Operating Engineers Regulatory Review

Findings and Recommendations Report

June 19, 2017

Prepared by Deloitte on behalf of the Operating Engineers Expert Panel

Preface

In November 2016, the Ontario Ministry of Government and Consumer Services (MGCS) and the Technical Standards and Safety Authority (TSSA) brought together a volunteer panel of stakeholders with experience related to the operating engineer field. The objective of this panel was to provide recommendations for government's consideration to support revisions to the Operating Engineers Regulation (O. Reg. 219/01)[1] under the Technical Standards and Safety Act, 2000[2]. Deloitte facilitated the stakeholder engagement process and prepared the report on behalf of, and with input from, the panel.

The panel discussed a number of topics including the burden on business, encouraging innovation, and addressing the inadequate operating engineer labour supply.

Seven panel meetings were held between November 2016 and February 2017. The panel discussions identified challenges within these topics, the range of options available, and which of those options would be the most effective.

By the end of the consultations the panel identified a number of recommendations to maintain high-levels of public safety, while reducing undue burden on business. This report represents the culmination of the panel's recommendations to government, TSSA and industry.

[1] Government of Ontario. Operating Engineers Regulation. https://www.ontario.ca/laws/regulation/010219
[2] Government of Ontario. Technical Standards and Safety Act. https://www.tssa.org/CorpLibrary/ArticleFile.asp?Instance=136&ID=BF806C9B56F5466989EBB0CB0AD4DE23

Signed by:

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Executive Summary

Operating Engineers Regulatory Review

In 2015, the Ministry of Government and Consumer Services (MGCS) and the Technical Standards and Safety Authority (TSSA) initiated the Operating Engineers Regulatory Review. The review was conducted to address stakeholder concerns regarding the Operating Engineers (OE) regulation and to develop recommendations to maintain high-levels of public and occupational safety while supporting business competitiveness in the operating engineering industry.

MGCS engaged Deloitte to facilitate the work of the expert panel. The 15 members of the Operating Engineers Expert Panel included a balanced representation of the industry with stakeholders from the following sectors: labour, manufacturing, natural resources, oil and gas, power plants, the public sector, and refrigeration.

At the outset of the expert panel process the panel developed a number of desired outcomes[3] to guide their work throughout the regulatory review process including:

- Maintain high-levels of public safety (inclusive of both employees and the broader public);
- Maintain the safety of property; and
- Impose a minimum burden on business (e.g., minimal cost, minimal administration)

The panel's discussions focused on seven key topics:

A. Reducing undue burden on business
B. Encouraging innovation
C. Improving regulatory clarity
D. Improving regulatory compliance
E. Addressing inadequate labour supply
F. Modernizing the operating engineer certification system
G. Improving public knowledge of the operating engineer profession

The panel spent the majority of their time discussing topics A and B, and formed two pivotal recommendations:

[3] See Table 2 for full list of desired outcomes.

- The first is that the OE regulation should be revised to be 'risk-based', meaning that the requirements in the regulation should be informed by evidence of the risks posed by different plant types (see recommendation #1).

- The second is that the OE regulation should include two alternate paths to achieve compliance (see recommendation #4). Plant owners should have the opportunity to choose to comply with prescriptive regulatory requirements or develop a site-specific risk and safety management plan.

In total the panel developed 25 recommendations and reached consensus on 23 of the recommendations. The first recommendation that the panel did not reach consensus on was with respect to enforcement; panel members were not in agreement as to whether TSSA should have more tools to enforce the regulation (see recommendation #13). The second recommendation that did not reach consensus was about whether candidates entering the OE industry should have to take an online or in-class course (see recommendation #22).

In addition to the panel's recommendations, the Technical Standards and Safety Authority also proposed some revisions to the regulation including adopting the term "power engineer" to replace the term "operating engineer", and revising the regulation to include a code adoption document. The four additional recommendations proposed by TSSA are described in the section titled "Additional Proposed Revisions".

This report summarizes the panel's recommendations and is intended to encourage further discussion among Ontarians on these important topics.

Summary of recommendations

Table 1: Summary of recommendations

Recommendation	Panel Alignment[4]
Topic A: Reducing undue burden on business	
1. The regulation should adopt a risk-based approach.	Consensus
2. Given the risk-based framework which the new regulation will be founded on, TSSA should undertake an assessment to evaluate whether the exemptions listed under section 3 (2) of the regulation are still relevant.	Consensus
3. The regulatory provision (section 37 (3)) requiring electronic log entries to be printed and signed the next business day should be removed from the regulation.	Consensus
Topic B: Encouraging innovation	
4. The regulation should include two alternate paths that plants can adopt to achieve compliance with the regulation; Path 1 category-based requirements and Path 2 site-specific requirements.	Consensus
Topic C: Improving regulatory clarity	
5. All components of the regulation should be clear and precise to allow a non-technical, lay person to understand the regulation.	Consensus
6. TSSA should review current processes and procedures to support consistent application of the regulation.	Consensus

[4] The panel alignment column provides an indication of how aligned the panel is to the recommendation. Consensus is defined as “a willingness to commit to and support a recommendation”. The degree of consensus for a recommendation is defined in two ways: consensus or no consensus. Consensus reflects that the panel was able to come to a consensus on a particular recommendation. No consensus reflects that the panel was split into two to three groups around potential recommendations, but no clear consensus was achieved. The panel was able to come to a consensus on 23/25 recommendations.

Recommendation	Panel Alignment[4]
7. The definition of the term "boiler[5]" in the OE regulation should be changed to align with the definition in the Boilers and Pressure Vessels regulation 220/01 and TSSA should conduct a public safety risk assessment to determine whether emerging boiler and pressure vessel technologies should be regulated.	Consensus
8. The regulation should adopt the term "licence", instead of "certification" (e.g., 4th class licence, instead of certification).	Consensus
9. TSSA, in consultation with industry and OE associations, should establish guidelines for how qualifying experience is recorded.	Consensus
10. TSSA should improve the current documentation of the guidelines and process by which qualifying experience for internationally trained workers is assessed in Ontario to ensure the process is clear, transparent and predictable.	Consensus
11. TSSA should develop a standard reporting template for plants to report accidents.	Consensus
12. The qualifications of the Chief Officer and Plant Inspectors should be clearly documented.	Consensus
Topic D: Improving regulatory compliance	
13. To improve regulatory compliance, TSSA should have additional enforcement mechanisms to manage different situations.	No consensus
Topic E: Addressing an inadequate labour supply	
14. Qualifying experience for class 1-4 operating engineers should include all regulated technologies (e.g., refrigeration, turbines, compressors, etc.).	Consensus
15. TSSA and the ministry should consider opening up other avenues to acquire qualifying experience to ensure candidates[6] are able to get the experience required to achieve higher certifications.	Consensus

[5] Boiler means a fired vessel in which gas or vapour may be generated or a gas, vapour or liquid may be put under pressure by heating.
[6] The term 'candidates' refers to individuals who are working towards operating engineer and/or operator certifications.

Recommendation	Panel Alignment[4]
16. Candidates, including operating engineers and operators, should be able to write the exams for two levels above their current certification level without having to accrue the required qualifying experience.	Consensus
17. TSSA should establish and maintain a list of incentive programs that exist for employers to take on operating engineer and operator candidates for co-op placements, and publicize the list to the industry.	Consensus
18. TSSA should work with the colleges, employers, employees, and industry associations to develop a program to support the advancement of operating engineers, with particular focus on achieving 2nd and 1st class certifications and refrigeration A certifications.	Consensus
19. TSSA and MGCS should work with the Ministry of Advanced Education and Skills Development, the Ministry of Labour, and the Ministry of Indigenous Relations and Reconciliation to develop an approach to attract non-traditional OE labour market participants to the field.	Consensus
20. A steam prime mover operator certificate should be established to replace the current Steam Turbine Operator Permit.	Consensus
21. TSSA should develop a mechanism to collect information about the current OE workforce to support workforce planning.	Consensus
Topic F: Modernizing the operating engineer certification system	
22. To obtain an entry-level 4th class operating engineer certification, candidates should be required to take an in-class or online course.	No consensus
23. TSSA should develop a program for plant owners and chief operating engineers to ensure they have sufficient knowledge of the regulation to support the safe operation of their plants.	Consensus
24. The Government of Ontario should review the funding model for OE college programs to ensure that remote colleges are receiving sufficient funding to support and grow the program.	Consensus

Recommendation	Panel Alignment[4]
Topic G: Improving public knowledge of the operating engineer profession	
25. TSSA should work with stakeholders to develop an approach to better publicize the role of OEs and operators (refrigeration, compressor, steam prime mover) in Ontario.	Consensus

Background

Structure of the report

The body of the report, the recommendations section, is divided into seven sections, one for each topic area. Within each topic area are recommendations that are related to the topic. Some recommendations have considerations, which are thoughts or reflections that should be noted in conjunction with the recommendation. The considerations are intended to be reviewed by MGCS and TSSA when drafting revisions to the regulation or implementing the recommendations.

Context about the operating engineer industry

Ontario's Operating Engineers regulation (O. Reg. 219/01) under the Technical Standards and Safety Act, 2000, applies to the management, operation and maintenance of registered plants and the training, examination, and certification of operating engineers and operators.

Operating engineers (OE) are professional power plant managers and operators who oversee the provision of energy, climate control, electric power or other utilities for thermal-electric generating stations, industrial processes and facilities. They manage, operate and maintain boilers, steam turbines and engines, gas compression plants, refrigeration plants, and associated mechanical and electrical systems in power generation, industrial processes and environmental system plants.

In the OE field, there are four classes of operating engineer certifications, and certifications for compression and refrigeration operators. TSSA also issues steam turbine operator permits.

There are 3,208[7] plants in Ontario that are registered with the Technical Standards and Safety Authority. OE plants in Ontario are either attended or unattended. The regulation requires that plants be attended[8] if, among other things, they have a power rating[9] that is above a defined threshold. Plants do not

[7] Data provided by the Technical Standards and Safety Authority, as of April 1 2017.
[8] "Attendance", in relation to shift coverage, means the physical presence of a person for the purpose of mandatory shift coverage by an operating engineer or operator for the operation of the plant as set out in this Regulation and "attended" has a corresponding meaning.
[9] "Power rating" is defined as the highest power input or output that flows through a plant or equipment.

require attendance if they have a power rating below a defined threshold. In Ontario, 78%[10] of registered plants are unattended.

There are four main types of OE plants: refrigeration, boiler, compressor and steam prime mover plants. Attended plants align to one of the four classes of operating engineer. For example, first class plants require a first class chief, second class plants require a second class chief, etc.

Regulatory review process

In 2015, the Ministry of Government and Consumer Services (MGCS) and the Technical Standards and Safety Authority (TSSA) initiated the Operating Engineers Regulatory Review. The regulatory review is comprised of three phases: a jurisdictional scan, expert panel consultations, and public consultations.

- Deloitte conducted a jurisdictional review of 11 jurisdictions across Canada, the United States, Europe and Asia.
- The review addressed key topic areas including the scope of relevant regulation and code; the structure of the regulation and code; key challenges and mitigation strategies; leading practices; emerging trends; and relevant safety data.

- Deloitte facilitated the work of the expert panel to discuss key topics in the OE field and form recommendations to address the issues.
- The panel developed 25 recommendations, which are summarized in this report (Findings and Recommendations Report).

- The Findings and Recommendations Report is published on Ontario's Regulatory Registry for public comment from broader industry stakeholders and the public at-large.
- Following this consultation period the Ministry of Government and Consumer Services will draft revisions to the regulation for the government to consider.
- The draft revisions will also be posted on the Regulatory Registry for public comment.

[10] Data provided by the Technical Standards and Safety Authority, as of April 1 2017.

