

**YUKON
ENERGY**



YUKON ENERGY CORPORATION

20-YEAR RESOURCE PLAN: 2006-2025

SUPPLEMENTAL MATERIALS

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TAB 1

Whitehorse Diesel

1 **S1.0 WHITEHORSE DIESEL PLANT - MIRRLEES LIFE EXTENSION**

2 Chapter 4 of Yukon Energy's 20-Year Resource Plan (January 2006) proposed near-term commitment to a
3 Mirrlees Life Extension Project at the Whitehorse Rapids Diesel Plant from October 2007 to October 2009
4 to provide 14 MW of WAF firm winter capacity at an estimated cost of up to \$4.5 million. The Mirrlees Life
5 Extension Project was subject to confirmation of technical feasibility expected to be determined within the
6 first quarter of 2006. Technical uncertainties to be addressed regarding the Mirrlees Life Extension
7 included serious concerns about Yukon Energy's ability to get technical support and parts from the
8 manufacturer for 20 more years, and uncertainty as to whether the Mirrlees can be successfully
9 refurbished. Without this Life Extension, the three Mirrlees units will be retired in 2007, 2009 and 2011,
10 removing over 11 MW of currently rated firm winter capacity from the WAF system.

11
12 The Resource Plan set out a contingency plan in the event that the Mirrlees Life Extension is determined
13 not to be technically feasible. This contingency plan provided for replacing the three Mirrlees units with
14 new and larger diesel generators of at least 8 to 11 MW each (Whitehorse Diesel Replacement and
15 Expansion Project) at a cost in the range of \$0.8 to \$0.9 million per megawatt. The first unit would need
16 to be installed by October 2007, requiring planning work by summer of 2006, including order for the
17 necessary engine unit (with cancellation provisions).

18
19 This supplemental update reports on Yukon Energy's subsequent technical feasibility work related to
20 near-term options at the Whitehorse Rapid Diesel plant. The following are reviewed:

- 21 • Section S1.1: Activities Since January
- 22 • Section S1.2: Updated Capital Cost Assessments
- 23 • Section S1.3: Yukon Energy Updated Assessments
- 24 • Section S1.4: Recommended Near Term Actions

25 **S1.1 ACTIVITIES SINCE JANUARY**

26 Since January, Yukon Energy has conducted a detailed review of the technical feasibility of the Mirrlees
27 Life Extension option. In addition, Yukon Energy has had further assessments conducted of the diesel
28 plant "common" systems and determined capital investment required regardless of whether the Mirrlees
29 are being retained or replaced. Also during this period Yukon Energy had the opportunity to assess unit
30 performance in the major WAF outage event on January 29th (the YUB received Yukon Energy's separate
31 report on this event as filed April 11, 2006).

1 The assessments and conclusions arising are as follows:

- 2
3 • **Visit MAN in Oakville:** Yukon Energy representatives traveled to visit the MAN B&W
4 Diesel Canada Ltd. offices (the current owner of the Mirrlees production line is MAN
5 B&W) in late January to discuss the ongoing plans and expectations for parts and
6 technical support. MAN provided assurances that parts will be available from them or
7 potentially third-party manufacturers. MAN also indicated that they intended to keep a
8 technical support person in Oakville (although the territory includes all of North America,
9 the Caribbean and parts of South America) and that they were routinely using retired
10 mechanics from Stockport, England for contract duty when needed.
11
- 12 • **MAN staff visit to Whitehorse:** The MAN technical advisor for North America visited
13 Whitehorse from March 27-30. During his visit the three units were inspected, with a
14 focus on WD2. That unit was checked and test run to full load for 2 hours. Based on this
15 examination, the MAN technical representative confirmed that, in his opinion, the three
16 units can be brought back to "near new" condition by a 12,000 hour overhaul using
17 factory recommended tolerances to accept or reject existing parts. The MAN technical
18 representative has provided a list of the parts typically replaced at 6,000 hour intervals
19 and a second list of the parts typically replaced on alternate overhauls (12,000 hour
20 interval). It is expected that Life Extension will require more than the normal
21 complement of parts for the 12,000 hour overhaul because there is a record of only one
22 overhaul (on WD1) since the 1980s.
23
- 24 • **Letter assurance from MAN senior executives:** MAN continued the manufacture of
25 the KV Major engines until the fall of 2005. The Managing Director (Mr. W. Jones,
26 Stockport, England) has provided YEC with a written undertaking (Feb. 20, 2006) that
27 MAN currently plans to support the Mirrlees KV Major series of engines with both parts
28 and technical support "...until 2020 at a minimum".
29
- 30 • **NTPC "balance of plant" studies:** Northwest Territories Power Corporation (NTPC)
31 conducted a study of the condition of the Whitehorse Diesel Plant, prepared a summary
32 of work required based on current conditions and standards (including if the Mirrlees
33 were either retained or retired) and provided costing of their initial estimates to have the
34 Mirrlees overhauled compared to new units. NTPC recommends YEC not retain the
35 Mirrlees units.

- 1 • **January 29 outage:** During the major January 29 outage related to the cabling at
2 Aishihik, all 3 Mirrlees units were brought on line and aided in carrying WAF load. At that
3 time, new concerns over cooling systems at the Whitehorse Rapids Diesel Plant were
4 identified (part of plant systems separate from these engine units), which limited the
5 ability of the units to carry full load.

6 **S1.2 UPDATED CAPITAL COST ASSESSMENTS**

7 A summary of the capital costs identified or arising from the key post-January assessments regarding the
8 Whitehorse Rapids Diesel Plant options is provided in Table S-1 below.

9
10 The table indicates the costs for the “overhaul” or “replacement” portion of the work in the top section,
11 for “common costs” in the middle section, and the average cost per MW in the bottom section. Common
12 plant upgrade costs of \$1.6 million are assumed to be incurred for all options.

13
14 Three versions of the Mirrlees Life Extension project capital costs are provided, and one cost estimate for
15 the Replacement option.

16
17 1) **NTPC “zero hour”:** The NTPC estimate for a “zero-hour” overhaul is in the first column. This
18 option indicates a \$6.5 million budget for the overhaul work, including substantial costs to
19 convert the Mirrlees units to radiators (\$1.3 million). Including common costs, NTPC indicated a
20 budget estimate of \$8.1 million.

21
22 2) **YEC Expected:** YEC’s expected cost estimate is provided in the second column, based on
23 NTPC’s numbers, further discussion with MAN, and some additional issues that were not
24 addressed by NTPC (such as the WD3 generator). The overhaul cost under YEC’s best estimate is
25 \$4.9 million, plus \$1.6 million for common costs, for a total of \$6.4 million.

26
27 a. Compared to the NTPC estimates, the major variance reducing the costs is in the cooling
28 components, as YEC would seek to retain river water cooling rather than moving to
29 radiators as assumed by NTPC.

30 b. Compared to the January Resource Plan (up to \$4.5 million for Mirrlees Life Extension),
31 the major increases are in provisions of \$1.9 million for additional overhaul cost
32 elements.

3) **Expected Maximum Parts Scope Possible:** The third column indicates a broader scope "maximum" costing scenario assuming near complete replacement of moving parts on the unit, as a bound on the potential parts exposure within the project budget. Were this to arise, the parts budget could exceed estimates by as much as \$5.5 million. YEC does not expect this scale of parts to be required; however, active monitoring of the overhaul is recommended to track actual requirements.

Table S-1

Mirrlees Life Extension versus Replacement
Options and Estimates Received to Date (\$millions)

	Mirrlees Life Extension Options			New Diesel Option
	NTPC "zero-hour"	YEC Expected	expected max parts scope possible	3 new medium speed diesels (3x8MW)
Costs for Overhauls/New Units				
new units/overhaul costs	2.8	3.0	+5.5	16.2
WD3 generator	-	0.2		
silencers	0.3	0.3		incl
cooling	1.3 note 1	0.2		incl
fuel handling	0.2			incl
other	0.5			1
SCADA	-	0.1		0.15
ES&G (10%)		0.4		incl
Contingency (20%)	1.3	0.7		3.5
	<u>6.5</u>	<u>4.9</u>	<u>10.4</u>	<u>20.8</u>
subtotal				
Common Costs (required under all scenarios except NTPC basic)				
Seismic upgrade	0.6	0.6	0.6	0.6
HVAC	0.6	0.6	0.6	0.6
tankage (150,000 litres)	0.2	0.2	0.2	0.2
EMD cooling issue	0.2	0.2	0.2	0.2
	<u>1.6</u>	<u>1.6</u>	<u>1.6</u>	<u>1.6</u>
Total	<u>8.1</u>	<u>6.4</u>	<u>11.9</u>	<u>22.3</u>
Capacity secured/added compared to retiring the Mirrlees	14 MW	14 MW	14 MW	24 MW
Average cost per MW (\$millions)	0.577	0.457	0.850	0.930

note 1: NTPC assumed new radiator cooling system to avoid using river water as heat sink. YEC plans to retain river as heat sink for at least the Mirrlees units.

