ELECTRICITY SYSTEM INVESTMENT ISSUES FOR YUKON GOVERNMENT

A PUBLIC DISCUSSION PAPER

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Energy Resources Branch
Department of Economic Development
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PREFACE

In November 1995, the Government of Yukon released a three year plan for the development and management of the energy sector from 1996 through 1998. The Energy Plan was created to ensure that the Yukon's energy potential is developed and managed in an economically, socially and environmentally responsible manner. Two of the Energy Plan strategies are to:

> *"Promote the development of Yukon's energy resources to reduce our dependence on imported fossil fuels."*
>
> *"Encourage the development of a sufficient supply of competitively priced energy for industry and communities."*

A number of the specific actions related to each of these strategies pertain to capital development in the electricity sector including a direction to the Yukon Energy Corporation (YEC) to work with stakeholders to review future electricity supply options.

Capital planning by YEC will integrate electricity development options, such as new generation and transmission facilities, with energy management options, such as conservation and efficiency improvements, to determine the most viable alternatives for meeting future increases in electricity load.

From a public perspective, electricity supply planning and regulation can appear complicated and at times difficult to understand. The outcomes of the process however, can directly affect matters of public concern such as the cost of electricity, the availability of power for economic development and the impact of electricity development on the environment. In order to increase public understanding of the capital planning process, the Energy Resources Branch has prepared a series of discussion papers on some of the current electricity system planning issues in Yukon.

The discussion papers do not include statements of Yukon Government policy or recommendations on electricity supply options being considered such as hydro, coal, wind, wood, fossil fuels or energy conservation. Topics addressed by the series include the following.

Electricity System Investment Issues for Yukon Government

Trends in the Development of Non-utility Generation

Trends in the Role of Energy Management in Electricity Supply Planning

Trends in Electricity Market Reform

CONTENTS

EXECUTIVE SUMMARY

The risk of stranded investment in surplus generation or transmission assets is a significant barrier to electricity system expansion in Yukon. It is not a question of who will pay for the construction of a new facility. The Yukon Energy Corporation (YEC) is capable of raising commercial investment capital as are the private producers who have expressed interest in developing non-utility generation (NUG) facilities in Yukon. The issue is, who will carry those financing costs during an economic down-turn when the market for power declines or ceases to exist; utility investors, ratepayers or does government have a role to play in the name of economic development?

Although there are parallels between the electrical system in Yukon and provincial systems in risk related to transmission projects, the degree of risk experienced by Yukon in generation is fairly unique in two respects.

1. Unlike the provinces, Yukon does not have a transmission interconnection to the North American electricity market to dispose of surplus generation. As a result, a power surplus resulting from a mine closure, for example, will be wasted because there is no opportunity to sell that power to other customers on the open market.

2. YEC operates the smallest provincial or territorial electricity system in Canada and as a result the investment risk of any major project is disproportionate to its revenue base and asset base as compared to other utilities.

Yukon Government has recognized the greater degree of risk associated with electricity system development in Yukon and has stated its intention to become a risk broker to encourage investment in new generation facilities. While Yukon Government's will to support economic development is clear, it does not currently have the legislated ability to effectively manage long term investment. Three features of the current capital budgeting process make it unsuitable as a option for backstopping electricity infrastructure investment.

1. The capital budgeting process is not flexible enough to equity. Capital projects are expensed at the time of project construction rather than amortized over the useful life of the project. As a result, the taxpayers who benefit from the project are not necessarily the taxpayers who paid for it. For example, a project may have a useful life of 40 years while the project is financed by taxpayers over one, two or three years. The mis-matching of benefits and tax burden is diametrically opposed to the principle of equity used by the utility industry to ensure fairness.

2. The Taxpayer Protection Act removes government's option to deficit finance infrastructure projects. As a result, government is now limited to backstopping infrastructure projects in years when it can be certain that there will be enough of a surplus in the capital budget to offset any risk obligations previously agreed to. While the Act affords taxpayers a high degree of protection, it can also limit the options that government has to undertake infrastructure projects.

3. The capital budgeting process was not designed with an eye to facilitating public-private sector infrastructure partnerships. While government may choose to backstop an infrastructure project, legislation and regulations which would enable government to enter into agreements with the private sector for the financing, construction and operation of infrastructure projects do not exist. Currently, any such agreements must be provided for in separate legislation which must be debated in the legislature.

This discussion paper proposes the development of a new framework for investment in electricity infrastructure by Yukon Government. The proposed framework is based on a model designed in Pakistan which has been used to facilitate public-private partnerships in the development of electricity infrastructure. The Yukon government currently has a portion of the framework in place through YISP, although some aspects require further development. The model outlines five critical success factors.

1. A clear statement of government policy to involve the private sector through the development of new legislation.

2. A clear statement of Yukon Government preferences to be considered in investment decisions, such as the use of local energy resources or specific efficiency standards.

3. Specially created government institutions to facilitate private sector development such as more fully developed versions of YISP.

4. Provision of effective financial support through mechanisms such as revolving loan funds, reserve funds, sinking funds, standing appropriation authority for loans and guaranteed purchase contracts.

5. A clear statement of the government's acceptance of risks that would otherwise be borne by the project proponents.

Before government can agree to backstop any amount of risk, however, it must first decide how it will evaluate the potential costs and benefits of a given project. Just as government must choose the financing method that best protects the interests of taxpayers, government must also choose to backstop the project that will deliver the highest possible level of benefits to Yukoners. YEC currently uses financial analysis to determine the viability of generation projects. This paper discusses the advantages to government of considering other evaluation methods such as cost-benefit analysis and multiple accounts evaluation to determine a wider range of economic social and environmental benefits.