Current state

Informed by the outputs of the jurisdictional scan and interviews with over 50 stakeholders, the Ministry of Government and Consumer Services (MGCS) and Technical Standards and Safety Authority (TSSA) convened an expert panel[11] of industry practitioners to address the following overarching problem statement:

> *How can the Operating Engineers regulation be revised to maintain high-levels of public safety, while supporting business competitiveness?*

Through discussions and debate the expert panel deconstructed this problem statement into seven key topics:

A. Reducing undue burden on business
B. Encouraging innovation
C. Improving regulatory clarity
D. Improving regulatory compliance
E. Addressing inadequate labour supply
F. Modernizing the operating engineer certification system
G. Improving public knowledge of the operating engineer profession

Given that the overall levels of safety in the OE sector are extremely high, with an average of one incident reported each year, the focus of the panel's discussion was on how to improve the regulation while maintaining the strong record of safety[12].

Future state vision

The panel identified several key outcomes of the regulatory review. These outcomes summarize what revisions to the regulation should achieve in the future. For example, any changes to the regulation should result in maintained or improved public and occupational safety and protection of property. These outcomes guided the panel's work throughout the regulatory review process and should continue to guide MGCS and TSSA as they work to develop and implement revisions to the regulation.

[11] The panel was guided by its Terms of Reference which set out the scope of the panel's work, the roles and responsibilities of the panel members (as well as those of the staff of the ministry, TSSA, and Deloitte) and the process. The Terms of Reference highlighted the importance of considering the public interest and striving for consensus in making recommendations to government. The full Terms of Reference can be found in Appendix A.
[12] TSSA. Annual State of Public Safety Report. FY2016. https://www.tssa.org/corplibrary/ArticleFile.asp?Instance=136&ID=92F45AA58A4811E6A763005056AD4CB7

Table 2: Desired outcomes of the regulatory review

Priority	Outcomes
Primary Outcomes	Maintain high-levels of public safety (inclusive of both employees and the broader public)
	Maintain the safety of property
Secondary Outcomes	Impose a minimum burden on business (e.g., minimal cost, minimal administration)
	Provide industry with alternate paths to compliance
	Develop a sound evidence base and documented rationale for regulatory requirements
	Promote efficient use of technology
	User friendly and easy to understand
	Impose a minimum burden on candidates currently being qualified to join the industry and those currently working in the industry
	Implementable and enforceable
	Allows for changing circumstances in the OE field
	Relevant now and in the future

The vision for the future of the OE regulation is also guided by the Government of Ontario's commitment to build a better business climate[13]. The government, in its 2015 Burden Reduction Report, committed to undertaking a government-wide effort to reduce burden on business and stakeholders. In addition, the government has established a number of regulatory policy principles[14], including:

- Regulations respond to a clearly identified need for regulation
- Regulations are developed and implemented in a transparent manner
- Regulations must be results-based, where appropriate and to the extent practicable
- Regulations are based on assessed risks, costs and benefits and minimize impacts on a fair, competitive and innovative market economy

[13] Government of Ontario. Building a Better Business Climate for Ontario: 2015 Burden Reduction Report. https://www.ontario.ca/page/building-better-business-climate-ontario-2015-burden-reduction-report
[14] Government of Ontario. Ontario Regulatory Policy. https://www.ontariocanada.com/registry/downloads/Ontario%20Regulatory%20Policy.pdf

These principles guided the panel's work and are largely consistent with the panel's outcomes.

Achieving the vision

In order to achieve the future state vision, the panel agreed that major changes would need to be made to the regulation. A number of the issues identified by the panel are foundational challenges that cannot be addressed by making minor changes to the regulation.

The recommendations set out in this report are bold and transformational, and are intended to maintain high-levels of public and occupational safety, while supporting business competitiveness.

Recommendations

Topic A: Reducing undue burden on business

The current regulation imposes undue burden on some businesses, without improving safety outcomes.

Given that the overall levels of safety in the OE sector are extremely high, with an average of one incident reported each year, the focus of the panel's discussion was on how to reduce the burden on business while maintaining the strong record of safety[15].

While the requirements in the OE regulation were developed in consultation with experts in the OE field, they are not informed by scientific data or evidence of the risks[16] posed by plants. Instead, the requirements in the regulation are uniformly applicable regardless of plant configuration and in many cases impose an undue burden on business, without necessarily contributing to the safety of the plant. The burden on business is particularly acute for small plants that must comply with onerous plant attendance requirements.

Recommendation #1

The regulation should adopt a risk-based approach.	Consensus

Ensuring that regulations are risk-based is consistent with Ontario's regulatory policy and is a regulatory leading practice worldwide[17]. The regulation should be revised to be risk-based to ensure that any regulatory requirements imposed on business are informed by the risk posed by the plant. Revising the regulation to be risk-based will require a foundational change to the regulation, described in more detail below.

Risk-based regulation

Risk-based regulation is based on the foundational concept that regulatory requirements imposed on business should be informed by the risks posed by the business to the regulatory objectives. Risk-based regulation has been used in a

[15] TSSA. Annual State of Public Safety Report. FY2016. https://www.tssa.org/corplibrary/ArticleFile.asp?Instance=136&ID=92F45AA58A4811E6A763005056AD4CB7
[16] Risk is defined as a situation involving exposure to danger.
[17] OECD. Risk and Regulatory Policy. http://www.oecd.org/gov/regulatory-policy/44848493.pdf

number of industries including: hazardous installations, workplace health and safety, food safety, technical safety, and nuclear installations.

A core part of risk-based regulation is an acknowledgement that there will always be some amount of risk, however the purpose of risk-based regulations are to identify an acceptable level of risk and implement regulatory requirements that allow that acceptable level to be maintained over time.

There are a number of different standards available to help define what the acceptable level of risk is. For example, one commonly used criteria is a standard that has been developed by the Major Industrial Accidents Council of Canada[18], another example is the ALARP[19] criteria, As Low As Reasonably Practicable.

These standards allow regulators and government to align on a risk-level they are willing to tolerate and then implement regulatory requirements that allow them to achieve the defined standard.

In order to develop a risk-based regulation, TSSA and the ministry will need to work in conjunction with risk experts and industry to complete a six phase process including, forecasting ('risk assessment'), prevention ('risk management'), oversight ('regulatory review'), implementation, coping, and evaluation[20].

Recommendation #2

Given the risk-based framework which the new regulation will be founded on, TSSA should undertake an assessment to evaluate whether the exemptions listed under section 3 (2) of the regulation are still relevant.	Consensus

The regulation identifies a number of items in section 3 (2) that the regulation does not apply to, such as:

- a person who performs work in connection with a plant other than the actual operation of it;
- a boiler used in connection with an open-type hot water heating system having no intervening valves between the boiler and any direct vent, preventing any pressure build up above atmospheric pressure;
- a high or low pressure steam plant or power plant or a high or low temperature water or power plant while used in connection with any growing operation, except a growing operation being carried on in a greenhouse where a person, other than the user of the plant or his or her

[18] Major Industrial Accidents Council of Canada. Risk-based Land Use Planning Guidelines. http://www.cheminst.ca/sites/default/files/pdfs/Connect/PMS/Risk-Based%20Land%20Use%20Planning%20Guidelines.pdf
[19] UK Government. Health and Safety Executive. http://www.hse.gov.uk/risk/theory/alarpglance.htm
[20] OECD. Risk Regulation and Governance Institutions. (p. 140-141).

immediate family, is employed or works in connection with the growing operation.

As the new regulation will be risk-based, TSSA should undertake a review of each item to determine whether there is a risk-based rationale for why it is exempt.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- Additional technologies should only be considered for regulation if a public safety risk assessment has been undertaken and the need for regulation has been clearly identified.

Recommendation #3

The regulatory provision (section 37 (3)) requiring electronic log entries to be printed and signed the next business day should be removed from the regulation.	Consensus

The regulation includes a provision requiring plant owners that have an electronic log to print out and sign a paper version of the log the next business day. The purpose of this provision is to ensure that there is a physical copy of the log that is printed, bound and signed, and cannot be edited or altered after the log entries are made.

While the intent of this requirement is still relevant, increasingly plants are using technology that allows the log to be stored electronically and has appropriate controls in place to ensure that the entries cannot be edited or changed. As a result, the requirement to print the log at the end of each shift is burdensome and unnecessary.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- Industry, TSSA and the ministry should consider how to ensure the information in the electronic log cannot be edited or tampered with after it has been recorded. If a plant does not have an alternative method of recording shift activity that is safe and secure, the requirement to print out the log should remain in force.

Topic B: Encouraging innovation

The current regulation does not provide businesses with the opportunity to pursue innovative ways to achieve acceptable safety standards.

The requirements in the regulation are prescriptive. For example, the attendance requirements in the regulation stipulate the precise qualification an operating engineer must have and duration of time they must be present to attend the plant. This is problematic for some plant owners because the regulation does not provide any flexibility in terms of how they comply with the regulation, regardless of unique controls or systems that plants may have in place to manage risk. For example, the regulation does not take into consideration plant specific controls and conditions such as, monitoring systems, automated shut down procedures, or geographical considerations.

This lack of flexibility is a source of concern for industry because it does not provide any incentive for plants to invest in innovative technologies. This is especially challenging for relatively small plants that have to comply with attendance requirements, which result in a significant cost to the plant, despite being able to make capital investments in innovative technologies that could achieve the same standards of safety.

Modern regulatory practices have shifted from the prescriptive approach to an outcome-based approach to regulation. The objective of an outcome-based regulatory model is to shift the focus from requiring registrants to comply with a specific set of rules or processes, which tend to be prescriptive in nature, toward the broader regulatory outcomes or objectives they are expected to achieve by setting only the end targets that must be met.

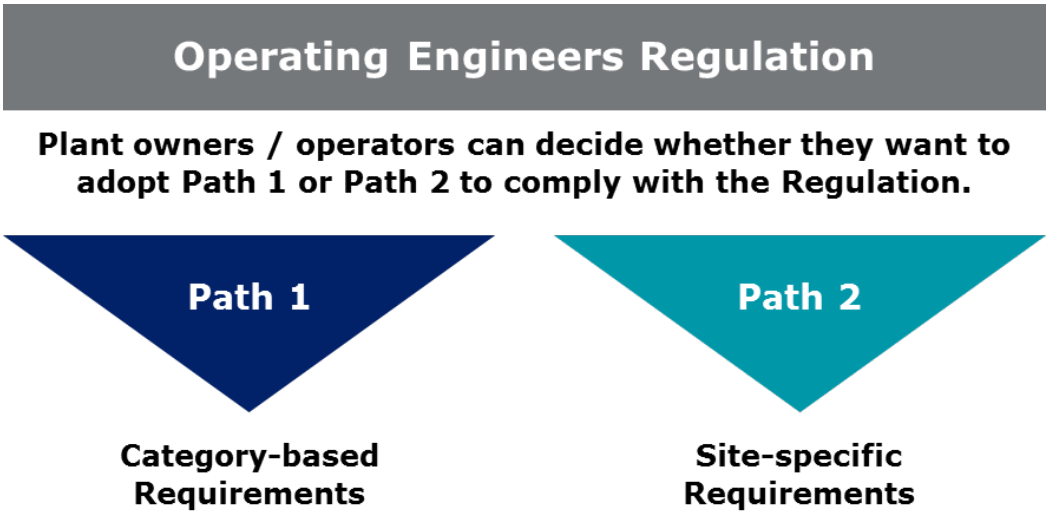
This approach has a range of benefits including:

- Helping regulators and regulated parties focus on the purpose behind rules rather than just on the detailed compliance provisions;
- Enabling greater flexibility for regulatory agencies and regulated parties in determining how to comply with rules;
- Reducing complexity and focusing attention on the important rules; and
- Facilitating more open dialogue between regulatory bodies and regulated parties, thereby creating a more collaborative approach to achieving desired outcomes.

