments) with approximately 55% - 60% of PPD sales and they are growing in proportion to private sales.
- During the pursuit of privatization and possible amalgamation with NTPC, there was little capital investment made. Approximately $25 million in infrastructure is required in PPD communities.
- If strides are made in providing hydroelectric energy or natural gas in some Mackenzie Valley communities, heating oil sales could be significantly reduced, and the economics of the current PPD operation could be substantially impacted.

Options to be considered for the GNWT to maintain a role in the provision of electricity should be directed towards expanding the revenue base and improving upon the economies of scale of power generation and distribution in the NWT.

NTPC Role in the Generation, Transmission and Distribution of Electricity

As a public utility that generates and supplies much of the NWT electricity needs, NTPC either has a direct role in, or is directly affected by, most of the issues regarding energy demand management, supply and regulation in the NWT. The future role and structure of NTPC is a fundamental energy policy question that will directly impact short-term actions and the long-term approach to energy planning in the NWT.

In 2001, the Robertson Report discussed a number of options and made some recommendations regarding the role of NTPC. The recommendations included that the GNWT maintain ownership of NTPC, repeal the NTPC Act and establish the company under the Canada Business Corporations Act (CBCA). The principle behind the proposal was to allow NTPC to expand operations, compete in the private sector, and improve upon economies of scale. Additional revenues would improve NTPC operating efficiencies, reducing fixed costs per kilowatt/hour and therefore power rates. Also, other lines of business, such as supplying industrial developments with hydroelectric power, would increase NTPC profitability, thereby increasing the dividend paid to the GNWT that could be available to subsidize escalating power rates in the future.

In the context of the GNWT maintaining a direct role in the provision of electricity, options for the future structure of NTPC should be examined. Options considered should be directed towards expanding the revenue base and improving upon the economies of scale of power generation and distribution in the NWT. Taking this direction may also increase the shareholder value for the GNWT, allowing for a greater return to the public if NTPC is eventually sold to Aboriginal or other private interests.

Key considerations in implementing these recommendations include:

- Calculating the extent to which "bigger" will realistically result in improved economies of scale, increased revenues and therefore, lower energy costs to NWT consumers; and

- Determining the appropriate corporate, governance and management structure to ensure the anticipated advantages of an expanded NTPC will be realized.

Proposed Actions / Policy Direction

- Examine the potential for PPD to become a subsidiary of NTPC, addressing the need for some level of continued subsidization while increasing the revenue base for PPD through an expanded fuel services delivery and management business.

- Develop options for the future structure of NTPC, allowing the company to pursue other lines of business with the objective of increasing its revenue base and profitability.

F. Develop a NWT HYDRO Strategy

Hydroelectric power is renewable, insulated from rising fuel prices, and provides a legacy for future generations.

While the potential use of domestic natural gas may have some potential to displace the use of imported diesel fuel in the future, hydroelectric power appears to be the key to long-term energy planning in the NWT. The potential benefits from the development of NWT oil and natural gas resources need to be maximized. However, hydroelectric power is insulated from rising fuel prices and environmentally friendly, and the GNWT requires a long-term strategy to maximize the development of hydro for domestic use and export to southern markets.

Uncertainty regarding future energy supply; the rising global demand for energy; and a growing concern over the state of the environment have renewed interest in harnessing the power of Canada's Northern rivers. These realities have contributed to an emerging consensus that views the present as "...a prime opportunity for the Canadian North to position itself as a reliable energy supplier to the North American continent and to the energy supply grids which in turn feed continental demand."[6]

[6] Northern Powerhouse: The Untapped Energy of the Northwest Territories (Chapman and Brata Das, 2004).

The vast majority of the Northwest Territories' world class hydro potential is not yet developed. As illustrated in Table 1, the NWT has approximately 12,000 megawatts of hydroelectric potential, of which less than 0.5% has been developed.

Table 1: NWT Hydroelectric Potential*

River	Capacity (MW)	Energy (GWh)	Developed %	
			Capacity (MW)	Energy (GWh)
Talston	190	1,111	9.47%	14.13%
Great Bear	568	3,640	0.00%	0.00%
La Martre	27	167	0.00%	0.00%
Snare	63	406	47.39%	43.62%
Mackenzie	10,450	59,535	0.00%	0.00%
Lockhart	269	1,437	0.00%	0.00%
Yellowknife	8	42	100.00%	100.00%
Snowdrift	1	8	0.00%	0.00%
Total	**11,557**	**66,345**	**0.48%**	**0.57%**

Through the Northwest Territories Energy Corporation[7], the Government of the Northwest Territories, in partnership with Aboriginal organizations, is currently focusing its efforts on determining the feasibility of two hydro sites. The proposed site on the Great Bear River would generate sufficient energy to provide power to the Mackenzie Valley Gas Pipeline, while expanding the Taltson Hydro facility would serve the needs of the growing diamond mine industry.

These two hydro proposals share a key characteristic in common with previous hydro development in the NWT. To achieve the economies of scale necessary to justify the high capital costs of construction, the Great Bear and Taltson Hydro Projects would

* Note: It is the position of the GNWT that hydroelectric development will occur only in partnership with local Aboriginal governments – therefore the question of "potential" is one that ultimately rests with Aboriginal governments.

[7] The Northwest Territories Energy Corporation is a subsidiary of Crown owned Northwest Territories Power Corporations.

use current resource developers as 'anchor' customers. As TD Economics points out, such legacy infrastructure developments will likely be key outcomes of the current boom in resource development across the NWT.8 Examples of these development synergies are presented in Table 2, where it can be seen that all of the NWTs' current installed hydro capacity was brought online as a result of past industrial development. If industrial development did not support these projects, the entire North would be generating power through the burning of fossil fuels.

Table 2: Hydro Sites Constructed and Resource Development in the NWT.

Development	Legacy Impact	Benefit (Affordable Power)
Con Mine	Bluefish Hydro	■ Rae/Edzo ■ Yellowknife
Giant Mine	Snare Hydro	■ Dettah
Pine Point Mine	Taltson Hydro	■ Hay River ■ Ft. Smith ■ Ft. Resolution
Mackenzie Gas Project	Great Bear Hydro?	■ Delta/Sahtu

While there is some long-term potential with emerging technologies such as solar, micro-turbine and/or fuel cells, hydroelectricity is still the pre-eminent renewable technology and will remain so for the foreseeable future. As the Canadian Electricity Association (CEA) states:[9]

Whatever form that support for emerging renewables takes, the fact remains that hydro power is an established renewable technology that offers the environmental benefits associated with emerging renewable competitors at a cost-effective price, with dependable supply, and the added benefit of opportunities for continued expansion.

