Intertie Restoration

RECOMMENDATION PAPER

Kelly L. Gunsch, Vice-President, Market Services

Date: October 7, 2010

Prepared by: Kris Aksomitis
Program Manager, OR & DR

Department: Market Services

Phone: 403-539-2623

Table of Contents

1. Executive Summary

Alberta currently has two interconnections with other jurisdictions, and these interconnections are subject to congestion that reduces the available transfer capability (ATC). The BC interconnection is rated at 1200 MW for imports and 1000 MW for exports, and the Saskatchewan interconnection is rated at 150 MW for both imports and exports. The Transmission Regulation directs the ISO to restore the capability of these paths and this paper recommends a range of initiatives to this end.

The AESO recommends developing an armable LSS service that will be called LSSi. LSSi will be dispatched by the system controller, which requires that suppliers be able to respond to arming and disarming instructions. Scheduled imports above 715 MW on the BC interconnection cannot be readily achieved via the development of an LSSi product given the current system configuration. Therefore, it is also recommended that other options to further restore import ATC should be pursued in addition to the LSSi initiative. One potential option that has been identified involves the installation of an AC/DC/AC converter station on the BC interconnection. The AESO is currently determining the viability of this option.

Export restoration requires resolving a range of constraints that currently limit export ATC to a maximum of 735 MW and an average of less than 400 MW. SOK limits are one of the limiters of export flows. Export limits are at the maximum when there is more southern generation online and/or southern load is low. Voltage stability limits, over-frequency protection for the loss of the intertie and BC internal constraints also limit export capacity.

In order to restore export capacity, the AESO recommends a process to solicit proposals for export restoration should be initiated. GRAS, using existing interconnections as a RAS, infrastructure solutions and any other technically feasible options will be considered. The AESO will work with market participants to develop criteria to evaluate proposals as well as to provide technical support for interested participants.

The AESO also recommends that several internal projects in response to stakeholder feedback and working group sessions continue. These include projects include integrating the wind forecast into the ATC calculation tool, auditing the ATC calculation tool to determine if opportunities exist to increase export ATC and updating system studies in response to new transmission infrastructure that will be online in the near future.

2. Purpose

The purpose of this paper is to summarize stakeholder comments to the intertie restoration discussion paper issued in February 2010, provide AESO responses to the comments and to provide AESO recommendations for intertie restoration. Note that the purpose of summarizing the stakeholder comments is to demonstrate the AESO's understanding of the comments and are not intended to reflect the official stakeholder position. The actual stakeholder comments (www.aeso.ca/market/20238.html) should be referred to for this purpose. The AESO welcomes feedback on all areas outlined in this recommendation paper.

3. Policy Coherence and Principles

Transmission interconnections with neighbouring jurisdictions are essential to a well functioning power market as they support reliability, market diversification, generation development and continued economic growth in Alberta. Albertans benefit from these interconnections by having the ability to import and export power as needed with physical access to diverse markets, achieving the most efficient, economic and environmentally beneficial exchange for a resource.

3.1 Obligation to Restore Capacity

The Transmission Regulation, Transmission Development Policy, Alberta's Electricity Policy Framework and the Provincial Energy Strategy all provide guidance relevant to restoring intertie capacity. The Transmission Regulation directs the ISO to develop a plan to restore the capacity of existing interties:

> 16(1) In making rules under section 20 of the Act, and in exercising its duties under section 17 of the Act, the ISO must prepare a plan and make arrangements to restore each intertie that existed on August 12, 2004 to, or near to, its path rating.
>
> (2) The plan to restore interties to their path ratings must specify how the ISO intends to restore and maintain each intertie to, or near to, its path rating without the mandatory operation of generating units.
>
> (3) The plan to restore and maintain interties must be incorporated into and form part of the transmission system plan as soon as practicable.

