Project Charter for: Dynamic Limits in Real-Time (DLRT)

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1 Executive Summary

The Dynamic Limits in Real-Time (DLRT) project is a significant step forward in ensuring the reliability of the province's power system, and delivers foundational change in how transmission limits are determined and used to operate the grid.

The project deploys capabilities to continuously evaluate the security of the grid and provides timely and precise information to our operators, even following unforeseen events. These capabilities will enable the IESO to continue to meet its regulatory obligations in light of evolving reliability requirements, enhance the resiliency of the grid, and provide improved market outcomes. The incremental costs are more than offset by the benefits, given its potential to achieve significant market savings, which, at the minimum, are $1.5 million every year following completion of the project.

Reliability and resiliency: The IESO has a mandate to ensure the reliability of the province's power system, which includes operating within the capabilities of its equipment (i.e. ratings), in order to prevent equipment damage, and to protect staff and the public. While our mandate is not new, we are seeing a trend within the industry whereby manufacturers and asset owners are "tightening" equipment ratings – including allowed operating voltages. [redacted]

As a result, the IESO is currently in a position where it must acquire new capabilities to assess and monitor the system with respect to these new criteria, or be non-compliant with our Market Rule obligations. This project implements a cost-effective solution to assess and monitor post-contingency voltage levels in real-time, and protect equipment from over-voltages.

Market Efficiency: Dynamically-determined real-time stability limits will often allow for increased power transfers on the grid because they take into account actual system conditions, as opposed to the off-line calculated limits in use today. Off-line calculated limits need to rely on conservative assumptions to account for the variety of conditions that may exist over the

period for which they will be in use. As a result, real-time stability limits improve the utilization of the existing transmission system and increase market efficiency such that the efficiency benefit generates a positive, yet conservative, net present value for this project in excess of $1.7 million in just the first four years of in-service operations of DLRT.

Process efficiency: Deploying real-time stability limit derivation capability will lay the foundation for gains in efficiency for process work related to providing back-office engineering support to the Control Room and for development of mid-term and short-term operating limits.

Requested Approval:

This project continues the natural progression of the online limit derivation platform (OLLD), which is part of a long-standing strategy to enhance system reliability and maximize the use of the transmission system. The OLLD platform was first established in 2008 and has been continually refined in pursuit of this long-standing strategy. This project formalizes the next significant step in this progression, evolving the tools that are used in the back-office, and extending those tools into the Control Room.

The DLRT Project is the first of two projects planned for implementing and integrating the DLRT platform with real-time security and market systems. Both projects provide significant benefits, with the first project being necessary pre-requisite for achieving the benefits of the second project. It is not necessary to initiate the second project to realize the full benefits of the first project.

The first project, which is the subject of this Charter, builds out the DLRT platform and deploys real-time voltage monitoring and stability limits in parallel with static, off-line limits into Control Room system operations. The subsequent project, if approved in the future, is expected to provide capabilities to automatically input dynamically-calculated real-time stability limits into the security monitoring and the market tools, including Real-Time Market (RTM) and the Day Ahead Market (DAM).

The DLRT Project was included in 2021 approved project portfolio with an allocated capital cost of $4.2M over four years.

The overall DLRT Project budget is $5.1M of which $4.6M is capital and includes a contingency of $1.2M which reflects an estimation accuracy of +/- 30%.

Overall, the DLRT Project is expected to take 45 months to complete which includes 12 months of contingency to account for scheduling uncertainties.

The table below shows the anticipated expenditure over the period of the project.

Year	2021	2022	2023	2024	Total
Capital (Incl. Contingency)	$337,884	$2,351,410	$1,662,634	$249,920	$4,601,848
Operating (Incl. Contingency)	$218,999	$139,960	$92,440	$28,004	$479,403
Total	$556,883	$2,491,370	$1,755,074	$277,924	$5,081,251

Subsequent version of the Project Charter (PC v2) will be issued after planning and detailed design to reflect refined cost and time estimates.

2 Business Objectives and Measures

1. Comply with regulatory requirements by providing the capability to assess and monitor post-contingency voltage levels on the transmission system in real-time.
2. Enhance the reliability and resiliency of the IESO-controlled grid by significantly improving the timeliness of stability operating limits with respect to varying real-time system conditions.
3. Improve the utilization of the IESO-controlled grid resulting in $1.5M annual market benefit through reduced costs to ratepayers.
4. Add new capabilities for determining and manually implementing dynamic limits in real-time, while maintaining current staffing levels within M&R.