[8] Canada's Northwest Territories: Can Gas and Gems Bring Sustained Growth to the North? (TD Economics Special Report, 2003).
[9] CEA Fact Sheet: Renewable Energy in North America: The Hydroelectric Advantage (available on-line at www..canelect.ca).

To capture the environmental, economic, and efficiency gains attributable to hydroelectric development, significant challenges must be overcome.

However, to capture the environmental, economic, and efficiency gains attributable to hydroelectric development, significant challenges must be overcome. Primary obstacles include:

- Many of the sites suitable for hydro development are a great distance away from potential markets.
- The existing load base in the NWT is too small to achieve the economies of scale necessary for hydroelectricity to be profitable at a competitive price.
- Pre-development costs typically represent 5 to 10% of total capital costs. For larger projects, this represents a substantial cash outlay with a large risk component and a very long lead-time prior to any returns being realized.

These factors suggest that, as with past hydro developments in the NWT, future hydro development will be dependant on industrial and/or resource development anchor customers. In the long-term, hydro development will require vision and a proactive, long range planning horizon. While the current focus is on meeting domestic industrial needs to facilitate the development of infrastructure, the conditions might exist in the next 10 to 20 years to export renewable power to southern markets. With the completion of the Mackenzie Valley Pipeline, the NWT will have what might mark the beginning of an energy transportation corridor to southern markets for oil, natural gas, and ultimately an unending supply of renewable hydroelectric power. A sufficient level of study needs to be undertaken so that the NWT has the information required to aggressively pursue potential customers as development in the North proceeds and customers materialize.

Proposed Actions / Policy Direction

To complement a NWT Energy Plan, develop a NWT Hydroelectric Development Strategy that has as a long-term vision for the development of NWT hydroelectric resources for export to southern markets.

GNWT APPROACH TO ENERGY POLICY AND PLANNING

As stated earlier, the purpose of this discussion paper was to raise the key policy issues for discussion as the basis for a detailed NWT Energy Plan. It will be important for all stakeholders to assist in framing the long-term vision and direction of the GNWT regarding the demand, supply and regulation of energy in the NWT.

There are a number of other areas and issues that will need to be addressed in a detailed plan that have not been discussed in any depth in this paper:

- **Planning for Devolution** – devolution negotiations with the federal government have been underway for many years. If further progress is made with the recently elected federal government, it will be important that the GNWT undertake detailed planning for the future management of lands and resources. This planning will have to occur in close consultation with Aboriginal governments.

- **Other Energy Initiatives** – work is underway on a number of issues that have some potential to provide environmental and economic benefits. Examples include:

    - A proposal to provide "interruptible power" from the Taltson hydroelectric facility to buildings in Fort Smith for electric heating;

    - An examination of the potential benefits and challenges of allowing "distributed generation" of power by private individuals that could be sold into the grid;

    - Efforts on a number of fronts to leverage federal dollars to support energy-related initiatives such as expanding the geological knowledge base of energy resources in the GNWT, and undertaking detailed feasibility studies on the development of hydroelectric power.

- **Coordinated Planning** - the GNWT is currently in the process of establishing a three-person Energy Planning Unit,

located in the Department of Industry, Tourism and Investment. This unit will coordinate short and long-term energy planning for the GNWT, and develop and maintain the appropriate policy environment that encourages the further development of NWT energy resources.

As seen in Appendix D, GNWT departments and agencies make a large number of energy-related investments. These investments need to be coordinated, and in some cases rationalized and prioritized to ensure they are congruent with short and long term objectives.

Coordinated planning also means coordinating efforts with other provincial/territorial governments and the federal government, leveraging federal dollars for NWT energy projects, sharing research, ensuring that NWT energy interests are represented in pan-Canadian initiatives, and that NWT positions are heard at the national and at times international level.

To ensure that efforts are tracked, an annual GNWT Energy Report will be produced, providing an up-to-date environmental scan and reporting on initiatives related to the generation, transmission and use of energy in the NWT.

The following table summarizes the proposed actions and policy direction to be taken in the development of a detailed Energy Plan. Taking these proposed actions and establishing the policy direction for the GNWT represents the critical next step, and the bulk of the work, in developing a comprehensive NWT Energy Plan.

Proposed Actions / Policy Direction
Develop a NWT Energy Policy that clearly states northern interests and expectations with respect to energy generation, transmission and use, identifying specific conditions for development and the tools to be used to encourage a lasting legacy of affordable, renewable energy for the benefit of all northerners.
Develop an Energy Action for 2006/07 that provides for: ▪ A wide range of energy efficiency and conservation measures designed to assist northerners in dealing with the high cost of energy in NWT communities; and ▪ Direct support for Community Energy Planning initiatives, based on input from NWT communities.
An updated NWT Greenhouse Gas Strategy and Implementation Plan will be released by the summer of 2006.
Complete feasibility study and gather input from Mackenzie Valley communities regarding the potential for the conversion of some communities to natural gas for heating and/or electrical generation purposes. Determine the conditions that would need to exist to make such conversions feasible in the long-term.
Evaluate promising technologies and lead the development of Alternative Energy Pilot Projects.
Develop options for the simplification of the regulatory process for utility rates, including a rate-zone approach to electricity rate setting and the options for a streamlined Public Utilities Board process.
Examine the potential for PPD to become a subsidiary of NTPC, addressing the need for some level of continued subsidization while increasing the revenue base for PPD through an expanded fuel services delivery and management business.
Develop options for the future structure of NTPC, allowing the company to pursue other lines of business with the objective of increasing its revenue base and profitability.
To complement a NWT Energy Plan, develop a NWT HYDRO Strategy that has as a long-term vision for the development of NWT hydroelectric resources for export to southern markets.