Recommendation #4

The regulation should include two alternate paths that plants can adopt to achieve compliance with the regulation; Path 1 category-based requirements and Path 2 site-specific requirements.	Consensus

To address the lack of flexibility in the current regulation and encourage innovation in the OE sector the regulation should include two paths to compliance. This recommendation is consistent with the outcomes-based approach explained above. By including two alternate paths to achieve compliance in the regulation, plants will have options for how they wish to achieve the same outcome which is an acceptable risk-level. In order to expand on this recommendation TSSA developed a Path 1 and Path 2 regulatory model that is being recommended by the panel.



Path 1 category-based requirements

The Path 1 approach would provide plants with category-based requirements to fulfil based on the risk rating of a plant type. Risk ratings would be developed for different categories of OE plants. Attendance requirements (including certification level[21] and duration[22] of time) would be prescribed based on a risk calculation that would take into consideration the technologies the plant type has, as well as the broadly accepted process and technology controls the plant type is required to have in place.

[21] Certification level refers to the class of certification that the attending operating engineer or operator would need to have.
[22] Duration refers to the amount of time per day that the attending operating engineer or operator would need to be overseeing the specific technology.

It is important to note that any additional site-specific controls will not be considered in the risk calculation. For plants to take credit for such controls, Path 2 is available.

Table 3: Panel perspectives on the potential benefits and challenges of the Path 1 regulatory approach

Note: the chart below is a summary of the opinions of the diverse group of expert panel members and therefore some of the benefits and challenges may conflict.

Potential Benefits	Potential Challenges
• Requirements are clearly identified in the regulation. • Easy for industry to understand and comply with the requirements. • Minimal ambiguity in the compliance process; easy for TSSA and plants to understand when they are in compliance with the regulation. • Allows for standardization across plant categories	• The requirements are prescriptive and do not take into consideration additional site-specific controls a plant may have in place. • Prescriptive requirements do not encourage innovation in the OE sector. • Prescriptive requirements may not provide the most efficient solution for managing risk. • Path 1 is limited to prescribing staffing and attendance requirements which may not sufficiently address all sources of risk for some plants.

The following table describes the four step process that would be undertaken to determine the Path 1 category-based requirements.

Table 4: Path 1 regulatory approach process

Step	Description
1. Hazard identification	• The hazards that are present within a plant type as a result of technologies that are within the scope of the regulation will be identified.
2. Identify system conditions and controls	• The process and technology controls that a plant type has in place/are required to have in place will be identified.

Step	Description
3. Risk calculation	• The risk calculation will be completed by taking into consideration the hazards and the controls identified.
4. Plant attendance requirements	• Based on the outputs of the risk calculation, plant attendance requirements will be prescribed. • The plant attendance requirements will stipulate both the required certification level (e.g., 1st class operating engineer, refrigeration operator A, etc.) and hours per day that the plant must be supervised.

While Path 1 is one alternative to achieve compliance with the regulations, plant owners can consider undertaking Path 2 for their own benefits. Path 2 allows plants to identify risks that may be specific to their operations and determine the optimal controls to manage them.

Path 2 site-specific requirements

The Path 2 approach would provide plants with an opportunity to develop their own site-specific risk and safety management plan (RSMP). For Path 2 the regulation would identify requirements for what would have to be included in the RSMP, but the onus would rest with the plant owner to develop a plan that provides sufficient evidence to prove that the plant would be able to maintain the acceptable risk-level. Path 2 allows owners to identify, assess and manage plant safety using acceptable standards and practices in risk assessment and management. Under Path 2, TSSA would monitor plant owners' compliance with their RSMP. Providing Path 2 as an alternative mechanism to achieve compliance with the regulation was seen by the panel to have a number of potential benefits and challenges.

Table 5: Panel perspectives on the potential benefits and challenges of the Path 2 regulatory approach

Note: the chart below is a summary of the opinions of the diverse group of expert panel members and therefore some of the benefits and challenges may conflict.

Potential Benefits	Potential Challenges
• Provide plant owners with flexibility as to how they want to manage the safety of their plant,	• Slow uptake; few plant owners opting to take the Path 2 approach.

Potential Benefits	Potential Challenges
while still being overseen by TSSA. • Encourage innovation by prompting plants to implement innovative solutions to achieve safety. • Encourage the use of new technologies, which may also be more energy efficient. • Allow plant owners and chief operating engineers within plants to become proactive safety managers. • Promote a culture change from reactive to proactive regulatory compliance. • Improve the financial viability of plants, and encourage investment in Ontario, by allowing plant owners to implement solutions that ensure safety and minimize cost.	• Cost to industry to develop the RSMP and TSSA to review, approve, and monitor compliance with the RSMP. • Will require TSSA to change how they train inspectors and conduct inspections of Path 2 plants. • May require plant owners to hire an external party to develop the RSMP. • Potentially prolonged and subjective approval processes.

The following table describes the main components of the Path 2 site-specific risk assessment.

Table 6: Path 2 regulatory approach process

Step	Description
1. Site-specific information	• A number of pieces of information about the plant would be documented, including facility layout, number and type of installations, population density around the facility, design and process details, and safety and control systems.
2. Hazard identification	• The possible hazard scenarios in the plant would be identified, including causes, consequences, existing controls, and gaps.

Step	Description
3. Risk assessment	• The hazard scenarios would be assessed by the owner for probability (frequency) and consequence of failure events (e.g., fire, explosion, toxic release, pressure boundary failure, etc.). • The risk would then be estimated as a combination of the probability and consequence of the occurrences. • The risk would then be evaluated against acceptable risk standards.
4. Risk reduction and mitigation	• Depending on the outputs of the risk assessment the plant will need to identify risk reduction and mitigation measures to ensure the plant is able to operate within acceptable risk-levels. • Risk reduction and mitigation measures may include additional technologies, processes, and/or people.
5. Emergency preparedness and response	• An emergency preparedness and response plan would need to be developed by the owner to articulate how the plant will respond in emergency situations. • A maintenance plan would need to be developed to ensure all technologies are being maintained over time. • If applicable, a Spills Prevention and Contingency Plan should also be included.

Considerations

While the panel was in full agreement with the stated recommendation, there are a few important considerations to note:

Path 1 considerations:

- The requirements should be clear and understandable, as many plant owners are not technical experts;
- The risk calculation should be updated on a periodic basis to reflect new technologies and available evidence;
- The risk calculation should be available through a publicly accessible tool so that plant owners can input their information and view their risk score; and
- The risk calculation should be evidence-based and accompanied by clear rationale.

Path 2 considerations:

- TSSA should develop educational tools to support the use of the Path 2 approach in Ontario (e.g., instructions, frequently asked questions, templates, and educational sessions);
- Where possible, there should be alignment between what is being asked for in the RSMP and other regulations to minimize the duplication of effort or potential conflicts (e.g., Environmental Emergency Regulations (E2 Regulations));
- TSSA should ensure it is clear to industry how the process for reviewing and assessing the RSMP is conducted, and what criteria it must meet to be approved; and
- TSSA should consider developing an oversight committee comprised of industry representatives to ensure RSMPs are being reviewed and approved consistently by TSSA.

Overarching considerations:

- Developing the Path 1 and 2 regulatory approach is a significant undertaking that will require sustained effort over the course of approximately one year. Given this, the panel recommends that a separate initiative be undertaken to complete this task. TSSA should convene two groups to complete this work: a Task Group comprised of risk experts, and an Advisory Group to provide inputs to the Task Group throughout the process. The panel endorsed a Terms of Reference and Scope of Work document that TSSA will use to guide the Task Group and Advisory Group (see Appendix B for full document).
- Panel members should have the opportunity to continue to be engaged in the Task Group or Advisory Group, as applicable. This will help ensure continuity between the work of the panel and the subsequent work effort.
- TSSA should consider how the process of conducting inspections will need to be changed to reflect the fact that some plants may decide to adopt Path 2 and consequently develop their own site-specific RSMPs. The inspections for plants that adopt Path 2 will need to be customized to the requirements in the RSMP. This may require more effort on the part of inspectors, may impact the inspection process, and may require a change to how inspectors are trained.

Topic C: Improving regulatory clarity

The current regulation is difficult to understand and applied inconsistently.

The regulation is difficult to read and understand, which makes it challenging for plant owners to comply with the regulation and TSSA to apply the regulation consistently.

Below is a brief summary of some of the specific challenges with the regulation:

Table 7: Unclear sections of the regulation

Section	Description of Challenge
Interpretation (section 1(1))	The term ‘accident’ and ‘qualifying experience’ are generally not well understood and should be further clarified.
Absence from plant (section 19)	The current wording of the section articulates that an operating engineer or operator holding a certificate of qualification not less than one class lower than that of the operating engineer or operator that is absent may operate the plant for not more than 30 working days per year. Some plant owners are unsure as to whether they can have multiple lower class operating engineers and operators fill in for 30 days each, or whether any lower class operating engineer or operators can fill in for a cumulative total of 30 days.
Chief operating engineer and chief operator (section 15)	The phrase “be available to accept from the owner or user authority to hire, dismiss, promote or demote any employee in the plant under his or her control or supervision” has led some plant owners to be unsure as to whether they have the responsibility to hire and dismiss, or whether that is the responsibility of the chief operating engineer or operator.
Table 2-8	Tables are difficult to read and understand.

In addition to these challenges, the panel expressed significant challenges understanding the different regulatory instruments that exist in the OE field and how they intersect, what takes precedence, and how they are governed.

Below is a summary of the various different regulatory instruments available in the OE field:

Table 8: OE regulatory instruments

Regulatory Instrument	Description
Act	Technical Standards and Safety Act, 2000.
Regulation	Operating Engineers regulation.
Director's Safety Order	Referenced in Section 14 of the Technical Standards and Safety Act, 2000. Issued to specific persons or classes of persons, to require that specified things not be used or only used in a particular way. The order can also authorize inspectors to address any imminent hazard.
Director's Order, Limited Use	Referenced in Section 27 of the Technical Standards and Safety Act, 2000. Places limits on the operation of a thing that is found to be defective or to not comply with the conditions of its authorization after the thing is fabricated or installed.
Director's Order, Public Safety	Referenced in Section 31 of the Technical Standards and Safety Act, 2000. Used only where there is or may be a demonstrable threat to public safety and the matter has not otherwise been provided for in the Act or regulations. Can require, among other things, notices, markings, or the use or disuse of specified things.
Temporary codes and variations	Referenced in Section 36 of the Technical Standards and Safety Act, 2000. Stopgap measure to accommodate new developments or technological advances.
Advisory	Not legally enforceable. Often used for guidelines or interpretations.
Safety Bulletins / Guideline	Not legally enforceable. Important mechanism for conveying accurate and timely safety information to regulated customers and interested industry stakeholders.

Recommendation #5

All components of the regulation should be clear and precise to allow a non-technical, lay person to understand the regulation.	Consensus

The specific sections of the regulation identified in Table 7 should be clarified and the entirety of the regulation should be revised to ensure it meets accessibility requirements and minimizes ambiguity.

Recommendation #6

TSSA should review current processes and procedures to support consistent application of the regulation.	Consensus

In addition to clarifying the regulation, TSSA should also review current processes and procedures to ensure it is consistently applying the regulation to the OE field. Below are a few examples that should be clarified.

- **Inspections:** the inspections process within OE and across other related TSSA program areas should be consistent. For example, a formal process should be established for situations in which a non-OE TSSA inspector identifies a potential OE violation;
- **Evaluation of internationally trained workers:** the process by which TSSA evaluates the qualifying experience of internationally trained workers should be clarified and publicized to the OE industry (see recommendation #10); and
- **Variance:** the process TSSA has in place to provide a variance to a plant should be clearly documented and applied consistently.