As part of any future review of investment framework options or project evaluation methodologies, government will survey precedents in other jurisdictions. Researchers will find that provincial governments are getting out of the generation sector and taking steps to promote a competitive market. As mentioned earlier, Yukon does not have access to that market. As a result, the Yukon Government's policy on investment risk may have to be out of step with national trends. In effect, government must find a "made in Yukon solution" to the issue. As part of the preliminary exploration of "next steps" Yukon Government can take, four options are proposed.

1. Government can makes its general policy directions known. Utilities and regulators broadly acknowledged that crown corporations and regulatory boards are accountable to government for ensuring that they respond to policy, even without specific direction from Cabinet. If government supports energy self sufficiency or conservation, or regulatory streamlining, or the development of a specific energy resource, it is the responsibility of the utility and the regulator to take those interests into account.

2. Government can give specific direction to the YEC and YUB. There are precedents for government to simply direct a crown owned utility to take an action, or adopt a policy or build a specific project. There are also similar precedents for government to issue a direction to regulators.

3. Government can adopt a preferred project assessment methodology. In Yukon, reliability and least cost are the only considerations in capital planning. As applied in other provinces, multiple accounts evaluation, for example, would likely lead to an increase in energy management activity in Yukon and would likely improve the viability of renewable energy supply options. It would also provide an opportunity to include the value of job creation, business development and the displacement of imported energy resources into the comparative assessment of generation options.

4. Government can establish a framework for investment in electricity generation projects and share the investment risk with partners. In order for Yukon Government to enter into partnership agreements as an investor, or risk broker, direction must be given to departments responsible to build on the foundation provided by the Yukon Industrial Support Policy and create a framework similar to the one described in this paper. This would include the introduction of enabling legislation.

Yukon Government has been grappling with the issue of investment risk in the electricity sector since it purchased the assets of NCPC in 1987. The most difficult question for Yukon Government has been; how does government do this in a way that is compatible with the mandates of the YUB and the YEC and is perceived to be a good investment by energy industry stakeholders and the people of Yukon? Achieving a resolution to this question has been complicated by the fact that the unique risks discussed in this paper may require government to take actions that are, in some cases, out of step with national trends. This is a difficult thing to do for any government.

INTRODUCTION

Section 6.4 of the Yukon Government Energy Plan directs the Departments of Economic Development and Finance to work with the Yukon Energy Corporation to:

> *" assess the role of government in making strategic investments in electricity infrastructure to support industry development"*

This public discussion paper has been written as a first step in that assessment to provide electricity sector stakeholders with information on the risks associated with investment in electricity generation and transmission projects in Yukon.

The paper will define investment risk and explain why it is a particularly significant barrier to electricity system development in Yukon. It will then describe the current capital planning environment and note the role Yukon Government could play in mitigating investment risk and enabling the construction of new electricity generation facilities.

The paper will also review the way in which Yukon Government budgets are developed for capital projects and will propose a model for investment decisions related to major electricity infrastructure. It will then review the way in which electricity projects could be evaluated in order to show how different evaluation criteria can affect the rationale for investment decisions.

Finally, the paper will briefly review some future actions Yukon Government can take to clarify its role in mitigating the investment risks related to building new electricity generation and transmission facilities.

AN HISTORICAL PERSPECTIVE

The challenge of producing a sufficient supply of electricity for industry and community growth has been a point of discussion and debate in Yukon since the commissioning of the first wood fired generation plant in Dawson in 1901. The three main questions to be answered in this debate have remained fairly consistent.

1. Who will ensure that there is sufficient power to support economic growth?

2. Who will invest in the facilities required to generate and distribute electricity to the mining industry?

3. Who will bear the risk of stranded investment in generation facilities if the mines shut down and the market for the electricity is dramatically reduced: utility investors, industrial customers, other electricity ratepayers or, does government have a role in mitigating or bearing the risk?

During the post war years, federal and provincial governments took a leading role in the development of electricity infrastructure across Canada. In the north, the Northern Canada Power Commission (NCPC) was created in 1948 to build and operate electricity facilities to encourage the development of

communities and industry in the Yukon and North West Territories. A more detailed history of that development is included in Appendix A. As we review the history of electricity system growth in Yukon, we can make the following observations about how investment risk has been managed over the past 50 years.

1. As a federal government department, any risk associated with investment in hydro dams by NCPC was backstopped by the federal treasury.

2. NCPC invested in hydro generation and inter-community transmission lines to meet government's social and economic objectives, but as an unregulated utility there was no publicly accessible evaluation of whether these were good investments, nor was there any measurement of social or economic costs and benefits.

3. This lack of assessment and public review was acceptable because it was consistent with national trends. The federal and provincial governments of the day were in the business of providing infrastructure to support economic growth.

4. The shut-down of the Faro mine in 1982 turned the new Whitehorse Number Four Turbine into a 38 million dollar stranded investment for NCPC and demonstrated the reality of investment risk related to constructing generation facilities to serve mining customers.

5. The federal government's absorption of investment risk related to the Number Four Turbine did not entirely protect other electricity consumers on the Yukon system because, after the 1982 closure, NCPC planned to raise rates in annual increments of 5% to recover a portion of the cost of its surplus plant.

6. During the transfer of NCPC assets to Yukon, the guarantee of investment risk previously provided by the federal government was not formally adopted by the Yukon Government. As a result, it is now the utilities and their customers who are primarily at risk when new facilities are built to serve mines.

7. The need to define Yukon Government's role in mitigating investment risk related to the construction of new generation facilities was recognized during the 1992 Energy Policy Consultation Process as well as the 1992 YUB Capital Hearing.

8. Yukon Government responded to the risk issue by developing the Yukon Industrial Support Policy (YISP) in 1993. YISP enabled Yukon Government to make investments or provide loan guarantees for the construction of generation facilities or transmission lines to serve new mines.

