

**THE PUBLIC UTILITIES BOARD
OF THE
NORTHWEST TERRITORIES**

DECISION 20-2009

OCTOBER 21, 2009

IN THE MATTER OF the Public Utilities Act being Chapter 110 of the Revised Statutes of the Northwest Territories, 1998 (Supp.), as amended

AND IN THE MATTER OF an application by the Northwest Territories Power Corporation for approval of a project permit pursuant to Section 54(1) of the *Public Utilities Act*.

THE PUBLIC UTILITIES BOARD

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1. APPLICATION

By letter dated August 13, 2009, the Northwest Territories Power Corporation (“**NTPC**”, “**Corporation**”) submitted an application (“**Application**”) to the Northwest Territories Public Utilities Board (“**the Board**”) for approval of a project permit, pursuant to Section 54 of the *Public Utilities Act* (“**the Act**”), for a major capital project permit respecting the Bluefish Lake Dam Replacement Project. NTPC stated that the total cost of the proposed project is estimated at \$18.5 million and addresses design and construction of a new dam at an alternative location. The project would allow for the continued safe and reliable operation of Bluefish to the benefit of the Corporation’s ratepayers.

NTPC indicated the project permit application was a result of an independent engineering study and the Corporation’s practice to continually evaluate its capital infrastructure.

NTPC indicates the project represents a significant capital expenditure over and above normal capital spending. Therefore the Corporation requested approval in principle to borrow up to \$18.5 million related to the project. NTPC indicates it will provide a separate application for approval of the specific terms of the borrowing following approval of the capital project permit.

In its Application, NTPC stated that:

“The Project represents a significant capital expenditure over and above normal capital spending. Therefore the Corporation is also requesting approval in principle to borrow up to \$18.5 million related to this Project. The Corporation will provide an application for approval of the specific terms of the borrowing following an approval of the capital project permit. Details on the background of the Project, Project rationale and a description of the Project are provided in Section 2 of this Application.

Proceeding with the proposed Project is the lowest cost option for continued supply of power on the Snare/Yellowknife system. Work completed to date has allowed the Corporation to design the Project in a manner that allows for continued hydro-electric generation throughout the construction period. This is a substantial benefit to customers, as continued hydro-electric generation will result in fuel savings estimated at \$6 million each year throughout the construction period.

In the event that the dam were to fail, Bluefish Lake would be drained. In addition to causing considerable environmental problems, reconstruction of the facility following a failure would require using diesel generation to replace the lost hydro-electric generation. The estimated cost to replace the dam under these circumstances is approximately \$36 million. In the alternative, permanently replace Bluefish generation with diesel generation on the Snare/Yellowknife system would lead to substantially higher costs for customers – the Project economics analysis suggests more than three-fold higher cost of diesel generation over Bluefish generation over the life of the project. The proposed Project also has substantial environmental benefits, including reduced Greenhouse Gas Emissions. Further details on Project economics and grounds in support of the Application are provided in Sections 3 and 4 of the Application.

The preliminary Project budget includes the following costs:

	(\$000's)
1. Engineering Cost	\$ 2,256
2. Construction Cost	10,853
3. Contingencies	2,194
Sub-total Project Cost	\$ 15,303
Overheads	1,530
AFUDC @ 9.674%	1,667
Total Project Cost	\$ 18,500

Further details on Project costs are provided in Attachment D. Capital costs do not include regulatory costs related to filing the Project permit application. These costs will be included in the Corporation's regulatory deferral account.

Due to the length of time required for construction and the risks associated with a failure at the dam, the Project is being undertaken on an urgent basis. Work undertaken to date has served to mitigate the emergency risks associated with the present condition of the dam such that Bluefish can continue to operate during the construction period. The Project is scheduled to be completed in 2011/12. The Project is the

largest capital project ever undertaken by the Corporation and represents an extremely high priority for NTPC. All resources necessary to meet the project timelines will be assigned. The Project will allow for the continued safe and reliable operation of Bluefish for years to come, to the benefit of customers and the Corporation.” [Application, p. 1-2]

Also in the Application, NTPC provided a background of the construction of the original dam and the upgrades to the dam. NTPC also provided the following table showing the chronology of work completed by NTPC to ensure the integrity of the dam from the time of purchase to the present:

Table 1
Chronology of Work Undertaken to Ensure the Integrity of the Bluefish Dam