3.1.1 Stakeholder Comments

1. ATCO Power expressed concern that the proposal to charge some or all of the costs associated with restoring import capacity represented preferential treatment for imports relative to internal loads. ATCO suggested that the current approach of constraining import ATC is consistent with the Transmission Constraint Management protocol whereby upstream generation is curtailed and the price is set at the higher price from downstream generation. ATCO also noted that generators must carry the costs associated with any RAS on their facility, whereas imports would be restored with a RAS paid for by the system.
2. Alberta Direct Connect (ADC) agrees that the intertie capacity should be restored.
3. AltaLink agrees that the AESO has a duty to restore the intertie capacity in order to maintain reliability and promote a FEOC market.
4. Capital Power supports the initiative to optimize and efficiently utilize current transmission infrastructure.
5. ENMAX agrees that the legislative framework requires the AESO to restore intertie capacity.
6. IPCAA agrees that the legislation and policy establish a clear duty to restore the interties. IPCAA believes this is a priority and it should be pursued in a timely

manner. There are other policy issues that must be resolved but these should not hold up the development of the LSSi product.

7. NaturEner agreed that the AESO has an obligation to restore intertie capacity, but noted that that obligation is in the context of 3 interties (including MATL), rather than only the existing interties.

8. TransAlta believes import and export capacity should be restored in parallel. It is not FEOC to proceed with one initiative without taking action on both sides of the equation.

9. TransCanada states that there is a very explicit obligation for the AESO to restore intertie capacity. TransCanada notes that with an increasing amount of wind generation expected on the system, restoring export capacity in hours when it is economic to export is of particular importance. Export restoration should not wait until major transmission upgrades are completed.

3.1.2 AESO Response and Recommendation

The AESO acknowledges its obligation to restore both import and export capacity. The AESO has initiated working groups for both import and export restoration in an effort to meet this obligation. These initiatives are equally important, but implementation of specific projects to restore capacity in one direction or the other may proceed at different rates.

The import restoration group has focused on the development of LSSi to date. The AESO recommends that the development, procurement and implementation of the LSSi product proceed as the first step in the import restoration initiative. Subsequent initiatives will be pursued to further restore the intertie capacity per the Transmission Regulation requirement.

The export restoration group has examined a number of options to increase export ATC. Several of the initiatives discussed include:

- Examine range of RAS options, including GRAS and using interconnections as RAS
- Initiate a study of historical export ATC posting based on forecast values versus potential export ATC based on actual values
- Examine transmission investment options, such as DC converters with the BC system
- Conduct studies to determine whether technology, infrastructure or operational practice changes exist that would increase export ATC

The AESO recommends that both the import and export restoration initiatives proceed in order to meet the direction from the Transmission Regulation to restore intertie capability. While it is unlikely all of the potential restoration options identified in the working group will proceed, the AESO is currently conducting preliminary work to assess the technical feasibility options identified.

3.2 Cost Allocation

A key issue in developing services to restore intertie capacity is whether they should be treated as system services and funded by load, or whether they should be treated as

'market' services and funded by the individual users of the service. For example, a service to restore export capacity could be funded by exporters, or it could be funded by load generally as an ancillary service cost.

The Transmission Development Policy paper[1] states that services to restore intertie capacity should be allocated to load.

> Inter-ties are an essential part of a competitive market both as a means to import power when needed, and to export surplus energy and to support effective functioning of the wholesale market. Without such capabilities, market signals and wholesale prices are distorted and unreflective of true market conditions. Since the ability of inter-ties to exchange electricity in both directions (i.e. import and exports) is essential to a robust wholesale market and a reliable electric system, the cost for internal reinforcements and RAS arrangements to allow the inter-ties to function as designed will be allocated to load.

3.2.1 Stakeholder Comments

1. The ADC believes that the fixed cost of the import service should be allocated to load and any variable component allocated to importers that are using the service. The cost for export restoration should be borne by the exporter as they directly benefit from the service.

2. AltaLink agrees with the AESO that the proposed products are temporary "non-wires" solution to address congestion problems that impact the ability of the market to access the intertie for both imports and exports. AltaLink suggests that the cost allocation for import and export restoration should reflect the principles set out in Transmission Policy and Regulation.

3. Capital Power states that transmission support products should be treated as non-wires solutions for resolving transmission constraints and transmission costs should be allocated to load. At this time there is not enough information available on the pricing structure of these products to provide comment on the appropriateness of variable cost flow through.

4. EnerNOC takes no position as to the appropriate allocation of LSSi costs at this time, beyond the general principle that beneficiaries of a product or service should generally pay for it.