9. While YISP provides Yukon Government with a mechanism for investment in infrastructure, it is limited by governments current capital budgeting process which is not designed to manage the type of long term investments required to finance the construction of electricity generation facilities. YISP is also specifically intended to mitigate risks related to building electricity infrastructure to serve industry and does not address the role of Yukon

Government in promoting the use of local energy resources to displace imported fossil fuels or serve the growing needs of communities.

10. In 1995, the Yukon Government stated its willingness to provide an investment guarantee, or another form of risk mitigation, for a major generation project in order to meet the future power needs of the mining industry.

Yukon Government's willingness to accept a role in the mitigation of investment risk raises two new questions to be added to the three proposed at the beginning of this section of the paper.

1. What financing mechanisms can be used to encourage electricity infrastructure development?

2. How can the Yukon government evaluate projects to ensure that infrastructure development is encouraged for only those projects which deliver the highest level of benefit for Yukoners?

Before these questions can be addressed, we must first clarify what investment risk is and why it is more of an issue in Yukon than in most other parts of Canada.

THE RISK TO GOVERNMENT

What is risk? The academic literature describing risk is extensive and many types of risk have been identified. The four types of risk relevant to this discussion paper are financial, market, environmental and regulatory.

Financial Risk

Financial risk is the potential risk faced by the project funder that the financial assumptions used in calculating the viability of the project are off the mark. For example, since the project will be built using borrowed money, if the cost of borrowing (the interest rate) increases over the life of the project, the project may at some point no longer be viable. However, once the project has been started it soon becomes more expensive to abandon the project than to complete it and operate it at a loss. Other financial risks include capital cost calculation errors and construction delays which add to project costs and can affect project viability.

Market Risk

Market risk refers to the stability and predictability of long-term electricity sales. Stable consumption of electricity translates into low risk, while the possibility of wide fluctuations in the volume of futures sales results in higher risk. For example, a new electricity generation facility built to service a mine would be subject to a high level of market risk since the probability of the mine operating continuously for 30 years is low. The high level of market risk in this example erodes the viability of the project.

Environmental Risk

Environmental risk is the risk that an electricity infrastructure project will have adverse effects on the environment and as a result incur higher than estimated operating costs. Examples of adverse environmental effects include damage to fish stocks, air pollution, loss of wildlife habitat and potential human hazards. Environmental effects become a risk to project proponents when the cost of the effects borne by the proponents are higher than originally estimated. For example, the cost of mitigation measures required by environmental regulators as a result of unforeseen events can affect the long-term viability of a project.

Regulatory Risk

Regulatory risk is the risk that the regulator will not allow utilities to recover capital costs through electricity rates. This is of particular relevance in Yukon because, in 1993, the YUB disallowed YEC expenditures on demand side management and hydro site planning. Regulatory risk must be recognized as a factor, although under normal conditions it would not be given as much weight in the analysis as the other three forms of risk noted above.

Any project proponent will be faced with each of the first three types of risk described above. In the interests of brevity, the term "investment risk" in this paper refers to a combination of all these risks. In a competitive market, the sum total of the risks described above are parted out between the various market players and the risk borne by a single player is correspondingly reduced.

In the Yukon context, most of the existing electricity generation and transmission facilities were developed because NCPC bundled and carried most of the investment risk by itself in the name of northern development. In the absence of an NCPC-type agency, the next logical stage of development is to let private industry assess the risks and act accordingly. Yet, what would happen if the market decided that the potential rate of return from new infrastructure was not high enough to offset the estimated risks? There would be no development. If government decides that economic development is still an important objective, then government must become a risk broker and carry some of the risk itself. The risk faced by government, should it choose to play the part of risk broker, is a mix of all types of risk described above.

INVESTMENT RISK ISSUES UNIQUE TO YUKON

Although there are parallels between the electrical system in Yukon and provincial systems in risk related to transmission projects, the degree of risk experienced by Yukon in generation is fairly unique in two respects.

1. Unlike the provinces, Yukon does not have a system interconnection to the North American electricity market to dispose of surplus generation.

2. YEC operates the smallest provincial or territorial electricity system in Canada and as a result the investment risk of any major project is disproportionate to its revenue base and asset base as compared to other utilities.

In the provinces, surplus generation is sold to other Canadian or American utilities. This market is evolving rapidly through a process of reform that is leading to the dismantling of large natural monopolies through the process of de-coupling generation from transmission and distribution. With a deregulated generation sector, utilities can now develop new facilities with less risk of stranded investment if local load requirements decrease. The lack of a system interconnection in Yukon prevents utilities from de-coupling generation and entering the broader market. Thus, in Yukon, a surplus plant will remain surplus until the local load increases. Although this degree of risk is experienced by the North West Territories Power Corporation (NWTPC) and some isolated utilities in Alaska, there is really no parallel example of similar amounts of risk in the provinces.

Risk is, however, a factor in the provinces in transmission development, particularly in the case of lines built to serve major industrial customers. General practice is that the utility shares the risk with the customer by gambling that the installation costs will be paid by the customer over the anticipated life of the project. In the case of high risk customers, utilities may ask for a customer contribution up front, particularly if the economics of the service connection are marginal, and try to recover the remainder of their costs over as short a time period as possible. Ontario Hydro considers the risk of serving mines to be high enough to require new mining customers to pay the full capital cost of a service connection up front. This policy is gaining broad acceptance in other jurisdictions including Yukon where a similar approach was proposed as part of the 1993 General Rate Application pre-hearing settlement agreement signed by the utilities, industry and other rate case intervenors.

In cases where the need for a short pay-back period could in fact cripple the start-up of a new mining project, there are examples of governments providing support to meet economic policy goals. In Yukon, this is done through assistance programs such as YISP. General practice is not to provide that subsidy through rates, but to either partner with the utility by sharing the cost of the transmission line or provide some form of loan or grant directly to the customer. It should be noted that governments are moving away from this type of involvement as they embrace market reform and increased competition. So what do utilities do when, despite precautions, they end up with stranded investment?

