Project Services Input for Capex Case 11 OL Screening Level (MF, 900 MW Island Link LCC Tecnology with Overload, and 500 MW Maritime Link VSC Technology)

Dave Pardy to: Steve Goudie 08/13/2010 10:55 AM

Cc: Jason Kean

Steve

As discussed please find attached the files for case 11 OL. I have also attached In Services Dates and a high level schematic for your reference .

This is similar to case 9 but with overload capacity - therefore the in service dates are the same as for Case 9.

Case 11 Ol Consist of the following:

1. Generation
    - Facility
        - 4 206 MW units at Muskrat Falls
    - Transmission
        - 2 x 345 kVac transmission Muskrat Falls to Churchill Falls

2. Island Link
    - Converter Stations
        - 900 MW LCC with Overload Capacity at Muskrat Falls
        - 810 MW LCC with Overload Capacity at Soldiers Pond
    - Overland Transmission (50 year return period)
        - +/- 320 kVdc Muskrat Falls to SOBI
        - +/- 320 kVdc SOBI to Soldiers Pond
    - Marine Crossing
        - 3 +/- 320 kVdc subsea MI Cables
        - Transition compound Labrador
        - Transition compound Newfoundland
    - Electrodes and Electrode Lines
        - Shoreline Pond Electrode at SOBI
        - Shoreline Pond Electrode at Dowdens Point
        - Wooden pole electrode line (MF - SOBI)
        - Wooden pole electrode line (Soldiers Pond - Dowdens Point)
    - Island Upgrades
        - Synchronous Condensors
        - 2 x 150 Mvar (Conversions at Holyrood)
        - 3 x 300 Mvar (New)
        - Breakers
        - 6 x 138 kV
        - 18 x 230 kV

3. Maritime Link
    - Converter Stations
        - 500 MW VSC at Lingan
        - 500 MW VSC at Bottom Brook
    - Overland Transmission
        - +/- 200 kVdc Cape Ray to Bottom Brook
        - 230 kVac single circuit Bottom Brook to Granite Canal
    - Marine Crossing
        - 2 +/- 200 kVdc MI Cable
        - Transition Compound at Lingan
        - Transition Compound at Cape Ray
    - Electrodes and Electrode Lines
        - Shoreline Pond Electrode at Lingan
        - Shoreline Pond Electrode at Bottom Brook
        - Wooden pole electrode line (Lingan)
        - Wooden pole electrode line (Bottom Brook)
    - Island Upgrades
        - Allowance (200 km 230 kVac Single Circuit Line)
        - Allowance (Switchyard Modifications)

Any queries please give me or Jason Kean a call.