- 1 4) **New Diesel Option:** The final column indicates the cost estimates for 3 new units to replace the
2 Mirrlees, assuming a maximum practical size for such units is desired (to enhance long-term plant
3 capability) and equals 8 MW per unit given the current building scale. As modern medium speed
4 diesels of this stature are larger output, the scenario is for 24 MW of new capacity (compared to
5 14 MW assumed here for the Mirrlees) so the price per unit (\$930/kW) reflects a more
6 meaningful costing for comparison with the Mirrlees scenario (\$457/kW expected) than the
7 comparison of total costs (at \$22.3 million for 24 MW of new capacity versus \$6.4 million for 14
8 MW of Mirrlees Life Extension capacity).

9 **S1.3 YUKON ENERGY UPDATED ASSESSMENTS**

10 As a result of the above investigations, Yukon Energy in early May reviewed courses of action available
11 regarding the Mirrlees units and the Whitehorse Rapids Diesel Plant. Key conclusions were as follows:

- 12
- 13 1) **Longer-term plan needed for this plant:** The WAF system will require substantial capacity
14 from the Whitehorse Rapids Diesel Plant, and all options being considered at this time should
15 reflect a longer-term plan for how to maximize the capacity output of the Whitehorse Rapids
16 Diesel plant over time. In this regard, it can be noted that the three Mirrlees units are among the
17 larger units at this plant, while the three EMD units are each much smaller (at 2.5 MW to 2.7 MW
18 each). Accordingly, subject to the issues addressed below, Mirrlees overhaul and life extension is
19 consistent with long term effective use of this facility; in contrast, relocation of the EMD units at
20 some future time could facilitate considerable expansion of the overall plant capacity at such time
21 as new and larger replacement units are required to meet system needs. Long term options for
22 new capacity in this regard that merit serious review include turbine simple cycle engines which
23 could run on either diesel fuel or natural gas with enhanced winter performance, and could also
24 be upgraded (with enhanced fuel efficiency) when required with the addition of a combined cycle
25 steam facilities.
- 26
- 27 2) **Extensive plant upgrades currently needed:** The plant requires more common near-term
28 systems work than had been assumed at the outset in the Resource Plan, and this upgrade work
29 needs to be focused initially primarily on unit cooling, HVAC systems, and seismic stability.
- 30
- 31 3) **Confirmation of Mirrlees refurbishment feasibility and capital cost advantages:** The
32 Mirrlees Life Extension option remains expected to involve materially lower cost than replacing
33 the units, and the technical ability to complete a "12,000 hour overhaul" on the units to bring
34 them back to full operating condition has been basically confirmed. The capacity of the

1 overhauled units is expected to equal or exceed 14 MW. A new engine control panel and other
2 adjustments are expected to provide for unmanned future operation of the overhauled units.

3
4 4) **Ongoing concerns about MAN ability to supply parts and service support:** The key
5 ongoing issues with regard to the Mirrlees units relate to the ability of MAN to provide the needed
6 parts in particular, but also technical support, into the future. In spite of the reassurances and
7 undertakings by MAN representatives to maintain parts and support “until 2020 at a minimum”
8 noted during the review, and the evidence of extended ongoing Mirrlees engine use by BC
9 Ferries, YEC has a record of difficulty in identifying and obtaining replacement parts in what it
10 considers to be a timely and effective manner. To address these concerns, specific mitigation
11 measures are proposed to secure parts in advance at the time of each overhaul and in addition to
12 train local Yukon resources.

13
14 5) **Need for enhanced ongoing operating and maintenance budgets to address ongoing**
15 **concerns:** Any plan to retain the Mirrlees will require diesel plant budgets for operating and
16 maintenance costs that reflect the costs required to sustain these units into the future, rather
17 than the practice to date of merely maintaining them through a planned retirement phase. This
18 will include fuel budgets necessary to properly exercise the units on a regular basis and to
19 maintain the familiarity of staff with their operating characteristics, added training for the diesel
20 plant mechanics and operators for the units, and (until such time as MAN performance removes
21 current YEC concerns) sufficient parts inventory in hand at YEC to allow timely repair and
22 maintenance without relying on timely parts delivery from MAN.

23
24 Without a ready source of parts and technical support as required to carry out overhauls and expected
25 use, the Mirrlees units cannot be considered to be a technically feasible option for Life Extension. In
26 assessing this concern, it is noted that the overhauled Mirrlees units are expected to be used initially as
27 stand-by capacity, and accordingly the timing for the next 6,000 hour overhaul (let alone the next 12,000

1 hour overhaul) may be extended many years into the future.¹ An approach of pre-purchasing, after each
2 such overhaul, parts for YEC's inventory as required for the next overhaul is one way identified to date to
3 enhance security as to future parts availability. Training of YEC staff and other local resources during
4 each overhaul, plus more regular "exercising" operation and maintenance of these engines, will also help
5 to manage concerns about length of effective engine life and long-term support capability from MAN.

6
7 The updated assessment indicates expected capital costs for Mirrlees Life Extension at \$6.4 million, which
8 is considerably higher than the \$4.5 million estimated in the January Resource Plan. Nevertheless, the
9 Mirrlees Life Extension costs still remain substantially below the costs needed to replace the Mirrlees with
10 new units (savings at about \$0.473 million per MW, or about \$6.6 million).²

11 **S1.4 RECOMMENDED NEAR TERM ACTIONS**

12 Based on the above considerations and investigations, Yukon Energy has determined that a careful and
13 staged Mirrlees Life Extension Project should be pursued rather than proceeding at this time to replace
14 the Mirrlees with new units. In addition, measures to upgrade the Whitehorse Rapids Diesel Plant will
15 also be undertaken, including options to address cooling for the EMD units (possible use of radiators
16 rather than river cooling water), and longer-term options will be assessed to expand overall plant
17 capacity in future by possible relocation of the EMD units.

¹ A scenario of 30 years potential life can be described as follows based on the proposed approach. Overhaul of the three Mirrlees units would provide at least 14 MW of firm winter capacity, i.e., an amount less than the capacity reliability requirements associated with a single radial transmission line connection to the Aishihik generation units. If the units are used only for standby operation related to (say) unplanned outages of the Aishihik line, annual usage might easily average materially less than 400 hour (implying 6,000 hour overhaul likely to occur no sooner than about 15 years and 12,000 hour overhaul no sooner than about 30 years). After the initial Life Extension overhaul and with YEC inventory retained at that time of 6,000 overhaul hour parts, the Mirrlees units would once again face retirement option assessment only when they became "too old" either due to wear and usage or due to technological obsolescence (each of which is unlikely to occur for units used for standby), or if for some reason it becomes not possible to service or provide needed parts (which is also mitigated by the prior purchase of the 6,000 hour overhaul parts list – and, when the 6,000 hour overhaul is carried out, the prior purchase at that time if needed of the 12,000 hour parts list).

² Table 4.3 of the January Resource Plan estimates total Base Case costs (2005\$) to 2012 for the Mirrlees Life Extension and 3.1 MW of new diesel at \$5.5 - \$7.3 million, assuming Marsh Lake Fall/Winter Storage in 2007 and Aishihik 3rd Turbine in 2009 (without the Carmacks-Stewart Transmission interconnection). With similar assumptions as to the project mix, the new Mirrlees Life Extension and new diesel costs to 2012 (2005\$) based on this update approximate \$9.1 million. The impact (2005\$) for such diesel costs was previously estimated (page 4-56 of January Resource Plan) at up to \$0.8 million/year on the revenue requirement or 2.2% impact on rates; the updated impacts (2005\$) approximate \$1.0 million on the revenue requirement and 2.7% on rates.