APPENDIX A

Global and Continental Energy Supply, Demand, and Pricing

Crude Oil

According to the National Energy Board's (NEB) 2003 Energy Supply/Demand Report, at 19% Canada ranks second in the world, after Venezuela and ahead of Saudi Arabia, in terms of share of total estimated discovered world crude oil and bitumen resources of 1.6 trillion barrels. Including bitumen in Alberta's oil sands Canada has oil reserves of 49 billion cubic metres or about 308 billion barrels. The United States has only about 2.4% of total oil reserves and Mexico, our other North American Free Trade Agreement (NAFTA), partner 1.8%. World oil and bitumen reserves are summarized in the following table.[10]

World Oil and Bitumen Resources
Billion Cubic Metres

	Oil	Bitumen	Total
Venezuela	11.9	42.9	54.8
Canada	**2.4**	**46.6**	**49.0**
Saudi Arabia	42.9	0.0	42.9
Russia	8.7	11.9	20.6
Iraq	18.3	0.0	18.3
U.A.E.	15.9	0.0	15.9
Kuwait	15.9	0.0	15.9
Iran	14.8	0.0	14.8
U.S.A.	5.1	1.3	6.4
Libya	5.1	0.0	5.1
Mexico	4.6	0.0	4.6
China	4.0	0.0	4.0
Nigeria	4.0	0.0	4.0
Norway	1.1	0.0	1.1
Algeria	1.1	0.0	1.1
Kazakhstan	0.8	0.0	0.8
TOTAL	**156.6**	**102.7**	**259.3**

Source: National Energy Board 2003

About 38% of global daily crude oil production of approximately 83 million barrels per day (MBD) currently comes from countries that belong to the Organization of Petroleum Exporting Countries (OPEC). By serving as the global "swing producer" the cartel has

[10] To convert the data in the Table to barrels multiply by a factor of 6.28

considerable influence on the price of oil thorough strategic changes in the levels of production in the member countries. The OPEC members are mainly located in the Middle East and Africa but Indonesia, Venezuela and a number of countries in other global regions belong.

The 2006 Annual Energy Outlook of the U.S. Energy Information Administration (EIA) indicates that approximately 54% of global crude oil demand is in the industrialized countries of North America, Western Europe, Japan, Australia and New Zealand. Canadian and U.S. daily oil requirements of about 23 MBD represent about 51% of total crude oil demand in the industrialized countries and 28% of world demand. Demand in the "transitional" economies of the former Soviet Union republics and Eastern Europe countries accounts for 7% of global demand. The oil requirements of the so-called "emerging economies" (China, India, South Korea, Turkey and other countries in Asia, the Middle East, Africa and Latin America) are approximately 32 MBD.

According to the International Energy Agency (IEA) the demand for crude oil could increase from 82 MBD in 2004 to about 120 MBD in 2030. This implies an average annual increase in global daily oil consumption of 1.5 million barrels and a compound annual growth rate of 1.5%. This projection assumed that the price of crude oil would be in the U.S. $ 40 per barrel to $50 per barrel range in constant 2005 dollar terms. At significantly higher prices (in the vicinity of $60 per barrel which now seems more likely) the IEA's analysis indicates that we can expect to see slower demand growth but still an impressive annual increase of at least 1 MBD or about 1% annual average growth.[11]

Crude oil demand growth will be strongest in the emerging economies because of increased transportation fuel requirements as more people are able to afford to purchase motor vehicles. Mainly because of the rapid growth in gasoline and diesel fuel consumption, crude oil demand is expected to increase at an annual rate of 3.2% in China and by 2.7% in India in the period from 2004 to 2030 according to the EIA. Overall, crude oil demand is

[11] Refer, in particular, to the February 2005 presentation by Mr. Kenji Kobayashi of the IEA in Australia on the outlook for oil supply and demand to 2030. Also note that according to the EIA's 2006 Annual Energy Outlook, global oil demand growth will average 1.4% from 2004 to 2030, increasing demand by about 1.4 MBD each year on average.

anticipated to increase by 26 MBD in the emerging economies during this period compared with only 7 MBD in the industrialized countries.

It is anticipated that world crude oil and bitumen reserves will be adequate to meet the demand growth expected to occur during the next twenty-five years but not without tremendous development costs and increased production costs since more remote basins and resources will need to be tapped involving, in some cases, the application of more extensive technologies.

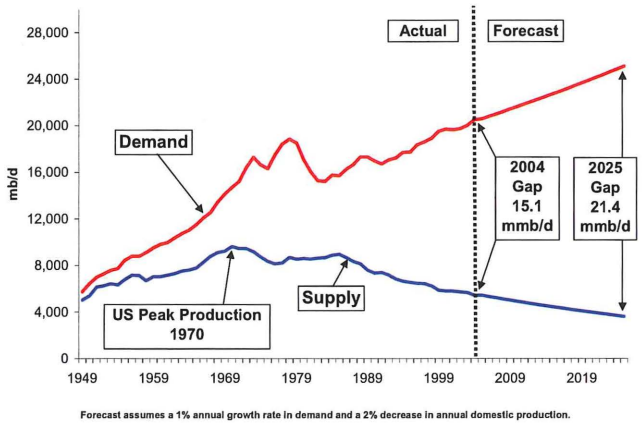
Oil will continue to be the most widely traded fuel in the world. In addition, oil transportation miles will increase because of the anticipated growth in refined petroleum product demand and the fact that the average distance of the consuming centres from crude oil supply sources will be increasing. As a consequence, the IEA is warning that the risk of supply disruptions will increase.

In the United States oil production peaked in 1970 at just less than 10 MBD and has been declining fairly steadily since. Because of persistent demand growth, except during the oil crises of the 1970s, the shortfall of domestic oil production relative to demand has increased remarkably. As indicated by the graph on the following page, the gap in U.S. domestic oil production relative to demand is forecast to increase by approximately 6 MBD from 2004 to 2025, (from 15.1 MBD to 21.4 MBD). (12) For this reason, and the likelihood of increased supply disruptions as traffic bottlenecks develop, it can be expected that U.S. oil importers will place increasing strategic importance on the need to develop secure continental sources of supply like Alberta's oil sands bitumen reserves and "frontier" supplies in Alaska and Northern Canada.

Although Canadian production of conventional crude oil is declining it is being more than being replaced by synthetic crude oil and bitumen supplies from rapidly expanding bitumen production and upgrading facilities being developed in Alberta oil sands locations. Canadian demand for crude oil and refined petroleum products is expected to continue to grow by at least 1% per year in spite of higher prices but, because of the outlook for expanded production of bitumen and synthetic crude oils, it is

[12] Data and figure are from a 2005 report by Raymond James Inc.

widely expected that Canada will experience a growing surplus of crude oil production for many years to come. Most of the surplus will be exported to the United States to help meet increasing American dependence on imported crude oil and the need for dependable, secure supplies. In addition, Canadian bitumen and synthetic crude oil are anticipated to make inroads in the Chinese and Indian markets where, as noted earlier, the demand for crude oil and refined products is expected to continue to grow rapidly in spite of higher prices. Japan, too, has expressed interest in oil from the oil sands because of the certainty of supply.