David P

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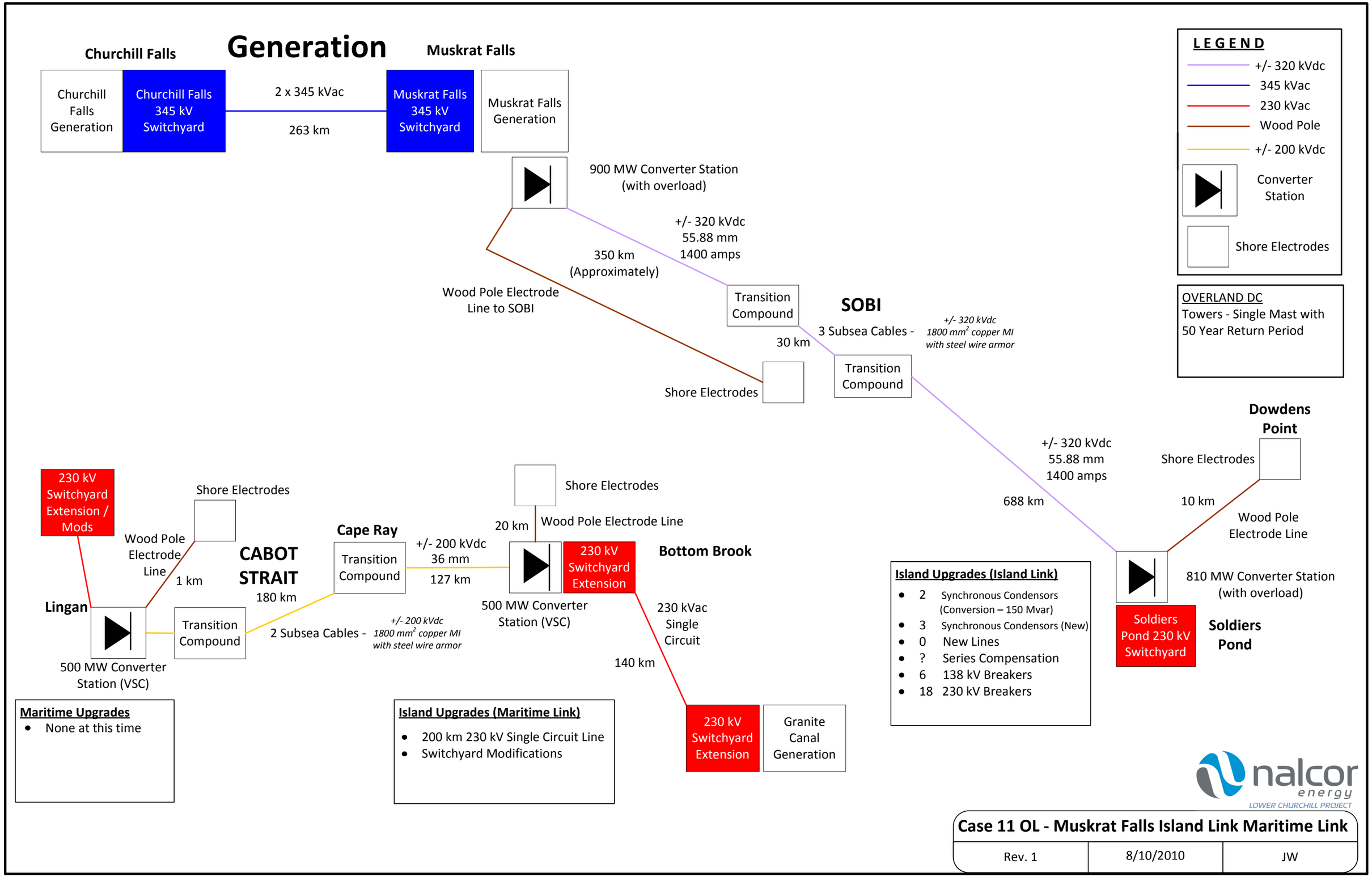
Visio-Case 11 OL Rev 1.pdf

C11 OL XXMF_IM LCC 345 MF-CF ILML 900 MW Screening Level Cost and Schedule Cost Flow for Finanical Model.xls