2001	Condition assessment of the Bluefish facility by AMEC anticipates total replacement of Bluefish Dam within 10 to 20 years.
2003	NTPC purchased the Bluefish generating facility from Miramar Con Mine.
2005	Dam Safety Review completed by EBA.
2006-2007	Reconstruction of the rockfill buttress on the downstream side of the overflow section of the dam completed. Ongoing monitoring program for the Bluefish Dam instituted.
2008	A contingency spillway into the existing overflow spillway was constructed in order to allow for the spilling of high water over the dam while minimizing the hydrostatic pressure on the deteriorated wooden components of the overflow spillway and dam. Improved water management processes implemented by maximizing production and use of the auxiliary stoplog spillway. Dam monitoring intensified by (i) increasing the frequency of operations inspections to twice daily; (ii) implementing periodic engineering inspections both internally and with consultants; and (iii) installation of visual monitoring system. Risk management and public safety plan implemented, by adding specific measures to the workplace safety plan; limiting public access to the areas immediately below the dam; mobilizing materials and equipment to be able to respond to an event to limit environmental impacts. EBA is retained to complete a preliminary engineering study of options for repair or replacement of Bluefish Dam. Study recommends replacement of Bluefish Dam.
2009	NTPC begins the regulatory permitting and approval process for the construction of a new Bluefish Dam. Active water management measures in place. Implemented safety procedures for ingress/egress downstream of the dam.

[Source: Application, p. 5]

In August 2008, EBA Engineering Consultants Ltd. (“EBA”) was retained to

assess the alternatives available to NTPC for permanent repair or replacement of Bluefish Dam. EBA was requested to examine the following options:

- Repair the existing dam
- Replace the existing dam at the present location
- Replace the existing dam at a new location

NTPC states replacement of the existing dam at the present location poses significant challenges. Given the topography of the existing site, construction of a coffer dam upstream of the existing dam would be impractical. This would mean significant drawdown of the Bluefish lake with consequent impact on fish populations. Drawdown would also result in loss of hydro generation from Bluefish which would need to be replaced by expensive diesel generation.

NTPC states after examining each option, it became apparent that the most feasible option was to replace the Bluefish Dam at an alternate location downstream of the existing site.

EBA outlined two potential sites for the construction of a new dam downstream of the existing dam, identified as Site "A" and Site "B". Site "A" is located approximately 421 m downstream of the existing dam and Site "B" is located approximately 228 m downstream of the existing dam. NTPC selected Site "A" for the new dam construction based on expert engineering advice and consideration of the relevant merits of each site option. The following reasons were given by NTPC for selection of Site A:

- This site is located at a bedrock ridge that forms the end of the plunge pool in Yellowknife River immediately downstream of the existing dam. Preliminary visual reconnaissance of the site indicates continuous

exposed bedrock across the proposed dam site;

- Immediately below the site is a natural pool in Yellowknife River that would be effective for dissipation of energy of discharge from the spillway; and
- There are no alluvial deposits (gravel, sand, silt), which would require extensive excavation prior to the construction of the new dam. This would present significant challenges in terms of construction timelines, cost, environmental impacts of construction activities and others.

In the analysis of possible design of a new dam, EBA considered the following design options for the new dam:

- a. Concrete Gravity Base Dam
- b. Rockfill – Asphalt Core Dam
- c. Rockfill – Sheet Pile Diaphragm Wall
- d. Rockfill – Concrete Diaphragm Wall
- e. Rockfill – Geomembrane Liner

NTPC stated that the most feasible option as outlined in the EBA report is the Rockfill – Sheet Pile Diaphragm Wall Dam. The primary features of this type of structure are the impermeable core of vertical steel sheet pile with the entire seams weld sealed, the sheets are keyed into a trench in the bedrock and sealed with concrete and the rockfill is placed on the upstream and downstream sides of the diaphragm wall.

NTPC stated that this type of structure is particularly suited to the constraints presented by the remote site. Other than a relatively small amount of concrete aggregate for the toe seal it required the import of very little processed aggregate to site and/or processing on site, greatly reducing the time required and construction costs.

The Corporation anticipated the project will allow for increased energy generation at Bluefish. At present, when the water in Bluefish Lake reaches a certain level it spills over the spillway and around the plant without capturing energy generation benefits from the water. The new spillway will allow the facility to hold more water back (.6 m higher). NTPC anticipated this will contribute to higher long-term average water generation potential of approximately 1.2 GWh per year. The net present value of this additional generation could be up to \$2.0 million in avoided diesel fuel costs.

In its Application, NTPC provided the economic benefits of the project. NTPC reviewed the current operating benefits of the Bluefish Hydro station, the short-term economic benefits related to the dam replacement project and the long-term economic benefits.

NTPC noted that based on the economic analysis summary, the Bluefish facility, including the proposed project, provided continuous and sustainable benefits to NTPC's ratepayers. Further potential benefits from reduced greenhouse gas emissions and increased ability to serve load growth will only serve to enhance the project benefits.

Pursuant to the provisions of section 13.(1) of the Rules of Practice and Procedure, the Board, by letter dated August 28, 2009 directed NTPC to publish notice of the project permit application in newspapers that circulated in the Northwest Territories. The notice provided a schedule for the written hearing.