U.S. Crude Oil and Supply

The 2003 long-term energy supply/demand analysis by the NEB shows light crude oil exports rising steadily through the next twenty years. This is especially likely after 2010 when synthetic crude oil production from upgraded bitumen is anticipated to accelerate because of the investment in new oil sands production facilities that is now occurring.

The price of crude oil is determined on a global basis. The interaction of supply and demand essentially sets the price for crude oil of various types such as Saudi Light, Brent (North Sea) and West Texas Intermediate. Price differences among crude oils of different qualities and origins mostly reflect transportation cost and quality differences. Crude oil prices have increased sharply since 2004. The main reason has been the strong growth of demand in China, India and other emerging economies and the inability of producers to respond quickly enough to the higher price signals. In addition, there has been considerable speculation over

the ability of the global market to meet the anticipated demand growth in product demand. There is considerable debate as to how much of today's +/- US$ 65/bbl price is real and how much is speculation. What is clear is that the market has been unable to reach balance without higher prices.

Looking ahead, there is considerable uncertainty as to how much, if at all, oil prices may settle back and what trajectory they are then likely to follow. The NYMEX forward market closing settlement prices for West Texas Intermediate (WTI) crude oil on Friday, January 20, 2006 suggest that to some extent prices may be locked-in in the upper U.S. $65 per barrel to $70 per barrel range from now through December 2009. In their 2006 Annual Energy Outlook "Reference Case" released in December 2005, the EIA assumed that the crude oil price will continue to rise through 2006 and then decline to about $47 per barrel in 2014 (in 2004 dollars) as new supplies enter the market. The price is then assumed to slowly rise to about $54.08 per barrel by 2025, which is 64% higher than the price of $32.95 per barrel assumed for that year in the EIA's 2005 Annual Outlook. Alternative EIA Outlook cases assume both higher and lower world oil prices, respectively. Some observers believe that oil prices will fluctuate in the vicinity of U.S. $60 per barrel (in constant dollars) for a while and then gradually increase towards the $70 per barrel level and possibly higher because of strong demand growth in the emerging economies and supply-side uncertainties and possible disruptions. In their view the oil price assumption in the EIA's current Reference Case is too conservative.

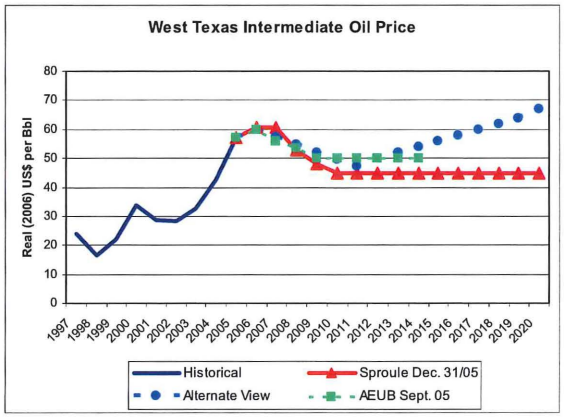
The figure on the following page provides several recent forecasts for WTI crude oil. The "Alternative View" was developed from NYMEX forward market settlement prices through 2009 on November 7, 2005 and a judgmental forecast with respect to the following years.[13]

Clearly, a major change has taken place in the oil price outlook since 2003 when the NEB assumed an average WTI price of U.S. $22 per barrel to 2025 (in 2001 dollars) when examining Canada's long-term energy supply/demand prospects. The strengthening in

[13] Because the forward market prices fluctuate the alternative view could be higher or lower today. Generally, though, forward market oil prices have strengthened somewhat since November 2005.

the outlook for crude oil prices since then bodes well for the development of oil resources in the Northwest Territories and the Beaufort Sea.

Exploration and development activity in NWT will have to compete with the Alberta oil sands as a potential source of oil supply for U.S. and possible other markets. However, much of the oil sands reserves locations is now already under lease. Moreover, development of oil sands production and upgrading facilities has a very large capital cost component and the labour cost element appears to be increasing because of manpower shortages.



The prices of refined petroleum products are determined in the regions where the crude oil is refined. Essentially, they fluctuate with the price of crude oil, which is the major cost element. Labour cost, electricity rates, environmental restrictions affecting emissions and gasoline and diesel fuel quality, taxes and economies of scale (refinery size) also impact product prices. In addition, the local/regional supply demand balance is always factor. This explains why product prices can be expected to increase in regions or countries where gasoline or other fuel demand is increasing rapidly or where the existing refinery capacity is constrained. In the case of the NWT, which has no oil refinery capacity, the distance from refineries in Edmonton, Vancouver or other product supply locations means that consumers have to pay for a much larger transportation cost component than consumers located in closer proximity to a refinery.

Natural Gas

Unlike crude oil for which there now is a well-developed global market the markets for natural gas are continental and regional in nature. The main reason for this is that most of the natural gas that

is consumed is delivered from the producing basins to residential, commercial, industrial and electric generation consumption centres via pipeline rather than tanker. The situation is gradually changing as pipeline accessible gas supplies in North America and Europe are diminishing relative to ever-increasing demand and imported liquefied natural gas (LNG) from North Africa, the Middle East, Southeast Asia and (soon) Eastern Russia is increasingly being called upon to fill the gap between domestic production and demand instead of pipeline gas. It will likely be at least twenty years before the industrialized countries' dependence on LNG and the volume of LNG in transit or available for shipment at any point in time will be sufficiently large to allow LNG exporters to strongly influence the price of gas and a global natural gas market evolves similar to today's world oil market. Meanwhile, natural gas prices will continue to be determined in the continental and regional markets and LNG exporters will continue to be price takers.

According to the NEB's 2003 report on Canada's long-term energy supply/demand outlook entitled "Canada's Energy Future", Canada's natural gas resources including undiscovered reserves, total about 550 trillion cubic feet (Tcf). This compares with Canadian annual gas consumption of about 3.3 Tcf -- implying a reserve life of 167 years if no gas were exported. However, total production is in the vicinity of 6.5 Tcf per year because of exports. This implies a reserve life of 87 years including undiscovered and undeveloped reserves most of which are thought to be located in remote high cost development areas.