In Service Dates.xls


Generation
Churchill Falls
Churchill Falls Generation
Churchill Falls 345 kV Switchyard
2 x 345 kVac
263 km
Muskrat Falls
Muskrat Falls 345 kV Switchyard
Muskrat Falls Generation
900 MW Converter Station (with overload)
+/- 320 kVdc
55.88 mm
1400 amps
350 km (Approximately)
Wood Pole Electrode Line to SOBI
Transition Compound
SOBI
3 Subsea Cables -
+/- 320 kVdc
1800 mm² copper MI
with steel wire armor
30 km
Shore Electrodes
Transition Compound
LEGEND
+/- 320 kVdc
345 kVac
230 kVac
Wood Pole
+/- 200 kVdc
Converter Station
Shore Electrodes
OVERLAND DC
Towers - Single Mast with 50 Year Return Period
Dowdens Point
Shore Electrodes
+/- 320 kVdc
55.88 mm
1400 amps
688 km
10 km
Wood Pole Electrode Line
810 MW Converter Station (with overload)
Soldiers Pond 230 kV Switchyard
Soldiers Pond
Island Upgrades (Island Link)
2 Synchronous Condensors (Conversion – 150 Mvar)
3 Synchronous Condensors (New)
0 New Lines
? Series Compensation
6 138 kV Breakers
18 230 kV Breakers
230 kV Switchyard Extension / Mods
Shore Electrodes
Wood Pole Electrode Line
1 km
Lingan
500 MW Converter Station (VSC)
Transition Compound
CABOT STRAIT
180 km
Cape Ray
Transition Compound
2 Subsea Cables -
+/- 200 kVdc
1800 mm² copper MI
with steel wire armor
+/- 200 kVdc
36 mm
127 km
Shore Electrodes
20 km
Wood Pole Electrode Line
500 MW Converter Station (VSC)
230 kV Switchyard Extension
Bottom Brook
230 kVac
Single Circuit
140 km
230 kV Switchyard Extension
Granite Canal Generation
Maritime Upgrades
None at this time
Island Upgrades (Maritime Link)
200 km 230 kV Single Circuit Line
Switchyard Modifications
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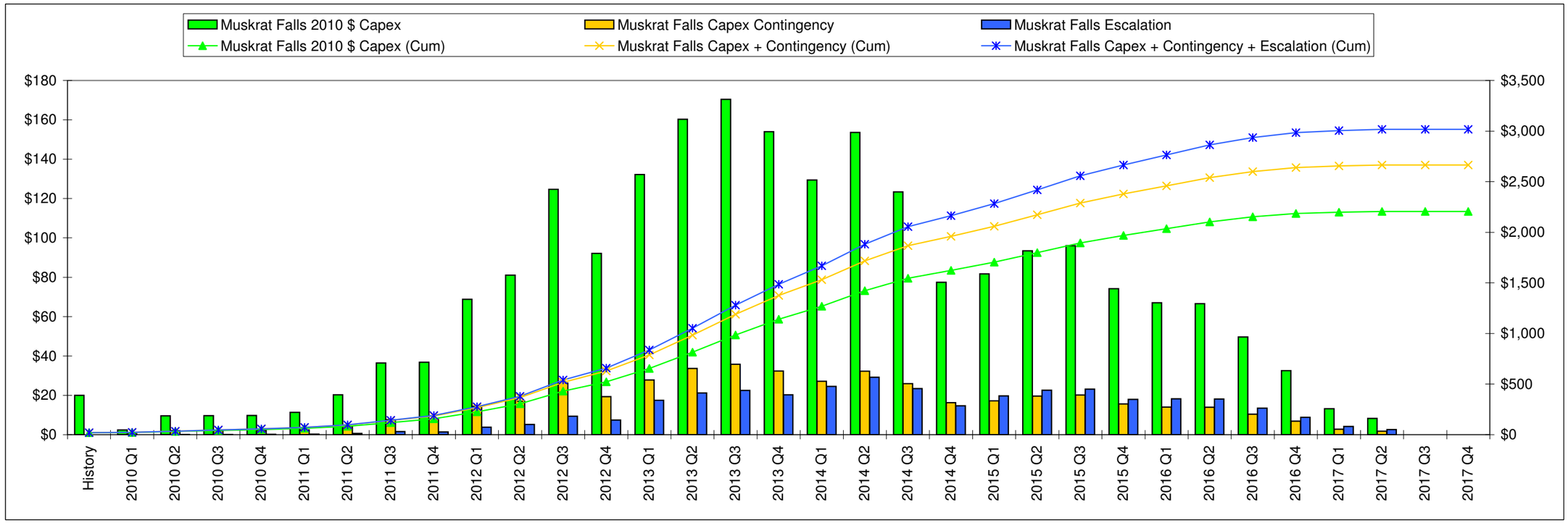
LOWER CHURCHILL PROJECT
Case 11 OL - Muskrat Falls Island Link Maritime Link
Rev. 1
8/10/2010
JW