The Board and the City of Yellowknife (**"the City"**) submitted information requests, to which NTPC responded.

NTPC and the City submitted written argument on September 30, 2009 and also submitted written reply argument on October 7, 2009.

2. GROUNDS FOR DECISION

Section 54.(4) of *the Act* provides that the Board, in reviewing an application for a project permit, shall consider any matter it considers relevant, including:

- a) the impact of the project on rates;
- b) the public need for the project; and
- c) the reliability of the public utility.

The Board's consideration of the matter is set out below.

a. Impact of the project on rates

NTPC stated that the project represents the least cost alternative for securing long-term energy and capacity benefits for customers on the Snare/Yellowknife system. The two credible alternatives considered by NTPC are as follows:

1. Replace the capacity available from Bluefish with a diesel generation plant. This would require an estimated \$7-\$10 million in diesel generation plant capital, as well as fuel and non-fuel O&M expense of approximately \$7.289 million in 2012/13. Fuel expense would increase in each subsequent year due to price inflation.
2. Proceed with the proposed project. In contrast with option 1, the proposed project is expected to have a return on rate base plus amortization expense cost of approximately \$2.024 million. These costs would decline over time as the capital costs are amortized.

NTPC provided the following table as an illustrative estimate of the relative rate impact of the two options.

Table 3
Estimate of Bluefish Dam Replacement Project Impact
on 2007/08 Test Year Revenue Requirement

Category	7MW Diesel Plant Alternative	Bluefish Dam Replacement Project
Mid-Year Ratebase (\$000)	8,287 ⁸	18,241 ⁹
Return on Ratebase (\$000) ¹⁰	802	1,765
Amortization Expense (\$000)	213 ¹¹	259 ¹²
Fuel and Non-fuel O&M Expense (\$000)	7,289	0
Total Revenue Requirement (\$000)	8,304	2,024

NTPC noted that the estimated rate increase for a Territorial Power Subsidy Program (“**TPSP**”) eligible customer consuming 700 Kw.h per month is \$9.14 at current TPSP rates. However, the energy rates currently in place will not change until the time of NTPC’s next General Rate Application (“**GRA**”), which is presently anticipated for the 2011/12 test year.

NTPC stated that Bluefish generation is expected to continue to offer material savings to NWT ratepayers both in the near-term and long-term, even with the project costs included in rate base. The benefits of using the Bluefish facility on the Snare-Yellowknife system are to:

- Reduce the requirements of higher cost diesel generation;
- Meet the load growth in the community;
- Reduce the need for diesel capacity; and
- Reduce future diesel engine replacement at the Jackfish plant due to lower operating hours and reduced diesel generation.

The City expressed concern with two aspects of the estimated \$18.5 million replacement costs; first, the cost estimates are based on rough order of magnitude estimates of plus or minus 50% and second, the assumptions regarding depth of bedrock. The City stated the EBA report indicates it would be necessary to establish bedrock at discrete locations, take undisturbed samples, install piezometers to test for groundwater, test for permafrost, drill boreholes into bedrock to assess bedrock quality, assess subsurface conditions along the spillway alignment and conduct a Ground Penetrating Radar and Resistivity Survey of the dam/spillway alignment.

The City noted since the EBA Report was prepared in February 2009, it appears that NTPC has added internal costs including the emergency work to reduce the risk of breach, overheads, contingency, AFUDC, ice road costs, transportation, camp facilities, environmental and fuel etc. but did not update construction quantities nor unit costs.

The City submitted it would prefer that NTPC, without causing any delays to the project, carry out the additional investigations recommended by EBA and update its cost estimates before a project permit is issued to ensure that the least cost site is chosen.

With respect to specific rate impacts, the City noted the Yellowknife wholesale rate increases by 3.7% and 7.4% in years one and two based on the project budget and by 5.6% and 11.1% based on 50% cost overrun solely due to the Bluefish dam replacement.

In its Reply, NTPC stated:

"It is important to note that this Project is in the planning stages with construction of the ice road scheduled to commence in early January

2010. NTPC has already committed to providing refined cost estimates to the Board upon completion of the tendering and will also provide the Board with geotechnical updates at that time. NTPC does not believe a decision on its Application should be delayed until after these refinements." [NTPC Reply, p, 1-2]

Board Findings

The Board notes the City's concerns respecting the plus or minus 50% accuracy level of NTPC's forecast of project costs including the potential cost impacts resulting from uncertainty over the results of the geotechnical tests yet to be undertaken. The Board also notes the cost of the project is significant in relation to NTPC's rate base of about \$200 million in 2007/08. Given the plus or minus 50% accuracy level of the \$18.5 million project cost forecast the rate impacts can vary over a wide range.

