

Outage Management Redesign Consultation Process (SE-109)

June 4, 2014



- IESO Response to Stakeholder Feedback
- Proposed Software Design Details
 - Equipment Model
 - Outage Request Attributes (Priority, Constraint & Purpose Codes)
 - Auto Advance Approval Validation
 - 3 Day & 1 Day Advance Approval Process Considerations
- Next Steps

- **Stakeholder feedback in bold**
 - *IESO response in italics*
- **No concerns provided appropriate reserve margin forecasts are available to support outage planning**
 - *With the exception of considering future generation installations as available resources, the Quarterly Adv. Approval (AA) Process methodology will be identical to the 18 Month Outlook Process*
 - *This scenario's available reserve margin is available from information already provided in the 18 Month Outlook (i.e. subtracting the sum of forecasted capacity to be shutdown from [Table 4.2](#) from the 'Total Existing Installed Resource Capacity' in [Table 4.3](#))*
 - *The IESO will consider calculating and incorporating this reserve margin scenario into the 18 month outlook for the purposes of supporting the Quarterly AA process and provide feedback at a future meeting.*

- **Provide clarity on the differences between the 18 Month scenarios (i.e. firm & planned) and the Quarterly AA scenarios (i.e. neither firm nor planned)**

Table 4.3: Summary of Scenario Assumptions for Resources

		Planned Scenario	Firm Scenario
Over the 18-Month Period	Total Existing Installed Resource Capacity (MW)	32,961	
	New Generation and Capacity Changes (MW)	All Projects	Generator shutdowns or retirements, Commissioning Generators and Generators starting in the first 3 months
		3,306	262

- *The 18 Month scenarios includes future generating installations whereas the Quarterly AA scenario does not*
- *Quarterly AA scenario assumes available capacity = Total Existing Installed Resource Capacity less forecasted shutdowns (not separately shown above)*

- **Using neither of the 18 Month Outlook scenarios (i.e. firm nor planned) in the Quarterly AA process may give participants a false sense of certainty if planning further in advance were solely based on existing 18 Month Outlook methodologies.**
 - *Not including future installations as available capacity in the quarterly process will provide participants and the IESO with greater certainty that outage requests will maintain their advance approval.*
 - *The risk of having a false sense of certainty is present in the current outage management process as it also assumes future installations are unavailable.*
 - *To mitigate this risk and as mentioned in the previous slide, the IESO will consider incorporating this scenario into the 18 Month Outlook.*

- **Keep API user application-side changes to a minimum**
 - *IESO is committed to working closely with API users to ensure that proposed changes, if implemented, can be performed in a timely manner.*
- **Finalized API specification and market rules are key requirements for API user development to begin.**
 - *An API specification will be one of the first vendor deliverables*
 - *The IESO does not see a need for drafting market rules ahead of software development as they are not considered to be on the critical path from a project schedule perspective.*
 - *The IESO is committed to incorporating the business rules of the final process design into the proposed software, allowing API user development to proceed with confidence.*
 - *Deferring market rules development until after software acceptance testing will also help ensure any potential process-side changes can be captured.*

- **The new solution should retain historical outage requests longer than the existing solution.**
 - *The IESO proposes retaining historical outage requests in the new system for at least five years.*
 - *However retention of historical outage request data from the existing solution to the new solution is subject to further IESO and stakeholder consultation (to be discussed at the next SE-109 meeting)*

- **COMPLEX OUTAGE PROFILES:**
 - **Maintain existing functions (continuous, daily, available/unavailable weekends) but keep additional functions optional**
 - *All existing functions are supported with others being available at the participant's discretion*
- **MULTIPLE RECALL TIMES:**
 - **Maintain the existing max recall and recall measurement properties. Additional recall times should be optional.**
 - **Allow for multiple recalls on different outages request periods**
 - *Multiple recalls for different outage periods are not supported*
 - *Upon further review of this feature, the IESO proposes to only maintain the max recall time since value-added functionality on this info-only recall field are not supported.*