As in business, when the risk turns bad, utilities have to absorb the cost. In most cases this has relatively little impact on rates or the financial stability of the utility. A $25 million stranded investment, for example, is manageable for a utility worth hundreds of millions of dollars like Manitoba Hydro and Saskpower; or billions of dollars like BC Hydro, Ontario Hydro and Hydro Quebec. In Yukon however, having even a small line extension, such as the proposed $5 million 30 km extension to Carmacks Copper, would raise consumer rates by an average of 2% on the $112 million YEC system. As a result YEC is considering policy options to limit the amount of investment risk that would be considered acceptable in system planning.

THE CURRENT CAPITAL PLANNING ENVIRONMENT

From the perspective of utility investors, or non-utility generation (NUG) proponents, the risk of stranded investment in surplus generation or transmission assets is the most significant barrier to electricity system expansion in Yukon. It is not a question of who will pay for the construction of a new facility. The utilities are capable of raising commercial investment capital as are independent NUG producers. Utilities are also required to demonstrate to the YUB that there is a firm market for the additional power and that the cost of the project can be fairly recovered from customers over the life of the asset. The issue is, who will carry those costs during economic down-turns when the market for that power declines or ceases to exist?

Mining investors accept closures and stranded investment as endemic risks of their industry. The Faro mine has had three owners since 1968 and has been shut down 6 out of its 27 years of operation. From a mining industry perspective, being in operation 75% of almost three decades is a sign of long term stability. From a utility perspective, load losses resulting in plant shutdowns of any duration are a cause for concern. As an essential service, an electricity utility cannot simply halt production like a mine until the market improves, nor can it go out of business. If an extended period of load loss causes a utility to become insolvent, the company must be bailed out by investors, ratepayers or government. As a result, utility owners, managers and regulators have come to value prudence in system planning to ensure secure long term load and revenue streams.

From the perspective of an electricity utility, mines are high risk customers. In 1975, mining customers accounted for 70% of total system load in Yukon. By 1993, mining load had dropped to less than 1%. In 1995 it returned to close to 40%. When utilities assess the viability of generation options they consider the stability of the market over the life of the project. In the case of hydro dams utilities are looking for a firm market over a period of 40 to 60 years. In the case of coal generation, the expected life of the project is 25 to 40 years. In the case of wind generation, the life expectancy of turbines is 20 to 25 years. And in the case of diesel generation, engine life varies from 10 to 15 years.

The cyclical nature of mining load has lead YEC to determine that the least cost and least risk option in providing service to new mines is diesel generation. Considering that rates for industrial customers are set at 100% of the cost of service and that utilities generally attempt to recover connection costs as early in the service agreement as possible, blended diesel/hydro power costs for new mines could be high enough to discourage mining investment. This is a discouraging outcome for the mining industry and does not further the interests of Yukon Government in promoting investment in mineral development.

In the current regulatory environment, the YUB is responsible for reviewing YEC's capital development proposals and using normal regulatory practices and principles to determine whether development costs should be included in rate base. The YUB must consider how best to protect both the customers and the utility from investment risk. In the absence of specific policy direction from Yukon Government, it is likely that the YEC and YUB will shy away from

infrastructure development intended to serve industrial customers without a significant customer contribution up front to cover the cost.

In order to influence the decision making process in a way that does not undermine the independence or integrity of both the YEC and the YUB, Yukon Government must now review its role in mitigating investment risk. As a first step, government can assess its ability to make investments or provide loan guarantees for a major electricity generation projects over a 10 to 60 year period. As part of this assessment, government can identify a framework for future investments in electricity infrastructure.

THE NEED FOR A FRAMEWORK FOR GOVERNMENT'S ROLE IN MAKING INVESTMENTS IN INFRASTRUCTURE

As explained in the previous section, it is not likely that YEC will invest in new electricity infrastructure without some form of third party financial support. If the private sector does not believe that the potential rate of return from new infrastructure is high enough to offset the estimated risks, then Yukon Government may choose to become a risk broker. If government chooses to become a risk broker, how can it finance the risk? This section of the paper examines the suitability of using the current capital budgeting process for backstopping risk.

Yukon government investment decisions are made in accordance the Financial Administration Act and the Taxpayer Protection Act. The Acts spell out the circumstances *when* public funds may be spent. The five year capital plan is the prioritization tool used by government to decide on *what* projects public funds will be spent. Each department is responsible for annually drawing up a five year capital plan which includes a ranking of projects from highest to lowest priority. The first year of the five year capital plan becomes the capital budget for that department for the current year. Management Board is then responsible for prioritizing projects among departments.

Three features of the capital budgeting process make it unsuitable as a option for backstopping electricity infrastructure investment.

1. The capital budgeting process is not flexible enough to ensure equity. Capital projects are expensed at the time of project construction rather than amortized over the useful life of the project. As a result, the taxpayers who benefit from the project are not necessarily the taxpayers who paid for it. For example, a project may have a useful life of 40 years while the project is financed by taxpayers over one, two or three years. The mis-matching of benefits and tax burden is diametrically opposed to the principle of equity used by the utility industry to ensure fairness.

The Taxpayer Protection Act removes government's option to deficit finance infrastructure projects. As a result, government is now limited to backstopping infrastructure projects in years when it can be certain that there will be enough of a surplus in the capital budget to offset any risk obligations previously agreed to. While the Act affords taxpayers a high degree of protection, it can also limit the options that government has to undertake infrastructure projects.

2. The capital budgeting process was not designed with an eye to facilitating public-private sector infrastructure partnerships. While government may choose to backstop an infrastructure project, legislation and regulations which would enable government to enter into agreements with the private sector for the financing, construction and operation of infrastructure projects do not exist. Currently, any such agreements must be provided for in separate legislation which must be debated in the legislature. An example of such legislation is the Curragh Loan Guarantee Act.

