1. **Purpose**

   To establish processes for reporting AIES system disturbances and documenting potential recommendations for subsequent action. This OPP outlines criteria for Alberta system relevant events, responsibilities, general content of an Alberta disturbance report, and identification, tracking and resolution of system disturbance issues.

2. **Background**

   Disturbance analysis and reporting is a key process of the reliable and safe operation of power systems. This process is aimed at improving system performance by reviewing system events, and identifying and correcting problems that arise from these events, in a timely and effective manner, thereby minimizing the likelihood of similar events in the future. Also, it will provide valuable feedback to facility owners, system and operations planners and real-time operators. An important aspect of this process is disturbance analysis, which plays a critical role in system performance assessment and validation and enhancement of simulation models. System disturbance reports document relevant system events, facility and operational performance analysis results, and issues that require further action.

   Prompt notification of system events is critical to ensure timely review and to determine if further investigation is warranted. Avenues to communicate system disturbances must be maintained between real-time operations and the persons responsible for equipment and system performance of both the facility operators/owners and the ISO. Monitoring and enforcement processes are employed to ensure that the identified action items are addressed in a timely manner.

3. **Policy**

   3.1 **General**

   Following a system event as defined in Section 3.2, the ISO will complete a prompt review. If deemed to be a reportable disturbance, an investigation will be initiated and, if necessary, a disturbance report completed. The decision to initiate an investigation and to prepare a disturbance report will be made by the ISO (with input from affected parties) and communicated to key parties identified. The ISO will also coordinate the efforts to prepare the disturbance report. The report or parts of it may be submitted to NERC/WECC if required. The disturbance report will not be made public; the dissemination of sensitive information will be done with due regard for the interests of facility owners and facility operators.

   E-mail is the preferred communication channel. It may be used for tracking or as reference for closure of issues. A generic e-mail address (opsevents@aeso.ca) will be used for these submissions until ISO personnel have been assigned responsibilities to coordinate this process.

   Generally, the disturbance reporting process should be carried out under the rules stated in this OPP. However, there may be situations, such as very large events involving many parties, which
will require deviations from these rules. These will be dealt with on a case-by-case basis, based on specific request(s) to the ISO, and agreed upon during the initial assessment (within 24 hours of the event).

3.2 System Events Requiring Further Assessment

The events that require a prompt review and assessment for potential investigation and, if necessary, reporting include but are not limited to the following:

- 300 MW load or more has tripped off for greater than 15 minutes due to an event on the transmission system
- Firm load shedding (manual or automatic) greater than 100 MW or beyond the ISO’s current operating criteria in order to maintain security and reliability of the AIES excluding times of energy shortfalls as outlined in Section 202.2 of the ISO rules, Short Term Adequacy and Supply Shortfall.
- Large geographical areas (two or more facility owners or facility operators) are affected by the same event
- Unplanned tripping of multiple generators
- Events triggering UVLS scheme
- Frequency excursions greater than ±0.05 Hz when AIES remains connected to the WECC system
- Frequency excursions greater than ±0.5 Hz when AIES islands from the WECC system
- Events triggering UFLS scheme
- Multiple transmission system facilities are forced out of service
- Initial indication of protection misoperation (including RAS), cascading outages, incorrect operation of equipment or equipment failure, which impact the transmission system
- Continued operation outside operating criteria (OPPs, ISO Rules)
- Identification of a disturbance beyond recognized criteria
- Any indication of physical or cyber sabotage
- Any unusual event, as deemed by the ISO, or for any event potentially leading to identification of valuable lessons

4. Responsibilities

Investigating and reporting system events are collaborative processes in which affected parties will share responsibilities as described in the following sections.

4.1 ISO

- The ISO is responsible for coordinating the collaborative efforts to assess system events, and, where necessary, investigating and analyzing the event and compiling the disturbance report. Also, the ISO will log, monitor, follow-up, and enforce the action items resulting from this process to ensure timely and effective completion. In this respect, the ISO will:
• Prepare and submit the reports required by the WECC and NWPP (Northwest Power Pool). Also refer to OPP 1305.

• Assess system events and decide whether a disturbance is to be further investigated and reported (a reportable disturbance) based on preliminary information submitted by the facility operator.

• If a disturbance is to be further investigated, identify the key parties to be involved in this process.

• Specify the scope of the review and communicate it to the entities involved in the disturbance.