- **PRIORITY CODES:**
 - **No concerns**
 - *The IESO's final proposal for priority codes are discussed in the next section*
- **PURPOSE/REASON CODES:**
 - **Changing this attribute from free form text to a "pick-list" may be an issue for API user development**
 - *A free form text description will continue to be a mandatory field but will require a corresponding mandatory purpose code*
 - *An 'other' purpose code will be available which leaves development of the remaining codes at the API user organizations' discretion*
- **CONSTRAINT /STATUS CODES (i.e. Out-of-Service, De-rated):**
 - **No concerns, but impact assessment requires API spec to be provided**
 - *The IESO's final proposal for constraint codes are discussed in the next section*

- **FLAGS (e.g. Loss of Redundancy, Process Inclusion etc.):**
 - **Incorporating binary flags shouldn't be an issue provided they do not drive business rules and API user application modifications.**
 - *The IESO proposes introducing several binary flags that would be used to drive business rules (discussed in the next section).*
- **STATE & STATE TRANSITION (Proposed/Submitted/Study etc.):**
 - **Please describe IESO visibility on the Proposed state**
 - *IESO would have full visibility of this 'draft' state which will receive an ID number but not a priority date (i.e. timestamp) until the outage request is placed into the Submitted state.*

- **COMMENT FIELDS (Public/Confidential based on permission model):**
 - **Existing public/confidential comment fields should be maintained**
 - *Existing comment fields will be maintained.*
 - *The ability for third party participants to see 'public' outage request information appears to be available through role definitions and permissions*
- **FILE ATTACHMENTS (Both Web Client & API):**
 - **No concerns**

- **EVENT HANDLING, NOTIFICATIONS & VALIDATION:**
 - **All notifications (i.e. approvals etc.) should be available via the API.**
 - **Error messages should be in plain English and available in the API**
 - *Initial discussions with the vendor suggest notifications and error messages related to business rules are available and easily interpreted via the API.*
- **CONFIGURABLE RULES ENGINE:**
 - **Changes require impact assessment before implementation**
 - *The IESO agrees and supports the need for stakeholder input.*
- **VERSIONING FEATURES:**
 - **No concerns**

- **Participant submission of actual start and end times via the API may be challenging**
 - *IESO intends to move forward with this functionality as it will eliminate task redundancy and non-value added verbal communications*
 - *IESO will further consult with API user organizations to better understand how the IESO can support development of this functionality.*
- **Clarification on the Study State and how participants can make outage request changes**
 - *Changes can be made through the Negotiate State (IESO discretion) or by cancelling the outage request and resubmitting a new request.*
 - *Any changes made in the Negotiate State will not affect priority date*

- **Planned Outage without Quarterly AA (Scenario)**
 - *Receives an 'At Risk' declaration by the end of the Quarterly Assessment Process*
 - *Available for re-assessment in either the Weekly AA or 3 day AA process*
 - *Participants can opt non-critical outages for Weekly inclusion*
 - *Maintains its priority date as long as significant changes aren't made to the outage request.*
 - *Exception – if an At Risk outage is resubmitted to start beyond the first three months of the Quarterly coverage period and before the start of the next Quarterly study period, it will also retain its priority date.*

- **Clarification on extensions**
 - *Forced, Urgent and Information outage requests can have their end times extended without having to create a new outage request for the extension.*
 - *Planned and Opportunity outage requests require a new submission to reflect an extension (software allows for efficient creation of these extensions)*

- **Provide additional allowances for scheduling flexibility**
 - *The IESO proposes Opportunity outage requests will have a submission lead time of zero, however the obligation to assess these requests will be at IESO discretion.*
 - *‘Best effort basis’ criteria will be developed through future SE-109 consultations. The criteria should satisfy minimal IESO effort and overall benefit to the IESO controlled grid.*
 - *The IESO proposes introducing several cause (i.e. purpose) codes to support the opportunity outage criteria developed through SE-109 (discussed in the next section).*