In summary, the capital budgeting process is not a suitable option for financing infrastructure projects. Since government cannot spend, or make a promise to spend, without authority delegated by voters, what other options exist for the backstopping of investment risk? The next section of the paper proposes a framework which will allow government to backstop risk outside of the capital planning process.

CREATING A YUKON FRAMEWORK

The following example of an infrastructure development framework is based on a model designed in Pakistan which has been used to facilitate public-private partnerships in the development of electricity infrastructure. The Islamabad Model is similar to the more basic model provided by YISP and outlines five critical success factors.

1. A clear statement of government policy to involve the private sector.

2. A clear statement of project features.

3. Specially created government institutions to facilitate private sector development.

4. Provision of effective financial support.

5. A clear statement of the government's acceptance of risks that would otherwise be borne by the project proponents.

The Yukon government currently has a portion of the framework in place. However, some aspects require further development. In the following section, each of the critical success factors of the Islamabad Model are reviewed in the Yukon context.

1. A clear statement of government policy to involve the private sector.

Under the Model, government must make a clear policy statement that it will partner with the private sector to facilitate infrastructure development. One method of making such a statement is to implement legislation which recognizes that specific government support may be required in the financing, construction, operation and maintenance of projects by the private sector. In addition, the legislation may offer the private sector the opportunity to earn competitive real rates of return.

The Yukon Government already has the Yukon Industrial Support Policy which clearly states government's wish to involve the private sector in the development of electricity infrastructure. In order to carry out infrastructure investment in partnership with the private sector there must be enabling legislation. The Energy Infrastructure Loans for Resource Development Program (EILRDP) is an example of the type regulation provided for under the Business Development Assistance Act that conforms with the Model.

1. **A clear statement of project features.**

Under the Model, the general features that government wishes to incorporate into a given infrastructure development are clearly stated either as part of the legislative framework or as part of the project tendering process. For example, the Yukon Government may want to make a statement to the effect that it will provide power purchase guarantees to project proponents or that electricity generation projects using a specific energy resource are preferred.

1. **Specially created government institutions to facilitate private sector development.**

Under the Model, project proponents and government need an effective and efficient administrative process. Government institutions are required to evaluate projects, draft contracts, administer any incentive packages, and negotiate and administer power-purchase guarantees. In Yukon, while a specially created institution has not been established, the functions of such an institution are already carried out by existing departments. For example, the Department of Economic Development currently undertakes most of the functions described above as the delivery agent for YISP.

1. **Provision of effective financial support:**

Under the Model, the concept of risk sharing is synonymous with project cost sharing, or guarantees of revenue streams to the project proponents. Therefore, when government commits itself to risk sharing, it commits itself to some form of financial support. For the financial support to be effective it must offer the project proponent the opportunity to earn a competitive rate of return on invested capital.

If government investment in electricity infrastructure is considered, it is necessary to develop a mechanism for providing effective financial support in conjunction with the development of a legislative and administrative framework. Of primary importance is to ensure that the assumption of risk will not be destabilizing to government and, therefore, that the government's share of project costs are matched to the financial capacity of government.

The following infrastructure financing mechanisms are all examples of how government can backstop investment risk outside of the confines of the capital budgeting process.

Revolving Loan Funds

A revolving loan fund is a pool of cash which is funded by annual legislative appropriations. The funds in the pool are subsequently loaned out to project proponents and loan repayments are put back into the fund to finance

future projects. As a result, the fund is self-perpetuating (to the extent loans do not go bad). The fund can be added to over time thereby spreading project costs over many years if necessary. In the context of risk, the advantage of a revolving loan fund is that government can take on some risk, and therefore encourage development, and at the same time limit its' level of risk to the total value of the fund. Revolving fund loans can accommodate projects with large returns, or with no returns and can make loans at low or zero rates of interest. In addition, the loans can be arranged such that repayment of principle can be deferred in certain circumstances.

Reserve Fund

Reserve funds are similar to revolving funds in that every year an amount of money is added to the a pool of cash. However, unlike revolving funds, where payments to project proponents are loans, a reserve fund makes grants. Similar to a revolving fund, project costs paid out of the reserve fund are not expensed at one point in time, but are instead expensed over a period of time. Since the value of the reserve fund can be built up prior to a project going ahead, government can limit its risk exposure by keeping its risk commitments below or equal to the total value of the fund.

Direction to a Crown Corporation by Government

As a crown owned company, YEC is allowed to earn a real rate of return (or, profit) on its assets. Another funding option available to government is to simply direct YEC to undertake and fund an infrastructure project from its profits. Direction by government for YEC to undertake an infrastructure project provides the government with more flexibility as to the types of arrangements it enters into. YEC does not require legislation or government expenditure authority to implement policy. Therefore, implementation of a project can occur more rapidly and costs to government would not show up as expenditures that contribute to the surplus/deficit position of government.

It should be noted that since 1993 the Yukon Government has directed YEC to use a significant portion of annual profits for bill relief to residential and commercial consumers. Having to pay bill relief from its profit has eroded YEC's ability to accumulate capital for future infrastructure projects.

It should also be noted that directing YEC to undertake infrastructure development does not get the Yukon Government off the risk hook. As noted above, YEC is owned by government. Should YEC face financial failure as a result of losses on a new generation facility, the Yukon Government would be ultimately responsible for bailing out the Corporation.

Borrowing Money with Repayment of Principle Using a Sinking Fund

Under a sinking fund approach government would provide for the cost of the project by incurring debt, either by issuing its own debt or by borrowing from a third party. A sinking fund would then be established for the repayment of the debt. The debt is paid down through annual appropriations from government's operations and maintenance (O&M) budget; not the capital budget. The sinking fund method spreads the costs of capital projects over the useful life of the project and thereby matches

project costs with the future benefits. However, since the financing of infrastructure projects through issuing debt may cause the government to contravene the Taxpayer Protection Act, use of a sinking fund to finance such projects may not be an available option.

