

## **401 REGULATING RESERVE SERVICE**

### **1. Purpose**

To define the policy and procedures for the system controller (SC) in dispatching generators for regulating reserve service to manage regulation range levels in the Alberta balancing authority area.

### **2. Background**

The criteria for determining minimum operating reserves, comprising of contingency reserves plus regulating reserves are established by the Alberta Reliability Standards. Based on regulating reserve levels identified in [Table 1](#), the ISO will procure regulating reserves from the ancillary service exchange or by other means. The SC may be required to adjust the volume of regulating reserve in real-time based on actual system conditions.

Generators that provide regulating reserve service are controlled by an automatic generation control (AGC) system that adjusts generator output levels within an established regulation range to compensate for the moment-to-moment changes in load and generation, as well as to follow the trend in energy imbalances. This compensation provides a balance between generation and load within the Alberta balancing authority area while maintaining the interchange schedule on the interconnection with British Columbia and the scheduled frequency of 60 Hz. AGC performance is monitored applying the requirements in the Alberta Reliability Standard's control performance standards.

Regulation range is the total amount of generation (MW) made available for AGC operation between the upper and lower regulating limits of each generator providing the regulating reserve service.

All generators on AGC are controlled through either the AltaLink AGC master controller or the ISO AGC master controller. When operating in the set point control mode, all generators will respond to control set points calculated by the ISO AGC master controller. The set point specifies for each generator a MW control level to ramp to, based on their portion of the total AGC range being used in the AIES at the time.

The SC uses the ancillary service merit order, which is sorted in priority sequence and has a maximum contract amount for each offered asset, for the dispatching of regulating reserve. The ancillary service merit order contains two supply types: active and standby. Regulating reserve assets with an active supply type will normally be dispatched and assets with a standby supply type will only be dispatched if required.

### **3. Policy**

#### **3.1 General**

- Operating reserves consist of regulating reserves and contingency reserves. This document addresses regulating reserves and [OPP 402](#) addresses contingency reserves.
- The volume (MW) of regulation range will not be less than the minimum shown in [Table 1](#).

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- The maximum amount of energy that will be dispatched for each asset is equal to the ISO contract amounts displayed in the ancillary service merit order or the amount the ancillary service provider has made available in the energy trading system ancillary service declarations, whichever is less.
- The marginal asset dispatched for regulating reserve service can be partially dispatched.
- In the set point control mode, the ISO AGC master controller calculates the set points for all generators providing regulating reserves. The set point calculation considers the high regulating limit, low regulating limit and ramp rate as per operating constraints for each generating unit.
- All regulating reserve service assets controlled by the AltaLink AGC master controller will normally be operated in the EX (external base point) control mode with a priority set at 0, which will use the set points calculated by the ISO AGC master controller.
- Regulating reserve service assets controlled directly by the ISO AGC master controller are either on or off and have no other specific control modes.
- Resources may be suspended if they do not comply with the applicable Technical Requirements. Suspended resources will not be included in the ancillary service merit orders unless they have been reinstated.

### **3.2 Priority for selecting portfolios**

- Resources from the active portfolio are to be fully dispatched unless such dispatch would jeopardize system reliability. If there is a risk to system reliability, reduced volumes of active resources may be dispatched.
- If active portfolio resources are insufficient to meet the system requirements for regulating reserves then ancillary service resources from the standby portfolio will be dispatched.
- Standby portfolio resources will be dispatched from the ancillary service merit order. The ancillary service merit order sets out the priority order of the dispatch. Standby portfolio resources will be dispatched in order of increasing priority with the lowest priority being dispatched first.
- Under circumstances when more regulating reserves are required than are offered/dispatched in both portfolios, active and standby, then directive(s) will be issued to direct those ancillary services resources that are not offered in the ancillary services market to provide ancillary services.

### **3.3 Regulating reserve dispatches under system constraints**

- System constraints can cause regulating reserve dispatch to be either:
  - A partial dispatch from lower priority ancillary services; or
  - A bypass of the dispatch of a lower priority resource.
- System constraints can result from either:
  - System conditions where the dispatch of resources from the active portfolio would jeopardize system reliability; or

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- Transmission outage events restricting the flow of energy from an area, thereby limiting the utilization of some resources.

### **3.4 AGC**

- The ISO will operate the AGC on Tie Line Bias (TLB) mode unless such operation is adverse to system or interconnection reliability.
- When the AIES is separated from the Western Interconnection, the AGC will be operated on Constant Frequency (CF) mode.
- If the ISO is unable to calculate area control error (ACE) for more than 30 minutes, the Vancouver Reliability Coordinator (VRC) will be notified

## **4. Responsibilities**

### **4.1 ISO**

The ISO will:

- As required, review and revise the requirements for regulation range and regulating reserves.
- Acquire sufficient regulating reserve resources for the active and standby portfolios.
- Monitor and assess the performance of resources providing regulating reserve service.