Recommendation #7

The definition of the term "boiler[23]" in the OE regulation should be changed to align with the definition in the Boilers and Pressure Vessels regulation 220/01 and TSSA should conduct a public safety risk assessment to determine whether emerging boiler and pressure vessel technologies should be regulated.	Consensus

[23] Boiler means a fired vessel in which gas or vapour may be generated or a gas, vapour or liquid may be put under pressure by heating

There is confusion in the OE sector because there is a lack of consistency in the definition of “boiler” in the Boiler and Pressure Vessels (BPV) regulation and the Operating Engineers regulation. In the BPV regulation the term “boiler” uses the generic definition of working fluid: “gas, vapour or liquid”. The OE regulation, on the other hand, uses “water/steam” as the working fluid for its legal definition of a “boiler”.

The lack of consistency between the BPV regulation and the OE regulation resulted in confusion in the treatment of emerging technologies such as Organic Rankine Cycle, which is regulated under the BPV regulation but not the OE regulation, as it uses a non-water working fluid. In order to address this challenge and provide clarity to the industry TSSA published Voluntary Safety Guidelines for Organic Rankine Cycle Systems (Safety Bulletin OE-001016). The Safety Guidelines were intended to provide clarity to the industry given current wording in the regulations.

In order to improve consistency and clarity the definition of “boiler” should include working fluids other than water, and an impact assessment should be conducted to determine the impact the change in definition will make.

Considerations

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- An assessment should be conducted to determine the impact such a change in definition would have. The assessment should identify what additional technologies may be regulated as a result of the change in definition, in addition to Organic Rankine Cycle. Additional technologies should only be included in the regulation if a risk has been clearly identified.

Recommendation #8

The regulation should adopt the term “licence”, instead of “certification” (e.g., 4th class licence, instead of certification).	Consensus

The regulation refers to a “certificate” of qualification. In order to improve the reputation and credibility of the qualifications, the term “licence” should be used instead.

Recommendation #9

TSSA, in consultation with industry and OE associations, should establish guidelines for how qualifying experience is recorded.	Consensus

In order to ensure that candidates have a full record of the skills they gained during their qualifying experience, TSSA should establish guidelines for how qualifying experience is recorded by the candidate and signed-off on by the chief operating engineer or responsible person. This would help ensure that both candidates and prospective employers have access to a clear record of the skills that the candidate has gained during their qualifying experience.

The guidelines may include:

- The type of technology (e.g., compressor, turbine, etc.);
- The amount of time spent working with the technology;
- The specific functions completed by the candidate; and
- Core skills learned.

Recommendation #10

TSSA should improve the current documentation of the guidelines and process by which qualifying experience for internationally trained workers is assessed in Ontario to ensure the process is clear, transparent and predictable.	Consensus

There is a lack of understanding of how TSSA assesses the qualifying experience of internationally trained workers coming to Ontario because the process is not applied consistently, despite TSSA having an established process. To address this lack of clarity, the process by which TSSA assesses the qualifying experience of internationally trained workers coming to Ontario should be reviewed to ensure it is clearly documented and understood by industry.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- The Government of British Columbia and the British Columbia Safety Authority are working to modernize and streamline the process they use to assess qualifying experience for internationally trained workers. MGCS and

TSSA should continue to monitor changes in BC to determine if similar changes should be made in Ontario.
- TSSA has adopted SOPEEC's standardized Canada-wide policy of assessing practical experience obtained internationally.

Recommendation #11

TSSA should develop a standard reporting template for plants to report accidents[24].	Consensus

In order to ensure greater consistency in the process of reporting accidents, TSSA should develop a standard reporting template. The template should include the following elements:

- Time and date of the accident;
- A description of the plant rating, technologies, and equipment involved;
- A description of the accident (how it happened, who was involved);
- A description of the result of the accident (what was the nature of the injury);
- A description of any property damage involved in the accident.

By developing a standard reporting template for plants to report accidents it may also provide TSSA with better data by ensuring consistent information is being received by TSSA.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- TSSA should consider whether they could establish a consistent template across all branches[25] of TSSA. This would make it easier for the plant owners to report accidents to TSSA in an expedient fashion, as they would only have to complete one form, and it would allow TSSA to establish a consistent data base of information on accidents across all branches of TSSA.

[24] The regulation defines 'accident' as a failure of equipment that causes personal injury or loss of life, or loss of or damage to equipment or property.
[25] There are seven branches of TSSA: amusement devices, boilers and pressure vessels, elevating devices, fuels, operating engineers, ski lifts, and upholstered and stuffed articles.

Recommendation #12

The qualifications of the Chief Officer and Plant Inspectors should be clearly documented.	Consensus

The panel agreed that the qualifications for the roles of Chief Officer and Plant Inspectors should be clearly documented, however the panel disagreed as to where this information should be documented. Some panellists were of the opinion that it should be included in the regulation to ensure it is clear and not able to be easily changed, while others were of the opinion that the qualifications should be documented in internal TSSA hiring policies to ensure they are able to be changed and adapted over time as the roles evolve.

Topic D: Improving regulatory compliance

While the OE sector is very safe some companies are non-compliant with the regulation.

Under the Technical Standards and Safety Act, 2000, TSSA has two mechanisms to ensure compliance with the regulation, issuing an inspector order and affixing a seal. In addition, TSSA also engages in mediation with non-compliant plants to resolve issues. Below is a brief summary of the three actions TSSA currently takes in the case of non-compliance:

Table 9: OE regulatory enforcement process

Enforcement Tool	Description
Inspector orders (section 21(1)(a))	• Inspectors will identify infractions and issue an order for corrective action. • The period given for corrective action depends on the safety risk of the infraction. • If the corrective action is completed within the prescribed period the issue is closed. • Extensions can be requested before the due date which the inspector can accept or decline. • Otherwise, the issue is escalated to the next step.
Mediation (e.g., one-on-one discussion)	• Failure to comply with the inspector's order within the prescribed period results in a one-on-one discussion between the inspector and the chief engineer / responsible person. • The intent of the discussion is to establish a revised completion date. • If the plant shows proof of a 'working toward compliance' or having taken alternative safety measures which satisfy the intent of the regulation, a 'time to comply' extension may be granted/issued by the inspector. • Otherwise, the issue is escalated to the next step.

Enforcement Tool	Description
Affixing a seal (section 21(1)(b))	• When a plant fails to demonstrate that they are working towards compliance and there is a demonstrable threat to public/occupational safety, the next step is to make the owner aware of TSSA's intention to seal the non-compliant equipment. • Sealing a piece of equipment reduces the exposed risk and will mean the plant operates at reduced capacity. To date, this has always captured the attention of plant management to deal with the issue. • Inspectors are required to check with the Director prior to sealing equipment which will severely impact the production output of the plant.

TSSA expressed challenges with this current model because it does not provide many options to ensure compliance before affixing a seal.

Recommendation #13

To improve regulatory compliance, TSSA should have additional enforcement mechanisms to manage different situations.	**No consensus**

The panel discussed at length whether TSSA should have alternative methods to ensure compliance[26]. The panel members have divergent opinions on this topic. The two main points of view are detailed below.

Opinion #1: There is a need for TSSA to have additional mechanisms to ensure compliance

Some panel members were of the opinion that TSSA should have additional mechanisms to ensure compliance because the current methods do not provide TSSA with the flexibility they need. For example, if there is a plant that is non-compliant after the mediation has taken place, TSSA's only recourse is to affix a seal, which they are hesitant[27] to do because of the significant financial

[26] In 2016 the non-compliance rate of registered OE plants is 57%. This indicates that of the registered plants inspected, 57% of the plants were issued an inspection order as a result of an observed non-compliance. While the non-compliance rate provides an outcome of the periodic inspections, TSSA also assesses the potential safety risks associated with non-compliances found during inspection. This assessment shows that less than 1% of all inspections conducted from 2012-2016 pose unacceptable levels of risk. (TSSA. Annual State of Public Safety Report. https://www.tssa.org/corplibrary/ArticleFile.asp?Instance=136&ID=C9AEC5D98A4B11E6A763005056AD4CB7)

[27] In situations in which there are safety risks TSSA will not hesitate to affix a seal.

implications of shutting down the equipment. Given this, some panellists are of the opinion that TSSA should be able to impose administrative monetary penalties on non-compliant plants and/or there should be some process for publicly disclosing non-compliant plants to encourage compliance.

TSSA should also consider other mechanisms that do not require changes to the regulation such as the ability to notify a plant's insurance company in the case of non-compliance. For plants the risk of having their insurance company notified in the case of non-compliance could be a significant incentive to ensure compliance because of the possible negative repercussions (e.g., increased insurance rates).

Opinion #2: The current mechanisms TSSA has in place are sufficient to ensure compliance

Some panellists are of the opinion that the current mechanisms TSSA has in place are sufficient and should not be altered. These panellists argue that imposing administrative monetary penalties or allowing for the public disclosure of non-compliant plants are punitive measures that may negatively impact the relationship that plants have with TSSA. Further, these panellists argued that because TSSA has an inspection process whereby non-compliant plants are inspected more often there is already a financial disincentive for non-compliance because plant owners are responsible for the cost of inspections.

Consideration

In addition to the opinions expressed by panel members on this topic, there is a consideration to note:

- TSSA should consider how the compliance process may be impacted with the new Path 1 and Path 2 regulatory approaches in place. For example, the current inspection process may be satisfactory for Path 1 plants, but for plants that have adopted the Path 2 approach, the inspection process and enforcement mechanisms may need to be tailored to the plant. Below are some additional questions that TSSA and the ministry should consider when developing the new regulation:
    - Should Path 2 plants that are found to be non-compliant continue to be able to use the Path 2 approach?
    - How will the hiring and training of inspectors need to change based on the introduction of the Path 2 approach?
    - Will there be any impacts on insurer inspections of boilers and pressure vessels?

Topic E: Addressing an inadequate labour supply

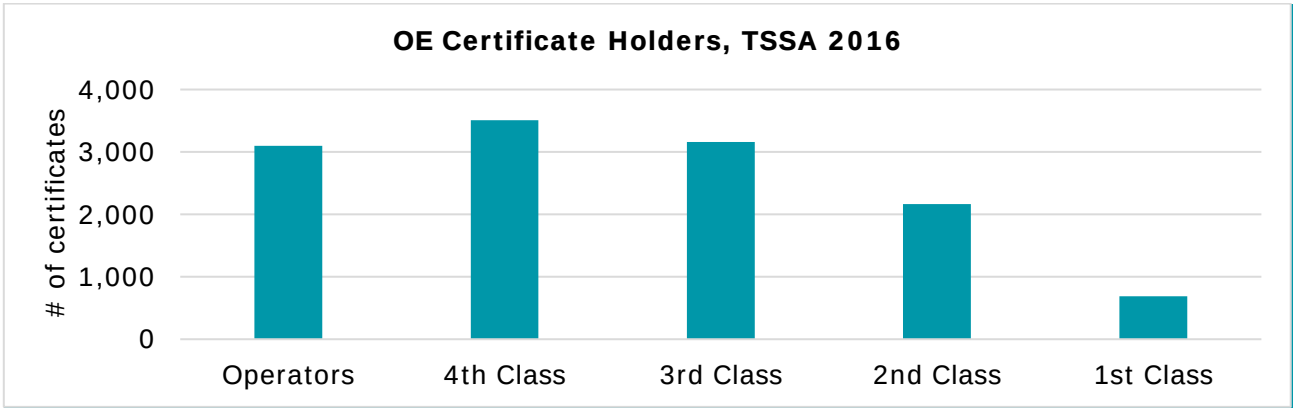
Some businesses are finding it difficult to fill OE and operator roles.

The current supply of operating engineers and operators does not meet the demand in Ontario[28]. This is a concern that has been echoed by a number of stakeholders in the OE industry including, TSSA and the Risk Reduction Group (a sub-committee of TSSAs OE Advisory Council[29]). While there is a need for more certified OEs of all classes, there is a particular need for 1st and 2nd class OEs in Ontario.

The challenge of attracting and retaining 1st and 2nd class OEs is particularly acute for plants that are in remote regions of the province. For example, many relatively small businesses in northern Ontario are having difficulty attracting 1st and 2nd class OEs to their plants because of the remote location.