Standing Appropriation Authority for Loans Up to a Maximum Limit

Government can also provide loans to project proponents pursuant to a standing appropriation under the Financial Administration Act. Standing appropriations are not considered to be expenditures for financial reporting purposes and therefore would not throw the government offside of the Taxpayer Protection Act. The loan could be funded out of surplus funds, or through borrowings from third parties. If the loan repayments by government to its lender are scheduled to take place in concert with loan repayments by the proponent to government, government can backstop the project without effectively spending any funds.

Government Guaranteed Purchase Contracts

Government can provide potential electricity generation proponents with a *guarantee to purchase*, also known as a *take or pay contract*. Under a purchase guarantee, the owner of the new generation facility would contract with YEC for the purchase of power. In the event that the power becomes surplus to system requirements and YEC no longer needs the additional electricity, the guarantee would kick in and the government would pay a minimum revenue stream to the owners of the new generation facility. The owners are assured a minimum rate of return on their invested capital despite the possibility of under-utilization of their generation facility. There is no cost to the government unless the electricity market declines. If power from the new facility does become surplus and the guarantee takes effect, the cost of financing the risk is spread over many years. In the worst case scenario, the cost would be expensed over the life of the contract.

In evaluating any of the financing options discussed above, consideration must be given to how taxpayers can be protected from having to bear an increased fiscal burden in a year when government must make good on its risk guarantee. As a result, any financing method which spreads the investment risk and potential costs over many years is generally preferred.

1. A clear statement of the government's acceptance of risks that would otherwise be borne by the project proponents.

Under the Model, the types and levels of risk that the government is willing to accept must be clearly stated in legislation, regulation, contracts, or policy. Two examples of how the Yukon Government could clearly state its willingness to backstop risk are: entering into purchase guarantee contracts with project proponents, and drafting a regulation under the Business Development Assistance Act which commits government to funding a specified portion of a project's capital costs.

Before government can agree to backstop any amount of risk, however, it must decide how it will evaluate the potential costs and benefits of a given project. Just as government must choose the financing method that best protects the interests of taxpayers, government must also choose to backstop the project

that will deliver the highest possible level of benefits to Yukoners. The next section of the paper looks at how government can evaluate the costs and benefits of potential projects by discussing three common project evaluation methodologies; financial analysis, cost-benefit analysis, and multiple accounts evaluation.

PROJECT EVALUATION METHODOLOGIES

Financial Analysis

Financial analysis has historically been the standard method for evaluating the feasibility of electricity infrastructure projects. The end product of financial analysis is an answer to the question; "will the project be profitable?" In other words, will the revenue generated by the project equal or exceed the costs of building the project? To answer the profit question, the costs of building and operating the facility are compared to the revenues expected to be generated over the life of the project. If the expected revenues equal or exceed the estimated costs the project is said to be "economic". Conversely, if expected revenues are less than the estimated costs the project is said to be "uneconomic"

While financial analysis is simple and quick to carry out it represents a narrow approach to evaluating the merits of a project. Only the costs and revenues borne and enjoyed by the builder of the project are considered. Costs which are borne by others, such as pollution and loss of wilderness lands, are not included in the analysis. Similarly, benefits from the project such as job creation in areas of high unemployment and improved economic development opportunities are not considered.

Cost-Benefit Analysis.

When it became apparent that the costs and benefits from new projects could not be adequately described in simply financial terms, cost-benefit analysis (CBA) became the preferred approach to project evaluation. While CBA became a more popular method of project evaluation, financial analysis was not rejected as a valid method. In fact, financial analysis forms a cornerstone of CBA since all of the same costs and revenues that are considered in financial analysis are also included in the CBA method. However, CBA also attempts to include non-financial (or, intangible) costs and benefits such as pollution and job creation.

The CBA method of project evaluation may be briefly summarized in three steps. The first step is to identify all possible costs and benefits of the project. The second step involves quantifying (or monetizing) the costs and benefits identified in the first step. The final step requires summing the costs and the benefits and then comparing the total costs to the total benefits of the project. The end product of CBA for a given project is a single number, the ratio of costs to benefits.

While the inclusion of all possible costs and benefits may be an admirable objective at the theoretical level, in practice the process of monetizing intangible costs and benefits is fraught with technical hazards. Monetization assumes that all costs and benefits can be traded in a market. For example,

some benefits, such as increased employment, are easily measured since labour is traded in a market where the unit of exchange is dollars. Other possible benefits, such as a more reliable supply of electricity, are not so easily monetized. Without knowing what consumers are willing to pay for electricity that is available 100% of the time versus only 98% of the time (off line for example on the 7 coldest days in the year), it is difficult to calculate the dollar value benefit of increased reliability. The end result of incomplete monetization is often analysis that purports have included all possible costs and benefits but is really only half baked when costs and benefits which are difficult to measure are ignored or assumed away.

Another factor which complicates the practice of cost-benefit analysis is the choice of an appropriate discount rate. Since costs tend to be concentrated at the beginning of a project and the benefits occur over an extended period of time it is necessary to convert the value of the future benefits into present value terms. The conversion of future benefits into their present value is done with the use of an appropriate interest factor or, discount rate. The choice of what constitutes an appropriate discount rate has always been and remains a matter of debate. The substitution of one discount rate for another can easily turn a 'loser' project into a 'winner'.

The highly technical nature of cost-benefit analysis leads to another problem. While financial analysis may be limited in its scope, the methods used are transparent and the results reproducible. Cost-benefit analysis, in contrast, typically requires the technician to make many subjective decisions, some of which are not reproducible. As a result, the technician, who is often far removed from the conception of the project, can end up being a critical decision maker.