Approximately half of Canada's gas resource base resource base is located in the Western Canadian Sedimentary Basin (WCSB) where it is believed that one-half of the gas originally in place has already been produced and production of conventional [excluding coal-bed methane (CBM)] gas supplies appears to have peaked. The WCSB also contains considerable volumes of CBM that are just beginning to be tapped. The Alberta Energy and Utilities Board (EUB) recently (September 2005) released projections of Alberta CBM production to 2014. According to the EUB's report

Alberta CBM production is likely to reach 1.5 Bcfd in that year.[14] This is closely similar to the projection of 1.7 Bcfd CBM production in 2014 reported in the Market Study that Navigant Consulting Inc. (NCI) and Energy and Environmental Analysis Inc. (EEA) prepared for the proponents of the Mackenzie Valley Pipeline (MVP), which was filed with the pipeline proponents' NEB application in the fall of 2004.[15]

With the exception of Nova Scotia, most of Canada's frontier resources are situated in areas that are not currently producing gas and there is considerable uncertainty surrounding the actually quantities of gas in place. The most recently available information from the NEB indicates that the NWT has about 10.5 Tcf of producible gas reserves.[16] However, judging from information contained in the 2001 report of the Canadian Potential Gas Committee (CPGC) these estimates may be misleadingly low. In fact, the CPGC report indicates that there likely are remaining marketable reserves in excess of 60 Tcf in the NWT: 5 Tcf in the Mackenzie Valley, 30 Tcf in the Beaufort Basin and 26 Tcf in the Sverdrup Basin in the High Arctic. With increased exploration in the North and offshore employing it is likely that additional reserves will be discovered.

Proven Gas Reserves (Tcf)

Canada	57.0
U.S.	186.9
Mexico	38.9
Total	**282.8**

Source: Jan. 2005 report of the the North American Energy Working Group

[14] Alberta's Reserves 2004 and Supply/Demand Outlook 2005-2014. Publication ST98-2005.
[15] It should be noted that the EUB's CBM production estimates are just with reference to Alberta. The NCI/EEA estimate was for the entire WCSB. Since most of the CBM production in the WCSB is anticipated to be in Alberta the comparison is still useful.
[16] This represents about 18% of Canada's proven gas reserves. The 10.5 Tcf total compares with a "discovered resource" estimated of 6.3 Tcf reported in Indian and Northern Affairs Canada's 2004 report on northern oil and gas activities. But the INAC estimate does not include the Arctic Offshore.

The relationship of Canada's proven gas reserves to those of Mexico and the United States is highlighted by discussion in the January 2005 report of the three-country working group of government energy officials known as the North American Energy Working Group. Canada's proven natural gas reserves represent about 30% of the North American total. For North America as a whole the ratio of established or proven reserves to production, or the reserve life index, is about 10.6. This does not mean that North America will run out of gas in ten to eleven years because each year a portion of the presently unproven and undiscovered reserves will be added to the inventory of proven reserves and offset much of the decline caused by reduced production levels. However, North America as a whole will have to import substantial and growing quantities of gas as time goes on.

In the United States the shortfall of domestic gas production in relation to consumption is expected to widen considerably. In fact, according to the most recent "Consensus Forecast" compiled by Natural Resources Canada, combined U.S. pipeline gas and LNG imports are expected to grow from approximately 8.6 Bcfd in 2004 to 14.8 Bcfd in 2010 and to reach 20.8 Bcfd by 2020. This indicates that the demand for gas from the NWT will grow with time and suggests that the value of the resource can also be expected to increase.

Although Canadian gas production currently exceeds domestic demand by a wide margin, allowing considerable export volumes, the NEB's 2003 long-term "Supply-Push forecast scenario suggests that without development of reserves in frontier areas such as the Mackenzie Delta the supply/demand balance would become tighter – implying that, without the MVP and other developments, Canadian gas exports would be reduced. Gas demand, especially for power generation, will continue to grow but the decline in WCSB production (including CBM) will be only partially offset by increased offshore Atlantic production and the start-up of LNG import facilities in Quebec, Nova Scotia and New Brunswick. A reduction in the margin of domestic production over consumption, with reduced gas exports to the U.S. as a consequence, is the expected outcome. This development will be slowed if the MVP is built as gas supplies from the North will then be available both for consumption in Canada and for export.

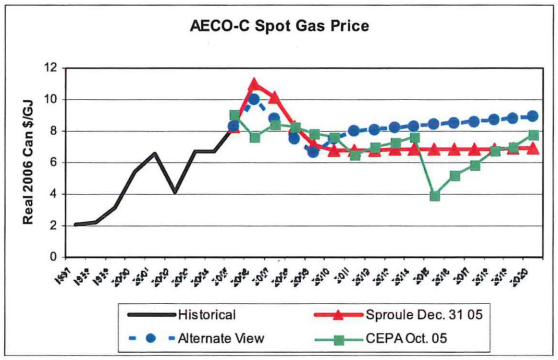
Within Canada and the United States gas prices are established through spot and forward market sales at the various market centres or hubs such as Henry Hub (in Louisiana), Chicago and the Alberta AECO-C or "NIT" (Nova Inventory Transfer) hub). However the prices at the various hubs are interlinked by the cost of transporting gas from one point to another. If the price at one centre exceeds that at an adjacent centre by significantly more than the transportation cost for a significant period then gas can be expected to move from the low cost to the high cost point either physically or by arbitrage.

The general consensus is that the real price of gas will be much higher through the next quarter century and beyond than most forecasters were predicting only several years ago. The price forecast that underlies the Base Case analysis presented in the gas Market Study that Imperial Oil Resource Ventures Ltd. filed with its application to construct the Mackenzie Gas Pipeline was prepared during the early spring of 2003. The Market Study projected an average price at the AECO-C market hub of US $3.94/MMBtu or about Can $4.70/GJ through the 2011-2020 period. Since then, escalating oil prices and signs of an emerging shortfall in continental gas supplies have both pulled and pushed North American gas prices higher. The fundamental reasons for the radically changed price outlook are that:

- Sharply higher fuel oil prices have been causing electric generators and industrial consumers with fuel switching capability to turn to gas; and

- U.S. and Canadian conventional gas production has peaked, or virtually so, while consumption, especially to meet electric generation requirements in the U.S. continues to grow. This means that significant quantities of new gas supply delivered via pipeline from "frontier" regions, such as the NWT and Alaska, and LNG imports will be required to maintain supply/demand balance. Otherwise, the North American market is likely to become even more constrained than it is, with higher prices and greater reductions in industrial load as large industrial gas consumers relocate to other countries or find alternate means of meeting or reducing their process heat requirements.

Although there is much uncertainty with regard to the gas price outlook (which is only partly because of the oil price uncertainty), the Alberta price of gas could be well above Can $8.00/GJ through the foreseeable future. This compares with prices generally close to or below $4.00/GJ prior to 2003 except for the price spike in 2001 and the run up to that spike in 2000. This perspective is underscored by the fact that the closing forward market settlement prices for gas at Henry Hub on the NYMEX Exchange on Friday January 20, 2006 for the period to the end of 2009 were mostly above US $9/GJ (or Can $ 10.50/GJ).