Ref #	Business Objective	Procedure for Measures (identify how the performance will be measured)	Measured when and by whom?
1	3	**Market benefit** Applying real-time limits to the real-time market, operating reserve market, and security monitoring tools results in an annualized benefit of $1.5M. Improvements are applied at Control Room System Operator discretion in order to remove binding constraints within the real-time and operating reserve markets in real-time operations.	WHEN: Fourteen months post project closure BY WHOM: Senior Manager Engineering Studies, Senior Manager System Operations effectiveness,

Ref #	Business Objective	Procedure for Measures (identify how the performance will be measured)	Measured when and by whom?
		This measure is a post-operations comparison between legacy off-line limits ([redacted]) and real-time limits, with an assessment performed by Market Analysis to determine the net benefit to the market as a result of the limit improvements (i.e. as a result of real-time limits having been used in place of pre-determined limits).	Supervisor Market Analysis
2	1	**Assessment and monitoring of post-contingency voltage criteria exceedances on the real-time transmission system** Capabilities are developed, and successfully tested, for assessing real-time post-contingency voltages for all 115kV, 230kV, and 500kV buses on the ICG, with regards to all respected contingencies. The Real-Time post-contingency voltage assessments are performed at least once every 15 minutes, and are provided to Control Room Operators and made available to back-office support staff (MF&I). These capabilities are sufficient to meet the IESO's market rule obligation to monitor and inform actions to respect voltage ratings established by asset owners as stipulated in the Market Rules.	WHEN: Before go-live BY WHOM: Senior Manager Engineering Studies, Senior Manager System Operations, Senior Manager Market Forecasts & Integration
3	2	**Timely determination and communication of real-time stability limits and supporting information** Real-Time stability limits are automatically determined and communicated into the Control Room ([redacted]) at least once every 15 minutes. Operations Staff have the capability to initiate stability assessments on-demand, with these assessments targeted to specific areas of identified	WHEN: Two months post project closure BY WHOM: Senior Manager System Operations,

Ref #	Business Objective	Procedure for Measures (identify how the performance will be measured)	Measured when and by whom?
		concern (i.e. target system interface). On-demand assessments are performed immediately following the request, and take no longer than 15 minutes[1] to complete following the initial request. Real-Time limits are provided to Operations Staff with supporting information (such as limiting contingency and critical limit sensitivities) and are presented in a format that is easy to understand and helps facilitate actions to be taken on the grid.	
4	4	**Supporting the Real-Time Limit Platform** Integrate support for the real-time limits into existing business processes, including the development of a new support role within Operations for the platform. This new role is staffed by means of efficiencies gained within PSA and Market Operations. (i.e. net-zero impact to head-count within M&F).	WHEN: Six months post project closure BY WHOM: Senior Manager Engineering Studies, Senior Manager Market Forecasts & Integration Senior Manager Performance, Applications and Integration

2.1 Benefits Expected

This initiative directly supports multiple core corporate strategies, including:

A. Ensuring cost-effective system reliability – The project achieves compliance with Market Rules and enhances system reliability and resiliency, and at an incremental cost that is more than offset by its potential to achieve market savings, which, at the minimum, are

[1] This compares to many hours to obtain new limits from off-shift engineering staff today.

$1.5 million[2] every year following completion. Indications are that this figure could be much higher, considering that the analysis performed was for only 6 constraining transmission interfaces out of 60+ in Ontario, and considered only a portion of efficiencies to be gained in the Real-Time and Operating Reserve markets.

B. Driving business transformation to meet the needs of an evolving industry and business environment – Deploying real-time stability limit derivation capability will provide the foundation for future improvements in efficiency for process work related to providing back-office engineering support to Control Room and for development of mid-term and short-term operating limits. Real-time limits have significant potential to reduce process work related to providing mid-term and near-term limits (via automation), and will enable a new and valuable data stream for use by the business in identifying and leveraging relationships between power system stability and conditions on the ICG.

   These efficiencies are achieved following the subsequent project which integrates real-time limits with the market tools.

C. Enabling competition – Real-time calculated limits are generally higher than offline-calculated limits, and will therefore reduce or relieve the constraints which restrict the flow of energy across the transmission system. This will result in better alignment between locational prices in the upcoming single schedule market, which will improve competition between market participants;

D. Advancing sector leadership – This project deploys a specialized approach to validating limits output by the DLRT platform, enabling real-time limits to be implemented without the need for a complement of on-shift engineers within the Control Room, and yielding benefits in terms of work process efficiency for producing mid-term and short-term limit assessments. This is an innovative approach which involves "remembering" previously determined operating limits and corresponding system conditions, and using these to inform and validate future limit assessments.

This project helps to address multiple strategic enterprise risks, including:

[2] As determined from a joint Engineering Projects and Market Analysis investigation into potential market savings following DLRT completion, and considering MRP deployment. This investigation considered 2019 demand and supply conditions and a subset of stability limited interfaces [redacted] modelled with and without expected DLRT improvements using [redacted]. The investigation also considered potential savings in Operating Reserve market due to improved [redacted] interface. The investigation yielded total benefits up to $3M, but this has been reduced to $1.5M considering that, at this stage of development (i.e. following this project), improvements are input into the market tools manually and at Operator discretion.