### **System Controller (SC)**

The SC will:

- Dispatch assets for regulating reserve service according to the ancillary services merit order, starting with the lowest numbered regulating reserve service offer in the priority sequence.
- Ensure a dispatch time of no less than 15 minutes from the time of dispatch, unless mutually agreed to with the ancillary service provider.
- Ensure active supply type assets are fully dispatched whenever possible.
- Identify assets providing the regulating reserve service with an RR service type using the dispatch tool.
- When practical, maintain a regulation range, on an hourly average, between the minimum range and maximum range shown in [Table 1](#).
- If the maximum range indicated in [Table 1](#) is exceeded because the SC needs more regulation range due to system conditions, log the reason in the dispatch tool comment field of the asset(s) dispatched above the maximum range.
- Operate the AGC on TLB mode unless such operation is adverse to system or interconnection reliability.
- Operate the AGC on CF mode when the AIES is separated from the Western Interconnection.

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- Notify the VRC if Alberta has lost the capability to calculate ACE or to operate the AGC for more than 30 minutes.

#### **4.2 Ancillary Service Provider**

The ancillary service provider will:

- Restate the ancillary service declarations 30 minutes before the start of the hour, if possible. This will ensure restated active supply type assets will be dispatched. By 15 minutes before the start of the hour, the SC will have ancillary services dispatched. Ancillary service providers restating ancillary service declarations after this time need to call the SC to inform him of the change in their ancillary service declarations. The SC will then assess at what time the changed asset can be dispatched.
- Ensure that the appropriate ramp rate for the generating unit providing the regulating reserve service is entered in the operating constraints. This ramp rate will be used in the set point calculation by the ISO AGC master controller and must match that of the unit capability.
- Position the generator within the established regulation range and have the generator(s) ready to respond to control signals from the AGC controller by the dispatch time.
- Decline a dispatch received with less than 15 minutes to the dispatch time if they are unable to comply. The ancillary service provider will then immediately call the SC to explain the reason for declining the dispatch, at which time the SC will assess if another asset will be dispatched or if the asset will be re-dispatched with no less than 15 minutes to the dispatch time.
- Notify the SC of any changes to the regulation range of a generator providing regulating reserve service and restate the asset's ancillary service offer to reflect this change.
- Restate the availability of the generator if the asset is withdrawn from actively providing regulating reserve service.
- Restate out of the energy market merit order any energy issued an ancillary service dispatch from the ancillary services merit order. A restatement must be submitted any time energy availability or amounts change.
- Comply with SC directives to direct ancillary services resources that are not in the ancillary services market to provide ancillary services, unless there is an immediate risk to personnel, equipment safety, environment (including hydrological constraints) or the public.

#### **4.3 TransAlta Generation Operator**

The TransAlta generation operator will:

- As directed by the SC, include in or remove from the AltaLink AGC master controller, regulating reserve assets.
- Ensure regulating reserve assets included in the AltaLink AGC master controller are in EX - external base point mode with a priority set at 0 unless notified by the SC to change to the CE mode.

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## **5. System Controller Procedures**

### **5.1 Dispatching assets on regulating reserve service**

The SC will:

1. Dispatch up all regulating reserve assets with an active supply type offered in the ancillary service merit order, unless an asset can cause a risk to system reliability, and identify to the ancillary service provider the:
  - a. Dispatch time, which will be no less than 15 minutes from the time of dispatch unless mutually agreed to with the ancillary service provider.
  - b. Amount (MW) of regulating reserve service required.
2. Determine the amount of regulation range needed to meet the real-time operational requirements of the AIES.
3. Refer to [Table 1](#) to identify the minimum regulation range and maximum regulation range for the hour.
4. If more regulating reserve service is required than is offered as active supply type, select the regulating reserve asset(s) and volume of regulation range to dispatch according to their priority in the ancillary services merit order in the dispatch tool.
5. When a regulating reserve asset with a standby supply type is dispatched, identify one of the following causes in the dispatch tool comments:
  - a. Insufficient resources to meet requirements.
  - b. Failure of another resource.
  - c. Declined dispatch by another resource.
  - d. Transmission constraint.
6. Dispatch the regulating reserve asset using the ancillary service merit order in the dispatch tool and identify:
  - a. The time the asset is to provide the regulating reserve service. This time is to be no less than 15 minutes after the ancillary service dispatch is issued to the provider unless mutually agreed to by the SC and the ancillary service provider.
  - b. Amount (MW) of regulation range required.
7. If more regulating reserves are required than are offered/dispatched in all portfolios:
  - a. Direct regulating reserve resources that are not offered in the ancillary services market to provide ancillary services with use of the ancillary service dispatch tool. The tool will flag these regulating reserve resources as “O” (out of market).
  - b. Follow up the directive with a phone call to the regulating service provider to confirm.
  - c. Adjust the directive volume if required as system conditions change.
  - d. Cancel the directive when it is not required.
  - e. Enter in the shift log the details of the directive including reasons, times and participant names, as described in [OPP 1301](#).