Some recent forecasts of the Alberta gas spot price are provided in the above figure. "CEPA" refers to the Canadian Energy Pipeline Association. The "Alternative View" was estimated from monthly NGX Exchange forward market settlement prices through 2009 as of November 7, 2005 and a judgmental forecast with respect to the following period.[17] Other things equal, the higher price outlook will make natural gas exploration and development in the North more attractive. If the MVP is built, exploration and development of gas reserves can be expected to increase fairly sharply and possibly within a fairly short time frame as happened in Bolivia recently following completion of the Bolivia to Brazil gas pipeline.

Following completion of the MVP gas production should increase substantially, with throughput reaching initial capacity at an early stage and the owners following through

[17] Because the forward market prices fluctuate the alternative view could be higher or lower today. Generally, though, the gas forward market prices have strengthened somewhat since November 2005.

with their planned expansion phase. Further, higher natural gas prices will improve the profitability of production and ensure success of the pipeline.

The federal government and royalty revenues will grow as production increases. The NWT's eventual share of such revenues should also increase but the extent will depend on devolution and related negotiations.

Electricity

Electricity "markets" are provincial, state or regional in nature and exist only where the authorities allow wholesale supply and demand to set the price by "deregulating" formerly regulated markets. In Canada, this is only the case in Alberta and Ontario although the door has been opened to limited wholesale competition in New Brunswick. In the NWT the Public Utilities Board regulates prices.

If it becomes feasible to export electricity to Alberta at some point in the future then it will be incumbent upon the owner(s) of the generation facilities to carefully examine how market forces in Alberta and in other "markets" further south are likely to shape the wholesale price unless a long-term fixed price agreement can be negotiated. At present the possibility of power exports appears to lie only in the very long term.

APPENDIX B

NWT Energy Overview

The following is a high-level scan of the energy sector in the NWT. Key topics include energy resources, energy use and supply, energy transmission, energy costs and environmental costs.

Energy Resources

The NWT has an abundance of largely untapped energy resources. For example:

- Discovered oil reserves are estimated at 2.8 billion barrels with an undiscovered recoverable resource of up to 10 billion barrels.
- The estimate for discovered natural gas reserves is almost 11 Tcf, with an ultimate recoverable resource of at least 60 Tcf..
- The hydroelectric development potential is at least 11,000 megawatts.

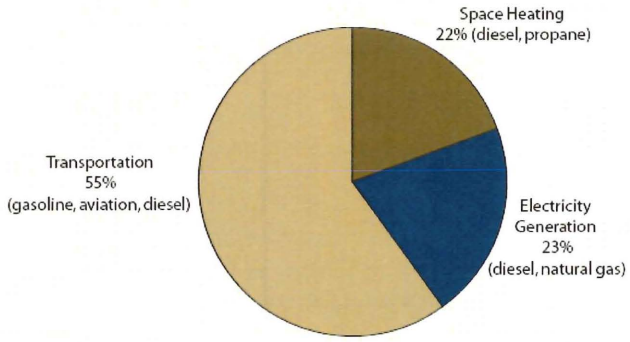
The NWT's potential is very significant in the context of the North American energy market. For example Canada's total conventional oil and natural gas proven reserves are estimated to be 4.3 billion barrels and 58 Tcf, respectively, at the end of 2004. The hydro potential is on a similar scale to what has been developed in B.C., Quebec, and Manitoba.

Currently only a small portion of the NWT's energy potential has been developed. The most significant development has been the Norman Wells oil field. Since large-scale operations began in 1985, Imperial Oil has shipped over 205 million barrels of sweet, high grade crude to market. In fact this field is Imperial's single largest producing source of conventional crude oil.

Natural gas production is currently on a small scale with production of around 70 million cubic feet per day. Much of this production is exported from the southern NWT. However in Inuvik and Norman Wells locally available natural gas is used for electricity generation and space heating.

Energy Use and Supply

NWT Fuel Consumption by Sector
(2004/05 - 415,574,000 estimated litres)



The types of energy required by the NWT economy are directly related to how energy is consumed. The transportation sector is the largest energy end-use in the NWT accounting for approximately 65% of total consumption.

This transportation segment requires gasoline, aviation and diesel fuels, which must be imported from large capital intensive refining complexes located close to Southern markets. There are currently no viable substitute fuel choices for the transportation end use in the North.

The volume of transportation fuels consumed is in the range of 260 million litres per year split as follows:

Diesel 49% (127/261)

Gasoline 21% (55/261)

Aviation 30% (79/261)

In addition to liquid fuels, other significant energy sources include electric power and natural gas. The table below provides an overview of the quantity and type of electricity generation in the NWT.

2004/05 NWT Annual Electricity Generation (MWh)

	Utility	Industrial	Total
Hydro	292,087 (75%)		292,087 (43%)
Diesel	76,377 (19%)	181,899(63%)	258,276 (38%)
Gas Turbine	22,748 (6%)	107,353(37%)	130,101 (19%)
Total	**391,212**	**89,252**	**680,464**

Data from: NWT Statistics Quarterly

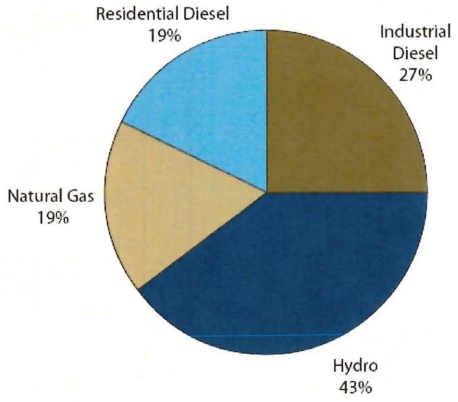
The above table shows that the Taltson and Snare-Bluefish hydro-electricity systems supplying the South and North Slave areas produce 75% of the total utility supply. Natural gas is the utility fuel of choice in Inuvik and Norman Wells while diesel fuel is burned for utility requirements in the smaller communities.

Industrial generation is dominated by diesel usage at the two diamond mines accounting for 63% of industrial supply. Gas turbine generation at Norman Wells supplies the remaining 37% of industrial use. In total, hydro is the dominant energy source accounting for 43% of electricity generation, followed by diesel fuel at 38% and natural gas at 19%.