1. An extreme weather event significantly damages generation or transmission assets:

   Implementing real-time limits will position the IESO to more effectively respond following grid contingencies, such as by enabling more timely re-preparation of the system and more secure and optimized operating limits that are derived within minutes, as compared to hours in today's environment. This will reduce the impact to rate-payers and to market participants.

2. A critical bulk electricity system reliability outage is triggered by actions arising from distribution connected resources for which the IESO lacked visibility over:

   Implementing real-time limits will position the IESO to more effectively respond following contingencies, improving our capability to withstand and adapt to unmonitored threats.

3 Project Overview

3.1 Project Scope

The project builds out the DLRT platform and deploys real-time stability limits in parallel with static limits in system operations, with the objectives of achieving compliance with the market rules, enhancing situational awareness, system security and resiliency, and improving grid utilization. In addition, it will address the IESO's operational need for monitoring post-contingency voltage levels on the transmission system.

The project includes two major deliverables:

- "**DSA Enhancement**" enhances the real-time stability limit toolset such that it is capable of effectively determining real-time stability limits.
- **"Limit Validation & Dashboard**" implements a new process and supporting solutions for validating real-time stability limits; and also procures interactive tools and capabilities for communicating real-time stability limits and supporting information into the Control Room.

Figure 1 – High-level overview of DLRT scope of deliverables

3.2 High Level Assessment of Impacted Business Processes, Systems and Governing Documents

3.2.1 Processes

1. [redacted]
   a. [redacted]
2. [redacted]
   a. [redacted]
3. [redacted]
   a. [redacted]

4. [redacted]
    a. [redacted]
5. [redacted]
    a. [redacted]

3.2.2 Systems

- [redacted]
    - [redacted]
    - [redacted]
- [redacted]
    - [redacted]
    - [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

3.2.3 Governing Documents

Changes to procedures and processes to be identified in Planning phase.

3.3 Out of Scope

- [redacted]
- [redacted]

[3] Undocumented activities supporting both Plan Operations and DSTO

[4] Including “Address Issue with Participant”

3.1 Overall Project Timeline

The project was initiated in March 2021 after the kickoff meeting, and is planned to complete following deployment of Limit Validation and Dashboard platform into production and closure phase by January 2025 including 12 months of contingency to account for scheduling uncertainties

The project consists of two main delivery streams: "DSA Enhancement" and "Limit Validation & Dashboard Platform. Planning phase activities will be started after project kick off and will enter into requirement gathering and design stage after the approval of the project charter (version 1.0) for both delivery streams. The Planning Phase will be completed in two stages with an Integrated Project Plan being developed and approved before moving into the Execution Phases for each component (DSA Enhancements and Limit Validation and Dashboard Platform). The overall Planning Phase is expected to complete after "Limit Validation & Dashboard Platform" procurement completion and project charter V2.0 approval.

Execution phase for "DSA Enhancement" delivery will be started in parallel with procurement activity for "Limit Validation & Dashboard Platform" delivery.