• Prepare a disturbance report following the investigation of a reportable disturbance within 60 days of the event. Disturbance reports should be shared with the Transmission Operations Coordination Committee (TOCC) affected members and other stakeholders identified during the course of the investigation, for review and comment before finalization. The disturbance report will, in its Recommendations section, identify the issues revealed by the disturbance analysis and specify action items to prevent recurrence of this type of event. Each action item will have a target completion date and identified party responsible for action item resolution.

• If necessary, request information from other parties, including but not limited to ancillary service providers, transmission customers and neighbouring control areas, required to complete the analysis of the disturbance.

• Review the information submissions upon receipt, and notify the sender whether the submission is acceptable.

• Log the issues and the action items identified within the disturbance reports in the ISO maintained disturbance database. The database entry will also identify personnel/party accountable and timelines for the respective issue resolution. The ISO will maintain this contact information up-to-date, based on facility owners’ input.

• Track the issues identified within the disturbance report and periodically (no longer than 3 months span) review their status, and provide updates at the TOCC meetings.

• Close the issues identified within the disturbance report based on documentation submitted by the responsible party.

• If necessary, make recommendations for initiation of compliance review, for issues that are not satisfactorily addressed in accordance with agreed upon timelines, or if at any time it is considered that any of the outstanding issues resulting from a disturbance puts system reliability at risk.

**System Controller (SC)**

• The SC’s responsibilities are described in OPP 1305.

**4.2 Facility Owners and Facility Operators**

This section refers to generation, transmission, and distribution facility owners and operators. The facility owner or facility operator, as appropriate, will:

• Upon the ISO’s request, submit a preliminary report regarding a system event described in Section 3.2 associated with their facilities, as soon as possible but no later than 24 hours
after the ISO’s request. This report should include, to the extent possible, the information described in Appendix A or otherwise requested by the ISO. Appendix A also contains a template that may be used for this purpose. A copy of this submission will be sent electronically to opsevents@aeso.ca.

- Submit to the ISO any additional information obtained after the preliminary disturbance report has been submitted.

- Provide the ISO with data records pertaining to a system disturbance under investigation within 5 days of the event and according to the ISO’s request specifications.

- Provide the ISO with a full disturbance report within 30 days of any system disturbance deemed reportable by the ISO, describing the root cause of the disturbance, sequence of events, actions taken, any potential issues already identified and suggested course of action. Minimum content and information requirements for the disturbance report are presented in detail in Appendix B. This report is to be e-mailed to opsevents@aeso.ca.

- Inform the ISO about any issues pertaining to the system performance and reliability (for example, changes in protection settings or remedial action schemes, any equipment modification resulting in a change of specifications) as they become aware of them and the course of action they have taken or plan to take to resolve each issue.

- Upon becoming aware of a failure of a Disturbance Monitoring Equipment (DME) or non-compliance with the current standards, immediately advise the ISO and take the necessary action to correct this. DME include phasor measurement units, digital fault recorders, power swing monitors and other sequence-of-events recorders.

- Take immediate action to resolve the outstanding issues presented in the report recommendations (action items with timelines) or as directed by the ISO.

- Provide regular progress reports to the ISO about system disturbance issues (no more than 3 months between reports).

- Provide documentation to the ISO (for example, report of investigation’s findings and modifications made to equipment or processes) to support closure of issues identified in the disturbance report.

- Provide the ISO with updated contact personnel information for the disturbance database, if necessary.
Appendix A: AIES Preliminary Disturbance Report Information Requirements

Provide the following information in preliminary disturbance reports within 24 hours of the event:

- Date and time of the disturbance.
- Weather conditions in the area, if relevant for the particular event.
- Brief description of system status before the disturbance, indicating any major elements that were out of service.
- Brief description of the disturbance event, including a list of the elements that tripped, the order in which they tripped, the time each element tripped, and the time each element was restored to service.
- For transmission outages, indicate the amount of load or generation lost as a result of the outage, and the duration of the outage. Provide the time when customer load or transmission access availability for generation was restored.
- For generation outages, indicate the amount of generation lost, the duration of the outage, and the time when the generation was restored. For outages involving multiple generation units, provide the outage duration and restoration time for each unit.
- Indicate the amount of customer load or generation lost due to the operation of under frequency load shed or other remedial action schemes, and indicate the magnitude of load or generation loss for each scheme that operated.
- Provide information on frequency and voltage deviations. (The ISO will use SCADA data available on the PI or PMU database whenever possible).