5. ENMAX agrees that loads should pay import-related costs, since loads benefit from increased import capacity. However, ENMAX does not support having loads pay for export capacity.

   ENMAX states that import and export capacities should be determined by the market, not by the AESO or the government. ENMAX agrees with the AESO that variable costs should be charged to the users of a service that causes costs to be incurred.

   Charging loads for the fixed costs associated with exports violates the principle of cost causation, creates a mismatch between risk and reward, creates subsidies

[1] Transmission Development - The Right Path for Alberta - A Policy Paper. Government of Alberta, November 2003. Page 9.

from Alberta consumers to consumers in other provinces and the United States, and potentially saddles consumers with significant stranded costs.

ENMAX supports the concept of an export must run service to support exports. It could be made openly competitive by having a competitive process to determine which southern generator is paid to stay online to support exports; both gas-fired generators and wind generators with “backstop” contracts could participate.

6. IPCAA believes that the fixed costs associated with restoring import capacity should be charged to loads, since loads will benefit from the additional capacity. The LSSi product should be designed to include three pricing components: (1) an availability payment; (2) a utilization payment; and (3) an exercise payment. Loads should pay the availability payment; however, importers could pay the utilization payment in exchange for acquiring ATC. As stated in the paper, variable costs associated with import capacity restoration services may be allocated to the product user.

   IPCAA does not agree with loads paying for export restoration. This will send a perverse price signal. Exporters and consumers in other marketplaces will benefit from the restoration of export capability.

7. NaturEner agrees that the Transmission Development Policy clearly contemplates that load would bear the cost of services to increase intertie capacity. NaturEner supports the AESO's characterization of the proposed intertie support product as akin to a "wires solution" and therefore an inappropriate cost to be charged to importers and exporters. In order to provide meaningful comments on a variable cost proposal, the specifics of the product design need to be detailed. If AESO determines that importers must be charged the variable cost, and if the magnitude is significantly higher than costs associated with AESO tariffs for IOS, NaturEner would expect there to be an associated direct benefit to the importer providing the payment.

8. TransAlta believes all costs associated with import and export restoration should be allocated to load.

9. TransCanada states that exports are loads, albeit with fewer rights than intra-Alberta load, and should be treated as such, i.e. the cost of export restoration should be allocated to load.

   TransCanada suggests the AESO should consider whether it is appropriate to fund a portion of the direct costs of restoring import capacity to imports or develop some other mechanism to level the playing field and potentially benefit Albertans. Import suppliers have a number of advantages over generators in Alberta and TransCanada sees merit in allocating the variable costs of restoring import capacity to importers where those importers have caused the variable costs to be incurred.

3.2.2 AESO Response and Recommendation

The AESO recommends that the cost of import and export restoration should be charged to load on the basis that these costs are akin to a non-wires solution to optimizing the transmission system capability. This recommendation is consistent with explicit policy

guidance provided by the Alberta government, as well as with current practices for services such as Load Shed Service that provide both a reliability and transmission capability benefit.

The AESO does not recommend that the incremental variable costs associated with the use of LSSi, GRAS or other services or infrastructure investments contemplated should flow through to the users of the product. The level of these costs would be arbitrary based on the design of the product, and could also form a potential distortion in the decision to import or export in a given hour. The AESO also notes that this treatment would be inconsistent incremental costs necessary to support an internal load or generator.

The AESO does not agree with comments that suggest differential treatment for imports and exports. Charging either imports or exports for the cost of restoration in isolation has the effect of altering the energy price signal by encouraging more imports or more exports, depending on which flow was charged the higher price. Intertie restoration policy should not be used to explicitly influence price outcomes in this manner.

4. Restoration Plans

4.1 Import Restoration

Alberta has used and continues to use two distinct products to reduce constraints on imports over the BC interconnection. ILRAS service has been in place since 1998, when it was originally implemented by TransAlta. ILRAS is an armable service that allows loads to be tripped when the intertie is tripped under high import conditions. Load Shed Service is also used to support import transactions. LSS is a frequency responsive product that trips loads anytime the system frequency drops below 59.5 Hz, irrespective of interchange levels or system load conditions.