1 As a first step, Yukon Energy is recommending a staged approach for WD3 to be prepared for a 12,000
2 hour overhaul during 2007. The staged approach allows ample time to receive needed parts in advance
3 of the work, and as well seeks to ensure that actual overhaul work begins as soon as feasible in 2007 in
4 order to allow for possible contingencies encountered during the overhaul. The staged approach further
5 enables Yukon Energy careful consideration of the capability and credibility of MAN in its ability to provide
6 ongoing support and parts for these units.

7 The stages for dealing with plant upgrades and Mirrlees Life Extension would be as follows:

- 8
9 1) **Cooling System modifications in 2006:** In 2006, cooling system issues at the plant will be
10 addressed by ready modifications to the pumping system to allow simultaneous operation of the
11 units connected to the river water cooling system (no cost estimate yet prepared).
12
- 13 2) **WD3 generator work in 2006:** Also in 2006, YEC will repair the cut winding on the WD3
14 generator (\$200,000).
15
- 16 3) **MAN parts and other commitments in 2006 for WD3 12,000 hour overhaul:** As soon as
17 possible, YEC will place orders for the full 12,000 hour overhaul parts for WD3, to confirm the
18 ability of MAN to provide timely and complete parts support for the project (approximately
19 \$250,000); concurrently, YEC will secure necessary technical staff commitments from MAN for an
20 early 2007 12,000 overhaul of WD3 (to commence in March/April as required to ensure work
21 completed before October). This approach will ensure that parts are in fact on hand well in
22 advance this year, and also will allow the full summer next year for the work, if there are any
23 problems that arise.
24
- 25 4) **2007 overhaul work:** For the overhaul of WD3 in 2007, YEC will maximize the man-hours
26 provided from its own mechanics and other local resources on the project to increase their
27 familiarity with the units (up to \$0.55 million outside of parts previously ordered). Also at that
28 time, a new silencer will be installed (\$100,000) as well as new switchgear (\$100,000), SCADA
29 connections (\$50,000) and engine controls (\$100,000). YEC will assess after the overhaul the
30 need to order additional parts inventory as a precaution for future needs.
31
- 32 5) **WD 2 and WD1 Overhauls after 2007:** Based on the experience with the WD3 overhaul in
33 2007, YEC will proceed with a similar overhaul staged approach for WD2 and WD1 in subsequent
34 years in accordance with schedules outlined in the Resource Plan.

1 6) **Other Projects in 2006/2007:** Other projects to be initiated at the plant as soon in 2006 or
2 2007 as can be accommodated within the capital plan include the following:

- 3 a. A project to stiffen the building to current seismic restraint standards (\$600,000)
- 4 b. Removal of the EMD units from the river water cooling system and connection to new
5 radiators. This will allow the cooling system to revert to its original design to serve solely
6 the Mirrlees. This will also allow potential future flexibility with regards to the EMDs,
7 which are the smallest units in the Whitehorse plant and may be suitable for future
8 redeployment elsewhere on WAF when expansion of diesel capacity is Whitehorse is next
9 required. (\$200,000)
- 10 c. Consideration of expanded fuel tankage to allow full 24 hour operation of the entire plant
11 (\$200,000)
- 12 d. Other plant upgrades to address combustion air supply, building heating and ventilation,
13 drainage and sumps, and other small systems (up to \$600,000).

14
15 In the event that MAN for any reason is not able to provide the required parts or commitments in a timely
16 and acceptable manner this summer sufficient to enable the overhaul of WD3 to be securely carried out
17 starting next March/April, the Mirrlees Life Extension Project will be determined to be not technically
18 feasible, and YEC will need to proceed with alternatives for orderly replacement of the units. The most
19 serious timing issue in this regard will relate to securing the capacity needed for fall 2007.

Tab 2

Carmacks-Stewart Transmission Project

1 **S2.0 CARMACKS-STEWART TRANSMISSION PROJECT UPDATE**

2 Chapter 4 of the January Resource Plan proposed the Carmacks-Stewart Transmission Project as a near
3 term enhancement opportunity for possible in-service to connect the Mayo Dawson (MD) and
4 Whitehorse-Aishihik-Faro (WAF) grids as well as facilitate WAF transmission access to potential new mine
5 loads at Minto and Carmacks Copper. Chapter 4 estimated that connecting the two grids will provide 5.6
6 MW of additional firm near term capacity and 15 GW.h/year of additional near term energy for the WAF
7 grid, assuming no new mine loads on the MD grid. The Resource Plan noted that development of this
8 project, which was estimated to cost from \$30 to \$35 million (2005\$), is subject to provision of Yukon
9 Government (YTG) funding plus mine customer contributions to ensure that there is no net cost to Yukon
10 Energy or Yukon ratepayers beyond what would be required for any other option to provide required
11 capacity and energy¹.

12
13 Chapter 4 (Page 4-22) of the Resource Plan noted that this project is not currently economic for Yukon
14 Energy as a regulated utility to pursue in its entirety. Both the WAF and MD systems today have surplus
15 hydro power, so connection of these two grids does not offer any immediate cost savings to generation
16 on either grid. Accordingly, this project has initially been planned to be developed only to the extent
17 facilitated by YTG Infrastructure Funding and/or contributions provided by mines connected to this
18 transmission development (such that ratepayers are not adversely affected by the project²). As noted in
19 the Resource Plan, current planning for this project is seeking to protect an in-service date between mid-
20 2008 and mid-2009, focusing on the critical timing needed to help the development of the two mines
21 based in particular on the current development schedules for Minto.

22
23 This supplemental material updates the information currently available on the Carmacks-Stewart
24 Transmission (CS) Project. The following are reviewed:

- 25 • Section S2.1: Initial Planning and Target Milestones
- 26 • Section S2.2: Initial Step 1 Planning Activities
- 27 • Section S2.3: Update re: Scheduling
- 28 • Section S2.4: Update re: Financing

¹ By way of example, firm winter capacity needs might otherwise be met with new diesel generation while energy needs might otherwise be met by running more diesel fuel generation; the commitment here is that any costs charged to ratepayers for the Carmacks-Stewart Transmission Project would not be any higher than what would otherwise be needed to meet capacity and energy requirements from diesel generation or other available resources.

² Funding contributions from new participating mines and YTG must be sufficient to prevent the Project from increasing Yukon revenue requirements beyond what would otherwise be required without the CS Project.

1 **S2.1 INITIAL PLANNING AND TARGET MILESTONES**

2 Prior to the fall of 2005, various planning studies and reports regarding this CS Project identified a 500 m
3 corridor for the route generally along the Klondike Highway.³ Routing of the Project will in some areas be
4 adjacent to, or crossing, Northern Tutchone First Nations (NTFN)⁴ settlement lands. Prior to the fall of
5 2005 Yukon Energy also obtained land from the Crown for the new transmission line substation at
6 Carmacks, located north of the river on the 138 kV line from Carmacks to Ross River.

7
8 Yukon Energy estimated in the fall of 2005 that \$3.0 million of YTG funding would be required to
9 complete all planning, permitting, design and tender activities needed to start construction of the CS
10 Project in early 2007. Based on this planning milestone, and allowance for up to two years of construction
11 of any segment, the CS Project would then be able to come into service by at least the third quarter of
12 2008 for the segment from Carmacks to Pelly Crossing and by late 2009 for the full development to
13 Stewart Crossing.

14
15 In summary, the following planning and construction milestones were set out last fall:

16
17 1. **Planning milestones required prior to a decision to proceed with construction – target**
18 **to complete by end of 2006:** The overall target schedule was to complete all planning and
19 permitting milestones by the end of 2006 in order that construction can begin during the winter
20 season in January 2007. Three milestones were to be achieved by the end of 2006 as part of this
21 regulatory approvals and planning activity:

22
23 a. **Environmental and Permitting Submission – Route Selection:** This first step enables
24 YEC to select a specific right-of-way (ROW) route (for a proposed 60 m wide right-of-way)
25 and to file the necessary submissions needed for all permitting. These filings were initially
26 targeted for completion before the end of June 2006⁵. As an example of requirements to
27 initiate final permitting, the new Yukon Environmental and Socio-Economic Assessment Act

³ Yukon Energy has a Map Notation for this 500 m corridor for the Project, issued May 28, 2004 by the Lands Branch. The final right-of-way required for the Project, once constructed, will be 60 metres in width.

