meridian

7 May 2009

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Wellington

Dear Siobhan

Lower South Island

Thank you for the opportunity to provide comment and ideas on the Lower South Island Reliability investigation.

Question 4

You acknowledge that there is a parallel investigation into enabling renewables for the same area and we think that there are a number of opportunities to solve both these problems with the same investment.

1. You have identified CYD ROX as being a weak link in providing reliable supply to LSI however our view is that this might also include NSY ROX depending on the level of generation at Clyde. We would therefore like you to consider whether there is merit in upgrading NSY ROX. Even if this investigation doesn't recommend an upgrade it would be useful to understand the benefit for the enabling renewables investigation.

2. Also we think there is room for more visionary ideas such as a 220kV option line from Gore to Roxburgh to Waitaki Valley. This has the potential to meet the long term needs of the area for both importing and exporting power.

Question 7

Generally speaking we think there are wider benefits and costs that don't appear to be considered as part of your analysis.

Firstly on page 8 you state "325MW of generation at Manapouri is required to meet summer peak demand in 2009" however Meridian is concerned that we are not able to guarantee this level of generation as our capability is determined by inflows which varies significantly (please see attachment for additional information). There is no question here of cost as Manapouri largely operations as run of the river station and has very little opportunity to store water for the needs of grid security. We therefore would recommend that you apply some form of probabilistic analysis to the generation capacity if this is essential to meeting local demand. It is also worth noting that the Clutha catch has limited storage and there is significant correlation between Manapouri and Clutha inflows.

The second area is that some of the solutions may contribute to meeting the needs of both improving the Lower South Island reliability and enabling renewables. Solutions that have these dual benefits are

more likely to meet the long term needs of New Zealand and have the greatness overall benefit. However if these benefits are treated separately then we risk creating a solution that isn't robust. We therefore think that benefits to enabling renewables should be considered as part of this analysis.

Yours sincerely

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Attachment: Southland Grid Upgrade – Stakeholder Consultation

TRANSPOWER

Southland Grid Upgrade - Stakeholder Consultation

Information request from generators:

Please provide information on the following questions in detail. This information will enable Transpower to assess the supply reliability presently provided by the transmission grid in the Southland and for determining the options for future grid upgrades.

1. Flexibility of generation offered by the hydro generators in the region:
The flexibility needs to be addressed taking into account the environmental (including RMA), engineering design and operational constraints as well as any commercial contractual commitments.

1.1 What is the maximum / minimum level of available storage capacity?

Available "storage" between the extreme minimum level and the maximum control level (top of the Main Range) for Lakes Manapouri and Te Anau are as follows:
Lake Te Anau 275.5 GWh
Lake Manapouri 162.3 GWh

However the use and access of the storage in Lakes Te Anau and Manapouri are largely dictated by limitations imposed by the gazetted "Operating Guidelines for the Levels of Lakes Manapouri and Te Anau" pursuant to section 4a of the Manapouri-Te Anau Development Act 1963. These are included in the appendix for you review.

The operating guidelines are complex and constrain typical hydro storage optimisation activities. The intent of the guidelines is to ensure Lake operation is close to the natural lake hydrograph rather than a typical controlled storage environment.

The overall result is that the "storage" in Lakes Te Anau and Manapouri cannot be considered in the same terms as other hydroelectric storage reservoirs that are simply operated within defined minimum and maximum operating levels.

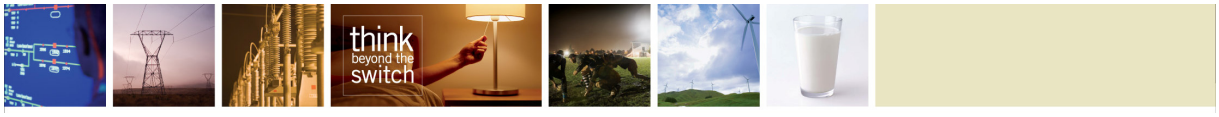
The complexities of the operating regime cannot be covered here. Meridian will provide further detail on the operation of the Manapouri system if required.

1.2 What level of seasonal variations in hydro inflows is expected (in normal years as well as dry and wet years)? Is there any correlation between seasonal inflows and southland demand?

Although long-term inflow records into Lakes Te Anau and Manapouri do exhibit a very weak seasonal signature, with slightly higher flows in spring and early summer and slightly lower flows in mid-winter, this seasonal signature is too weak to be usable. The strongly event-driven hydrology combined with the limitations imposed by the Guidelines negates the ability to plan based on seasonal parameters.

1.3 What is the range of generation (maximum and minimum) in terms of peak generation (MW) and energy (GWh) within a given time period.