Notwithstanding the uncertainties over project cost estimates, the Board is prepared to approve the project permit Application in view of the importance of the Bluefish generation plant to meet NTPC's supply requirements. However, NTPC is directed to prepare a refined project cost forecast at the plus or minus 10% accuracy level after completing any necessary geotechnical tests and preparation of unit cost forecasts following detailed engineering and tendering. NTPC is directed to file the revised and refined forecast together with an updated economic analysis and rate impacts with the Board as soon as the forecast is completed.

The prudence of the project construction costs will be examined at the time NTPC proposes to add the project to rate base. At that time, NTPC should be prepared to explain any variances between the actual project costs and the refined forecast at the plus or minus 10% accuracy level.

With respect to NTPC's request for approval in principle to borrow up to \$18.5 million related to the project, the Board considers it appropriate to consider this matter when NTPC presents an application for financing of the project with all the relevant supporting information. Accordingly, the Board will not consider NTPC's request for approval to borrow in principle as part of these proceedings.

b. Public need for the project

As part of the environmental regulatory and water licensing process, NTPC states it undertook a public consultation process consistent with the Mackenzie Valley Land and Water Board's *Public Involvement Guidelines for Development Applications to the MVLWB*. NTPC stated that it facilitated community consultation meetings to discuss environmental implications of the project with community representatives. The meetings provided the opportunity for the communities to discuss the project and state their concerns with the aim of addressing or mitigating those concerns in the final development where possible. In addition, the Corporation states it conducted a site visit with Northland representatives in the summer of 2009 and planned further discussions with the City of Yellowknife in August of 2009. NTPC states the replacement of the old dam is necessary and the project must be completed in the shortest practical timelines in order for NTPC to provide continued supply of energy and in the interest of public health and safety and the environment.

Board Findings:

The Board is satisfied that the project is necessary for the continued supply of hydro power by NTPC to its customers and meets the public need.

c. The reliability of the public utility

NTPC acknowledged that direct ownership of the Bluefish facility simplified both the planning and emergency operation of the Snare-Yellowknife system. This has reduced the loss of load expectations on the system. In addition, coordinated dispatch increases stability and power quality on the system.

NTPC also acknowledged that the present state of the Bluefish Dam represents significant risk to NTPC's ability to provide cost effective reliable power to the Yellowknife service area. Implementation of the project and construction of the new dam will increase the reliability of NTPC by achieving the following objectives:

- Provide a facility that meets the current standard engineering principles and current dam safety guidelines as published by the Canadian Dam Association.
- Provide a facility that provides safe operator control and water management.
- Provide a facility that assures reliable and cost effective power supply to the Yellowknife service area. The proposed project represents the least-cost sources of supply for the Snare-Yellowknife system.
- Provide a facility that can operate with minimal risk to the environment.
- Provide a facility that allows the Corporation to achieve substantial Greenhouse Gas savings.

Furthermore, NTPC stated that the project will not affect the quality of services, because construction can proceed to commissioning with essentially no lost generation. NTPC states it had undertaken the planning and development of the project to ensure that hydro-generation at Bluefish can continue throughout the

project. This would be a considerable benefit to the customers and the Corporation.

Board Findings:

The Board notes NTPC's statement that 7 MW of Bluefish capacity is presently available as firm capacity under the two planning criteria - both the N-1 and the LOLE calculations - for the Snare-Yellowknife system. NTPC states, absent this capacity, the Snare-Yellowknife system would be into material capacity shortfalls today requiring major capital investment to ensure reliable service to Yellowknife.

The Board is satisfied the project is required to meet the current supply reliability requirements of NTPC.

3. DECISION

After giving due consideration to the public need for the project and the reliability of the utility, the Board hereby approves NTPC's Application for a project permit for replacement of the Bluefish Lake Dam in an amount of up to \$18.5 million. The Board may conduct an examination of the plus or minus 10% cost forecast along with the updated economic analysis and rate impact analysis when this information is filed with the Board. At that time, the Board may impose additional directions respecting the project permit issued to NTPC with this decision.

4. SUMMARY OF DIRECTIONS

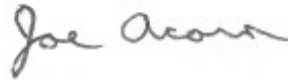
1. NTPC is directed to prepare a refined project cost forecast at the plus or minus 10% accuracy level after completing any necessary geotechnical tests and preparation of unit cost forecasts following detailed engineering and tendering.

2. NTPC is directed to file the revised and refined forecast together with an updated economic analysis and rate impacts with the Board as soon as the forecast is completed.

5. ORDER

The Northwest Territories Power Corporation's Application for approval of a project permit for replacement of the Bluefish Lake Dam in an amount of up to \$18.5 million is hereby approved.

**ON BEHALF OF
PUBLIC UTILITIES BOARD
OF THE NORTHWEST TERRITORIES**



**Joe Acorn
Chairman**

Dated October 21, 2009