⁴ The three NTFNs are Little Salmon Carmacks First Nation, Selkirk First Nation, and Na-cho Nyak Dun First Nation. Yukon Energy carried out initial discussions with the relevant First Nations in August and October 2005 to inform them of possible plans with regard to this Project, and to inquire as to their respective interests and concerns. Yukon Energy wanted to ensure, prior to final government funding being approved to fund the Project, that the transmission line easements required to cross settlement lands will be granted.

⁵ As noted below, as a result of many factors including delay in securing an MOU with the NTFN, this milestone date is now expected to occur in July or August, 2006.

1 (YESAA) process requires a submission to the Yukon Environmental and Socio-Economic
2 Assessment Board (YESAB) Executive Committee at the end of this first planning step of a
3 detailed Project Proposal that includes:

- 4 • Project description to the level of preliminary engineering and preliminary design,
5 including completed route selection, as needed for environmental and socio-economic
6 assessments.
- 7 • Consultation with First Nations, major potential mine customers, and all affected parties
8 on the project route selection and assessments, and progress on any related Benefits
9 Agreements with First Nations.⁶
- 10 • Completed Environmental and Socio-Economic Assessment based on the selected route.

11
12 b. **Project Design and Costing** – Detailed design and costing can proceed only after the
13 route selection and environmental assessment submission process is essentially completed.
14 This second step was proposed to facilitate subsequent final engineering design and costing
15 as required prior to a decision to start construction. Based on the target schedule to file the
16 step one YESAB submission, the detailed design and costing, including completion of a centre
17 line survey,⁷ was initially planned for the summer of 2006.

18
19 c. **Final Engineering and Costing** – In order to expedite the earliest feasible start date for
20 construction, a final feasibility cost estimate and then final design and tendering were
21 proposed following completion of Project Design and Costing in the fall of 2006, and
22 concurrent with the assumed timing for receiving final environmental approvals and permits
23 by the end of 2006.

24
25 2. **Construction target to complete CS Project by fall 2008** – It has been estimated that
26 between one and two years will be needed for construction (after completion of tender award),
27 depending on specific requirements (e.g., long-lead item order requirements and season sensitive
28 construction constraints) and what work has been completed prior to the tender award.
29 Construction will be constrained to winter where required to facilitate access and to minimize risk

⁶ Consultation and public involvement are an integral part of preparing the environmental and permitting submission. If this work is not completed at the outset, the YESAB application cannot be completed. A centre line survey is not required for this submission – however, the route selection documented in this submission is a prerequisite for initiating any centre line survey (or its equivalent).

⁷ The digitized mapping available for the route has now had preliminary review and may be sufficient in many areas for final planning without the need for a centre line survey in all areas (i.e., it may be feasible to restrict to only a few areas the need for specific field survey and study of ground conditions for the purpose of engineering design and costing).

1 of adverse environmental impact in wet ground areas – and the initial target schedule therefore
2 allowed for a possible need for two separate winter construction seasons (2007 and 2008) to
3 complete clearing and then line construction activities for at least an initial stage of development
4 from Carmacks to Pelly Crossing. Transmission substation design and equipment requirements
5 were acknowledged as another potentially long-lead order item to be addressed in final planning
6 following route selection and refinement.

7
8 YTG has committed funding to date of \$450,000 to facilitate initial step 1 YEC planning for this Project.
9 YEC has completed this initial planning work during late 2005 and the first five months of 2006.

10 **S2.2 INITIAL STEP 1 PLANNING ACTIVITIES**

11 Initial step 1 planning activities are summarized below by each of the work plan elements:

12
13 1. **Environmental and Socio-Economic Assessment & Submission Activities:** These
14 activities include project description as required for planning and permitting, collection of baseline
15 information as needed to assess route options and effects, public involvement activities for
16 planning and assessment of project impacts, assessment activities, and ongoing discussion as
17 required with YESAB and the various YTG and other decision bodies with regard to the needed
18 YESAB and other submissions for the project permitting and approvals. During the period to date
19 work has included:

- 20 • preparing an initial project description as required for planning and permitting activities;
- 21 • initial assessment of routing issues and refinement options (including review of past
22 studies, review of route issues and information, and outcomes of initial discussions with
23 NTFNs and others);
- 24 • review of stakeholder contacts and land tenure and use, as well as other existing and
25 available baseline environmental and socio-economic information on the route study
26 region;
- 27 • preparing public involvement plans and initiating public consultations and involvement,
28 including provision of information in December 2005 on YEC's web site⁸, and preparation
29 of a newsletter and other activities in May to proceed with community and other
30 consultations in May on route alternatives and issues;

⁸ The link to this information is found at www.yukonenergy.ca/environment/reports/carmacks-stewart.

- 1 • initial briefing meetings and discussions with YESAB members and officials as well as YTG
2 officials to discuss the project and related permitting and assessment planning issues;
3 and
4 • preparation of permitting work plans, initial project and assessment scoping, and initial
5 outlines for the YESAB submission.
6
- 7 2. **First Nation and Major Customer Consultations:** The work plan established separate work
8 components for consultations with the three NTFNs and with major customers who could be
9 served by the new transmission infrastructure (e.g., the Minto mine, Carmacks Copper mine, and
10 Yukon Electrical who currently serve customers in Carmacks, Pelly Crossing and Stewart
11 Crossing). Initial step 1 activity focused on initial discussions with the NTFNs and the two mines,
12 and resulted in the MOU with the NTFNs, a Letter of Intent with Minto Explorations Ltd., and
13 updated information on planning for the Carmacks Copper mine (including confirmation of
14 serious interest in access to WAF grid power through new transmission access). Specific activities
15 carried out to date or committed to the end of May include the following:
16 • meetings in 2005 and 2006 with the three NTFNs in the study region, including several
17 meetings with the three chiefs and a public meeting at Pelly in March 2006 with chiefs,
18 elders and community people from all three of the NTFNs;
19 • development in May 2006 of an MOU between the NTFNs and YEC addressing support
20 for the CS Project and the Minto mine spur within the Klondike Highway study area,
21 setting out commitments for a consultation process targeted to be concluded before the
22 end of June 2006 regarding the route selection and YESAB filing process, and principles
23 regarding a Project Agreement and arrangements targeted to be concluded by October
24 31, 2006 relating to benefits, access rights and easements;
25 • initiation of consultation planning discussions with the NTFNs, based on the MOU, to
26 proceed with community consultations on route alternatives and issues as soon as
27 possible in May;
28 • negotiations with Sherwood Copper and Minto Explorations Ltd. resulting in a Letter of
29 Intent (LOI) to supply power to the Minto mine through a new transmission connection
30 to the WAF grid before the end of 2008; work is now proceeding on the full Purchase
31 Power Agreement (which is a later step 1 or step 2 activity); and
32 • initial discussions with Western Copper Corp., the new entity responsible for the
33 Carmacks Copper mine, to confirm the mine's power needs and interest in transmission
34 access to the WAF grid, potentially by the 3rd quarter of 2008; discussions have now

1 started on a LOI to supply power to the Carmacks Copper mine through new
2 transmission connection to the WAF grid.

3
4 **3. Engineering Design and Costing: preliminary activities:** The work plan includes
5 engineering design and costing as required for the CS Project. Prior to submission of the Project
6 Proposal to YESAB this activity remains of a preliminary nature, including aerial photography and
7 mapping of the 500 metre wide route study area corridor, contributions to the project description
8 needed for the environmental and socio-economic assessment and YESAB submission, and initial
9 project costing assessments as needed for project financial planning and agreements with the
10 two potential mine customers. Specific activities carried out to date or committed to the end of
11 May include the following:

- 12 • completion of aerial photography of the 500m initial study area for the CS Project;
- 13 • assessment of digitized mapping option (rather than an on-the-ground centre line survey
14 as originally planned for Phase 3) to define the selected ROW route for planning and
15 design purposes;
- 16 • review and defining of detailed route options within the general route study area, prior to
17 public consultations on route options, to assess potential engineering design and cost
18 implications;
- 19 • updated estimates of CS project capital costs;
- 20 • review of costs for possible options to serve the mines, including options without the CS
21 Project; and
- 22 • initial review of construction schedule issues and constraints.