Maximum generation is currently limited by an RMA consent condition limiting the Tailrace flow to a maximum of 510 cumecs. This currently equates to about 730MW (which includes a buffer to avoid governor frequency response offsets breaching the resource consent) but varies a little depending on head



at the time. Operation in the High Range of Lake Manapouri constrains generation to maximum available capacity. Operation in the Low Range of Lake Manapouri limits maximum daily volume dependant on inflow at the time and can severely reduce the ability to peak.
Generation volumes normally range from 4.3 to 17.5 GWh/day however daily volumes lower than 4.3 can occur during Low Range operation due to inflow at the time.

1.4 What are the limitations on ramping up/ down the generation in relation to:

- Ramp up /down rates
  (see the ACS)

- Availability of communications (and the cost of installing communications if required)
  Communications have only reasonable levels of availability and reliability owing to the remoteness of Manapouri and to some extent White Hills. The existing primary links have failed to both Manapouri and White Hills. To provide resilient communications *with completely diverse paths would likely be a very expensive exercise*

- Frequency of ramping operations (limitations if any, e.g., 1 x per day?)
  None

1.5 Indicate any significant hydrological flow constraints resulting from interdependency of hydrology / generation with other generating stations (e.g. from cascading lakes / generating stations).

Manapouri Power Station is not hydraulically linked to any other power station.

In resource consent terms there are considerable constraints for the management of both Lake Manapouri and the Te Anau. These tend to lead to a need to balance lake levels and manage both dry periods and wet events.

2 Generating asset capability:

2.1 What is the maximum reactive power support capability of the units?

White Hill - reactive power capacity has no impact at the Transpower grid level due to the distance from the grid, however there are four 5 MVA capacitor banks installed at North Makarewa on the 66 kV bus that are generally connected during high White Hill generation operation. Replacement of the NMA 220 kV / 33 kV transformers with 220 kV / 66 kV transformers and reconfiguring NMA accordingly, may improve the influence of these capacitors on the Transpower transmission grid.

Manapouri – has considerable reactive power capability. Please look at our ACS documentation. Also note this information is confidential.

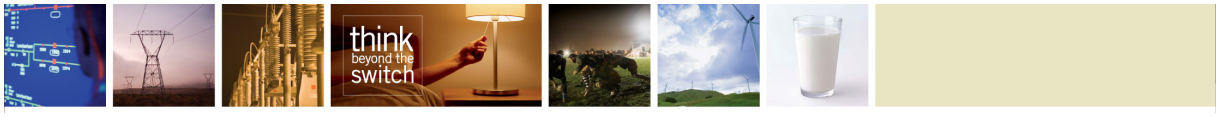
2.2 Are the generators capable of running with tail water depressed and provide reactive power support?

White Hill. no

Manapouri – Yes, this type of operation is provided - but has operational limitations due to risks of overtopping the surge chamber during large load acceptances

2.3 Influence on the lake levels

- on feasible generation capacity range (MW & GWh) and
- on generation efficiency.



Capacity is not significantly affected by Lake Level. Daily generation volumes are however significantly reduced during Low Range operation. The degree to which daily volume is reduced depends on inflow at the time.
Generation efficiency is not significantly reduced as head drops.

3 Generation Offers and Coordination:

3.1 Indicate the ability of the generator to enter into a grid support contract in the future. Also provide indicative quantity/ cost.

Developing purpose built options *- If the need can be defined Meridian may be able to provide assistance e.g. new voltage support equipment or inertial support (short term energy storage) equipment. Meridian has experience with devices of this nature.*

Manapouri *– has significant capability available to provide grid support over short periods of time. In theory it can peak up to ~730MW subject to machine availably, water availability and transmission limitations etc.*

The Southland/Otago peak is only 250MW above minimum demand. A grid support requirement any more than 250MW implies that the grid support is being required to meet base load demand.

Unfortunately because of the variable inflows Manapouri is not well suited to providing base load support and any grid support contract would need to have an energy limit of 4.3GWh per day to ensure that we could reliability meet the energy requirements of the grid support.

If an energy limit is not included in the grid support contract then Meridian would only be comfortable with providing grid support up to about 200MW to ensure a high level of reliability.

The cost of providing this service depends on the contractual terms of the agreement.

3.2 What are the constraints associated with or the benefits to be obtained by coordinating with other sources of generation in the company portfolio (e.g., wind)

Integrating the operation of White hill and Manapouri might allow Meridian to offer addition grid support as there is some diversity between wind and Manapouri inflows. We have not investigated this seriously but optimistic estimate would be ~20MW.