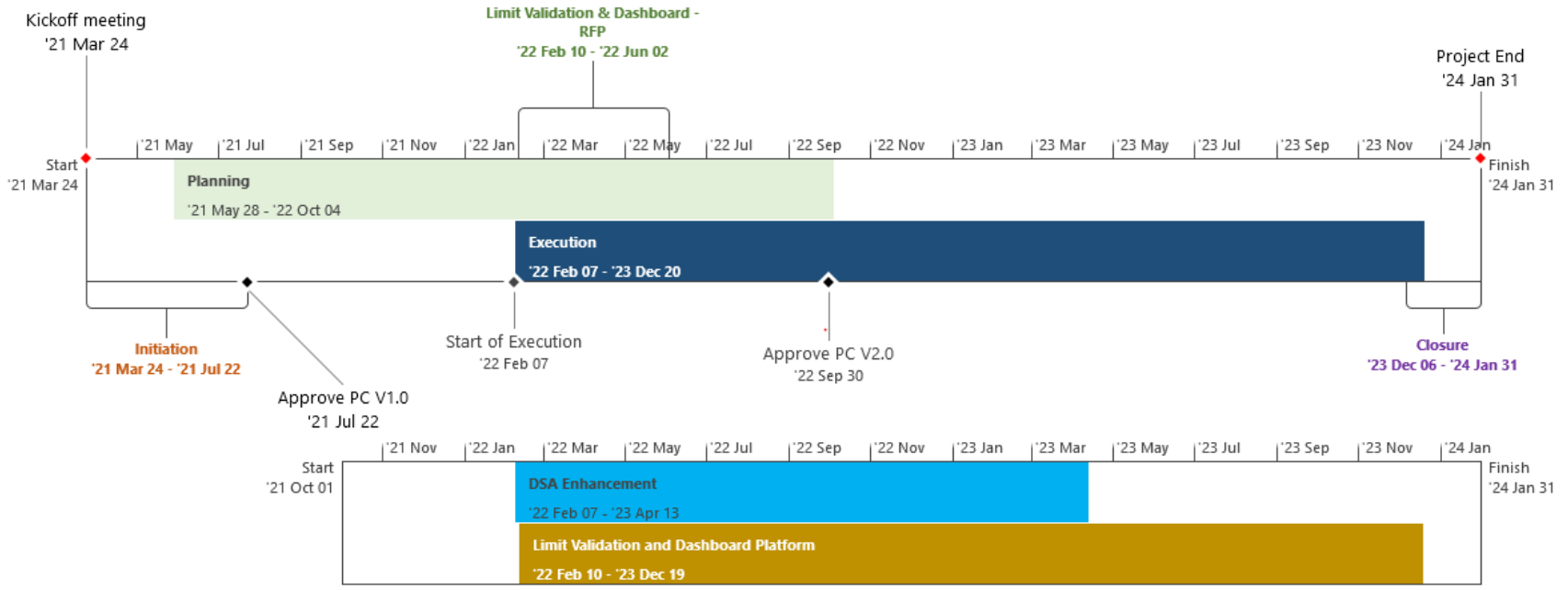


Figure 2 –Project schedule overview

3.2 Overall Project Cost

The overall project budget is $5.1M includes a contingency of $1.2M which reflects an estimation accuracy of +/- 30%.

The table below shows the anticipated expenditure over the period of the project.

Year	2021	2022	2023	2024	Total
Capital	$160,884	$1,997,410	$1,308,634	$72,920	$3,539,848
Capital (Contingency)					$1,062,000
Total Capital (Include Contingency)					**$4,601,848**
Operating	$200,499	$102,960	$55,440	$9,504	$368,403
Operating (Contingency)					$111,000
Total Operating (Include Contingency)					**$479,403**
Total (Include Contingency)					**$5,081,251**

3.3 Key Resource Needs

High level key resources required for this project are listed below:

- Project Manager
- Business Analyst
- Solution Architect
- Technical Analyst (CTS)
- Infrastructure and Network - SME
- Information Security - SME
- QA Lead
- Engineering Projects - SME
- Control Room - SME
- Market Forecasts & Integration - SME
- Real Time Applications - SME
- Market Analysis – SME
- Procurement Specialist

Resource Type	2021	2022	2023	2024	Average
Project Manager	0.7	0.6	0.6	0.1	0.5
Business Analyst	0.3	0.2	0		0.2
Corporate Technology Solutions -SME	0.2	0.4	0.4		0.3

Resource Type	2021	2022	2023	2024	Average
Engineering Projects - SME	1	1	1		1
Infosec - SME	0.1	0.1	0		0.1
Infrastructure & Telecom SME	0.3	0.2	0.1		0.2
IT Operations Management	0	0.1	0		0.1
Market Forecasts & Integration - SME	0.1	0.1	0.2		0.2
BSSD - PAO - SME	0.2	0.5	0.5		0.4
Performance Validation & Modelling - SME	0.2	0.1	0.1		0.2
Procure to Pay -SME	0.1	0.2	0		0.1
Quality Assurance - SME	0.2	0.4	0.3		0.3
Real Time Applications - SME	0.2	0.3	0.4		0.3
Control Room - SME	0.1	0.1	0.2		0.2
Solution Architect	0.4	0.3	0.1		0.3
Total (Average FTE)	**0.3**	**0.4**	**0.3**	**0.1**	**0.3**

3.4 Planning Phase

The planning phase includes the following activities:

- Integrated Project Plan
- Business Requirements Package
- Architecture Solution Definition and Technical Design
- Acquiring solution (Limit Validation & Dashboard)
- Refining the cost and time estimates
- Development and approval of Project Charter V2.0

3.5 Execution Phase

The execution phase includes the following activities:

- Update impacted process and procedures
- Acquiring Solution for DSA Enhancement
- Develop, Implement, Test and Transition to production
- Documentation
- User Training

4 Key Stakeholders

Key stakeholders are identified in Table 1.