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8. Check Ranger display 6955, AGC, to confirm the AGC parameters for each generator.
9. If the AltaLink AGC master controller controls the regulating reserve asset and AGC is operating:
  - a. in the set point control mode refer to [Section 5.3](#).
  - b. in the percentage of ACE control mode, refer to [Section 5.7](#).
  - c. with AltaLink performing the master controller function, refer to [Section 5.5](#).
10. Refer to [Section 5.4](#) if the ISO AGC master controller controls the regulating reserve asset.

## **5.2 Dispatching assets off regulating reserve service**

The SC will:

1. Determine the amount of regulation range no longer required.
2. Dispatch off the regulating reserve asset in descending priority as indicated in the ancillary service merit order in the dispatch tool.
3. Enter the date and time the regulating reserve asset was dispatched off in the dispatch tool.
4. Refer to [Section 5.3](#) step 2 if the AltaLink AGC master controller controls the regulating reserve asset.
5. Refer to [Section 5.4](#) step 3 if the ISO AGC master controller controls the regulating reserve asset.

## **5.3 Regulating reserve assets controlled by the AltaLink AGC master controller**

For each regulating reserve asset controlled by the AltaLink AGC master controller, the SC will request the TransAlta generation operator to:

1. Include in the AltaLink AGC master controller each of the dispatched regulating reserve assets controlled by the AltaLink AGC master controller.
2. Ensure when operating in the set point control mode that the AltaLink AGC master controller is set to the EX - external base point mode with a priority set at 0. Refer to [Section 5.5](#) if AltaLink is performing the AGC master controller function or refer to [Section 5.7](#) if the ISO AGC controller is operating in the percentage of ACE control mode.
3. When an asset is dispatched off of regulating reserve service, request the TransAlta generation operator to remove the asset from the AltaLink AGC master controller.

## **5.4 Regulating reserve assets controlled by the ISO AGC master controller**

For each dispatched regulating reserve asset controlled through the ISO AGC master controller the SC will:

1. On Ranger display 3913, AGCALL, ensure the following:
  - a. The Auto Part % poke point is solid blue. This is the preferred condition as it indicates the participation factor is being calculated automatically. If the poke point is an open white square the SC must calculate the participation factor for each asset by using the formula:

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$$\% \text{ Participation factor of asset} = \frac{\text{Regulation range of asset}}{\text{Total dispatched regulation range}} \times 100\%$$

- b. The NAME column displays the asset name. Squares in this column will indicate red if the individual generators at the plant are on AGC and the squares will be open when the generator is off AGC.
  - c. The DT column indicates by the green diamond that the asset has been dispatched on through the dispatch tool.
  - d. The AGC column indicates On. A red On indicates the plant has turned on their AGC, the asset has been dispatched on through the dispatch tool and Set PT Control and ACE Control on Ranger display 1275, PLTREGMO are on. The 1275 indications normally do not require adjustment.
  - e. Ensure the raise and lower ranges are accurately reflected in the Control Range columns.
  - f. Ensure the plant is reacting properly to the value shown in the SIGNAL column. This value is the control signal being sent to the plant and the plant should be ramping to this level. The signal for AltaLink indicates their portion of ACE and not an actual target value.
  - g. Ensure the participation factor, shown in the ACE Part Fact column, is correct for each dispatched asset.
  - h. Ensure the value shown in the ACTUAL column reflects the actual output of the plant on AGC. If the plant is on AGC this value should be dynamic and moving towards the value shown in the SIGNAL column.
2. Access Ranger display 1275 if problems are encountered with the plant's AGC parameters by clicking the MO poke point on Ranger display 3913. The SC has the ability to change the status, the level, the range and the ramp rates of the plants on AGC by implementing an override on this display. If the plant has tripped off of AGC due to tracking or other software issues, the Setpnt Output Mode will have to be turned back on from this display.
  3. To remove the plant from AGC service, dispatch the asset off of regulating reserve service using the dispatch tool.
  4. If a generator cannot be put on AGC through the dispatch tool and an override is required, go to display 3913, click the point in the MO column for the appropriate generator. This action will cause a jump to display 1275, from this display change the status of the generator in the override column to on. The AGC status on display 3913 will change to on.

### **5.5 Switching the AGC master controller function from the ISO to AltaLink**

If the ISO AGC master controller fails and the AGC master controller function needs to be switched to AltaLink, the SC will:

1. From display 3913 or 1120 switch the ISO AGC master controller to the monitor mode by clicking the "AGC Monitor" soft key.
2. Request the TransAlta generation operator to:
  - Switch the AGC control mode for all generators on AGC from the EX - external base point mode to the CE mode.