- *Participants will not be precluded from submitting planned outages after the quarterly submission deadline, however they will not be assessed until the weekly or daily process.*
- *Outage Priority Sequence:*
 - *Priority Code sets the first level of priority (i.e. Forced → Urgent → Planned → Opportunity)*
 - *All Forced outages are considered equal priority (i.e. they have already occurred)*
 - *Planned Start date determines priority level between competing “Urgent” priority codes (i.e. the earlier it starts, the sooner it must be assessed)*
 - *Advance Approval status determines priority level between competing “Planned” priority codes (i.e. Quarterly AA → Weekly AA → Daily AA)*
 - *Priority Date (i.e. submission date) determines priority level between completing Priority Codes and/or Advance Approval statuses (i.e. the earlier the priority date, the higher the priority).*

- *Non-Critical planned outages would not be precluded from being submitted in the daily coverage period as long as they were not already included in the weekly study period (i.e. requested for advance approval in the weekly process).*
- *Participants will have the ability to opt their non critical outages into the Weekly AA process via an inclusion flag on the outage request (this includes non-critical outages that receive an At Risk in the Quarterly process).*
- *Opportunity outages would not be precluded from being submitted into any coverage period and would be eligible for advance approval if the IESO agrees to study it.*
- *Resubmission of outage requests in an end state (i.e. Cancel, Reject, Revoke or Recall, Completed) are not supported using the same ID number.*
 - *Priority date from rejected, revoked or recalled outages can be retained by coupling process-side communication and new request submission.*

Proposed Equipment Classes:

- Disconnect Switch
- Breaker*
- Bus*
- Line*
- Line Section*
- Transformer*
- ~~Station Service Transformer~~
- Reactor*
- Shunt Capacitor*
- Series Capacitor*
- Static VAR Compensator*
- Converter
- Filter
- Phase Shifter*
- Voltage Regulator*
- Under Frequency Load Shedding (UFLS) Relay
- Synchronous Condenser*
- Generator*
- Load
- AC or DC Station Service
- ~~Automatic Voltage Regulator (AVR)~~
- ~~Power System Stabilizer (PSS)~~
- Special Protection System (SPS)
- Tone Communication Channels
- RTU/ICCP/HUB Equipment
- Other Communication Equipment
- Other Miscellaneous Equipment

*indicates an alternate way of reporting outages on auxiliaries associated with this equipment is being proposed (next slide)

- To minimize the size and maintenance of the equipment model, the following classes are NOT being proposed for the model:
 - Primary Protections & Breaker Failure Protections
 - Automatic Voltage Regulators & Power System Stabilizers
- The IESO proposes an alternate way of reporting outages on these classes:
 - Using constraint codes (similar to Out of Service, Derated)
 - Only available on certain equipment classes (shown with an asterisk on the previous slide)
- Sample Scenario:
 - Select the equipment class for which you wish to report a protection outage on (i.e. Line B560V or Portlands G1)
 - Select the constraint type “Protection Out-of-Service”
 - Provide a free text equipment description (i.e. ‘A’ Protection)

Priority Code	Constraint Codes applicable to the Priority Code	Purpose Codes applicable to the Priority Code	Purpose Description applicable to the Purpose Code
Forced	Out of Service (OOS)	Manually Removed From Service (MRFS)	Free Text
	In Service (IS)	Automatically Removed From Service (ARFS)	Free Text
	Derated	Failed to Synch (Gen Only)	Free Text
	Protection Out of Service (Prot OOS)	Other	Free Text
	Breaker Fail Protection Out of Service (BF Prot OOS)		
	Auto Voltage Regulator (AVR) OOS		
	Power System Stabilizer (PSS) OOS		
	Holdoff (HOLDOFF)		

Priority Code	Constraint Codes applicable to the Priority Code	Purpose Codes applicable to the Priority Code	Purpose Description applicable to the Purpose Code
Urgent	Out of Service (OOS)	Failed to Synch (Gen Only)	Free Text
	In Service (IS)	Other	Free Text
	Derated		
	Protection Out of Service (Prot OOS)		
	Breaker Fail Protection Out of Service (BF Prot OOS)		
	Auto Voltage Regulator (AVR) OOS		
	Power System Stabilizer (PSS) OOS		
	Holdoff (HOLDOFF)		