4.1.1 Stakeholder Feedback

1. The ADC agrees that LSSi service should be procured for in market use. The pricing mechanism, arming requirement, and telemetry requirements will be key to getting load interested in participating.
2. AltaLink noted that the definition of proposed LSSi only allows load assets to participate. This would eliminate the opportunity for fast response supply assets (< 12 cycles) to provide this service. AltaLink requests that any technology that meets the requirements be eligible to sell the service. AltaLink requests the AESO to consider a shorter duration of service than 60 minutes for the product.
3. Capital Power asked why LSSi is being pursued as compared to ILRAS and if ILRAS would continue to be procured.
4. EnerNoc supports the development of the LSSi product.
5. IPCAA requested information as to whether there are ways to increase import capacity beyond 715 MW with LSSi. IPCAA agrees that import capacity should be available for ‘market’ use and not restricted to reliability usage. However, the design of the product must be such that it actually results in an increase to import ATC.

6. NaturEner supports efforts to increase ATC for in market use and notes that market driven events will drive the need for ATC support products. NaturEner encouraged the AESO to examine the ability for counterflows to increase import ATC.

4.1.2 AESO Response and Recommendation

The AESO agrees with the stakeholder feedback that suggests LSSi should be made available for 'in market' use. This is consistent with the AESO's duty to restore the capacity of the interties and the policy directive that intertie capacity benefits the market through access to external markets.

The AESO recommends that the LSSi product development proceed as a priority for the AESO. The AESO has consulted with potential LSSi providers in the product design, and has incorporated this input to the extent possible within the existing market framework and policy guidance.

The AESO recommends that the key components of the LSSi product are:

- The product is armable/disarmable via communication with the system controller.
- A three part payment structure akin to the standby operating reserve market. The three payments are:
    - Availability payment – paid to providers in all hours they are capable of supplying LSSi.
    - Arming payment – paid to providers in all hours they are actually armed and at risk of being tripped.
    - Tripping payment – paid to providers in the event a qualifying event occurs and the load is actually tripped.
- The available LSSi will be used to post a higher ATC and LSSi will be armed as required based on scheduled flows.
- LSSi is a system service and the AESO does not support the bilateral procurement of LSSi or the creation of 'transmission rights' associated with LSSi. All ATC will be treated equivalently.
- The AESO acknowledges that LSSi should not be technology specific and will amend the technical specifications to reflect this intent. It should also be noted that the AESO will accept ILRAS providers in the LSSi program, i.e. providers will be allowed to trip based on an intertie trip or based on system frequency, as long as the response occurs in the timeframe required.

The AESO recommends that additional options be pursued to further restore the intertie capacity beyond LSSi. In particular, an option has been identified that requires back to back AC/DC/AC converter stations that allow flows over interconnections to be isolated. This could result in an increase to ATC over the BC interconnection because flows could be scheduled on the 138 kV system, and these flows continue even if the 500 kV line tripped. These options will be studied and the AESO will initiate discussions with the relevant external parties.

The AESO is also exploring options to restore existing intertie capacity that involve using existing interties as a RAS. These options utilize unused capacity on one intertie to backstop larger flows on another intertie. The AESO recommends that these options should be implemented if technically feasible and the impacted market participants are willing to supply the service.

The AESO recommends a process to solicit proposals for import restoration should be initiated. The specific options identified above are possible solutions, but the AESO is also aware that other options such as batteries or transmission infrastructure may result in an increase to import ATC.

4.2 Export Restoration

Export ATC is currently constrained primarily due to limitations on the north south (SOK cutplane) transmission system. Voltage stability limits, over frequency on loss of the intertie and constraints on the BC transmission system also limit export ATC below the path rating.

In the Import Restoration Discussion Paper, the AESO identified GRAS options that would increase export capacity after the north south transmission upgrade as the primary initiative to restore export capacity. The paper also identified incorporating the wind power forecast into the export ATC calculation as an initiative to increase export capability.

4.2.1 Stakeholder Feedback

1. AltaLink commented that the proposed definition of GRAS limited technology choices to generation. The service should be open to all technologies that can meet the specifications.

   AltaLink raised a concern for transmission facility owners (TFOs). GRAS trip signals would be sent from TFO facilities and AltaLink is concerned that this would result in liability issues if a TFO asset malfunctioned.