A preliminary disturbance report template is provided on the next page.
Preliminary Disturbance Report Template

Organization: [Insert here organization name]

Contact Info: [Insert here the contact person info]

Did the event originate in your system?  Yes  No

Cause of Event:
☐ Defective Equipment  ☐ Adverse Environment  ☐ Human Element
☐ Adverse Weather  ☐ System Condition  ☐ Foreign Interference
☐ Unknown at this time  ☐ Other (Please provide details)

System Status before Event:
[Insert details here]

Sequence of Events:

<table>
<thead>
<tr>
<th>SCADA Timestamp</th>
<th>Event</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Event 1 timestamp]</td>
<td>[Event, including protections operations]</td>
<td>[Insert here interpretation, additional details]</td>
</tr>
</tbody>
</table>

Event Details:

Gen tripped (MW)  [Total in MW]
[Insert units here]  [Unit 1 in MW]

Load tripped (MW)  Total  Firm  Interruptible
[Total in MW]  [Firm in MW]  [DOS in MW]

Frequency excursions  [Insert details here]
Voltage excursions  [Insert details here]

Protections operation  [Insert details here. If UFLS, UVLS, or LSS were triggered, please provide details, i.e. amount of load tripped, location, and timing]

Restoration Timeline

<table>
<thead>
<tr>
<th>Element</th>
<th>Outage</th>
<th>Start Restoration</th>
<th>End Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Element 1]</td>
<td>[Time of the outage]</td>
<td>[Start restoration time]</td>
<td>[End restoration time]</td>
</tr>
</tbody>
</table>

Issues currently under investigation:
[Insert details here]
Appendix B: AIES Disturbance Report

Contents

The system disturbance report will, as a minimum, contain the following sections:

Overview  
A summary of the system disturbance, including the amount of load or supply lost.

Sequence of events  
Detailed chronological list of applicable system events that occurred during the disturbance.

Conclusions and Recommendations  
Conclusions are drawn based on the events comprising the disturbance. A list of issues requiring action is included, and any recommendations, action items and initiatives to prevent recurrence of this type of event. All issues will have a target completion date. A status update will be included for any issues or recommendations that have been addressed before the final draft.

Appendices  
May include copies of the facility owners’ disturbance reports, data or other relevant information.

The disturbance report will be largely based on the information contained in the facility owner report submitted to the ISO.

Information Requirements

Disturbance reports submitted to the ISO by facility owners or operators must contain the following information:

1. Primary cause of the event – assigned to one of the following standard categories:
   - defective equipment
   - adverse weather
   - adverse environment
   - system condition
   - human element
   - foreign interference
   - unknown

2. Sequence of events with interpretation.

3. Date and time when the event happened and how long it lasted (until all the customers were restored; this includes UFLS, UVLS, etc.).

4. MW lost, in each of the following categories:
   - Load (both DOS and DTS): this should also include the number of customers affected and how long they were without service if this information is available.
   - RAS, SPS
   - Generation: this should include information about unit performance during the disturbance

5. Frequency Excursions: frequency plot, from t-0 until the frequency reached steady-state.
6. Under-Frequency Load Shed (UFLS): details of operation, including what blocks were shed and the MW per block.

7. Voltage Excursions: voltage plots, from t-0 until the voltage reached steady-state.

8. Protection Schemes (including RASs): operation with respect to design.

9. Details of any equipment malfunction that contributed to the disturbance, or equipment damage resulting from the disturbance.

10. SCADA information.

It is recommended that, to the extent possible, the disturbance data be reported in a format capable of being viewed, read and analyzed with a generic COMTRADE (IEEE C37.111-1999 Standard Common Format for Transient Data Exchange for Power Systems) analysis tool, and that the data files be named in conformance with the IEEE C37.232-2007 Recommended Practice for Naming Time Sequence Data Files.

**Remediation**

If issues have already been identified and an action plan to address them devised or even implemented, the report should also contain:

1. The issues already identified.

2. Remediation plans with specification of the issues addressed.

3. Completion date.

4. Any remediation already completed, with details.

### 5. Revisions and Approval

<table>
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<th>Issued</th>
<th>Description</th>
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<tr>
<td>2016-08-30</td>
<td>Revisions to subsection 4.2 to remove the provisions relating to event reporting by market participants to the AESO and other entities.</td>
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<tr>
<td></td>
<td>Revision to subsection 3.2 to update reference to OPP 801 with Section 202.2 of the ISO rules, <em>Short Term Adequacy and Supply Shortfall</em>.</td>
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<tr>
<td>2007-12-03</td>
<td>Supersedes 2003-07-28</td>
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<tr>
<td>2003-07-28</td>
<td>Revised to ISO Operating Policies and Procedures</td>
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