Priority Code	Constraint Codes applicable to the Priority Code	Purpose Codes applicable to the Priority Code	Purpose Description applicable to the Purpose Code
Planned	Out of Service (OOS)	Maintenance	Free Text
	In Service (IS)	Repair	Free Text
	Derated	Replacement	Free Text
	Protection Out of Service (Prot OOS)	Commissioning	Free Text
	Breaker Fail Protection Out of Service (BF Prot OOS)	Testing	Free Text
	Auto Voltage Regulator (AVR) OOS	Other	Free Text
	Power System Stabilizer (PSS) OOS		
	Holdoff (HOLDOFF)		

Priority Code	Constraint Codes applicable to the Priority Code	Purpose Codes applicable to the Priority Code	Purpose Description applicable to the Purpose Code
Opportunity	Out of Service (OOS)	Favourable Transmission Outage Condition (FTOC)	Free Text
	In Service (IS)	Favourable Generation Outage Condition (FGOC)	Free Text
	Derated	Favourable Adequacy Margin (FAM)	Free Text
	Protection Out of Service (Prot OOS)	Expedite a Return to Service (ERTS)	Free Text
	Breaker Fail Protection Out of Service (BF Prot OOS)	Commissioning	Free Text
	Auto Voltage Regulator (AVR) OOS	Testing	Free Text
	Power System Stabilizer (PSS) OOS	Other	Free Text
	Holdoff (HOLDOFF)		

Priority Code	Constraint Codes applicable to the Priority Code	Purpose Codes applicable to the Priority Code	Purpose Description applicable to the Purpose Code
Information	N/A	N/A	Free Text

- Notes:
 - All Priority and Constraint Codes must be finalized prior to starting vendor development.
 - Purpose Codes can be finalized after starting vendor development as these codes are IESO configurable.

- IESO proposes incorporating business rules to allow for Auto AA upon submission of planned outages (up to 16:00 EST 2 business days in advance, i.e. the 1 day AA submission deadline)
- Auto AA validation requires new mandatory fields (i.e. questions) on the outage request, for example:
 - Does the outage represent a Loss of Redundancy (LOR)?
 - Does the outage affect transformer cooling? (e.g. for station service outages)
- Limited to low impact equipment outage requests involving:
 - Primary Protections & Breaker Fail Protections
 - Hold-offs (Blocking of Line Re-closure)
 - Automatic Voltage Regulators (AVRs) & Power System Stabilizers (PSSs)
 - AC/DC Station Services
 - Distribution Equipment
 - Tone Communication Channels
 - Under Frequency Load Shedding (UFLS) Relays

- IESO projects between 4500 and 5000 outage requests eligible for Auto AA per year
- Benefits:
 - Greater Outage Certainty & Process Efficiency through:
 - Conflict Checking
 - Advance Approval on Submission
 - Final Approval in Advance (no phone call required in real-time)

- **PRIMARY PROTECTIONS**

- Priority Code = Planned;
- *AND* Equipment Class = Lines OR Generators OR Busses OR Transformers OR Shunt Reactors OR Shunt Capacitors OR Static VAR Compensators (SVCs) OR Station Service Transformers OR Phase Shifters OR Voltage Regulators OR Condensers;
- *AND* Constraint Code = Prot OOS;
- *AND* Loss of Redundancy (LOR) = YES;
- *AND* there are no other conflicting outage requests occurring (i.e. same equipment name and constraint code)

- **HOLDOFFS**

- Priority Code = Planned;
- *AND* Equipment Class = Lines OR Line Sections;
- *AND* Constraint Code = HOLDOFF

- **BREAKER FAILURE PROTECTIONS (Rule #1 for LOR = YES)**
 - Priority Code = Planned;
 - *AND* Equipment Class = Breaker;
 - *AND* Constraint Code = BF Prot OOS;
 - *AND* only one piece of equipment is on the outage request;
 - *AND* the outage request profile = Continuous and ≤ 4 hours;
 - *AND* no other with constraint code = BF Prot OOS are occurring at the same station
 - *AND* are adjacent breakers out of service = NO;
 - ***AND* LOR = YES**
 - *AND* there are no other conflicting outage requests occurring (i.e. same equipment name and constraint code)