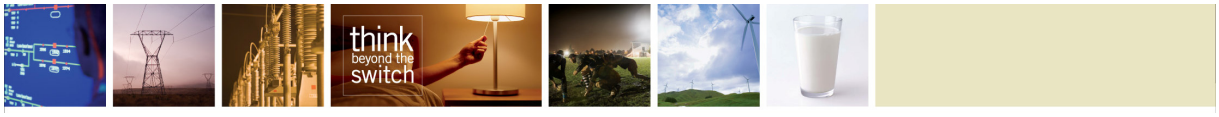
3.3. What is the flexibility available for accommodating intermittent generation with the same portfolio?

Block dispatch of White Hill with Manapouri can be implemented. This would require changes to Meridian's generation control systems and trading tools.

3.4 Are there any constraints/ factors determining generation mix from a given generating station if they inject into more than one node (e.g. 110kV/220kV or 110kV/33kVgeneration)

Under normal grid operation Meridian is not currently affected by local constraints.

3.5 What is the commercial or economic influence of HAMI/TPM on the level of generation and maximum generation?



New Projects -HVDC charge is about $100,000 NPV per MW of peak injection for Meridian. The business cases for continued operation of existing generation and the planning of new generation must include this charge. This makes Southland embedded generation (the local network is saturated with embedded generation), and South Island grid connected generation, less attractive than North Island investments.

Meridian estimates the HVDC charge for new entrants at around $430,000 NPV per MW of peak injection. Meridian believes it is unlikely that generators other than Meridian and Contact Energy will build new grid connected generation in the South Island. For example, if a 100 MW renewable generator costs $200m for a new entrant to build, it will also incur an additional HVDC cost in the order of $43m NPV, making it uneconomic.

Manapouri Tailrace Amended Discharge (MTAD) - The consent application for MTAD wasn't modified to avoid the HVDC charges. HVDC charges added some weight to the decision to try for 550 cumec max flow rather than 640 (810MW rather than 900MW). Although this was one of number of considerations

Meridian may choose to not run Manapouri up to the new consent while the current HAMI/TPM charging is in place. The problem is that the HVDC charges are incurred by peak MW, while the value to Meridian accrues from energy sold.

Meridian has developed optimisation models (SodaPop) for MTAD to look at the peak charge impacts simulated over the historical inflows (1933 to 2006). This shows that the rate of marginal energy gain drops off quickly as the maximum MW increases, It therefore becomes less and less attractive to secure peaking capacity. The value proposition for paying the HVDC charges for 810MW to get the full spill capture is still unclear.

4 Long-term development plans:

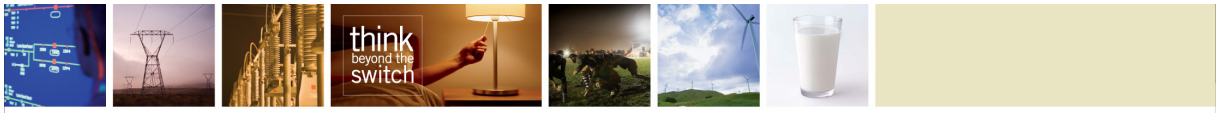
4.1 Are there any short term/ medium term plans for increasing/ decreasing generation capacity in the region?

Meridian has resource consents for an additional 12 MW of wind farm capacity at White Hill. The commitment of Meridian to developing this generation is dependent on PowerNet (The Power Co Ltd) committing to sub-transmission upgrades that will release this additional capacity. PowerNet has indicated in The Power Co Ltd's Asset Management Plan that these upgrades might occur in 2011. The upgrades are driven by demand growth. If the demand growth does not occur as anticipated then PowerNet will not upgrade its network and the wind farm extension will not progress.

Manapouri Tailrace Amended Discharge (MTAD) Meridian is preparing to apply to amend the tailrace resource consent. This will increase maximum generation output from 730MW to 810MW

The current consent limit is 510 cumecs, but Manapouri only operates up to 485 cumecs to maintain a buffer below the consent limit.

The MTAD consent would permit discharges right up to 550 cumecs. When the lake is in the low range its output at 550 cumecs will be about 800 MW. This will increase the station's reserve capability when it is generating at more moderate levels. Within the limits of its ramp rates, Manapouri should



be able to provide reserves up to the difference between its output and 800MW.

In the medium term Meridian also plans to progress Project Hayes in the Southland/Otago region. Hayes would connect mid way along the ROX-TMH A line. This proposal is in Environmental Court. Assuming a positive outcome, Meridian might have some generation available from Hayes in 2011.

Meridian is also considering a small number of minor potential generation opportunities that might be implemented in the longer term, post 2013, in this region.

4.2 For future generation, is there a preference to connect to the 110 kV or 220 kV networks in the region?

Constraints on the 110 kV systems are likely to discourage any new generation connections. Embedded connections are preferable in order to avoid the HVDC charge. For large proposals (larger than 60 MW), 220 kV connections are preferable in this region.