Multi Municipal Energy Working Group
AGENDA

MMEWG-2025-01
Thursday, January 9, 2025, 7:00 p.m.
Virtually via Microsoft Teams

Pages

1. Meeting Details

   Microsoft Teams

   Join the meeting now

   Meeting ID: 249 946 736 464

   Passcode: CV6D87yb

2. Call to Order

3. Election of Chair and Vice-Chair

   As per the Terms of Reference, the Working Group shall appoint a Chair and Vice-Chair at the first meeting of each year.

4. Adoption of Agenda

5. Disclosures of Pecuniary Interest and General Nature Thereof

6. Minutes of Previous Meetings

   6.1 MMEWG Minutes - November 14, 2024 — 1

7. Business Arising from the Minutes

   7.1 IESO Meeting

8. Delegations/Presentations

   8.1 Bill Palmer - Letter to the Office of the Fire Marshal — 19

9. Correspondence

9.1 Requiring Action

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10. Members Updates

11. New Business

12. Closed Session (if required)

13. Confirmation of Next Meeting

March 13, 2025 7:00 p.m. via Microsoft Teams

14. Adjournment

Multi Municipal Energy Working Group

MINUTES

MMEWG-2024-05
Thursday, November 14, 2024, 7:00 p.m.
Virtually via Microsoft Teams

Members Present: Mark Davis - Municipality of Arran-Elderslie - Citizen Appointee
Ryan Nickason - Municipality of Arran-Elderslie
Scott Mackey - Township of Chatsworth
Tom Allwood - Municipality of Grey Highlands
Todd Dowd - Municipality of Northern Bruce Peninsula
Sue Carleton - Township of Georgians Bluffs
Stewart Halliday - Municipality of Grey Highlands - Citizen Appointee

Others Present: Julie Hamilton - Recording Secretary
Bill Palmer - Technical Advisor

1. Meeting Details

2. Call to Order

The Chair called the meeting to order at 7:00 p.m. A quorum was present.

3. Adoption of Agenda

MMEWG-2024-11-14-01

Moved by: Terry Mckay - Township of Chatsworth

Seconded by: Todd Dowd - Municipality of Northern Bruce Peninsula

Be It Resolved that the Multi-Municipal Energy Working Group hereby adopts the agenda of the Thursday, November 14, 2024 as distributed by the Recording Secretary.

Carried

4. Disclosures of Pecuniary Interest and General Nature Thereof

There were no disclosures made by the Members.

5. Minutes of Previous Meetings

5.1 MMEWG Minutes - September 12, 2024

MMEWG-2024-11-14-02

Moved by: Ryan Nickason - Municipality of Arran-Elderslie

Seconded by: Sue Carleton - Township of Georgians Bluffs

Be It Resolved that the Multi-Municipal Energy Working Group hereby approves the minutes of the Thursday, September 12, 2024, meeting as presented by the Recording Secretary.

Carried

6. Business Arising from the Minutes

6.1 Letter from Arran-Elderslie Re: Recording Secretary

The Recording Secretary agreed to remain on a contractual basis.

MMEWG-2024-11-14-03

Moved by: Sue Carleton - Township of Georgians Bluffs

Seconded by: Scott Mackey - Township of Chatsworth

Be It Resolved that the Multi-Municipal Energy Working Group hereby agrees to a monthly contract amount of $200.00 for the Recording Secretary Services of Julie Hamilton.

Carried

6.2 FOI - Skyway 8 Turbine Failure

The original Freedom of information request was submitted in March of 2022 as follows:

"All documentation supporting the amendments to the original approval (5612-99-QHT7) to permit the installation and acoustic testing of a device known as a “Power Cone” on turbine T4 including the applications of June 28, 2018, and September 25, 2019, signed by Patrick Leitch, VP Skyway 8 Wind Energy Inc.,

and all supporting documentation submitted with these applications, including amended documentation up to November 12, 2019. In addition, we request all summaries, reports, memoranda, notes of meetings and telephone calls, and emails related to the catastrophic failure of the wind turbine in what is known as the Skyway 8 operated by Capstone, including the results of the investigation of the incident, the role of the "Power Cone" experimental equipment, and any recommendation for future operation of the wind power generator. Timeframe: January 1, 2018, to March 7, 2021."

The Working Group discussed the records that were released noting that there appeared to be no information on the acoustic testing related to the audit power cone failure as requested. There was before and after the failure aspect of the acoustic audit but no information or measurements with the power cone in place or related to when the failure occurred.

There is a second request that broadly addresses wind turbine failures that the results of have not yet been disclosed.

MMEWG-2024-11-14-04

Moved by: Mark Davis - Municipality of Arran-Elderslie - Citizen Appointee

Seconded by: Todd Dowd - Municipality of Northern Bruce Peninsula

Be It Resolved that the Multi-Municipal Energy Working Group hereby receives agenda item, 6.2 FOI - Skyway 8 Turbine Failure and further directs that a letter be drafted to acknowledge receipt of the information and address the information related to the request that was not included in the documentation.