Multiple Accounts Evaluation

Multiple accounts evaluation is representative of the current generation of project evaluation methodologies. Devised by U.S. water authorities in the early 1960's to facilitate land use decisions, multiple accounts evaluation is a highly adaptable technique which has been used for a variety of applications. An impressive feature of multiple accounts analysis is that it allows for comparison of economic, environmental and social factors without the requirement that all costs and benefits be monetized. As a result, costs and benefits which are suitable for monetization can be easily compared to costs and benefits which are not easily monetized.

The methodology for multiple accounts evaluation may be described by three steps. The first step is to specify the evaluation accounts. Any number of accounts may be defined and, similar to cost-benefit analysis, multiple accounts analysis includes the same information contained in simple financial analysis. The second step requires documenting and assessing the implications of the project. As noted above, multiple accounts analysis does not require converting all possible impacts of a project into dollar terms. For accounts that cannot be monetized, qualitative and descriptive measures can be used. The third step consists of presenting the results of the analysis in a matrix and facilitating the interpretation of the evaluation findings.

This is an example of a multiple accounts evaluation matrix.

	Base Case	Project #1	Project #2	Project #3
Economic Development Account - e.g., employment				
Environment Account - e.g., wildlife				
Social Account - e.g., quality of life				

Note that, in contrast to cost-benefit analysis where the end product is a single number, the end product of multiple accounts evaluation is a decision matrix which shows the gains and losses that accompany each project. A development decision is made by project stakeholders by comparing the relative merits of each project for each account.

Similar to financial analysis, multiple accounts evaluation is relatively transparent. The technician is removed from making subjective decisions in pursuit of a single number. The subjective decisions are made by all who have an interest in the decision and the matrix provides a record of how the final decision was made.

ACTIONS YUKON GOVERNMENT CAN TAKE

It will be difficult to rationalize any decision by government to backstop a major generation project based on current precedents from other jurisdictions. Governments are getting out of the generation sector and taking steps to promote a competitive market. As mentioned earlier in the paper, Yukon does not have access to that market. As a result, the Yukon Government's policy on investment risk may have to be out of step with national trends. In effect, government must find a "made in Yukon solution" to the issue. As part of the preliminary exploration of actions Yukon Government can take, the following four suggestions have been made by provincial governments, utilities and regulators.

1. **Government can makes its general policy directions known.**

   Utilities and regulators broadly acknowledged that crown corporations and regulatory boards are accountable to government for ensuring that they respond to policy, even without specific direction from Cabinet. If government supports energy self sufficiency or conservation, or regulatory streamlining, or the development of a specific energy resource, it is the responsibility of the utility and the regulator to take those interests into account. By reminding energy industry stakeholders what its general policy is for the energy sector government is saying, "I don't want to micro-manage your process, but I want you to ensure that these interests are met". By

itself, policy is not a backstop, but it does pass the responsibility back to the utility to make a specific proposal on how government's interests can be met and what is specifically required from government to mitigate investment risk.

2. **Government can give specific direction to the YEC and YUB.**

There are precedents for government to simply direct a crown owned utility to take an action, or adopt a policy or build a specific project. There are also similar precedents for government to issue a direction to regulators. In Yukon, both the YEC and the YUB enjoy an arms distance relationship with government. In fact, they may be among the most independent in Canada. Since 1984 when the Public Utilities Act was proclaimed, government has only issued one formal direction to the YUB; the Order in Council on rate design. In BC for example, government has issue eight Special Directions on different subjects to the regulator over the past 15 years. Despite the acceptance of governments right to issue a direction, there are no recent Canadian examples of major electricity generation projects that have been built under government direction without review and acceptance under normal regulatory practice.

3. **Government can adopt a preferred project assessment methodology.**

In BC, government has directed BC Hydro and the BCUC to adopt multiple accounts evaluation to include other social, economic and environmental values in the assessment of new generation facilities. In Yukon, reliability and least cost (which includes the cost of anticipated environmental mitigation) are the only considerations in capital planning. As applied in other provinces, multiple accounts evaluation would likely lead to an increase in energy management activity in Yukon such as conservation and energy efficiency improvements. Experience in other jurisdictions indicates that multiple accounts evaluation would also likely improve the viability of renewable energy supply options as compared to thermal-electric generation using coal, diesel, gas or wood. It would also provide an opportunity to include the value of job creation, business development and the displacement of imported energy resources into the comparative assessment of generation options. Multiple accounts evaluation has already been used successfully by Yukon Government in the Eagle Plains parks planning process.

4. **Government can establish a framework for investment in electricity generation projects and share the investment risk with partners.**

A recent example of a partnering initiative is the North Central Transmission Project in Manitoba. An agreement is now being finalized to build a 360 km 138kv line to serve First Nation communities in the Island Lakes District at a total project cost of $150 million. The line is not economic from the utility's perspective since there are only 6,500 customers and the demand for power is low. The partnering split reflects energy usage in the communities. The federal government takes 75% of the load and will pay 75% of the capital cost of the transmission line. The rationale for the expenditure is government's interest in providing a level economic playing field to self governing First Nations. The economic benefit to First Nations has not been measured. The decision is one driven by principle or policy

rather than economic evaluation. Interestingly, the province will pay 15% and Manitoba Hydro will pay 10%, but in fact the utility has been directed to pay the province's share. In return the province has offered the utility relief on water rents for a period of years. In order for Yukon Government to enter into partnership agreements as an investor, or risk broker, direction must be given to departments responsible to build on the foundation provided by the Yukon Industrial Support Policy and create a framework similar to the one described in this paper. This would include the introduction of enabling legislation.