As shown in the chart below, there are fewer 2nd and 1st class OE certificate holders, as compared to 4th and 3rds. While it is expected that there would be fewer 1st and 2nds, as they are more advanced certifications and there are fewer jobs in Ontario, taken in conjunction with the age of the workforce it demonstrates a labour supply challenge in Ontario for OEs.

Figure 1[30]

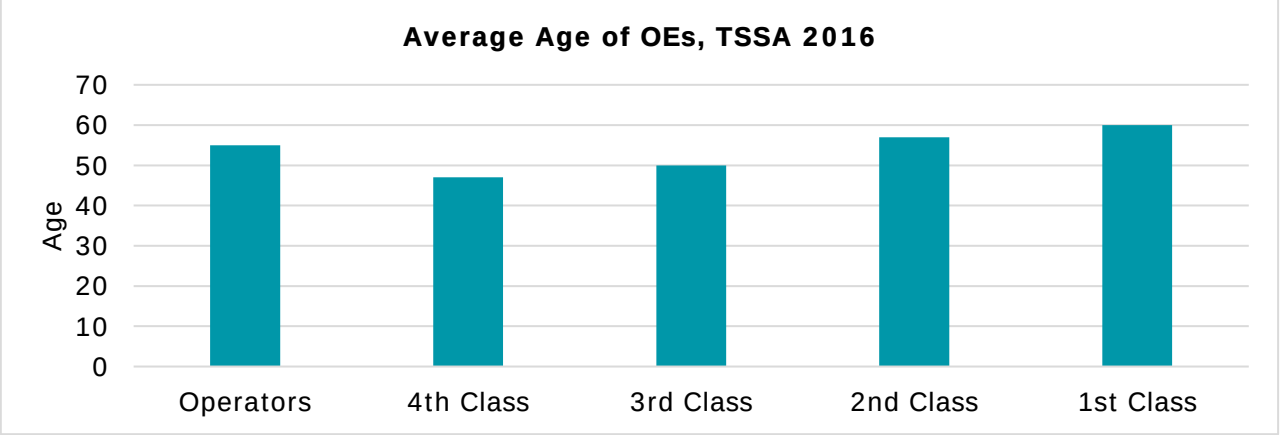


[28] The lack of sufficient labour supply has been widely reported across the OE industry, however due to a lack of available data, most reports are anecdotal. The data that TSSA has (see figures 1 and 2) is insufficient because it does not reflect the total number of OEs active in the labour market. Instead, these statistics show the total number of certificate holders, which may not equate to the total number of active labour market participants (e.g., some may be retired, working in other fields). The data that does exist, coupled with numerous reports of the difficulty plants have hiring OEs, is evidence of the labour supply challenges.
[29] The OE Advisory Council is a group of industry representatives that advise TSSA on topics related to the OE program.
[30] Data provided by TSSA, 2016.

The lack of supply of OEs and operators in Ontario is part of a broader societal trend. Canada's population is aging; baby boomers continue to accelerate Canada's population aging, and population growth has slowed[31].

The average age of OEs and operators in Ontario ranges from 47 years of age for 4th class OEs to 60 years of age for 1st class OEs. This shows that the vast majority of 1st and 2nd class OEs are close to retirement, while 4th and 3rd class OEs tend to have ~10-15 working years left before retirement[32]. These demographic trends are problematic because there is already a short supply of OEs, and the problem will be exacerbated in the coming years.

Figure 2[33]



The supply issues are exacerbated by the fact that there are a number of barriers candidates face when looking to progress through the class levels. The barriers are described in the table below.

Table 10: Barriers to moving up OE class levels

Potential Barrier	Description
Higher job demands	As the class level increases the demands that an OE faces on the job increase. 4th and 3rd class OEs are primarily operators, working directly with technology and taking on fewer management roles. An operating engineer at the 2nd and 1st class level tends to be working in much more complex plants, with highly sophisticated technology and in many cases is in

[31] Statistics Canada. Canada's population estimates: Age and sex, July 1, 2015. http://www.statcan.gc.ca/daily-quotidien/150929/dq150929b-eng.htm
[32] Assumes retirement age of 65.
[33] Data provided by TSSA, 2016.

Potential Barrier	Description
	charge of a number of lower level operating engineers. Many individuals entering the OE profession may not want to become 2nd and 1st class OEs because of the higher demands.
Loss of momentum	Panel members shared from their experience that it can be difficult to progress to the higher levels of the operating engineer classes (1st and 2nd) because by the time candidates are at the point where they have achieved their 3rd class certification other commitments (e.g., starting a family) tend to take priority. This can make it difficult for candidates to invest the time required to learn the material and acquire qualifying experience. Given this, many candidates may achieve their 3rd class certification and choose not to progress further. Another challenge is that many candidates can get jobs in the OE field at the 4th and 3rd class level so they may not wish to pursue higher-level certifications.
Lack of incentive	Panel members shared that some candidates may not choose to progress to the higher levels of the operating engineer classes because there is a lack of an incentive to do so. In some instances getting a higher qualification does not result in a corresponding increase in compensation, so for many candidates it does not seem to be worth the investment. In addition in some plants taking on a more senior role may result in the individual having to leave the union, which can also be undesirable.

In order to address concerns about the lack of adequate labour supply in the OE industry, the panel developed recommendations across four main themes:

1. **Facilitate career progression:** reduce the barriers to allow candidates to progress more easily through the class levels.
2. **Broaden the pool of candidates:** attract new candidates to the OE field.
3. **Facilitate labour mobility:** reduce barriers to individuals moving from one job to another.
4. **Collect data to improve workforce planning:** improve the collection of data to ensure TSSA has the information it needs to make informed decisions.

Each of the recommendations detailed below is intending to address one of the four main themes.

Theme 1: Facilitate career progression

Recommendation #14

Qualifying experience for class 1-4 operating engineers should include all regulated technologies (e.g., refrigeration, turbines, compressors, etc.).	Consensus

In the current OE regulation, experience operating a boiler is a requirement for operating engineers to move up the class levels. This is problematic for industry because it does not account for the fact that operating engineers work in plants with a number of different technologies (e.g., refrigeration, turbines, and compressors) and therefore should have a diversity of experience during their training.

As a result, the definition of qualifying experience should be broadened to include all regulated technologies because it will allow candidates to get their qualifying experience more easily and reduce the barriers to candidates progressing through the class levels.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- While candidates should be able to get credit for qualifying experience on a variety of different OE technologies, there is also a need to ensure that candidates are getting experience on technologies that are prevalent in the OE field. Given this, TSSA and the ministry should consider how to allow candidates to get a variety of different experiences while also ensuring that they develop basic skills on commonly used pieces of equipment.

Recommendation #15

TSSA and the ministry should consider opening up other avenues to acquire qualifying experience to ensure candidates are able to get the experience required to achieve higher certifications.	Consensus

As noted in recommendation #14, acquiring sufficient qualifying experience can be challenging for candidates and, in some cases, is a barrier to progressing

through the class levels. In order to reduce the barrier, TSSA and the ministry should consider opening up other avenues for candidates to get their qualifying experience. While the panel was in agreement that TSSA and the ministry should consider opening up other avenues to achieve qualifying experience they were not in agreement as to what those avenues should be. Two ideas that the panel discussed are opening up select unattended plants and expanding the use of simulators.

Select unattended plants

Currently only attended plants in Ontario have been approved by TSSA to provide qualifying experience to OE candidates. However, given that the vast majority (78%[34]) of plants in Ontario are unattended, and that candidates are having significant difficulty getting attended plants to take them on to complete their qualifying experience, TSSA and the ministry should consider allowing some unattended plants to provide qualifying experience.

Below is a summary of some of the potential benefits and challenges that the panel raised during their discussions.

Table 11: Potential benefits and challenges of allowing select unattended plants for qualifying experience

Note: the chart below is a summary of the opinions of the diverse group of expert panel members and therefore some of the benefits and challenges may conflict.

Potential Benefits	Potential Challenges
• Reduce barriers for candidates to get the qualifying experience they need to achieve the next level of certification. • Encourage candidates to get higher levels of certification by removing barriers to advancement. • Depending on the type of plant it may provide an opportunity for candidates to get experience working with a variety of different technologies.	• Unattended plants may not be able to provide a comparable learning experience, due to the nature of the plant and the fact that the candidate may not be overseen by an operating engineer. • May diminish the quality of practical experience that candidates are receiving and, in turn, negatively impact the reputation of the profession.

[34] Data provided by the Technical Standards and Safety Authority, as of April 1 2017.

During their discussions, the panel also noted a couple of characteristics that may make some unattended plants better suited than others to provide qualifying experience. TSSA should consider the following characteristics when conducting their assessment to determine if some unattended plants should be eligible to provide qualifying experience.

- **Operating Engineer employed:** Some unattended plants employ 4th class operating engineers, despite not needing to under the regulation. If an unattended plant has a 4th class operating engineer it may be more likely to be a rich learning opportunity for a candidate because they would have an OE overseeing their learning, and the OE can sign off on their qualifying time.
- **Manual systems:** Unattended plants that have some manual systems that a candidate could work with may be a better learning environment. Panellists raised that some unattended plants may be entirely automated, which would not provide much useful learning.

Simulators

TSSA and the ministry should consider allowing candidates to achieve a portion of their qualifying experience using simulators. Simulators are beneficial because they provide candidates with an opportunity to learn about the operations of OE technologies in a safe and controlled environment. Allowing candidates to gain a portion of their qualifying experience using simulators may encourage more plants to take on candidates to complete their qualifying experience, because the duration of in-plant time required would be shorter. However, given that simulators are already part of the college curriculum, consideration should be given as to whether candidates should spend additional time using simulators.

Considerations

While the panel was in full agreement with the stated recommendation, there are several important considerations to note:

- As steam experience is an important part of the OE certification, some percentage of a candidate's qualifying experience should be completed with a boiler.
- Consideration should be given to the potential impact on co-op terms if a placement in an unattended facility will not satisfy the full practical time requirement.

Recommendation #16

Candidates, including operating engineers and operators, should be able to write the exams for two levels above their current certification level without having to accrue the required qualifying experience.	Consensus

In order to encourage candidates to pursue higher-level certifications candidates should be able to write the exams for two levels above their current certification level upon passing the previous level exams without having to accrue the required qualifying experience. For example, a 4th class operating engineer should be able to write the exams for the 3rd class level and if they are successful proceed to writing the 2nd class exams before completing the qualifying experience for the 3rd class qualification.

In the current model, depending on how quickly candidates achieve the qualifying experience requirements after passing their current exams, it can be months or years before they can start and complete the next level of exams, which in some cases decreases the chance they go back to school or start studying again for the next certification exams.

Recommendation #17

TSSA should establish and maintain a list of incentive programs that exist for employers to take on operating engineer and operator candidates for co-op placements, and publicize the list to the industry.	Consensus

A number of incentive programs are offered by the federal and provincial government[35] to encourage employers to offer co-op placements so candidates can get the required qualifying experience. In order to encourage more employers to leverage these programs, TSSA should establish and maintain a list of incentive programs for employers to take on OE and operator candidates for co-op placements, and publicize the list to the OE field.

[35] Examples include the Science and Technology Internship Program (Natural Resources Canada), Career Focus (Employment and Social Development Canada), and the Co-operative Education Tax Credit (Government of Ontario).

Recommendation #18

TSSA should work with the colleges, employers, employees, and industry associations to develop a program to support the advancement of operating engineers, with particular focus on achieving 2nd and 1st class certifications and refrigeration A certifications.	Consensus

In order to increase the supply of 2nd and 1st class operating engineers in Ontario, TSSA should work with colleges and employers to develop a program to support the advancement of operating engineers, with a particular focus on achieving 2nd and 1st class certifications. This should also be done to support the advancement of refrigeration operators from class B to A.