- **BREAKER FAILURE PROTECTIONS (Rule #2 for LOR = NO)**
 - Priority Code = Planned;
 - *AND* Equipment Class = Breaker;
 - *AND* Constraint Code = BF Prot OOS;
 - *AND* only one piece of equipment is on the outage request;
 - *AND* the outage request profile = Continuous and ≤ 4 hours;
 - *AND* no other with constraint code = BF Prot OOS are occurring at the same station
 - *AND* are adjacent breakers out of service = NO;
 - ***AND* LOR = NO;**
 - *AND* are there CTs on both sides of the breaker = YES;
 - *AND* there are no other conflicting outage requests occurring (i.e. same equipment name and constraint code)

- **AUTOMATIC VOLTAGE REGULATOR (AVR)**
 - Priority Code = Planned;
 - *AND* Equipment Class = Generator;
 - *AND* Constraint Code = AVR OOS;
 - *AND* LOR = YES;
 - *AND* there are no other conflicting outage requests occurring (i.e. same equipment name and constraint code)

- **POWER SYSTEM STABILIZER (PSS)**
 - Priority Code = Planned;
 - *AND* Equipment Class = Generator;
 - *AND* Constraint Code = PSS OOS;
 - *AND* LOR = YES;
 - *AND* there are no other conflicting outage requests occurring (i.e. same equipment name and constraint code)

- **AC/DC STATION SERVICE**

- Priority Code = Planned;
- *AND* Equipment Class = AC/DC Station Service;
- *AND* Constraint Code = OOS;
- *AND* LOR = YES;
- *AND* Max Recall is ≤ 15 minutes;
- *AND* is Transformer Cooling Affected = NO;
- *AND* there are no conflicting outage requests occurring (same station + equipment class + constraint code)

- **STONE COMMUNICATION CHANNELS**

- Priority Code = Planned;
- *AND* Equipment Class = Stone Communication Channels;
- *AND* Constraint Code = OOS;
- *AND* LOR = YES;
- *AND* is RTU/HUB Affected = NO;
- *AND* Max Recall is ≤ 15 minutes
- *AND* there are no conflicting outage requests occurring (same station + equipment class + constraint code)

- **DISTRIBUTION EQUIPMENT**

- Priority Code = Planned;
- *AND* Equipment Class = Breakers OR Disconnect Switches OR Transformers OR Loads OR UFLS
- *AND* Constraint Code = OOS OR In-Service (INSRVCE) OR Derate (DERATE)
- *AND* Facility Class = 3 (Low Impact)
- *AND* there are no conflicting outage requests occurring (equipment name + constraint code + UFLS criteria violations)

- **UFLS EQUIPMENT**

- Priority Code = Planned;
- *AND* Equipment Class = UFLS;
- *AND* Constraint Code = OOS;
- *AND* there are no conflicting outage requests occurring (UFLS criteria violations)

- As per the existing Interim Process:
 - 3 Day AA process is intended for outage requests with non-critical equipment
 - 1 Day AA process is intended for outage requests with non-critical equipment and low impact outage request attributes (i.e. the 1 Day AA criteria of min duration, max recall, loss of redundancy etc.)
 - IESO must manually validate the 1 Day AA criteria is met
- To enable auto validation of 1 Day AA criteria, the vendor must code additional business rules to:
 - Differentiate a non critical outage request from a low impact outage request (by examining outage request attributes)
 - Determine which submission deadline applies
- Although auto validation is feasible, the risk of not being able to change the 1 Day AA criteria in a timely and cost effective manner exists
 - Alternatively, an existing vendor capability could be used to achieve similar (but limited) outcomes – next slide

Software Design Considerations: 3 Day & 1 Day AA Process Rules (con't)