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- Assign a priority of 1 to all generators on AGC.
  - Manually select the appropriate heat rate curve for the range that each hydro generator is being regulated in.
3. Request the AltaLink south transmission operator to switch their AGC master controller to deactivate the use of the external ACE signal received from the ISO.
  4. Ensure the AltaLink south operator has the correct schedule in place for the BC interconnection.
  5. As required to assist regulation, manually dispatch generators that are no longer directly receiving set points from the ISO AGC master controller by overwriting the set points for each generator on display 3913.
  6. Refer to [Section 5.6](#) to return to normal operation.

#### **5.6 Return to normal operation – Switching the AGC master controller function from AltaLink to the ISO**

To return to normal operation the SC will:

1. Request the TransAlta generation operator to switch the AGC control mode for all generators on AGC from the CE mode to the EX - external base point mode and to assign a priority of 0 to all generators on AGC.
2. Go to display 3913 or 1120 and turn on the ISO AGC master controller by clicking the “Restart AGC” soft key.
3. Perform the following to verify participant control for AltaLink is off:
  - Go to display 1246 and find “TAU” under “PARTICIPANT NAME” (try page 5).
  - Check the corresponding “ACE OUTPUT MODE” field is “OFF”. If this field indicates “ON” then turn it off.
4. Request the AltaLink south transmission operator to activate the use of the external ACE from the ISO on their AGC master controller and notify the operator that the ISO AGC controller is operating in external set point control.
5. If generators were manually dispatched for regulation by the SC, go to display 3913 and remove the override from the generator set points.

#### **5.7 Switching AGC to Percentage of ACE control mode**

If there is a problem operating in the set point control mode with AltaLink, and the ISO AGC master controller can be switched to the percentage of ACE control mode, the SC will:

1. Request the TransAlta generation operator to:
  - Switch the AGC control mode for all generators on AGC from the EX - external base point mode to the CE mode.
  - Assign a priority of 1 to all generators on AGC.
  - Manually select the appropriate heat rate curve for the range that each hydro generator is being regulated in.

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2. Perform the following to turn participant control for AltaLink on:
  - Go to display 1246 and find “TAU” under “PARTICIPANT NAME” (try page 5).
  - Turn the corresponding “ACE OUTPUT MODE” field to “ON” (the ISO AGC master controller will now send a percentage of ACE to the AltaLink AGC master controller).
3. Call the AltaLink south transmission operator and:
  - Verify their AGC master controller has external ACE set to active.
  - Notify the operator that AltaLink should now be receiving a portion of the ACE signal from the ISO AGC master controller.
  - Request to be notified if there are any problems. Confirm the dynamic BC interchange schedule is being received.
4. To return to normal operation refer to [Section 5.8](#).

**5.8 Return to normal operation – Switching AGC from Percentage of ACE control mode to set point control mode.**

To return to normal operation the SC will:

1. Request the TransAlta generation operator to switch the AGC control mode for all generators on AGC from the CE mode to the EX - external base point mode and to assign a priority of 0 to all generators on AGC.
2. Perform the following to turn participant control for AltaLink off:
  - Go to display 1246 and find “TAU” under “PARTICIPANT NAME” (try page 5).
  - Turn the corresponding “ACE OUTPUT MODE” field to “OFF” (the ISO AGC master controller will now send a percentage of ACE to the AltaLink AGC master controller).
3. Verify with the AltaLink south transmission operator that their AGC master controller has external ACE set to active. Notify the operator that the ISO AGC master controller is operating in the external set point control mode.

**5.9 Notifying the VRC**

If the ACE can not be calculated by either the ISO system or the AltaLink system for more than 30 minutes, or the AGC fails on both systems, the SC will:

1. Notify the VRC.
2. Log the event as described in [OPP 1301](#).
3. Notify the VRC and log the event when the ACE calculation and the AGC return to normal function.

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## 6. Figures and Tables

**Table 1**

Regulation range guidelines

<b>Time Period (Hour Ending)</b>	<b>Minimum Regulation Range (MW)</b>	<b>Maximum Regulation Range (MW)</b>
1	110	175
2	110	175
3	110	175
4	110	175
5	110	175
6	110	225
7	110	225
8	110	225
9	110	225
10	110	175
11	110	175
12	110	175
13	110	175
14	110	175
15	110	175
16	110	175
17	110	225
18	110	225
19	110	225
20	110	225
21	110	225
22	110	225
23	110	225
24	110	225

## 7. Revision History

<b>Issued</b>	<b>Description</b>
2009-xx-xx	Supersedes 2008-11-13
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2004-02-24	Approved for interim implementation
2003-07-28	Revised to ISO Operating Policies and Procedures