23
24 **4. Overall Management & YTG Funding Process:** Specific activities carried out to date or
25 committed to the end of May include the following:

- 26 • review of funding options for the CS Project, as well as review of funding options to
27 serve mines without YTG funding, and overall schedules for the CS Project; and
- 28 • preparation of overall revised schedules for CS Project, assuming development proceeds
29 in two phases:
 - 30 – Phase 1: Carmacks to Pelly Crossing by summer/fall of 2008
 - 31 – Phase 2: Pelly Crossing to Stewart Crossing by fall 2009.

32 **S2.3 UPDATE RE: SCHEDULING**

33 The updated schedule for the CS Project provides for start of Phase 1 transmission operations (Carmacks
34 to Pelly Crossing) in the 3rd Quarter of 2008 and the full line to Stewart Crossing in the 3rd Quarter of

1 2009. This schedule currently allows about 18 months for construction of Phase 1 and assumes
2 completion of all required planning (including securing all permits and approvals and completion of
3 project design and tendering) by the end of 2006 such that a final decision to proceed could occur as
4 soon as possible in the first quarter of 2007 and construction could commence during that winter.

5
6 The updated schedule also indicates current expected or possible timing for two major mine projects
7 (Minto and Western Copper⁹/Carmacks Copper) that, if developed, would likely be served by the CS
8 Project.

- 9
10
- 11 • **Minto Mine:** The Minto mine already has its permits and approvals, as well as a
12 developed access road and site infrastructure, and has been planned on the assumption
13 of on-site diesel generated power. Overburden removal work commenced at the mine
14 site in March 2006, and mill development is planning to proceed in order that mill
15 operations can commence by April 1, 2007. Accordingly, the CS Project cannot be
16 developed in time to supply power to the Minto mine at the start of its operations.
17 However, YEC has concluded a Letter of Intent with Minto Explorations Ltd. for
18 negotiating a Power Purchase Agreement whereby the mine will purchase power from
19 YEC's WAF grid as soon as the CS Project can facilitate this service prior to the end of
20 2008. Energy requirements at the mine site by quarter 2 of 2008, excluding any
21 secondary heating loads, are now expected with peak winter demand at 2.9 MVA to 3.5
22 MVA and annual energy requirements at 21.6 GW.h to 27.6 GW.h. Overall, the update
23 indicates higher loads than assumed in the January Resource Plan along with a shorter
24 expected mine life and much greater likelihood of mine operations starting in 2007. The
25 Minto mine currently is expected to have a life of about 8 years operation.

- 26
- 27 • **Western Copper/Carmacks Copper Mine:** The Carmacks Copper mine is currently in
28 the process of seeking all necessary permits and approvals, with a target to complete this
29 process during 2006/ early 2007. Based on recent discussions with Western Copper
30 Corp., it is currently assumed that, following receipt of permits and approvals,
31 construction would start by about mid-2007 and that operation could begin in the 3rd
32 quarter of 2008. Western Copper has confirmed to YEC its interest in purchasing WAF
33 grid power from YEC starting at the outset of its mine operations. Mine site power
requirements (excluding any secondary heating loads) are currently estimated with peak

⁹ Western Silver's interests in the Carmacks Copper mine have now been acquired by Western Copper Corporation.

1 winter demand at about 7.3 MW (summer peak demand is expected to be slightly higher)
2 and annual energy requirements at 47.9 GW.h. Overall, the updated information
3 indicates expected power loads similar to those assumed earlier, along with somewhat
4 greater likelihood of mine production starting in 2008. The Carmacks Copper mine
5 currently is expected to have a life of about 8 years operation. Western Copper has
6 advised YEC, given the high cost of on-site power generation and the significant power
7 demand of their project, that Western Copper feels that this power line could potentially
8 play a key role in their decision to implement the Carmacks Copper Project.

9 **S2.4 UPDATE RE: FINANCING**

10 YEC currently estimates that, in addition to the \$3 million planning costs, a further \$28.255 million
11 estimated costs (2005\$) would be required to construct the CS Project facilities (excluding inflation and
12 interest during construction). As defined for this cost estimate, the CS Project includes the line from
13 Carmacks to Stewart Crossing, the new substations at Carmacks and Pelly Crossing, and changes to the
14 substation at Stewart Crossing. Ancillary transmission projects to be funded by others include the spur or
15 tap connection to each mine from the CS Project as well as connections to local distribution systems at
16 Carmacks and Pelly Crossing as well as any other areas such as Minto Landing.

17
18 Filing of the submission with YESAB has been delayed until July or August due to many factors including
19 delays in securing an MOU with the NTFN, which YEC required to proceed further with the CS Project.
20 After the filing with YESAB, it is now expected that the YESAB review process will take until the end of
21 2006 or early 2007 – which implies that construction start may now be delayed until late next winter.
22 However, ongoing review now indicates minimal if any seasonal constraints (e.g., due to wet terrain)
23 affecting construction of the line from Carmacks to the two mines and to the Pelly Crossing area. YEC will
24 be reviewing in the next step of planning its ability to complete Phase 1 construction (Carmacks to Pelly
25 Crossing) by mid-year 2008 even if YESAB assessment and decision body approvals are delayed into
26 quarter two of 2007.

27
28 The major near term benefits from CS Project development are likely to arise from serving one or two
29 new mines, as discussed below.

30
31 In addition to the benefits secured from new firm power sales to each mine, additional ratepayer benefits
32 can also be secured from other elements of the CS Project:

- 1 • Displacing diesel generation at Pelly Crossing (present value benefit estimated at about
2 \$2.3 million in 2005\$);¹⁰
- 3 • Grid power benefits for other off-grid power users and developments along the CS power
4 line route (these benefits will affect other Yukon ratepayers only to the extent such off-
5 grid users are currently supplied by Yukon Electrical).
- 6 • Connection of the two grids under these assumed loads would yield additional ratepayer
7 benefits which (absent other new mine developments on either grid) could include both
8 capacity benefits (up to \$4.5 to \$5.6 million of near term capital cost deferrals) and
9 diesel energy generation cost savings (up to \$4.7 million present value over the period to
10 2025).¹¹

11 **S2.4.1 Mine Developments**

12 The LOI with Minto Explorations, and ongoing discussions with Western Copper, have enhanced the
13 overall picture considerably for some level of near-term new transmission development connecting these
14 mines to the WAF grid. The effects of this enhancement on CS Project development, however, will
15 ultimately continue to depend on timely commitment of YTG Infrastructure Funding.

16
17 On the one hand, development of these mine projects will create clear positive economic benefits and a
18 need to proceed with new transmission as soon as possible to connect the WAF grid with each mine. The
19 fact that the Minto mine is already proceeding and is located (in terms of transmission extension from the
20 WAF grid) beyond the Carmacks Copper mine also facilitates the need to move now in a way that can
21 accommodate both mines in the event that Carmacks Copper also starts to be developed in 2007.

22
23 On the other hand, however, given the defined life of these mines, the need to move forward with such
24 transmission connection coming into service in 2008 has become critical. Delay in bringing new
25 transmission into service for these mines under these circumstances acts directly to cut short the years of
26 ratepayer and mine customer benefits that can be secured, and thereby reduces the feasibility of the
27 transmission development. Accordingly, as reviewed below, transmission development to supply the
28 mines may soon need to proceed separately from the CS Project scope unless YTG capital funding for the

¹⁰ Present value benefits (2005\$) to 2020 (when WAF surplus hydro generation may be fully used) estimated at \$2.29 million.

¹¹ See January Resource Plan, page 4-23 footnote 14 regarding present value estimate of energy diesel generation cost saving benefits to 2025 assuming both mines are in operation. The capacity benefits reflect the estimated 5.6 MW of additional near term firm winter capacity benefits that are assumed would otherwise need to be provided with new diesel generation capacity. These estimates assume no other new mine loads on either the MD or WAF systems during planning period.