The program should be developed to address specific problems that candidates face. Program development should be informed by an assessment of the systemic and personal barriers (see Table 10) that candidates may face. The assessment should include a broad range of OEs and operators (including older workers and those newly entering the field) to ensure a diversity of perspectives.

Potential programs could include:

- **Fast-track:** a program could be developed whereby individuals in the program would achieve their 2nd or 1st class certification in a compressed timeframe. This would likely result in more candidates achieving higher-level certifications than is currently the case.
- **Additional incentive programs:** incentive programs by government or industry could be established to encourage candidates to achieve their 2nd and 1st class certifications. In the current model many candidates choose not to pursue higher designations because they are able to get a well-paying and secure job with a 4th or 3rd certification. Given this, a program of incentives may be needed to address this challenge.
- **Partnerships with universities:** consider developing partnerships with universities to establish programs where candidates may be able to receive a joint university degree and an advanced OE degree.

Theme 2: Broaden the pool of candidates

Recommendation #19

TSSA and MGCS should work with the Ministry of Advanced Education and Skills Development, the Ministry of Labour, and the Ministry of Indigenous Relations and Reconciliation to develop an approach to attract non-traditional OE labour market participants to the field.	Consensus

In order to broaden the pool of candidates TSSA and MGCS should work with government partners to develop an approach to attract non-traditional OE labour market participants to the field. Non-traditional OE labour market participants could include women and Indigenous peoples, who are currently underrepresented in the OE field. Encouraging a diversity of people to join the OE field will likely increase the supply of OEs in Ontario.

TSSA, MGCS and relevant ministries should pay particular attention to encouraging increased OE labour market supply in Northern regions of the province that are facing acute difficulty attracting and retaining employees.

Theme 3: Facilitate labour mobility

Recommendation #20

A steam prime mover operator certificate should be established to replace the current Steam Turbine Operator Permit.	Consensus

Currently, TSSA's statutory director issues a Steam Turbine Operator Permit (STOP) to registered plants for non-OE certified employees to operate steam prime movers. STOP is issued to plants for the number of employees that are operating steam prime movers in the plant and the permits are collectively renewed on an annual basis for all employees.

The STOP process is problematic because the permits are provided to plants and not individual employees. This means that if an employee has a STOP at one plant, and they want to take on another job at a different plant they no longer have access to the STOP and therefore may not be able to take on a similar role at a different plant. This can be particularly challenging for older workers who may have worked at a plant for a long duration of time using a STOP, and then either want to leave their job or exit their job because of downsizing. This has a

significant impact on their ability to get another comparable job and limits labour mobility more broadly.

To address this, the STOP should be replaced with a Steam Prime Mover Operator Certificate. The certificate would be granted to eligible candidates, as opposed to plants, who have demonstrated their ability to safely operate steam prime movers.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

- TSSA should establish a clear and appropriate process for candidates to obtain the Steam Prime Mover Operator certification, including a set curriculum, testing mechanism and practical experience requirement.

Theme 4: Collect data to improve workforce planning

Recommendation #21

TSSA should develop a mechanism to collect information about the current OE workforce to support workforce planning.	Consensus

TSSA expressed difficulty with the fact that they do not currently have access to information on the number of operating engineers and operators employed and working in the province. The only statistics that TSSA has of this kind are the number of certificate holders for each class of operating engineer and operator. This information is inadequate because it does not give TSSA an accurate picture of the workforce in Ontario. For example, certificate holders could be retired and not practicing operating engineers. To address this, TSSA should develop a mechanism to collect information about the current OE workforce (e.g., name, certification, type of plant they are currently working in, and employer). This would provide TSSA with the data it needs to support workforce planning in Ontario.

Considerations

While the panel was in full agreement with the stated recommendation, there are a few important considerations to note:

- TSSA should consider what the best mechanism is to collect comprehensive and consistent OE workforce information. For example, information about

people entering the OE field could be collected from Ontario colleges and information about people in the OE field could be collected as part of the certificate renewal process.

- TSSA should not ask for information that it has already collected through other means and has access to. For example, if any of the required information is already captured as part of the OE plant inspection and registration process and TSSA is able to use the information for workforce planning then it should not be requested again.
- To build on TSSA's current plant registration system, TSSA should work with their counterparts in British Columbia and Alberta as both provinces are at various stages of implementing plant registration systems that include operating engineer information and plant technology. Of particular interest may be the Alberta Certified Power Engineers Directory, published and maintained by the Alberta Boiler Safety Association. TSSA should review this directory as it may be useful to adopt in Ontario.

Topic F: Modernizing the operating engineer certification system

Some panellists do not think the certification system adequately equips candidates for the OE field.

The process of certifying (e.g., examinations and qualifying experience) operating engineers (OEs) in Ontario was a significant source of debate and conversation amongst the panel members. Some panel members are of the opinion that the current system does not adequately equip OEs for the profession. However, other panel members argue the system does equip OEs with the skills they need to be successful in the industry. Recommendation #22 will provide more detail on these perspectives.

The certification system for OEs has two key components, examinations and qualifying experience. Candidates are required to complete examinations that are standardized across Canada for each of the four class levels[36]. In addition to examinations, candidates are required to complete a specific amount of qualifying experience. The amount of qualifying experience a candidate needs to complete in industry is dependent on the class level and whether they have also completed an approved college course[37].

Recommendation #22

To obtain an entry-level 4th class operating engineer certification, candidates should be required to take an in-class or online course.	**No consensus**

Candidates are required to complete examinations and the requisite qualifying experience in order to receive an OE certification, however they are not required to complete any formal education (either in-class or online). The panel discussed this topic at length because some panel members are of the opinion that for all OEs to have a common knowledge base, candidates should be required to complete an in-class or online course in order to obtain a 4th class certification. However, other panel members disagree and instead argued that the current

[36] The OE curriculum is jointly developed by the Standardization of Power Engineer Examinations Committee (SOPEEC) and the Interprovincial Power Engineering Curriculum Committee (IPECC). These committees meet annually to develop course curriculum, exam syllabi and recommended reading material among other tasks. The OE curriculum is approved by the Association of Chief Inspectors and updated on an as needed basis, often at least every 3 years.
[37] The amount of qualifying experience that candidates must complete is detailed in Table 8 of the Operating Engineers regulation (O. Reg. 219/01).

model that allows candidates to write the examinations without any formal education is sufficient to ensure that OEs have a common knowledge base.

As the panel did not reach a consensus on this topic, each position is described below.

Opinion #1: To obtain a 4th class certification candidates should be required to take an in-class or online course

The panel members who agreed with this position did so for two key reasons:

a. Ensure a common knowledge base

Under the current model, the only standard and quantitative controls in place to ensure that OEs have all the required knowledge needed to adequately perform their duties are examinations. Some panel members are of the opinion that examinations are not a sufficient way to ensure candidates have the knowledge they need, as they cannot test all the knowledge an OE may need. Given this, some panel members are of the opinion that for the 4th class certification, it should be mandatory for all candidates to take an in-class or online course that covers all the content required. Panellists argue that this will better ensure that all OEs have a common knowledge base at the 4th class level.

b. Improve the reputation of the operating engineers profession

Some panellists are also in favour of this position because they believe implementing a mandatory course would improve the reputation of the OE profession. Panellists were of the opinion that allowing candidates to write the examinations without completing a required educational course weakens the certification. If all 4th class OEs had to complete a standard curriculum it would be easier to communicate what content was covered and, in turn, give plant owners and others in the OE field confidence that 4th class OEs were familiar with all content areas.

Opinion #2: To obtain a 4th class certification candidates should not be required to take an in-class or online course

The panel members who agreed with this position did so for two key reasons:

a. Examinations are a sufficient way to ensure a common knowledge base

Under the current model, candidates are provided with the option to self-study and then write the examinations for the 4th class certification, and all subsequent

classes. Panel members are of the opinion that the standardized SOPEEC examinations are sufficient to test and ensure that 4th class certificate holders have a common knowledge base. The examinations test a broad range of knowledge required at the 4th class level, which helps ensure that candidates are familiar with all of the content.

b. Introducing a mandatory in-class or online course will be a barrier to some individuals entering the OE field

Some panel members also think it is important that candidates are not required to take a course because it may be a barrier to potential candidates entering the OE field. A few panel members shared stories of their own experience studying extensively for the 4th class examinations, while continuing another job, and then writing the 4th class examination. These panellists argue that if there had been a mandatory course it would have been a barrier to them joining the profession.

Recommendation #23

TSSA should develop a program for plant owners and chief operating engineers to ensure they have sufficient knowledge of the regulation to support the safe operation of their plants.	Consensus

Owners of registered plants and chief operating engineers, regardless of whether they are certified OEs or operators, should have a greater understanding of the regulation and their obligations under the regulation. In instances where plant owners are not OEs or operators by training they may have little understanding of the risks posed by the equipment in their plant. For chief operating engineers this is also important because the SOPEEC[38] syllabus does not cover the Ontario regulation in detail, but instead focuses on teaching technical skills.

To address this lack of knowledge, TSSA should establish a program to improve knowledge of the regulation for chief operating engineers and owners. The program should also ensure that owners are aware of the responsibilities of chief operating engineers, and gain a greater respect for the role they play in maintaining the safety of the plant.

Consideration

While the panel was in full agreement with the stated recommendation, there is an important consideration to note:

[38] SOPEEC, Standardization of Power Engineer Examination Committee, is a national organization that is responsible for developing standard syllabus and examinations for operating engineers in Canada.

- Panel members highlighted the importance of ensuring that the program is not too burdensome on chief operating engineers and owners. The program should be clear, simple to access and complete, and provided at an appropriate cost.

Recommendation #24

The Government of Ontario should review the funding model for OE college programs to ensure that particularly remote colleges are receiving sufficient funding to support and grow the program.	Consensus

The panel expressed concern about the lack of sufficient funding for operating engineering college programs in Ontario. This concern was also emphasized by two college representatives[39] who presented to the panel. They expressed that the OE program is relatively expensive to run because it is capital intensive but the programs do not receive specialized capital funding. Given this, the Government of Ontario should review the funding model for OE college programs to ensure that particularly remote colleges are receiving sufficient funding to support the program and grow the program, as required to address labour supply challenges.

Additional discussion on certification

In addition to the recommendations described in this section, the panel raised a number of other important points with respect to certification. This section will describe some of the other ideas and reflections the panel raised:

1. Ensuring certifications match capabilities and are easily understood by the industry

Some panel members find that the current certification model is poorly understood by industry because there are a large number of certifications in the OE field, and the skills and capabilities of certificate holders is not always evident or intuitive.

In the OE field, there are four classes of OEs, certifications for compression and refrigeration operators, and TSSA issues steam turbine operator permits. For someone entering the industry, it can be difficult to understand the difference between capabilities across each of the four class levels and the operator certifications. For example,

[39] Two representatives from operating engineering programs at Ontario colleges presented to the panel. The representatives talked about how they deliver the operating engineers program. Both representatives identified a lack of sufficient funding as a challenge and difficulty ensuring their candidates are able to get the required qualifying experience.

- What makes a 3rd class OE different from a 4th class OE?
- What makes a steam turbine operator permit holder different from a 4th class OE?
- Is a refrigeration operator or an OE more knowledgeable about refrigeration plants?

In order to address this, some panel members are of the opinion that significant changes should be made to the certification system to ensure it is easier to understand and the certifications more accurately reflect the capabilities of certificate holders.

Some of the potential recommendations discussed by the panel include:

- Reducing the number of OE class levels
- Segmenting OE certificates by technology (e.g., instead of OE class certificates there could be refrigeration, compressor, steam and turbine operator licences)

These recommendations are not being made by the panel because a minority of panel members agreed with the recommendations and there was not sufficient time to discuss these topics in detail.