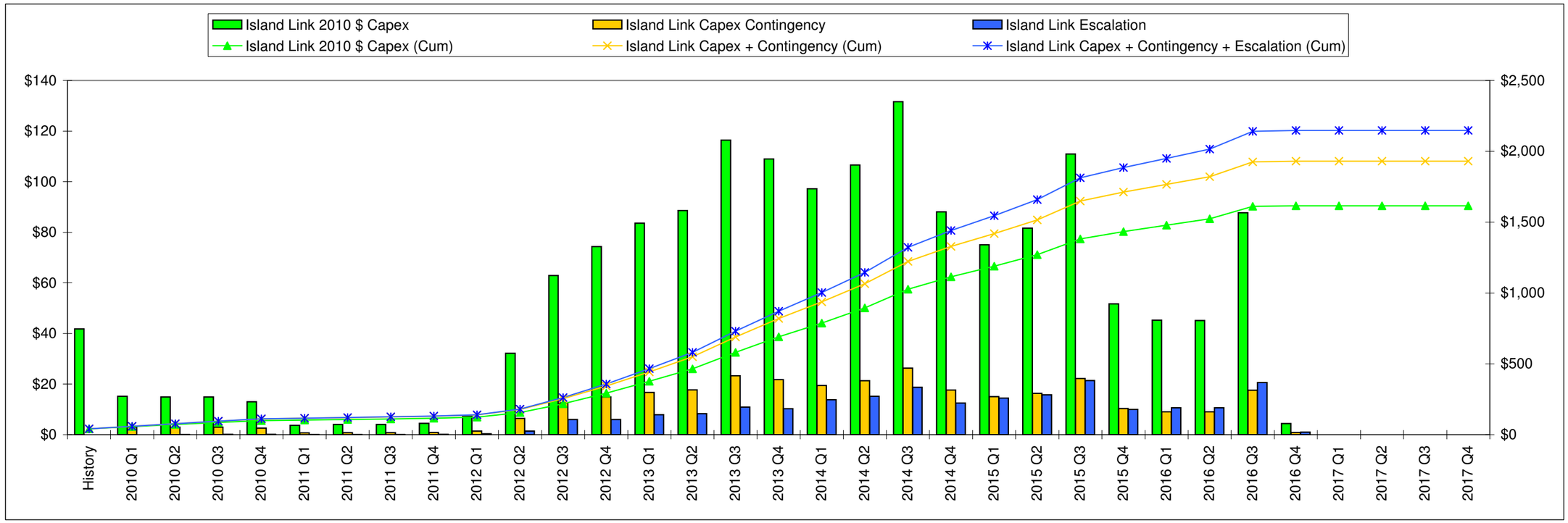
Muskrat Falls (345 Kv MF - CF)

P75* Cost on P50* Schedule Capital Cost Flow (Including 21% Contingency and Escalation(GI Proxy) without Capital Demand Factor)



	History	2010 Q1	2010 Q2	2010 Q3	2010 Q4	2011 Q1	2011 Q2	2011 Q3	2011 Q4	2012 Q1	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2	2017 Q3	2017 Q4	Total
Muskrat Falls 2010 $ Capex	$20	$2	$10	$10	$10	$11	$20	$36	$37	$69	$81	$125	$92	$132	$160	$170	$154	$129	$154	$123	$77	$82	$93	$96	$74	$67	$67	$50	$33	$13	$8	$0	$0	$2,206
Muskrat Falls Capex Contingency	$0	$1	$2	$2	$2	$2	$4	$8	$8	$14	$17	$26	$19	$28	$34	$36	$32	$27	$32	$26	$16	$17	$20	$20	$16	$14	$14	$10	$7	$3	$2	$0	$0	$459
Muskrat Falls Escalation	$0	$0	$0	$0	$0	$0	$1	$2	$1	$4	$5	$9	$7	$17	$21	$22	$20	$25	$29	$23	$15	$20	$23	$23	$18	$18	$18	$14	$9	$4	$3	$0	$0	$352
Muskrat Falls 2010 $ Capex (Cum)	$20	$22	$32	$42	$51	$63	$83	$120	$156	$225	$306	$431	$523	$655	$816	$986	$1,140	$1,269	$1,423	$1,546	$1,624	$1,705	$1,799	$1,895	$1,969	$2,036	$2,103	$2,152	$2,185	$2,198	$2,206	$2,206	$2,206	
Muskrat Falls Capex + Contingency (Cum)	$20	$23	$34	$46	$58	$72	$96	$140	$185	$268	$366	$517	$629	$789	$983	$1,189	$1,375	$1,532	$1,718	$1,867	$1,960	$2,059	$2,172	$2,289	$2,378	$2,460	$2,540	$2,600	$2,640	$2,656	$2,666	$2,666	$2,666	
Muskrat Falls Capex + Contingency + Escalation (Cum)	$20	$23	$35	$46	$58	$72	$98	$143	$189	$276	$380	$540	$659	$836	$1,051	$1,280	$1,487	$1,668	$1,883	$2,055	$2,164	$2,283	$2,418	$2,558	$2,665	$2,765	$2,863	$2,937	$2,985	$3,005	$3,018	$3,018	$3,018	