1 overall CS Project can be committed in a timely manner as required. In order for transmission facilities to
2 be in-service by at least mid to late 2008 (i.e., a reasonable outside current limit to timing for feasible
3 development related to the mines), timing requirements for permitting, design and construction dictate a
4 need for decisions today on transmission voltage, route and project approvals (including any YTG funding
5 commitments).

6
7 In the event that YTG funds are not available as required for the CS Project, either as to timing or the
8 amounts needed for the full project, Yukon Energy has identified and examined least cost transmission
9 options to connect the Minto and/or Carmacks Copper mines to the WAF grid in the event that these
10 projects proceed and seek (as would be expected) access to WAF power.

11
12 In summary, the following updated feasibility-related assessments can be noted in this regard:

- 13 • **Clear benefits to mines and all Yukon ratepayers:** Analysis confirms that it is in the
14 best interests of each mine and all Yukon ratepayers that each mine be supplied at this
15 time with surplus WAF hydro generation.
 - 16 – **Mine benefits:** At current and expected diesel prices, grid power is likely to provide
17 capital and operating cost savings to each mine sufficient to recover the full capital
18 cost of appropriate new transmission connection from Carmacks to the mine within
19 less than two years of mine operation.
 - 20 ▪ **Minto:** For the Minto mine, a 35 kV transmission connection would be needed
21 along the Klondike Highway from Carmacks to Minto Landing, and then west
22 across the Yukon River to the mine site. If the mine fully funded this 35 kV
23 transmission extension from YEC's new substation facilities to be developed at
24 Carmacks, cost savings to the mine would be expected to fully pay for this
25 transmission connection in less than two years.
 - 26 ▪ **Carmacks Copper:** For the Carmacks Copper mine and its higher load
27 (compared with Minto mine), a 138 kV transmission connection would be needed
28 along the Klondike Highway from Carmacks to McGregor Creek and then west
29 across the Yukon River to the mine site. If the mine fully funded this 138 kV
30 transmission extension from YEC's new substation facilities at Carmacks, cost
31 savings to the mine would be expected to fully pay for this transmission
32 connection in less than one year.
 - 33 – **Ratepayer benefits:** New firm WAF sales to these mines at this time would yield
34 rate saving benefits to Yukon ratepayers (and to YTG to the extent that YTG-funded
35 rate subsidies continue for residential and commercial ratepayers) through increased

1 firm sales of WAF surplus hydro generation involving little, if any, incremental utility
2 generation costs. The present value today of these ratepayer benefits (2005\$) from
3 connection to these two mines are estimated at \$11.6 million for the Minto mine and
4 \$13.7 million for the Carmacks Copper mine.¹²

- 5 • **LOI provisions for lower voltage option to serve the Minto mine:** Based on the
6 clear and material benefits to both the mine and all ratepayers, the Letter of Intent (LOI)
7 with Minto Explorations provides for the possible development, if needed, of a lower
8 voltage 35 kV line option funded by Minto Explorations solely to supply the Minto mine in
9 the event that the CS Project cannot be developed in a timely manner before the end of
10 2008 as needed for this mine.
 - 11 – It is expected that Western Copper also will seek arrangements with YEC for similar
12 options to ensure that a 138 kV connection can be made to the Carmacks Copper
13 mine available in any event, even if the CS Project is delayed or not proceeding, as
14 soon as the mine starts operation, potentially as soon as the third quarter of 2008.
- 15 • **Limitations to mine-related infrastructure development:** If both mines need to
16 proceed as currently discussed above to develop connections to the WAF grid at
17 Carmacks separate from any CS 138 kV transmission development, there are clear
18 limitations as to the extent of any near or long-term infrastructure benefits available for
19 Yukon ratepayers as a result of the connections needed solely for these mines. The
20 mine-related transmission developments could, however, be used as leverage to assist
21 toward building the long-term infrastructure connection of the two grids:
 - 22 – These mine-specific development options can assist, but by themselves will still fail,
23 to provide long-term infrastructure benefits; further, at the end of each mine's
24 operating life, the mine-specific transmission will also need, in whole or in part, to be
25 decommissioned to the extent that it fails to provide ongoing cost-effective service.
 - 26 – Extending the 138 kV grid infrastructure from Carmacks beyond McGregor Creek
27 would not be economic simply to serve these two mines or Pelly Crossing, i.e.,
28 development from McGregor Creek to Pelly Crossing based only on mine and other
29 local loads would provide the basis in the short-term to fund a lower voltage 35 kV

¹² Present value of ratepayer benefits (2005\$) are estimated prior to consideration of any rebates for CS Project funding contributions. The analysis assumes a net ratepayer benefit (2005\$) at 10 cents per kW.h for serving Minto mine loads, and 5 cents/kW.h for serving the Carmacks Copper mine loads (the lower level of savings for the Carmacks Copper load assumes the Minto load already exists and reflects an initial allowance for potential impacts on WAF peaking diesel requirements and costs – this analysis will be refined later in the planning process). The present value estimates assume a nominal discount rate of 7.5%/year (reflecting YEC's average cost of new capital), inflation at 2%/year and discounting back to the start of the year 2006.

1 line not suited to future interconnection of the WAF and MD grids. Accordingly, any
2 decision to upgrade this segment of line development to 138 kV would need to be
3 justified on the basis of its contribution to long-term infrastructure development
4 enabling ultimate interconnection of the two grids.

- 5 – Extending any grid infrastructure from Pelly Crossing (Phase 1) to Stewart Crossing
6 (Phase 2 of the CS Project, assuming prior development of the CS Project at 138 kV
7 from Carmacks to Pelly Crossing) would need to be seen in this context as a separate
8 future investment decision related to interconnection of the two grids and likely
9 would remain dependent upon YTG funding for at least a material part of the cost.

10
11 In order to facilitate timely development of the CS Project from Carmacks to the Minto Landing area
12 (where the spur to the Minto mine would start), the LOI with Minto Explorations provides for the mine to
13 contribute funding to the CS Project, if it proceeds, equal to the estimated costs for a 35 kV transmission
14 option from Carmacks to Minto Landing (currently estimated at about \$4.7 million (2005\$)). This funding
15 commitment from the Minto mine would be provided under the LOI on the condition that the mine would
16 receive a rebate at the end of each operating year equal to the lesser of (a) 20% of the amount that the
17 mine paid for power charges in that year, or (b) the annual cost of the mine funding contribution which
18 would be fixed at the start of service based on the funding contribution (e.g., the estimated \$4.7 million)
19 amortized over the remaining expected mine life less one year. This funding would be separate from the
20 mine fully funding the 35 kV spur line from the Minto Landing area to its mine site property.

- 21 • These arrangements will enable Yukon Energy, if necessary, to proceed with timely
22 development of the transmission connection required to serve the mine (in this case 35
23 kV would meet the mine's needs; such a low voltage line, however, would likely provide
24 no long-term infrastructure benefit to Yukon Energy or Yukon ratepayers, and would
25 therefore need to be used as leverage toward development of the needed 138 kV
26 facilities).¹³
- 27 • These arrangements can also provide funding to support timely commitments towards
28 development of the long-term CS Project 138 kV Infrastructure.

29
30 Yukon Energy is seeking similar funding and rebate arrangements with the Carmacks Copper mine,
31 keeping in mind in this instance that the CS Project segment to serve the Carmacks Copper mine would
32 be from Carmacks to the McGregor Creek area and that the mine load would require a 138 kV

¹³ The present value cost (2005\$) of the rebate for the Minto mine would equal about 22% to 24% of the present value of the estimated ratepayer benefits over the currently expected life of the mine.

1 transmission connection compatible fully with long-term infrastructure needs (estimated 2005\$ cost of
2 \$6.0 million for this segment of the CS Project)¹⁴.

3 **S2.4.2 Financing Requirements and Ratepayer Benefits**

4 CS Project development under the anticipated arrangements with the two mines will yield different
5 YEC/YTG financing needs as well as ratepayer benefits depending on the state of mine development and
6 the extent of transmission development. The following alternative situations are examined below:

7

8 1. Full CS Project development (Carmacks to Stewart Crossing):

9 a. concurrent with both mines; and

10 b. with only Minto mine

11

12 2. Phase 1 CS Project development (Carmacks to Pelly Crossing) concurrent with only the Minto
13 mine.