Yukon Government has been grappling with the issue of investment risk in the electricity sector since it purchased the assets of NCPC in 1987. Yukon Government's will to be a risk broker and potential investor was evident in 1992 when government considered its role in supporting the development of the Surprise Lake Hydro project and the Mayo-Dawson transmission line. It was evident again in 1993 when government released its Yukon Industrial Support Policy and again in 1995 when government publicly expressed its interest in the development of a thermal-electric generation plant utilizing coal resources.

The most difficult question for Yukon Government has always been; how does government do this in a way that is compatible with the mandates of the YUB and the YEC and is perceived to be a good investment by energy industry stakeholders and the people of Yukon? Achieving a resolution to this question has been complicated by the fact that the unique risks discussed in this paper require government to take actions that are, in some cases, out of step with national trends. This is a difficult thing to do for any government.

APPENDIX A

THE HISTORY OF GOVERNMENT INVESTMENT IN THE YUKON'S ELECTRICITY SYSTEM

Although commercial electricity service existed in many Yukon communities prior to the 1950s, the development of the government owned electricity system really began in 1948 when the federal government formed The Northern Canada Power Commission (NCPC) to develop electricity infrastructure in the Yukon and Northwest Territories.

NCPC was created to build and operate electricity facilities to encourage the development of communities and industry. The first project in Yukon was the 1952 construction of the 5 megawatt Wareham Dam to provide power to the village of Mayo and United Keno Hill Mines at Elsa and Keno City. This was followed in 1958 with the completion of the 11.5 megawatt Whitehorse Rapids Dam to serve the growing power requirements of Whitehorse. An 8.5 megawatt third turbine was added to the facility in 1969 to provide power for the new Cyprus Anvil mine and Faro town-site. This required the construction of the first inter-community high voltage transmission line which ran from Whitehorse to Faro. During this 20 year period, NCPC also installed diesel generation plants in Whitehorse, Faro, Dawson and Mayo.

The golden age of infrastructure development.

All of the hydro projects built by NCPC in Yukon, with the exception of the first phase of the Whitehorse Rapids facility, were primarily intended to supply power to mines. The rationale was that the availability of hydro generated electricity would encourage long term regional economic development. This rationale was never challenged. The prudence of the investment was never subject to regulatory review. The economic, social and environmental costs and benefits were not formally assessed. And the reason why NCPC's rationale was not exposed to scrutiny is that it was consistent with the national trends of the day in electricity infrastructure development.

The first 20 years of NCPC system development occurred during the peak years of Canada's golden age of government investment in electricity infrastructure. It began in the 1930s with rural electrification and continued into the post war period until the mid 1970s with the development of hydro mega-projects and nuclear stations as well as the substantial completion of the provincial and territorial electricity systems. The scale of development, and development risk, was larger than could be managed by the private sector.

Government's interest in using these systems to meet social and economic objectives such as: supporting high risk industry growth, serving remote areas, introducing postage stamp rates (rate equalization), and ensuring high standards of system reliability, created a suitable environment for the formation of natural monopolies. These natural monopolies took the form of large vertically integrated crown owned utilities that controlled the generation, transmission and distribution of electricity. Like NCPC, many of these utilities such as Ontario Hydro, Hydro Quebec and Saskpower report directly to their provincial legislatures and are still not subject to independent rate regulation.

NCPC enters a regulated environment.

The dam at Whitehorse Rapids is a "run of river" plant which means that it uses seasonally available river flows. Although the Yukon river system includes natural water storage in the form of upstream lakes, the ability to control water flows from those lakes is fairly limited. As a result, flow volumes decrease in winter and reduce the effective generation capacity of the dam just at the time of year when electricity loads are highest. In order to resolve this problem, NCPC looked for a hydro site that included a natural reservoir capable of storing water for use in generation to meet winter peak load requirements and to store water in wet years for use in subsequent dry years.

Aishihik Lake was selected by NCPC in 1970 as the most suitable site. The project included a 30 megawatt underground power house and was considered to be state of the art in both its design and its minimal impact on the environment. The facility was linked to the Whitehorse-Faro transmission system through a 138kv transmission line.

The Aishihik project proved to be unique in many respects that were not anticipated by NCPC. It was the first project subject to review under the newly created Northern Inland Waters Act (NIWA). In 1972, the Yukon Territory Water Board (YTWB) declined to grant a water use license for the Aishihik facility because NIWA had not been fully proclaimed. This lead to further hearings in 1973 and 1975 and caused construction delays and cost overruns.

For the purposes of this discussion paper, these events are significant because they demonstrate that most of the Yukon's major hydro facilities were essentially planned and built by NCPC in an unregulated environment. Aishihik was the first power project to be reviewed or to encounter significant opposition from environmentalists and First Nations. The Yukon Energy Corporation (YEC) and The Yukon Electrical Company (YECL) are now subject to increasingly stringent environmental regulation and a whole level of rate regulation never experienced by NCPC. The gradual introduction of this type of review and public scrutiny has created a new set of barriers to investment in electricity infrastructure.

NCPC experiences the down-side of investment risk.

In 1980, NCPC decided to expand the generation capacity of the Whitehorse Rapids Dam with the addition of a fourth turbine to meet the growing load requirements of the Cyprus Anvil mine. By the time Whitehorse Four was completed in 1984, the Faro mine had closed and the 20 megawatt facility had become a $38 million dollar stranded investment. In the short term, NCPC absorbed the cost of the debt related to the surplus plant rather than recover those costs through an immediate increase in consumer rates. Although NCPC debts were guaranteed, in business terms the Commission was essentially bankrupt. This situation is relevant to this discussion paper because it was the first demonstration that the risk of developing generation infrastructure for industrial customers was real and could erode the financial stability of the entire electricity system.

additional diesel generation. Although the Corporation has not added other major generation or transmission facilities to the system, it has been active in capital planning and has acknowledged that additional generation capacity could be required by as early as 1998 to meet an anticipated increase in mining load. The focal issue for YEC now is how to serve those new mines while also protecting itself and its customers.

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