Island Link (900 MW / 810 MW - Stand Alone) LCC Tech with Overload & MI Cables
Screening Level Cost and Schedule Capital Cost Flow (Including 20% Contingency and Escalation(IL Proxy) without Capital Demand Factor)



	History	2010 Q1	2010 Q2	2010 Q3	2010 Q4	2011 Q1	2011 Q2	2011 Q3	2011 Q4	2012 Q1	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2	2017 Q3	2017 Q4	Total
Island Link 2010 $ Capex	$42	$15	$15	$15	$13	$4	$4	$4	$4	$7	$32	$63	$74	$84	$89	$116	$109	$97	$107	$132	$88	$75	$82	$111	$52	$45	$45	$88	$4	$0	$0	$0	$0	$1,616
Island Link Capex Contingency	$0	$3	$3	$3	$3	$1	$1	$1	$1	$1	$6	$13	$15	$17	$18	$23	$22	$19	$21	$26	$18	$15	$16	$22	$10	$9	$9	$18	$1	$0	$0	$0	$0	$315
Island Link Escalation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1	$6	$6	$8	$8	$11	$10	$14	$15	$19	$13	$14	$16	$21	$10	$11	$11	$21	$1	$0	$0	$0	$0	$217
Island Link 2010 $ Capex (Cum)	$42	$57	$72	$87	$100	$103	$108	$112	$116	$123	$156	$219	$293	$377	$465	$582	$691	$788	$894	$1,026	$1,114	$1,189	$1,271	$1,382	$1,433	$1,479	$1,524	$1,612	$1,616	$1,616	$1,616	$1,616	$1,616	
Island Link Capex + Contingency (Cum)	$42	$60	$78	$96	$111	$116	$121	$126	$131	$140	$178	$254	$343	$443	$550	$690	$820	$937	$1,065	$1,223	$1,329	$1,419	$1,517	$1,650	$1,712	$1,766	$1,820	$1,925	$1,931	$1,931	$1,931	$1,931	$1,931	
Island Link Capex + Contingency + Escalation (Cum)	$42	$60	$78	$96	$112	$116	$121	$126	$132	$141	$181	$263	$358	$466	$581	$731	$872	$1,003	$1,146	$1,323	$1,441	$1,545	$1,659	$1,814	$1,886	$1,951	$2,015	$2,141	$2,148	$2,148	$2,148	$2,148	$2,148	

Separation of MF Gen and AC Transmission Capex
Dave Pardy to: Steve Goudie 10/28/2010 11:08 AM
Cc: Jason Kean

Steve

As discussed we have separated the AC Tx (including Switchyards) from the Generation Facility at Muskrat Falls and reduced the Contingency from 21% to 15%.

The Project Management and Engineering has been factored (.9 to MF and .1 to Ac Tx)

Please note that a review is being undertaken to assess the EA implications and potential benefits of advancing the 345 Kv AC Tx line to be constructed in two phases. If adopted this will change the Cost profile of the AC Tx scope of work.

Please contact me if you have any further questions regarding the attached spreadsheets .

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C11 OL XXMF_ No AC Tx.xls C11 OL XXMF_ AC Tx Only.xls