Table 1 Key Stakeholder list

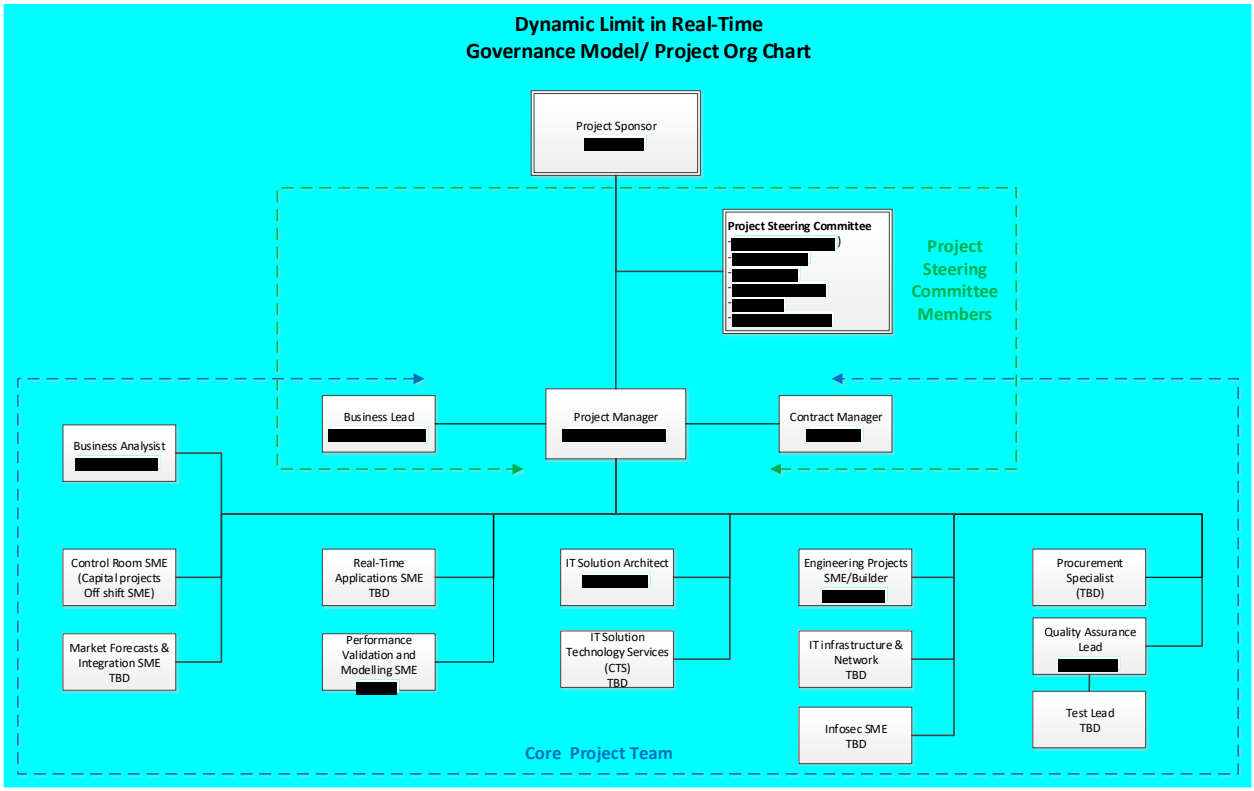
Stakeholder	Stakeholder Role	Process	How They Are Affected or How They Are Participating
Control Room System Operations M&R / Market Operations	End user Manager: Process Owner, Resource manager Builder	Direct Short-Term Operations (including activities Operate System Reliably and Recover from System Disturbance and Operate IESO Administered Markets (IAM))	• Direct users of the DLRT Platform—particularly the real-time dashboard interface for retrieving results and initiating studies. • Provide test cases • Provide business requirements • Participate in testing
Market Forecasts and Integration M&R / Market Operations)	Customer/Manager: Process Owner, Resource manager Builder	Plan Operations activities: Assess Outage	• Updated tools and procedures for MF&I outage assessment studies • New tools and procedures • Provide business requirements • Provide test cases • Participate in testing
Real-Time Applications (M&R / PSA)	Customer/Manager: Process Owner Resource manager Builder	Maintain Combined Network Model	• Combined Model as direct input to DLRT platform • DLRT platform to provide feedback into Combined Model improvements • Provide business requirements • Provide test cases • Participate in testing
Power System Limits / Engineering Studies (M&R / PSA)	Customer/Manager: Process Owner, Resource manager	Derive Mid-Term Limits	• Changes in SCO scope to support DLRT

Stakeholder	Stakeholder Role	Process	How They Are Affected or How They Are Participating
	Builder	Activity Derive Deployment Limits (Plan Operations)	• Feedback from DLRT to impact SCO development
I&TS – (BSSD Solutions Design, BSSD PAO, Corporate Technology Solutions, Infrastructure, Information Security, IT Operations)	Builder Subject Matter Experts Consultation Enterprise Architecture	Operate Technology Resolve IT Incident Resolve IT Problem SDLC	• Provide solution architecture design, solution integration services, vendor evaluation, etc. • Ensure alignment with architecture, including standards and practices of the solution • Provide application support and administration • Update manuals and procedures • Software security assessment, penetration • Provide IT Operation requirements, test cases, and testers.
Engineering Projects (Engineering Studies)	Builder Subject Matter Experts		• Provide business requirements • Developing DSA scenarios • Provide test cases
I&TS – BSSD - Quality Assurance team	Consultation		• Develop test plans • Provide support with planning and execution of testing activities
Procurement	Procurement	Procurement	• Provide input for procurement strategy • Prepare and issue procurement

Stakeholder	Stakeholder Role	Process	How They Are Affected or How They Are Participating
			documents and contracts.
Market Analysis (PA&O / MD&PR)	Consultation		• Measure Business Objective post project closure

5 Project Governance Structure

This document defines the high level approach and plan for the project. Complete details will be included in the Project Plan.