2. Ensuring the certification system matches the risk-based regulation

Topic A reducing undue burden on business, and Topic B encouraging innovation, focused on the need to ensure that the regulation is revised to be risk-based and includes two paths to compliance. These recommendations will result in significant changes to the regulation and in turn, the OE field. Given this, some panel members are of the opinion that the certification system may need to be significantly revised to match the new risk-based regulation.

The introduction of a risk-based regulation and two paths to compliance may impact the role of OEs and operators in Ontario. Currently, OEs and operators are expected to review the regulation and apply the prescriptive requirements to their plants. In the future, OEs and operators will be expected to take on a more proactive role to comply with the regulation. In order to do this, OEs and operators will need to have more information about what risk is, how to evaluate it and how to work in a risk-based environment. To ensure that OEs and operators are ready to take on these responsibilities, there may be a need to change how they are educated.

Some panel members are firmly of the belief that an additional review should be conducted on the certification system specifically to ensure it matches the needs of the new regulation. This was not a consensus position of the panel; other panel members did not agree that a subsequent review of the certification system should be completed.

Topic G: Improving public knowledge of the operating engineer profession

There is a lack of public knowledge of the valuable role operating engineers and operators play in our society.

There is generally a poor understanding of the OE field, including what OEs and operators do. In some cases this is also true for plant owners, who may not have much information about what OEs do and why they need to have them in their plant. This has resulted in situations where some plant owners are not understanding the direction they are being provided by OEs and operators, who have the technical knowledge and knowledge of the regulation.

Recommendation #25

TSSA should work with stakeholders to develop an approach to better publicize the role of OEs and operators (refrigeration, compressor, steam prime mover) in Ontario.	Consensus

There is a need to better publicize the role of OEs and operators in order to ensure that more Ontarians understand what OEs and operators do and the value they provide.

TSSA and relevant industry associations should consider how to improve the reputation of the OE field, so that OEs are viewed by companies as a competitive advantage as opposed to a drain on financial resources. OEs are integral to ensuring the safety of Ontarians; this message should be more widely understood across the province.

Additional discussion regarding the OE profession

The panel raised a number of other topics with respect to the OE profession, which are detailed below:

1. The need to ensure OEs feel they are able to act in compliance with the regulation without the fear of reprisal from company management

Panellists raised that there may be some limited situations where OEs face difficulties because they are bound by the regulatory requirements in place and are also beholden to their employer. In some situations OEs face difficulties because while they may be following the regulation, their employer may be

providing conflicting direction. Some panellists are of the opinion that OEs may have a fear of retribution in their workplace.

This remains an outstanding topic for additional analysis.

2. The need to ensure that collective agreements in Ontario are aligned with the OE regulation

Some panellists raised that collective agreements can cause confusion about the responsibility of shift engineers to supervise other employees, which conflicts with section 16 of the OE regulation.

This remains an outstanding topic for additional analysis.

3. The desire of some OEs to have a professional association

Some panellists are of the opinion that a professional association with formal ties to TSSA should be established to support the OE industry however potential conflicts of interest should be considered in such an arrangement. Some panellists believe that a professional association could take on some advocacy roles. For example, the professional association could manage the continuing education of OEs, advocate for the industry, and support the industry in the adoption of innovative technologies. While the panel agreed on the importance of having an industry group to support the OE field, the panel was not in agreement with whether there should be mandatory membership in the association and/or mandatory fees to the association.

Additional Proposed Revisions

As part of the regulatory review process, TSSA recommended some revisions to the regulation. While these are not recommendations from the panel, they have been included in this report to provide the public with the opportunity to provide comment on them in conjunction with the panel's recommendations.

Below is a summary of TSSA's proposed revisions to the regulation. TSSA and MGCS encourage the public to consider these revisions and provide any comments or feedback.

1. **Change the name of the regulation, legislative reference, and profession from "Operating Engineer" to "Power Engineer".**

Ontario and Quebec are the only provinces in Canada that do not use the term "power engineer". In Ontario, this lack of consistency has resulted in confusion in the industry. In order to improve consistency and harmonize with the majority of provinces, Ontario should adopt the term "power engineer". This change may not be achieved in the current regulatory review process since the term would have to be changed in the regulation and the Technical Standards and Safety Act, 2000.

2. **Change the shift engineer roles and responsibilities to include acting as the chief engineer when the chief engineer is absent for a certain period of time.**

The current regulation does not require shift engineers to take on the role of a chief engineer in situations where the chief is absent. This has resulted in some plants having to find a temporary chief engineer to fill in while the chief is absent. This is a suboptimal solution because the temporary chief may not have any knowledge of the plant. In order to ensure a shift engineer takes on the role of a chief in the chief's absence, the regulation should be revised to include this requirement in the roles and responsibilities of a shift engineer.

3. **The revised regulation could include a Code Adoption Document.**

The Technical Standards and Safety Act, 2000 provides for the use of codes, standards, guidelines or procedures or changes to codes, standards, guidelines and procedures to accommodate new developments or technological advances in industry. Codes referenced in the regulation such as ANSI/ASHRAE 34 and CAN/CSA-B52 are frequently updated by Standards Development Organizations, but these new versions are not easy to update as frequently in the regulation

unless the act is amended to enable the regulations to be automatically updated with the latest version of a code. TSSA is therefore proposing that the regulation could be altered to reference a code adoption document (CAD) and then the CAD can be updated by TSSA as required.

4. Consider creating a new definition to describe a “campus plant”.

The regulation addresses plant registration and power rating for multiple plants belonging to one user that are located on the same premises. However, it is not clear in its treatment of multiple plants of the same user, located on two or more street addresses. TSSA proposes creating a new definition in the regulation called “campus plant” to bring clarity to the industry as to what qualifies. TSSA is undergoing a process to clarify the definition of a “campus plant” but has not yet formed a recommendation.

Appendix A – OE Expert Panel Terms of Reference

Expert Panel Objectives

The expert panel is a time-limited group established by the Ministry of Government and Consumer Services (MGCS), with the support of the Technical Standards and Safety Authority (TSSA) and brought together for a special purpose. The ministry is establishing an expert panel to develop recommendations to reform Ontario's Operating Engineers regulation, which has not been updated in 15 years. The proposal will focus on issues such as attendance requirements, the inclusion of new technologies, better reporting requirements, the prescriptive nature of the regulation, and qualifying requirements for operating engineers (specifically regarding "steam time").

Deloitte has been engaged to facilitate expert panel meetings and prepare a Findings Report on behalf of the expert panel. Deloitte will work with the expert panel to gather input and will support the expert panel as it provides advice and recommendations.

After the expert panel process has concluded, the expert panel's report and its recommendations will be used by the ministry as the basis for broader consultation with the public and industry stakeholders and to inform future government decision-making.

Expert Panel Composition

The expert panel will be made up of up to sixteen stakeholders selected by the ministry with the support of TSSA.

Expert panel members bring a variety of professional experience, technical expertise, and public safety backgrounds from the following sectors: forestry, labour, manufacturing, oil and gas, power plants, the public sector, and refrigeration. The panel will also receive input from representatives from agriculture, food processing, and grocers.

Expert Panel Member Responsibilities

- Review pre-read materials that may be distributed in advance of the meetings

- Attend panel meetings, engage and participate in discussions in a collaborative manner
- Maintain a respectful environment where all are welcome to share their views
- Strive for consensus and commit to work in the broader public interest
- Contribute to finalizing the panel's report

Deloitte's Responsibilities

- Facilitate round table discussions as an independent third party
- Ensure all participants have an equal opportunity to share their views and key priorities
- Accurately reflect views of the panel members in a final findings report
- Deloitte will not provide advice to government on the recommendations made by the panel, nor is it acting as a technical advisor

MGCS's Responsibilities

- Listen intently to the opinions and perspectives of the Expert Panel members
- Provide insight to panel members on government priorities
- Support the Expert Panel discussion by clarifying regulatory processes and other relevant background information and context
- Administer survey at the end of process

TSSA Responsibilities

- Provide perspectives on agenda items and technical advice
- Support the work of the Expert Panel by answering technical and operational questions related to the OE regulation
- Provide insight into the implications of regulatory options on public safety objectives and TSSA operations

Public Service and Confidentiality

Participation as a member of the expert panel requires a commitment to the broader public interest. Expert panel members are asked to provide impartial advice for the benefit of all Ontarians, rather than advocating on behalf of any specific interest.

Expert panel members agree to share information and collaborate, while respecting each other's opinions, upholding the privacy of individual views expressed in the discussions.

The names of all expert panel members will be included in the report and ministry website to ensure public transparency.

Meetings will be conducted under the Chatham House Rule:

- *When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.*

Logistics

At the first meeting, the expert panel will discuss and come to a consensus on the final terms of reference, proposed agendas for meetings, number of meetings and duration of meetings.

Deloitte will strive to accommodate the schedules of expert panel members. Where a member is not able to attend a meeting, the member will be able to provide Deloitte with written comments.

It is anticipated that there will be up to seven expert panel meetings, held approximately every two weeks, beginning in November 2016 to March 2017. Meetings are anticipated to be full days, subject to discussion topics and meeting agendas.

Meetings will be held in the Greater Toronto Area and will occur during regular business hours. Alternative arrangements such as teleconference facilities will be made for members unable to travel, however regular in-person attendance is expected.

Deloitte will book and coordinate meeting dates, times and locations and provide any meeting day materials in advance.

Lunch and coffee breaks will be provided during expert panel meetings.

Each expert panel member will be responsible for their own travel costs and for any other expenses incurred to attend and participate in the expert panel meetings.

Please contact Nathan Fahey, Senior Policy and Program Analyst at 416-326-8875 or nathan.fahey@ontario.ca for any special accommodation needs such as dietary or accessibility needs, or if you have any questions.

Background

MGCS and TSSA initiated work on the Operating Engineers Regulatory Renewal Project in 2015 by engaging Deloitte to conduct a jurisdictional scan with a provincial, national and international lens as it reviewed the regulation, regulatory regimes, policy frameworks and unregulated environments across multiple jurisdictions in both North America and the European Union. MGCS and TSSA also conducted interviews with stakeholders to understand current issues facing industry.

MGCS and TSSA are now seeking to form an expert panel to advise government on how to reform Ontario's Operating Engineers regulation (O. Reg. 219/01) under the Technical Standards and Safety Act, 2000. The topics of reform may include the following:

- Attendance requirements that may not accurately reflect safety risk and impose undue burden on industry
- A rigid and prescriptive framework where code requirements are embedded in the regulation
- New and emerging technology that are cost effective and produce lower greenhouse gas emissions
- Out-dated requirements for agricultural operations and renewable biomass fuels
- Power plant ratings that are not harmonized with other provincial jurisdictions and
- Certification requirements that may be contributing to labour market challenges.

Appendix B – Risk Task Group Terms of Reference & Scope of Work

Purpose

The purpose of the Operating Engineers (OE) Risk Task Group is to develop a framework and methodology for a risk-based approach to regulating staffing requirements for plants, as proposed by the Operating Engineers Expert Panel.

The purpose of the Advisory Group is to reflect the voice of the panel and provide input and feedback from a broader industry perspective on public safety, applicability and potential cost implications of the work of the Task Group.

The objective of the Expert Panel was to review the Operating Engineers regulation (O. Reg. 219/01) and provide recommendations to improve public safety while imposing a minimum burden on business.

Background

The Ministry of Government and Consumer Services (MGCS) and the Technical Standards and Safety Authority (TSSA) are currently reviewing the Ontario Operating Engineers regulation (O. Reg. 219/01) ("the regulation") under the Technical Standards and Safety Act, 2000 through an expert panel approach. The Operating Engineers Expert Panel was constituted by MGCS and TSSA, met from November 2016 until February 2017, and will produce a findings report by June 2017.

The expert panel recommended a risk-based approach to regulating the staffing requirements for plants. The approach provides plant owners with two paths for compliance.