2. Capital Power supports the GRAS initiative to increase the export limit, but suggests the AESO should also pursue GRAS options to increase SOK capability.

3. ENMAX supports export ATC restoration initiatives provided they are paid for by exporters.

4. IPCAA does not object to export ATC restoration initiatives but states exporters should pay the cost.

5. NaturEner supports the use of southern wind generation in the export ATC calculation. NaturEner asks the AESO to consider allowing counterflows to clear prior to the determination of export ATC.

6. TransAlta states that the AESO should pursue the development of a GRAS product both to support export ATC and to support higher SOK capability. TransAlta believes the AESO also needs to consider other short term actions to restore export capability, and that the availability and timing of export capacity must be similar to import capacity in order to support the FEOC market.

7. TransCanada supports the development of GRAS, and that the AESO should not wait for the north south transmission upgrade to pursue options that increase export ATC in all hours. TransCanada believes the focus on GRAS for export restoration is too narrow and excludes important wires solutions that can decongest the transmission system. Exports increase utilization of Alberta generators when they are economic and attract investment that benefits Alberta. TransCanada also agrees that exports improve the ability to absorb wind generation.

   TransCanada supports the use of wind forecasting in the export ATC calculation and states that access to export markets is important for the continued development of this resource.

   TransCanada believes the AESO should examine whether the negative impacts associated with bifurcating ancillary services markets and/or using export must run service to support export ATC before determining these options will not be pursued.

   TransCanada also notes the concern raised by TransAlta that export ATC is often posted very close to real-time when it is not practical to actually use.

4.2.2 AESO Response and Recommendation

The AESO agrees with the stakeholder comments suggesting that the GRAS initiative should be expanded to examine other options for increasing export ATC. The AESO has formed an export ATC workgroup that has identified numerous options for increasing export ATC, and the AESO is currently examining the feasibility of several initiatives including:

- A range of RAS options, including GRAS and using interconnections as RAS
- Transmission investment options, such as DC converters between the Alberta and BC systems

The AESO recommends a process to solicit proposals for export restoration should be initiated. The specific options identified above are possible solutions, but the AESO is also aware that other options such as batteries or transmission infrastructure may result in an increase to export ATC at a lower cost than options such as GRAS. The AESO will work with market participants to develop criteria to evaluate proposals as well as to provide technical support for interested participants.

The AESO recommends that solutions that require generation to operate outside of the energy market merit order (such as export must run service) should not be pursued. These services impact the energy market by influencing the offer behaviour of units that could potentially offer the service. Additionally, the Transmission Regulation explicitly excludes the “mandatory operation” of generation units to restore intertie capacity, and an export must run service has very similar characteristics.

The AESO does not recommend that splitting the ancillary services market should be considered as a means to increase export ATC. This raises market power concerns in the ancillary services market, and is inconsistent with the pooled approach to energy markets.

The AESO is also working on several internal projects in response to stakeholder feedback and working group sessions. These include:

- Integrate the wind forecast into the ATC calculation tool
- Audit the ATC calculation tool to determine if opportunities exist to increase export ATC
- Update studies in response to new transmission infrastructure that will be online in the near future

The AESO recommends that these efforts continue and any increases to export ATC that can be realized be implemented.

5. Summary and Next Steps

The AESO recommends that the initiatives to restore intertie capacity proceed. In this regard the AESO will:

- Continue to develop the LSSi product with the plan to have LSSi in place for early 2011 as one tool to restore import capacity on the BC interconnection
- Allocate the costs associated with restoring intertie capacity to loads
- Study the potential value and technical feasibility of infrastructure solutions such as a back to back AC/DC/AC converter station with the BC system for both import and export restoration
- Issue a request for proposals for both import and export restoration. This will be open to proposals that incorporate transmission, generation, storage technologies or any combination of tools that result in increased import or export ATC. The proposals will be evaluated based on cost, effectiveness, timeliness and sustainability.

Please provide comments following the associated comments matrix to Kris Aksomitis, Kris.Aksomitis@aeso.ca by October 22, 2010. Should you have any questions on this paper in the interim, please contact Kris Aksomitis at 403-539-2623.