The NWT's electricity generation profile is quite desirable, with 81% of utility generation sourced from hydro-electricity and natural gas fired facilities. The remaining 19% is in small remote communities, some of which may be economically converted to natural gas assuming the proposed Mackenzie Valley Pipeline is in place.

The limited development of a distribution grid is an issue as it means that each community must have its own diesel-fuelled back-up power.

2004/05 Electricity Generation



As far as diesel-fuelled power generation is concerned, over 70% of generation takes place at the remote diamond mines. The mining companies have made a significant investment in this technology. In theory, with the right incentives and the construction of an expensive power line, they may be enticed to convert to hydroelectric power.

In terms of renewable energy, wood is an important primary or secondary heating source for 20% of NWT households. In fact, in 6% of households it is the primary heating source. Other renewable energy sources, such as wind and solar, are less prevalent because of a number of technical and economic barriers.

Energy Transmission

An important component of the NWT energy sector is the energy transmission infrastructure that moves energy from where it is supplied or generated to where it is consumed or sold.

Several energy transmission systems operate in the NWT. They are:

- The Taltson and Snare electricity transmission lines;
- The Norman Wells oil pipeline; and

The fossil fuel distribution network (including Petroleum Products Division operations).

The proposed Mackenzie Valley Gas Pipeline will be an important addition to this infrastructure, which may allow gasification of communities along the route.

The future expansion of the electricity transmission grid is crucial if the NWT is to develop its hydroelectric potential. This could include links to the diamond mines, additional communities and southern export markets.

Energy Costs

The cost of providing energy services in the NWT is very high. Some of the reasons for this include:

- A general lack of supply options and a dependence on imported fuels;
- A high demand for energy due to the cold climate and distances between the communities; and
- A lack of economies of scale in the smaller communities.

The high cost for energy services are reflected in the retail prices paid by consumers:

- Typical fossil fuel prices range from $0.80 to more than $1.60 per litre.
- Electricity prices range from $0.12 to $0.20 per kilowatt-hour (kWh) in communities served by hydro and $0.30/kWh to $2.50/kWh in diesel communities.

To protect consumers, the GNWT spends about $10 million per year on various direct and indirect subsidy programs that shield consumers from paying the full cost of the energy services they use.

Environmental Costs

Development of the NWT's oil and natural gas resources, population increases, and general economic growth are factors that have combined to significantly increase the NWT's annual emissions of the greenhouse gases that cause global climate change.

The following table illustrates the NWT's emissions of greenhouse gases, expressed as kilo-tonnes of carbon dioxide equivalents (CO2e), for the years 1996 and 2001:

Emissions Source	1996	2001
Stationary fuel consumption	673	912
Transportation fuel consumption	366	640
Upstream oil and gas	46	178
Prescribed burning	0	14
Other	4	6
All sectors	**1,090**	**1,750**

Note: the 1996 and 2001 estimates were derived from two different studies. The methods and data sources used to develop these estimates vary slightly.

From 1996 to 2001, emissions increased by about 60% and are expected to continue to increase at a significant annual rate as a result of ongoing resource development activities and general economic growth.

APPENDIX C

GNWT Energy Policy – Previous Work

In recent years, a number of studies have been conducted and strategies developed to address many of the challenges the NWT faces with respect to energy. An overview (issues addressed and key findings or recommendations) of each is provided below (in chronological order):

Review of Electrical Generation, Transmission & Distribution in the NWT (Robertson Report) – December 2000

Division of the Northwest Territories Power Corporation (NTPC) between Nunavut and the NWT resulted in a much smaller operation and significant loss of economies of scale. To assess the implications of such a change, the GNWT commissioned a study and released it for public comment.

Key issues addressed included:

- Hydro potential;
- Future of the NWT Power Corporation; and
- Regulation, franchise, and rate zone issues.

Key recommendations included:

- Take steps to develop NWT hydro potential only after regional Aboriginal governments are ready to directly engage in hydro research and pre-feasibility work;
- Develop and approve a new operating mandate for NTPC;
- Move to a single rate zone system as soon as possible,
- Maintain the Territorial Power Support Program where appropriate;
- Facilitate competition in new power generation; and
- Implement a simplified regulatory process.

Current status:

- NWT Energy Corporation is working with Deline and Tulita to determine the feasibility of a hydro development to supply the pipeline. NWT Energy Corporation is also working with the Akaitcho and Metis in the South Slave region to examine development opportunities with the Taltson River.

- Some work completed on the other issues, but generally, specific proposals for change and public consultations were deferred.

Utility Pricing and Subsidy Reports – January 2000 & February 2002

The first study was undertaken to review six existing subsidy programs and provide recommendations.

Key issues addressed included:

- Purpose and annual cost of the program;

- Major stakeholders; and

- How the program is administered.

The study estimated the GNWT was spending about $29 million (in FY 1998/99) to subsidize energy and utility services. Key recommendations:

- Determining the full cost (capital and O&M) of providing water/sewer and PPD services and moving towards full cost pricing once the costs are known.

- Subsidies be provided to consumers that do not have the financial capacity to pay full-cost prices.

- The provision of targeted subsidies be accomplished through a separate subsidy mechanism rather than inside the retail pricing structures.

- The separate subsidy programs be replaced by one comprehensive subsidy program.

The second study was done to assist the GNWT in moving forward with a redesigned energy and utilities support program.

The research resulted in:

- A set of principles to be used to develop an overall policy framework for the redesigned support program.
- A preliminary financial model to assess the economic impact on various stakeholders should changes be made in how subsidies are designed and administered.

Current status:

- Due to political concerns and data limitations, no substantial progress was made after conclusion of the second study.

NWT Greenhouse Gas Strategy (2001) and Strategy Review (2005)

Developed in consultation with stakeholders and released in 2001, the focus of the NWT Greenhouse Gas Strategy is to mitigate or control greenhouse gas emissions in the NWT.

At the time of its development, it was recognized that the Strategy would likely be revised in future years as more information became available. A recent review conducted by ENR (to assess the results achieved since 2001 and determine the need for renewal of the Strategy) reached the following conclusions:

- A general consensus among review participants that the Goals, Objectives and Principles in the original strategy are mostly "right" and do not require substantial revision.
- A general consensus that the themes in the strategy are appropriate and that the 34 greenhouse gas emission or climate change-related initiatives undertaken in the NWT since 2001 (by a wide range of organizations) represent a "good start" towards managing NWT greenhouse gas emissions.
- Participants' concerns about shortcomings in the existing strategy included a lack of specific emission

targets, the absence of an implementation plan, insufficient funding, and a general lack of accountability for results.