1. Path 1 is a risk-based approach that prescribes plant staffing and attendance requirements based on plant ratings determined by a scientific risk score.
2. Path 2 is a risk-based approach that allows plant owners to develop and implement a regulator-approved Risk and Safety Management Plan (RSMP).

MGCS and TSSA have proposed the formation of a Task Group to help establish the framework and the methodology for the risk-based approach that will ensure

successful implementation of these two paths for compliance. The framework will be based on best practices in risk management, aligned with Ontario's regulatory policy[40] and promote public safety. This document is intended to serve as the terms of reference and scope of work for the Operating Engineers Risk Task Group.

Scope of Work

The Task Group will establish a risk-informed decision-making framework and methodology for two paths for compliance that has been proposed as part of the OE regulatory review. The Task Group will use the risk framework outlined by TSSA and presented at Expert Panel Meeting #4 on January 12, 2017 as the starting point for its work (see appendix I). The Task Group will also use the work carried out by SOPEEC[41] and the hazard assessment templates completed by the OE Expert Panel as inputs.

The key tasks for the Task Group will include the following:

1. Develop a risk-informed framework and methodology for Path 1.
2. Develop a risk-informed framework and methodology for Path 2.
3. Develop a plan for addressing operational considerations for implementing the two regulatory approaches.
4. Guide TSSA in the development of tools and assessment of costs for implementation including the development of RSMP templates and guidelines, and implementation plans for the two paths of compliance.
5. Support TSSA and the MGCS in the public consultation process.
6. Develop a framework for monitoring and continuous improvement by TSSA.
7. Identify roles and responsibilities in Path 1 and Path 2 – for example, roles and responsibilities of owners in path 1 will be very different for those in path 2.
8. Develop a work plan.

The scope of work does not include the actual development of tools and estimation of costs for implementation. TSSA will complete these two tasks and submit them to the Task Group for commentary and feedback.

The Task Group's work will be concluded once it has considered comments obtained through the public consultation facilitated by TSSA. The final output of the Task Group will be the preparation of report written on behalf of the Task

[40] Ontario's Regulatory Policy - https://www.ontariocanada.com/registry/downloads/Ontario%20Regulatory%20Policy.pdf
[41] The Standardization of Power Engineer's Examinations Committee (SOPEEC) is a subcommittee of Canada's Association of Chief Inspectors (ACI)

Group by an independent facilitator. This report will be used by TSSA and MGCS to draft and implement the regulation.

Terms of Reference – Task Group

The following terms of reference have been identified for the formation and operation of the Task Group to ensure that the outputs of the Task Group align with best practices in risk management, achieve public safety outcomes and allow for smooth implementation of the proposed risk management framework. They include:

1. The Task Group and its work shall be coordinated by an independent facilitator with significant knowledge in technical/safety risk management, experience in facilitation and working knowledge of the Operating Engineers regulation and the industry sector.
2. The independent facilitator will be retained by TSSA to coordinate and organize meetings, facilitate risk assessment sessions and discussions, develop risk-based methodology, meet project plan expectations, deadlines and milestones, prepare presentations to stakeholders, and interim and final reports and related documents.
3. The Task Group will report to an Advisory Group whose membership shall be no more than 20 persons, drawn from interested members of the expert panel, broader industry and MGCS.
4. In conducting risk assessments, task group may seek data, information and expertise from external sources including those recommended by the OE Expert Panel members for different technologies, plant categories and sizes.
5. The Task Group shall develop the framework and methodology for both paths such that they are scientific and evidence-based, incorporate expert advice, are clear, easily understandable and predictable.
6. Path 1 shall be a risk-based methodology that is limited to determining the attendance requirements for plants.
7. Path 2 shall involve the development of a risk and safety management system that is aligned with best practices in process safety management and involve methods for demonstrated acceptable levels of risk.
8. The methodologies for rating plants using Path 1 and Path 2 shall be based on risk assessment methods and measures.
9. Compliance with Path 1 cannot be assumed to be safer than Path 2 and vice versa.
10. Simple and easy to use tools and guidance documents shall be developed for complying with Path 1.
11. Detailed guidelines, templates with example applications, and references to acceptable standards, tools, methods and databases shall be provided for complying with Path 2.

12. The Task Group can seek inputs and feedback from external experts.
13. The Task Group will work collaboratively and where possible seek consensus.

Terms of Reference – Advisory Group

1. The role of the advisory panel will include the following:
    a) Review reports from the Task Group and provide advice and input to the work of the Task Group.
    b) Provide input and feedback from a broader industry perspective on public safety, applicability and potential cost implications of the work of the task group.
2. Members of the OE Expert Panel who would like to participate in this process can do so through the Advisory Group.

Task Group Deliverables

1. A risk informed framework and methodology for Path 1 prescriptive regulatory approach.
2. A risk informed framework and methodology for Path 2 RSMP regulatory approach.
3. An implementation plan for the Paths 1 and 2 regulatory approaches.
4. Review and provide feedback to TSSA's tools and costs for implementing Path 1 and Path 2 regulatory approaches, including the implementation plans for Path 1 and Path 2.
5. A framework for monitoring and continuous improvement.
6. Final report.

Composition of Task Group

The technical Task Group will be comprised of not more than six members as follows:

a) Maximum of four representatives from the OE industry with knowledge on different technological categories and plant sizes and experience in technical risk assessments.
b) One TSSA Risk Management Advisor and one OE technical expert from TSSA.

Frequency of Meetings and Venues

The Task Group will hold 1-2 in-person full-day meetings each month in Toronto (location TBD). However, at the beginning of the process the meeting frequency may increase to 2 to 3 times a month.

Reporting

For the first four months, the Task Group will provide updates of its work to the Advisory Group on a monthly basis, and for the duration of the project, on a quarterly basis through in-person or teleconference meetings. The Task Group will provide a written status report with updates in advance of these meetings. The frequency of these meetings will be periodically assessed and any additional reporting requests shall be co-ordinated by the Task Group Secretariat.

Secretariat for the Task Group and the Advisory Group

A TSSA risk management advisor will document the technical input from the Task Group. TSSA and MGCS Policy Advisors will provide policy and regulatory input. The TSSA policy advisor will also coordinate the Task Group and Advisory Group and help prepare reports and materials for meetings.

Time Frame

The term of the Task Group shall be 12 months beginning March 2017 to February 2018.

Compensation

Task group members will not be compensated for their time or travel expenses and will participate on a strictly volunteer basis.

SUPPLEMENTARY APPENDIX I

TSSA's DRAFT FRAMEWORK FOR PATH 1 AND PATH 2 RISK-BASED REGULATORY APPROACH

PATH 1: RISK-BASED PLANT RATING

General Characteristics and Main Elements

- Objective is to develop a risk score to inform plant supervision requirements
- Allows for the determination of plant attendance requirements based on the operational hazards posed by the facility
- Model will be developed by TSSA and will include input from the Task Group and Advisory Group and other sources of expertise
- Model is simple and limits the burden to industry

Process Involves the Following:

- Systems and Sub-systems definition
- Type of facilities (systems) to be evaluated
- Boilers, refrigeration, compressor plants etc.
- Facility type (sub-systems)
- Steam, Hot Water Boilers
- Refrigeration
- Air, Gas Compressors
- Steam Prime Movers
- Requires safety information
- Operational parameters (temp, pressure)
- Hazardous substances used (fuels, refrigerants, other working fluids)
- Current mitigations requirements (administrative, regulatory and engineering controls)

1. Hazard Identification

   Identification of hazard scenarios from the defined Systems and Sub-systems, including attributes and preventive measures.
   Application of acceptable methodologies:
   - Hazard Identification (HAZID) analysis – Including the relevant hazards identified by the expert panel in meeting #3
   - Knowledge Based HAZOP analysis
   - What if Analysis

2. Model Design

   - Identification of relevant system's conditions, attributes and contributing factors that affect the risk profile (i.e. type of operation, temperature, pressure, substance toxicity and flammability, working fluid phase changes, population density etc.)
   - Identification of the top consequence events (i.e. fire, explosion, toxic releases, etc.)
   - Identification of generic risk reduction/mitigation controls (i.e. prescribed regulatory controls, inherently safe design attributes, process safety management etc.)
   - Developing a cause-effect relationship model that connects the system conditions and attributes with the top consequence events while accounting for existing risk reduction/mitigation controls

3. Risk Score Determination

Develop risk score logic.

Map out risk variables to produce a risk score that models the relative risk in the system by selecting the most appropriate risk assessment methodology (where risk can be measured and scored for ranking purposes) from:

- Fault Tree Analysis (FTA)
- Event Tree Analysis (ETA)
- Bowtie
- Relative Risk Index (e.g. Dow F&E and Mond Indices)

4. Plant Supervision Requirements

- Determine Risks Score and rank them for plant rating
- Align Risk Score with Plant Rating via a mapping exercise that incorporates expert opinion
- Prescribe staffing requirements using plant rating

PATH 2: RISK AND SAFETY MANAGEMENT PLAN

General Characteristics and Main Elements

- Allows owners to identify, assess and manage plant/site specific risks using allowable standards and practices in risk assessment and management
- Management of risks shall include an appropriate combination of people, processes, and technologies commensurate with the level of risk.
    - Provides opportunity for owners to implement a single integrated risk management system that covers hazards within and beyond the current OE jurisdiction
- Plants of similar combinations (e.g., owners with multiple identical plants) may be able to benefit from a single plan
- May involve additional development costs initially
- Subject to review if there is a change in plant or negative audit findings

Process involves the following:

1. Site Specific Information

- Facility layout
- Number and type of installations and operations;
- Population information in and around the plant (density, type)
- Types, quantities and properties of materials stored and used
- Design and process details
- Information on controls and control systems (including safety devices)
- Safety systems (e.g., interlocks, detection, or suppression systems)
- Mitigation controls/emergency systems

2. Hazard Identification

   - Identification and analysis of hazard scenarios (causes, consequences, existing controls, gaps/recommendations)
     - *Note: Similar to the exercise undertaken by the expert panel*
   - Screening/prioritization of hazard scenarios for risk assessment
   - Use of acceptable techniques such as HAZOP, FMEA, FTA/ETA etc.
   - References including acceptable standards will be provided in the TSSA guideline
     - Example applications can be included

3. Risk Assessment

   - Prioritized hazard scenarios (from hazard identification) assessed for probability (frequency) and consequence of failure events (e.g., fires, explosions, toxic releases, pressure boundary failures, etc.)
     - Based on a combination of historical site specific data, industry data, and expert judgment
     - Use of acceptable techniques and models (standards and best practices will be provided)
     - Credit can be taken for additional controls/procedures based on acceptable standards
     - Example applications including tools can be developed for use
     - References to reliable industry based failure databases can be provided
   - Risk estimated as a combination of probability and consequence of occurrences (typically as probable number of deaths/injuries/million people/year)
   - Risk evaluated against MIACC and/or ALARP criteria for acceptability

4. Develop Risk Acceptability Criteria

   - The MIACC or the ALARP criteria, which could be used to determine acceptable risk levels.

5. Risk Reduction and Mitigation, including Emergency Response and Preparedness

   - Need to develop if estimated risk is unacceptable
   - Risk reduction and mitigation measures can include additional technologies, processes and/or people
   - Examples of measures can be included in the guideline
   - Levels of credit associated with measures can be applied to reduce risk to acceptable levels (guidance will be provided)

- CSA Process Safety Management (Z767) standard can be used for guidance

6. Additional reliability and oversight considerations to be taken into account when developing Path 2

   - Prepared and attested by a competent person
   - Responsibility of implementation rests with plant owner
   - Approval mechanism (e.g., Statutory Director, oversight body)
   - Audits and inspections by TSSA
   - Zero tolerance approach to non-compliances (e.g., plant owners cannot take credit for these controls in the future unless they are able to provide evidence that they have rectified the issue)
   - Audits by industry associations to encourage best practices (e.g., Responsible Care Initiative by the Canadian Chemical Producers Association)
   - Transparency in reporting

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