14

15 If both mines are operating in 2008 and also enter into final purchase power arrangements with YEC as
16 described above, financing for the full CS Project development from Carmacks to Stewart Crossing
17 (estimated cost of \$31.2 million (2005\$)) would need to be as follows (all values in 2005\$):

18 • **Mines:** Contributions from the two mines to the CS Project are estimated to range from
19 about \$7.8 million up to \$10.7 million prior to rebates (range reflects possible
20 contingencies), based on least cost transmission connections separate from the spur lines
21 to each mine that start at the Klondike Highway (as reviewed above).

22 • **YEC/YTG:** The balance of required YEC/YTG funding would then be at least \$20.5
23 million (and could be up to about \$23.4 million, depending on final mine funding
24 commitments); these levels of YEC/YTG funding indicate overall costs that would be less
25 than the estimated present value of ratepayer benefits from connecting the two grids
26 (potentially up to about \$10 million) plus supplying the two mines (net of rebates) and
27 Pelly Crossing (potentially \$20.7 million).

28

29 Based on the above overview, CS Project development with the two mines appears on this basis to be
30 economically feasible and very beneficial. However, the projected benefits from interconnection as well as

¹⁴ With a \$6.0 million funding contribution, the present value of a rebate to the mine structured in the same way as the LOI provision for the Minto mine would equal almost 32% of the estimated ratepayer present value benefits, reflecting the lower assumed net ratepayer benefits (5 cents/kW.h) related to this second mine.

1 related to sales to the mines are subject to material risks such that Yukon Energy would not today
2 proceed with this full CS Project without commitments of YTG funds as well as firm mine funding
3 commitments.

4
5 This above picture changes dramatically, for example, if only the Minto mine is assumed to be operating
6 with the above purchase power arrangements:

- 7 • **Mine:** Contribution from mines is now only \$4.7 million prior to rebates.
- 8 • **YEC/YTG:** The balance of required YEC/YTG funding would then be \$26.5 million, which
9 is more than the estimated present value of ratepayer benefits from connecting the two
10 grids (now likely much less than \$10 million with only the Minto mine load) plus
11 supplying the Minto mine (net of rebates) and Pelly Crossing (potentially \$11.3million).

12
13 Committing to only Phase 1 development (Carmacks to Pelly Crossing) would mitigate some of the above
14 risks by reducing estimated costs (2005\$) by about \$12.8 million while only reducing present value
15 benefits (from connecting the two grids) by at most about \$10 million. However, the remaining \$18.45
16 million estimated cost (2005\$) would still require YEC/YTG funding of \$13.8 million if only the Minto mine
17 is developed - and this required funding would still exceed the likely ratepayer present value benefits of
18 \$11.3 million.

19 **S2.4.3 YTG and Yukon Energy Funding Options**

20 In order to mitigate the above risks and enable timely development of the full 138 kV CS Project to
21 interconnect the two grids, Yukon Energy's updated proposal to the Yukon Government is that YTG
22 Infrastructure Funding be committed to provide \$10 million of the project cost (2005\$), with \$5 million
23 for Phase 1 costs, based on the assumption that at least one mine (i.e., the Minto mine) proceeds on its
24 current schedule. A condition of this proposal is that, prior to any construction, YEC proceeds with all
25 permitting and approvals, including any access rights required to cross First Nation settlement lands, as
26 needed to proceed with the full CS Project (Carmacks to Stewart Crossing).

27
28 The net impact of this proposal for required YEC funding would be as follows (2005\$):

- 29 • **Phase 1 costs (Carmacks to Pelly Crossing):** In the event that only the Minto mine
30 is developed at this time, \$8.8 million of YEC funding would be required for Phase 1¹⁵.

¹⁵ The level of Phase 1 YEC funding required under this proposal is approximately \$3 million more (2005\$) than the cost for YEC developing a 35 kV line (and related substations) from Carmacks to Pelly Crossing with the Minto mine being developed and funding the segment to Minto Landing. The proposal therefore assumes that some of the ratepayer benefits are applied towards the long-term infrastructure development needed to connect the two grids.

1 YEC's required funding would be materially reduced if the Carmacks Copper mine is also
2 developed at this time and connected to the WAF grid under terms similar to those in the
3 Minto mine LOI. These costs compare with estimated ratepayer present value benefits of
4 \$11.3 million with only the Minto mine and \$20.7 million with both mines.

- 5 • **Phase 2 costs (Pelly Crossing to Stewart Crossing):** \$7.8 million of YEC funding
6 would be required, with the likely constraint that Phase 2 would only proceed at this time
7 in the event that both mines are operating.¹⁶ These incremental costs compare with
8 estimated ratepayer present value benefits of potentially up to about \$10 million (due to
9 interconnection of the two grids).

10
11 In the event that such YTG funding commitments cannot be provided, Yukon Energy would then have
12 two options remaining to consider with regard to developing transmission facilities from Carmacks to Pelly
13 Crossing.

- 14 • Short-term Mine-Focused Option
- 15 • Long-term Infrastructure Option

16
17 Under the Mine-Focused Option, Yukon Energy would focus on short-term economics and propose to
18 focus its planning attention on developing the least cost transmission to serve the two mines if and when
19 they each develop, as well as 35 kV transmission to Pelly Crossing as soon as this becomes feasible.
20 Under the potential arrangements with the mines noted above, the transmission connections to each
21 mine would presumably be funded by each mine – with the potential for 138 kV transmission from
22 Carmacks to McGregor Creek and 35 kV transmission for the extension beyond McGregor Creek to the
23 Minto Landing area. If both mines develop in the near term, Yukon Energy's ultimate development costs
24 (net of mine funding commitments) would likely be limited under these circumstances to less than \$6
25 million¹⁷ (2005\$) relating to the Carmacks substation costs, the incremental 35 kV transmission costs
26 from Minto Landing to Pelly Crossing, and related ongoing planning and permitting costs. As noted
27 earlier, the present value of gross ratepayer benefits (2005\$) prior to considering YEC's costs would

¹⁶ Phase 2 funding estimate allocations as between YTG and YEC assume no new MD mine loads during the mine lives of the Minto and Carmacks Copper mines. If the MD hydro generation surplus is otherwise absorbed by other new mine loads, the YEC Phase 2 funding would need to be reviewed and likely materially revised downward.

¹⁷ If YEC developed the 138 kV line to McGregor Creek without Carmacks Copper funding as needed, this cost could be about \$3 million higher. In the event that a 35 kV line was built first for this segment and then, at a later time, the Carmacks Copper mine was to be developed, a second 35 kV line would be needed to help serve the mine.

1 range from \$11.3 to \$20.7 million, depending on whether one or both mines are developed and
2 connected to the WAF grid during this period.

3

4 Under the Infrastructure Option, Yukon Energy would incur the added costs needed to establish the 138
5 kV long-term infrastructure as needed for Phase I of the CS Project from Carmacks to Pelly Crossing. In
6 the event that both mines were to be developed and connected in the near term, estimated additional
7 Yukon Energy costs (2005\$) under this option would approximate \$5 million (beyond the amounts
8 needed to fund the Mine-Focused Option noted above) and overall YEC costs would likely range between
9 \$7.3 million and \$10.6 million (as compared to ratepayer benefits of \$20.7 million).¹⁸ Phase 2
10 development to extend the 138 kV line to Stewart Crossing would then remain open for future
11 consideration.

12

13 Under either of the above options, it is apparent that ongoing planning by Yukon Energy to develop the
14 CS Project remains prudent and needed at this time, with continued attention to the options noted above
15 to ensure timely development of the appropriate new transmission connections in the near term.

¹⁸ If only the Minto mine developed during this period, the added YEC cost (2005\$) would approximate \$7.6 million. Total YEC costs would then be \$13.3 million, and exceed estimated ratepayer benefits (\$11.2 million).