- A strong consensus that more needs to be done to address climate change impacts in the NWT. Most participants supported the idea of developing a separate companion strategy (or plan) to co-ordinate and support impacts and adaptation activities (as opposed to combining emissions mitigation activities with impact and adaptation activities in a single climate change strategy or action plan).

Current status:

- ENR is revising the NWT Greenhouse Gas Strategy.

NWT Energy Strategy

Released in 2003, the NWT Energy Strategy contains a framework (Vision, Key Directions and Targets, Principles) for the sustainable development of the NWT energy sector and 14 suggested actions for achieving the stated directions and targets.

Due to various factors (other priorities, fiscal constraints, lack of consensus on some issues, lack of implementation planning), most of the actions contained in the Strategy have not been initiated.

It is anticipated that development of an NWT Energy Plan will build on the general framework established in the Energy Strategy and incorporate at least some of the suggested actions. In particular, much of the background work completed during the development of the Strategy remains valid and can be used to support the development and implementation of the NWT Energy Plan.

In reviewing previous work undertaken, the following conclusions can be reached:

- Energy resources play a major role in the NWT economy.
- The regulatory and fiscal environment as it relates to energy requires further examination.

- Any opportunities to reduce energy costs and replace imported energy supplies with domestic energy need to be explored.
- Canada and the NWT are committed to address climate change concerns.
- GNWT fiscal realities restrict the level and perhaps the type of energy-related investments that can be made.
- There is a need for a coordinated approach to energy-related initiatives and policy development.

The cost of implementing all or many of previous recommendations would amount to many millions of dollars. If it is accepted that some strategic investments need to be made, what is the approach? How are the investments prioritized – against what criteria? An overview of current energy investments in the NWT will inform the answer to these questions.

APPENDIX D

GNWT Energy Investments and Programs

To provide a fiscal context for the consideration of any future investments in the NWT energy sector, it is helpful to understand the extent and range of the GNWT's current energy-related investments and program expenditures.[18]

Department / Agency	Amount
Financial Management Board Secretariat ▪ Territorial Power Support Program – subsidizes remote community power rates to the Yellowknife rates for the first 700 kWh.	$8.3 million
Northwest Territories Housing Corporation ▪ Utilities Subsidies - The Local Housing Organizations pay the fuel costs of 2,300 Public Housing units ($6,064,000) and electrical costs of ($5,504,000). In addition, tenants pay 6 cents/kWh directly to the NTPC, over and above the $5,504,000 paid by the NWTHC.	$11.6 million
Public Works and Services ▪ Petroleum Products Division subsidizes fuel prices in the 15 communities, which it serves through a Grant-In-Kind from the GNWT for financing charges ($187,000) and amortization of capital ($789,000).	$976,000
Environment and Natural Resources ▪ Energy Conservation Program – encourages the efficient use of energy and water systems. Funding is available through ECP for retrofit projects that reduce consumption.	$220,000
2005/06 Energy Action Plan ▪ A variety of energy efficiency and conservation programs aimed at increasing grants to homeowners for efficiency upgrades, increasing Energy Assessment Programs, expanded training programs, public building energy efficiency testing and retrofits, education and public outreach programs, and pilot project testing of emerging technologies such as hybrid vehicles and Conematic heating systems.	$1.3 million

[18] Note: costs recovered from consumers through retail rates, all costs associated with water/sewer services and the GNWT's expenditures as a consumer of energy services have all been excluded.

Department / Agency	Amount
Arctic Energy Alliance- Core funding is currently provided by:	
GNWT – Environment and Natural Resources (ENR)	$50,000
GNWT- Municipal and Community Affairs	$50,000
GNWT – NWT Housing Corporation	$50,000
NWT Association of Communities	$5,000
Public Utilities Board	$12,500
Northwest Territories Power Corporation	$25,000
Northland Utilities Ltd.	$5,000
Environment Canada	$5,000
	$202,500
The balance of the draft 2005/06 annual budget is obtained from:	
ENR, delivery of Energy Management Program	$210,000
ENR support for energy technology, Pathfinder, and community energy planning	$55,000
Natural Resources Canada	$215,000
Indian and Northern Affairs	$255.000
EnerGuide audits and special contracts	$80,000
National Research Council/IRAP	$75,000
Other service contracts and consulting contracts	$60,000
	$950,000

Department / Agency	Amount
Municipal and Community Affairs Community Energy Planner [19] - funding proposed for the Arctic Energy Alliance to fund a full time position and associated operating costs in 2006-2007 (funded by the federal government in 2005/06)	$150,000
Community Energy Conference – A conference on energy planning and integrated community sustainability planning is planned for fall 2005 with partners Arctic Energy Alliance and the Northwest Territories Association of Communities.	$100,000
Gas Tax Funding Communities may use a portion of their federal gas tax funding for community energy planning.	-

[19] Proposed new funding for 2006/07

APPENDIX E

Cost Structure of Power in Remote Communities

		Deline	Ft. Simpson	Tuk	Lutsel K'e
Total Cost of Fuel	($/litre)	0.5030	0.4080	0.5460	0.4900
Plant Efficiency	(kW.h/litre)	3.4710	3.7630	3.5810	3.7930
Cost of Fuel	($/kW.h)	0.1449	0.1084	0.1525	0.1292
O&M	($/kW.h)	0.0200	0.0200	0.0200	0.0200
Total Cost of Fuel	($/kW.h)	0.1649	0.1284	0.1725	0.1492
Community Rate	($/kW.h)	0.5786	0.3680	0.6161	0.6206
Cost of Fuel as a % of the rate		**29%**	**35%**	**28%**	**24%**
Average Inventory Balance ($)		165,852	380,317	812,044	171,061
Inventory Carrying Costs		15,955	36,586	78,119	16,456

Note: based on the 2002/03 NTPC General Rate Application

NOTES

- Applying the Plant Efficiency Factor to the cost of fuel per litre provides a cost of fuel per kilowatt-hour.
- Cost of fuel represents 25 to 35% of overall Cost of Service.
- The remainder is made up of overhead, transmission, distribution, capital, rate of return
- The O&M component above represents costs associated with maintaining the diesel generators, the plant, etc.
- Carrying costs are identified separately as they would still be incurred, to a degree (at least 25%), in order to have diesel on-hand for back purposes.
- As an example, if the price of diesel in Deline increased by 20%, this would translate into a 3 cent/kWh increase in the rates, a 4.8% increase. For residential customers, for the first 700 kWh, this increase would be funded through the Territorial Power Subsidy Program.