6 Delivery Approach

6.1 Development Life Cycle

The project employs the Solution Development Life Cycle (SDLC). Each delivery stream produces business needs and requirements and solution blueprints for its deliverables prior to beginning their implementation. This approach will help ensure that the project has the capability to maneuver, as needed, to meet evolving expectations of the business and of end-users.

6.2 Planning Phase

During the planning phase, business needs requirements and design are captured from key stakeholders and formulated for both delivery streams. This approach will aid in development of the Integrated Project Plan, and ensures that all stakeholder input is captured early.

6.3 Buy and Build

New functionality is acquired using a combination of buy and build.

This includes enhancements to existing solutions by vendor change request (VCR), and includes procurement of specialized software. When procuring, the project will endeavor to use off-the-shelf software with minimal customization, to the extent feasible.

6.4 Modular Development

Platform development is modular, meaning that all major components should interface using common protocols. This ensures that modules can be enhanced or swapped out as needed to extend or enhance the platform following project closure, and avoids creating dependencies on specific IESO tools and/or platforms.

7 Assumptions, Constraints and Potential Risks

7.1 Project Assumptions

- No testing automation will be included in the scope of this project. However, given the initial assessment of the new tools, there is possibility to automate the health check for the DLRT tools (some scripting might be possible for DSA).
- [redacted]

- DLRT project does not have any technical dependency to MRP project. Any integration with day-ahead, pre-dispatch, and real-time market systems developed by MRP will happen post-MRP go-live.
- [redacted]
- The project does not anticipate impacting market rules or market manuals.
- The project will recommend changes to the organizational structure of PSA and Market Operations to support the platform and take advantage of its functionality, but implementation of such changes are left to the respective business units.

7.2 Project Constraints

N/A

7.3 Potential Project Risks and Mitigation Actions

The following table outlines project risks known to date that have a high or critical inherent risk level and identifies mitigation actions planned or taken in order to reduce the risk level to an acceptable level (Target Risk Level).

Table 2: Risk Summary

Risk ID	Risk Description	Inherent Risk Level	Control Action	Control Action Implemented[5] (Yes/No)	Residual Risk Level[6]	Target Risk Level
R001	Introduction of new technical capabilities (Limit validation , Dashboard, DB) currently not used by the IESO, will delay the Limit Validation & Dashboard delivery	High	1) Use demo/proof of concept during procurement 2) Build Time contingency to the project 3) Release the time	1) No 2) Yes 3)No	Medium	Low

[5] Status of implemented Control Actions

[6] The residual risk level reflects the current level of risk, based on status of control action implemented.

Risk ID	Risk Description	Inherent Risk Level	Control Action	Control Action Implemented[5] (Yes/No)	Residual Risk Level[6]	Target Risk Level
			contingency required			
R002	Introduction of new Business capabilities(Limit validation , Dashboard, DB) currently not used by the IESO, will delay the Limit Validation & Dashboard delivery	Critical	1) CRO and Engineers trained to use new tools 2) Process Stewards accepted new process using new tools 3) Early engagement of the CRO and communicate changes and collect the inputs on a continual basis 4) Build Time contingency to the project 5) Release the time contingency required	1) No 2) No 3) No 4) Yes 5) No	High	Low
R003	DLRT requirements may not be achievable without modifying the OSL Platform functionalities	High	1) Perform gap analysis of current OSL platform functionalities during planning phase 2) Revise the project scope, cost and schedule based on gap analysis and final design and include it in subsequent version of the PC (PCv2) 3) Include cost &	1) No 2)No 3) Yes 4) No	Medium	Insignifi cant

Risk ID	Risk Description	Inherent Risk Level	Control Action	Control Action Implemented[5] (Yes/No)	Residual Risk Level[6]	Target Risk Level
			time contingency to the project 4) Release the time & cost contingency required			
R005	Key vendors are unable to deliver tool enhancements within project timelines	Critical	1) Coordination with vendors as part of the VCR and SOW approval process 2) Incorporate time component in to the SOW or VCR to provide incentive for the vendor to deliver on time (option) 3) Include project contingency (time and cost) 4) Release the time & cost contingency required	1) No 2) No 3) Yes 4) No	High	Insignificant
R006	Key internal stakeholders are slow or resistant to integrate new technologies and processes delivered by the project.	Critical	1) Early engagement of all stakeholders and communicate changes and collect the inputs on a continual basis 2) Post stage 1 of the project includes a "break-in" period for key stakeholders to become familiar and confident with the tool. 3) Part of the project team will sit in with the Operators within the Control Room for a period of time	1) No 2) No 3) No 4) No	Critical	Low