Tab 3

Other Topics

1 **S3.0 OTHER TOPICS**

2 In addition to the Mirrlees Life Extension and the Carmacks-Stewart Transmission Project (see
3 Supplemental Materials S1 and S2), ongoing work since January has updated information on other
4 January Resource Plan topics. This supplemental update reviews the following:

- 5 • Section S3.1: Other Chapter 4 Topics (Aishihik 3rd Turbine and Southern Lakes
6 Study/Marsh Lake Fall/Winter Storage)
- 7 • Section S3.2: Chapter 5 Topics (update to mine loads)
- 8 • Section S3.3: Appendix B Topics (“protection” of Granite Canyon and other hydro sites)

9 **S3.1 OTHER CHAPTER 4 TOPICS**

10 Proposed actions in Chapter 4 include two projects that remain in planning stages subject to ongoing
11 advancement: the Aishihik 3rd turbine and the Marsh Lake Fall/Winter Storage. Updated cost estimates
12 for Aishihik 3rd Turbine are reviewed below, along with initial results of the Southern Lakes hydrology
13 study.

14 **S3.1.1 Aishihik 3rd Turbine Cost Estimate**

15 The January 2005 Resource Plan notes at footnote 9, page 4-19, that the \$7 million cost estimate
16 (2005\$) for the Aishihik 3rd turbine is “under active review”. Based on Yukon Energy now receiving the
17 preliminary review of the capital costs of an Aishihik 3rd turbine, this cost estimate has been adjusted
18 upward by 2.2% (\$7.155 million in 2005\$)¹.

19
20 It is concluded that the total capital costs remain well within the range of the \$7 million assumed in the
21 January 2006 Resource Plan, and the economic assessment of six cases in Appendix C of the Resource
22 Plan does not need to be updated. Further cost refinement will not be available until such time as YEC
23 proceeds, after completion of the current Resource Plan consultations and YUB review, to tender for the
24 project.

¹ The preliminary review indicated capital costs at \$7.298 million (2006\$), excluding interest during construction (estimated at \$0.427 million) and including contingencies (\$0.689 million). Assuming 2% annual inflation as assumed in the January analysis, the updated cost estimate is 2.2% more (\$7.155 million in 2005\$) than the \$7.0 million assumed in the January 2006 Resource Plan. Interest during construction is excluded in both assessments.

1 **S3.1.2 Southern Lakes Study and Marsh Lake fall/winter Storage**

2 At page 4-20 of the January 2006 Resource Plan, Yukon Energy notes that there is a potential for a
3 Marsh Lake Fall/Winter storage project that would enhance the output of the Whitehorse Rapids plant by
4 an estimated 1.6 MW and 7.7 GW.h per year. Yukon Energy also notes at page 4-38 that it is undertaking
5 a study to update specific knowledge of the hydrology of the Southern Lakes region.

6
7 Although the study of the Southern Lakes area is not complete, initial information indicates capacity
8 enhancements from the Marsh Lake Fall/Winter Storage are possible in the range noted in the January
9 Resource Plan. Energy enhancements are still being reconciled, but reflect an ability to at least achieve 5
10 GW.h/year enhanced normal annual output from Whitehorse Rapids.

11
12 Initial investigation has also noted that any similar opportunities for storage projects in the Southern
13 Lakes region are practically limited to Atlin Lake (by constructing a control structure at the outlet of Atlin
14 Lake) and Tagish Lake (by constructing a control structure near Tagish). However, neither alternative can
15 apparently be achieved for a cost in the range of Marsh Fall/Winter Storage (initial estimates are that the
16 control structures would cost in the range of \$7.5 million and \$16 million for Atlin and Tagish
17 respectively).

18
19 The other conclusion confirmed by the preliminary work undertaken to date is that the Whitehorse Rapids
20 GS capacity enhancement opportunities are limited by the absolute limitation of discharge to 165 cms at
21 times during the key winter months due to potential downstream icing issues. Based on Yukon Energy's
22 plant unit flow experience, this is a practical limit of 26 MW (if enhanced water flows could be obtained).
23 This is because any physical ability to enhance flows above that required to achieve 26 MW in output
24 must still be curtailed for portions of the winter when ice is forming or advancing, otherwise risks of
25 downstream flooding are increased in the Whitehorse area.

26 **S3.2 CHAPTER 5 TOPICS**

27 **S3.2.1 Update to Potential Mine Loads**

28 The following updates are currently applicable to the potential mine loads noted in Chapter 5 page 5-14.

- 29
- 30 • **Minto Property:** As noted in Supplemental Materials S2, new construction activities
31 resumed in March 2006 at the Minto mine and operation is now expected to begin in
32 March/April 2007, continuing thereafter for about eight years. Energy requirements at
the mine site by quarter 2 of 2008, excluding any secondary heating loads, are now

1 expected with peak winter demand at 2.9 MVA to 3.5 MVA and annual energy
2 requirements at 21.6 GW.h to 27.6 GW.h. Overall, the update indicates higher loads than
3 assumed in the January Resource Plan along with a shorter expected mine life and much
4 greater likelihood of mine operations starting In 2007.

- 5 • **Carmacks Copper:** As noted in Supplemental Materials S2, this property has been
6 acquired by Western Copper Corporation and (subject to completion of permitting and
7 approvals) mine construction may now start in mid-2007 with mine operations then
8 starting in quarter 3 of 2008 and mine operations continuing for about 8 years. Mine site
9 power requirements (excluding any secondary heating loads) are currently estimated
10 with peak winter demand at about 7.3 MW (summer peak demand is expected to be
11 slightly higher) and annual energy requirements at 47.9 GW.h. Overall, the updated
12 information indicates expected power loads similar to those assumed earlier, along with
13 somewhat greater likelihood of mine production starting in 2008.
- 14 • **Division Mountain Coal:** The Division Mountain coal property, if developed, is now
15 expected to operate at a level requiring 5 MW and 35 GW.h/yr compared to 15 MW and
16 105 GW.h/yr noted in the January 2006 Resource Plan. In addition, the owners of the
17 Division Mountain Coal property have indicated that they are currently assessing power
18 production opportunities (mine mouth generation) and have indicated that development
19 of the mine solely on utility-supplied power is not part of the current development plan.
- 20 • **Mt. Skukum:** The gold operations at Mt. Skukum are now expected to be 3 MW and 16
21 GW.h/yr, compared to the figures used in the January 2006 Resource Plan of 1.5 to 2.7
22 MW and 11 to 20 GW.h/year.
- 23 • **UKHM:** Since the January 2006 Resource Plan, the ownership of the UKHM property has
24 changed to Alexco Resource Corporation; the assumed in service date is now 2008.

25 **S3.3 APPENDIX B TOPICS**

26 **S3.3.1 "Protection" of Granite Canyon and Other Hydro Sites**

27 Appendix B of the January 2006 Resource Plan sets out a summary of selected potential hydro sites that
28 have been studied at one time or another by various parties in Yukon (primarily the Government of
29 Canada or NCPC). The summary reflects the scale and sizing of the plants reviewed in the various studies
30 produced between about the 1950s and the 1980s. Appendix B also indicates which sites have some
31 degree of protection under the Yukon Land Claims.

1 It is important to note that Yukon Energy has not conducted any assessments to date of the potential
2 technical, environmental or socio-economic impacts of most of these potential projects (and in particular
3 none on the larger projects that are beyond the scale being considered today). Appendix B merely sets
4 out the physical sites determined to be capable of producing hydro power according to work
5 commissioned over the past 50 or so years.

6

7 As part of recent reviews of the protections secured by the Yukon Government under the Yukon land
8 claims agreements, and in particular those relating to First Nations who are potentially affected by the
9 proposed Carmacks-Stewart Transmission project, Yukon Energy has carried out some preliminary
10 assessments of the existing Land Claims protections relating to the potential Granite Canyon hydro
11 project. Although there are no current plans by Yukon Energy to look closely at the Granite Canyon
12 project site, it is noted in Appendix B as one of the projects technically capable of being constructed to a
13 Very Large size.

14

15 Based on recent preliminary assessments of the existing Land Claims protections relating to the potential
16 Granite Canyon hydro project, Yukon Energy has determined that development of the site that can be
17 accommodated within the "protection" areas is far less than suggested in Table B-1 (e.g., Very Large
18 Hydro Sites category of 60 MW+), and may well fall within the categories of Small (5-10 MW) or Medium
19 (10-30 MW) Hydro Project scales. Further studies and consultations with the Selkirk First Nation would be
20 needed to determine what, if any, specific development may be feasible at this site.