- Vendor software currently uses the following properties in its lead time (submission deadline) validation:
 - Outage Request Priority Code (Forced, Urgent, Planned, Opportunity etc.)
 - Outage Request Constraint Code (OOS, Prot OOS, Derated etc.)
 - Equipment Facility Class (an integer value equipment property, i.e. 1, 2, 3)
- Facility Class can be used to define impact, for example:
 - Critical Equipment = Class 1 = Weekly AA Process
 - Non Critical Equipment = Class 2 = 3 Day AA Process
 - Low Impact Equipment = Class 3 = 1 Day AA Process
- These properties can be combined to form lead time rules, for example:
 - Planned + Non-Critical + Any Constraint Code due 5 business days out
 - Planned + Any Facility Class + Prot OOS due 2 business days out
 - Planned + Low Impact + Any Constraint Code due 2 business days out

Software Design Considerations: 3 Day & 1 Day AA Process Rules (con't)

- By using the existing vendor capability, a piece of equipment can easily be converted from Critical to Non Critical to Low Impact or vice versa, and therefore be subject to different submission deadlines.
 - Facility Class is configurable by the IESO and does not require vendor support
- A potential drawback is that some existing non-critical equipment may not be able to take advantage of a less restrictive submission deadline (i.e. the 1 Day AA) based on its outage request attributes, unless:
 - A new constraint code representing “Low Impact” could be combined with a Non-Critical facility, in turn driving a less restrictive lead time (i.e. the 1 Day AA)
- IESO is working with the vendor to implement the 3 Day AA and 1 Day AA process rules under the software’s existing framework.
 - Stakeholders are asked to provide feedback on this approach

Greenfield G1 (Non Critical Facility Class)

- Ignoring any outage request attributes, a planned outage to Greenfield G1 would have a submission deadline of 16:00 EST, 5 business days in advance
 - No new code required: G1 can be classified as non-critical and any planned outage request for G1 would have a submission deadline of 16:00 EST 5 business days in advance
- However, according to the 1 Day AA criteria, if the Greenfield G1 outage request starts and ends in the same day or has a max recall ≤ 15 min, the planned outage would now have a submission deadline of 16:00 EST 2 business days in advance.
 - New code required: G1 is Non-Critical, but software must ignore the 5 business day deadline and determine that a 2 business day deadline applies based on specific outage request attributes.
 - Alternatively, G1 could be modelled as a Low Impact Facility Class and be eligible for 1 Day Advance Approval regardless of outage attribute criteria.

OR

- G1 could be modelled as a Non Critical Facility Class and be eligible for 1 Day Advance Approval if the “Low Impact OOS” constraint type is used.

- Since the Interim Process Go Live (Feb 5), the IESO has processed the following number of outage requests eligible for 1-Day AA:
 - Generator Outage Requests = 250
 - Protection Outage Requests = 150
 - Load Outage Requests = 50
 - Reactive Outage Requests = 10
 - Other Auxiliaries = 100
 - Total = 560 (~10% of all outages assessed over the period)
- Data suggests the process is experiencing sufficient volume to justify need for scheduling flexibility.
- IESO has not experienced significant workload issues with the process
 - Automating the criteria validation and introducing Auto approval will minimize workload for low impact outages, allowing for an increased focus on higher impact outages

Final Process Design Update: Security and Adequacy Reporting

- The IESO will be replacing the existing SSR and SAA reporting systems
- A new stakeholder consultation is being proposed for Fall 2014 to gather feedback on the proposed replacement
- This replacement project is expected to also deliver the Quarterly AA Process Security and Adequacy Report
- SE-109 will continue work closely with the proposed consultation to capture outage related requirements
- More to come at the next SE-109 meeting

- **June 13** – Stakeholder Feedback Due
 - Proposed Equipment Model
 - Proposed Priority, Constraint & Purpose Codes
 - Proposed Auto Advance Approval Rules
 - Proposed Design Considerations for the 3 Day and 1 Day AA Processes
- **June 20** – IESO Response to Feedback Due
- **June 27** – Post Materials for the next SE109 Meeting
- **July 3** – Next SE109 Meeting

Questions/Comments?