Risk ID	Risk Description	Inherent Risk Level	Control Action	Control Action Implemented[5] (Yes/No)	Residual Risk Level[6]	Target Risk Level
			following launch, in order to provide additional training and support. 4) Dedicated training session with impacted stakeholders			
R012	Expanded model from WAVE Phase 2 project has materially adverse impact on performance of the DLRT platform (DSA)	High	1) DLRT team will have input in WAVE Phase 2 testing. Testing considers performance impact of expanded model onto real-time limit processing. 2) Consult with vendors to resolve the performance issues. 3) Extend the project execution to resolve the performance issues 4) Use Change Management to accommodate performance improvement 5) Include additional cost contingency in PC v2 (if required)	1) No 2) No 3) No 4) No 5) No	High	Low
R014	SDLC process is new to the IESO and may lead to learning curves for project members that can impact the schedule.	Critical	1) Incorporate the SDLC process into initial Project Plan 2) Include additional schedule contingency to manage the uncertainty 3) Keep project team	1) Yes 2) Yes 3) No	Medium	Insignifi cant

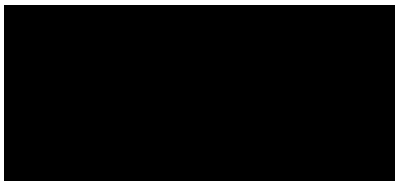
Risk ID	Risk Description	Inherent Risk Level	Control Action	Control Action Implemented[5] (Yes/No)	Residual Risk Level[6]	Target Risk Level
			engaged in SDLC activities and explain processes that are new.			

Note: The project team will maintain a comprehensive risk log which will include a complete list of project risks including those with a medium or low risk level. New or modified risks and mitigation plans will be highlighted to the Project Sponsor and Project Steering Committee members via monthly progress reporting.

8 Change Controls

Changes in the project that will impact/exceed tolerance levels for objectives, time and cost will be managed through the formal Project Change Management Process resulting in the Project Exception Report. The Project Exception Report (if approved) will result in the re-baselining of the project. Refer to the Project Exception Procedure for reference and additional details.

Appendix A: NPV Analysis and Cash Flow



Appendix B: Alternative Analysis

Identified Alternatives Summary

Alternative 1 – Do Nothing (Not Recommended)
Do not implement post-contingency voltage monitoring into the Control Room, and maintain existing processes and tools in use for deriving operating limits in the mid-term ([redacted]) and operations planning time-frames ([redacted]).

Benefits Realized:

- No realization of business objectives.

Risks**:**

- Do not achieve compliance with Market Rule obligation to monitor and take actions to respect ratings established by asset owners. Not taking steps to respecting these ratings could also result in damage to the transmission owner's assets, or bring harm to their staff or the general public.
- Not implementing Post-Contingency High-Voltage Monitoring capabilities would run the risk of Hydro One taking unilateral action to remove affected equipment from the grid without IESO foreknowledge or consent – resulting in potential for significant impact to system reliability across the broader bulk power system
- An extreme weather event significantly damages generation or transmission assets, and we do not have the capabilities to respond in a timely manner, resulting in significant impact to ratepayers and/or market participants.
- IESO Operations continues to rely on human judgement and existing manual processes to re-prepare the system following grid contingencies, resulting in unnecessary rate-payer and market participant impact, and greater risk to the security and reliability of the power system.
- The IESO continues to lack a tool based strategy to address potential for gaps within the operating plan inherent with offline derived limits, resulting in greater risk for local or widespread system and customer impact.
- A critical bulk electricity system reliability outage is triggered by actions arising from distribution connected resources for which the IESO lacked visibility over. We do not have capabilities to effectively respond and adapt.
- No savings are achieved within IESO Administered Markets (IAM).
- Do not improve utilization of the existing transmission system.

Alternative 2 – DLRT project (Recommended)

Deploy Dynamic Limits into the IESO's real-time operations environment.

Benefits Realized:

- Achieve compliance with Market Rule obligation to monitor and take actions to respect ratings established by asset owners.
- Cost effective reliability: IESO Administered Markets (IAM) savings of $1.5M per year.
- The IESO is positioned to more effectively respond following grid contingencies, including extreme weather events, by enabling more timely re-preparation of the system and more secure and optimized operating limits that are derived within minutes, as compared to hours in today's environment. This reduces the impact to rate-payers and to market participants.
- Improved monitoring of post-contingency voltage levels and grid stability, and enhanced capabilities to respond to changing grid conditions, resulting in enhanced system security, reliability, and resiliency.
- Future work process savings, considering shift of offline limit assessment work from Power System Limits and MF&I Operations Planning into Real-Time Operations.
- Establishes the foundational toolset necessary for integration into the IAM in subsequent project.

Risks:

- Unanticipated complexities involved in maintaining the newly deployed capabilities for real-time voltage monitoring and limits.

NPV:

- Net present value over 4-years of operation: $1.7M

Alternative 3 – Implement Post-Contingency High-Voltage Monitoring only

Develop the tools necessary to provide post-contingency high voltage monitoring to the Control Room.

Benefits Realized:

- Improved monitoring of post-contingency voltage levels resulting in enhanced system reliability.
- Achieves compliance with Market Rule obligation to monitor and take actions to respect ratings established by asset owners.

Risks:

- An extreme weather event significantly damages generation or transmission assets, and we do not have capabilities to respond in a timely manner, resulting in significant impact to ratepayers and/or market participants.
- IESO Operations continues to rely on human judgement and existing manual processes to re-prepare the system following grid contingencies, resulting in unnecessary rate-payer and market participant impact, and greater risk to the security and reliability of the power system.
- The IESO continues to lack a tool based strategy to address potential for gaps within the operating plan inherent with offline derived limits, resulting in greater risk for local or widespread system and customer impact.
- A critical bulk electricity system reliability outage is triggered by actions arising from distribution connected resources for which the IESO lacked visibility over. We do not have capabilities to effectively respond and adapt.
- Not cost-effective: significant expenditure is still required for enhancing the toolset, and there are no achievable market benefits.
- Additional 1 FTE resources are required to support the new high-voltage monitoring functionality, without any benefit to efficiency of existing work processes.

NPV:

- Net present value over 4-years of operation: $(- 4.4M)

Appraisal of Alternatives

Ref #	*Alternative*	*NPV*	*Achievement of Business Objectives*	*Risk*	*Consideration*
1	*Do Nothing*	*0*	- No business objectives are met	Critical risk: - Non-compliant with market rules - We do not have the capabilities to respond in a timely manner following severe weather events, resulting in potential for significant impact to ratepayers and/or market participants - Lack of tools to effectively respond and adapt following contingencies which come as a result of an unmonitored threat.	*Not recommended*
2	*This project*	*+$1.7M (with additional savings in future projects)*	- Achieve all business objectives - Compliance with Market Rule obligation to monitor and take actions to respect ratings established by asset owners - Enhance reliability and resiliency - Increase market efficiency - Add new capabilities for determining and manually implementing dynamic limits	Low risk: - Minor impact to one business objective is possible as a result of unanticipated complexity	*Recommended*
3	*Implement high-voltage*	*$(-4.4M)*	Achieves only one business objective:	Critical risk: - We do not have the capabilities to respond in a	*Not-recommended*

Ref #	*Alternative*	*NPV*	*Achievement of Business Objectives*	*Risk*	*Consideration*
	monitoring in EMS		- Compliance with Market Rule obligation to monitor and take actions to respect ratings established by asset owners.	timely manner following severe weather events, resulting in potential for significant impact to ratepayers and/or market participants - Lack of tools to effectively respond and adapt following contingencies which come as a result of an unmonitored threat.	

Appendix C: Project Cost Worksheet

Dynamic Limits in Real-Time (DLRT)			
Project Charter			
Code	**Project Capital Expenses**	**PC V1.0 Approved Budget**	
	Total Internal Labor	**$**	**1,143,700**
Mutliple	IESO Labour	$	1,143,648
	Total Contract/Computer Services	**$**	**1,615,700**
74000	Computer Services/Software	$	1,615,700
	Total Hardware and Building Services	**$**	**671,000**
74500	Computer Equipment	$	671,000
	Total Miscellaneous	**$**	**109,500**
87000	Interest	**$**	**109,500**
	Subtotal Capital Budget without Contingency	$	3,539,900
	Contingency	$	1,062,000
	Total Capital Budget with Contingency	**$**	**4,601,900**
Code	**Project Operating Expenses**	**PC V1.0 Approved Budget**	
	Total Internal Labor	**$**	**368,500**
Mutliple	IESO Labour	$	368,403
	Total Contract/Computer Services	$	-
	Total Hardware and Building Services	$	-
	Total Miscellaneous	$	-
	Subtotal Operating Budget without Contingency	$	368,500
	Contingency	$	111,000
	Total Operating Budget with Contingency	**$**	**479,500**
	Subtotal Capital and Operating Budget without Contingency	$	3,908,400
	Contingency (capital + operating)	$	1,173,000
	Total Capital and Operating Budget with Contingency	**$**	**5,081,400**

Document Control

Note: * indicates which roles will be required to approve in [redacted] workflow, however, document will be reviewed by all other roles identified.

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PMO	IESO
Finance	IESO

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1.0	Initial version of the DLRT Project Charter (PC v1.0)	22 July, 2021

References

Document Title	Document ID
Project Intake Document	[redacted]
Project Roles and Responsibilities	[redacted]

Related Documents

Document Title	Document ID
Integrated Project Plan	[redacted]

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