Carried

7. Delegations/Presentations

7.1 Bill Palmer - Update to MMEWG on presentation to Georgian Bay Chapter on BESS safety

Mr. Palmer made a presentation to the Working Group regarding a presentation he attended on BESS safety, which is appended hereto to form a part of the minutes. Palmer - Presentation on BESS Safety

The Working Group thanked Mr. Palmer for his presentation and entertained having Mr. Palmer making a presentation or getting more information into the hands of the Grey and Bruce County Fire Chief's. The existing codes and standards that are being relied on do not appear adequate enough to protect in the the event of a failure.

There was no discussion of setbacks during the presentation however, in an incident in Montreal that people were advised to evacuate and shelter in place, there were setbacks quoted in the article. The Working Group has circulated unwilling host information until which time as the Fire Marshall addresses the issue of fire safety in rural volunteer fire departments. There could be insurance implications were proper suppression methods are not available. In the past, related to wind turbines, bylaws have been put in place that put the onus to on the company to provide proof of sufficient fire suppression plans before any approvals were given.

A project in Arran-Elderslie has approved a project with the supply of special monitoring equipment and training for all of the local firefighters being a condition of approval.

MMEWG-2024-11-14-05

Moved by: Sue Carleton - Township of Georgians Bluffs

Seconded by: Scott Mackey - Township of Chatsworth

Be It Resolved that the Multi-Municipal Energy Working Group hereby receives, notes and files agenda item, 7.1 Bill Palmer - Update to MMEWG on presentation to Georgian Bay Chapter on BESS Safety for information.

Carried

8. Correspondence

8.1 Requiring Action

8.1.1 Approval of Recording Secretary Invoice - May - Oct 2024

MMEWG-2024-11-14-06

Moved by: Scott Mackey - Township of Chatsworth

Seconded by: Todd Dowd - Municipality of Northern Bruce Peninsula

Be It Resolved that the Multi-Municipal Energy Working Group hereby approves payment of the invoice for the Recording Secretary services for May, June, July, August and October.

Carried

8.2 For Information

8.2.1 Zorra Township Re: Municipal Support Resolutions

Warren Howard provided some context to the correspondence

There have been a number of project proposed in Oxford County which have been strongly opposed and produced unwilling host resolutions. In Zorra Township, a local group very quickly organized a well attended community meeting. Following this, a Mr. Howard made a presentation on the municipal rules relating to BESS proposals, which ran concurrent with a Council meeting, where the Mayor stepped down as Chair and proposed the motion, which passed unanimously.

MMEWG-2024-11-14-07

Moved by: Terry Mckay - Township of Chatsworth

Seconded by: Ryan Nickason - Municipality of Arran-Elderslie

Be It resolved that the Multi-Municipal Energy Working Group hereby receives, notes and files the correspondence for information purposes.

Carried

9. Members Updates

Member Dowd updated the Working Group on recent activity in Northern Bruce Peninsula regarding potential solicitation for new wind turbines leases as well as the extension of the Ferndale Turbine contract. Newmar Wind Limited is looking to lease land for new wind projects. It is suspected that the same conclusion will happen as years earlier, that the powerlines currently in place don't support moving the hydro off the peninsula. The current three wind turbine contracts expire June 26, 2027.

Member Davis raised a question regarding current solar panel installations and the renewal of those contracts. It was noted that there has been cases where companies have upgraded the panels to more modern, more efficient ones and the IESO said this was in contravention of the contract however the courts did not find it to be the case, so existing contracts are being extended. It was further noted that projects, including wind turbines, if they were attached to the grid, they do not need to meet the dispatchable criteria and they can renew their contract for a 5-year term.

10. New Business

10.1 Roundtable Discussion - IESO Updates

There was a webinar yesterday for the Indigenous and Municipalities related to the RFP-LT2.

The new Minister of Energy and Electrification gave the IESO some very clear points about being open minded on energy generation.

Mr. Howard provided the Members with an overview of the key talking points which are appended hereto to form a part of the minutes.

Howard - IESO Update - November 14 2024

Chair Allwood added that with the rated criteria points system, the lowest price gets the highest rating, but if there is local indigenous community participation, if the project is sited outside of prime agricultural area or in Northern Ontario, the project scores higher and the IESO may be willing to pay more if this criterion is met. He also addressed the requirement of a pre-engagement consultation on the municipal support resolution, noting that the correspondence is to go through the CAO, and not the Clerk. There is also no provision for conditional municipal support resolution. There are a lot of concerns with the agricultural assessment, the work involved and the timing of it. The IESO has no position on whether costs could be recouped by

municipalities, along with community benefit agreements. Decommissioning is also not dealt with in the contracts. Municipal support resolutions do not override normal planning processes and projects could fail even with support if the proper planning designations are not in place to support the project.

The meeting with the IESO has been proposed for December 4, 2024, which conflicts with Chair Allwood's council schedule. A new date will be requested. Chair Allwood, Warren Howard and Bill Palmer will attend and provide a summary for the Members. The talking points will be refined and sent to the IESO.

11. Closed Session (if required)

Not required.

12. Confirmation of Next Meeting

The next meeting is scheduled for January 9, 2025, 7:00 p.m. via Microsoft Teams.

13. Adjournment

MMEWG-2024-11-14-

Moved by: Ryan Nickason - Municipality of Arran-Elderslie

Seconded by: Sue Carleton - Township of Georgians Bluffs

Be it Resolved that the meeting of the Multi-Municipal Energy Working Group is hereby adjourned at 8:40 p.m.

Carried

Tom Allwood, Chair

Julie Hamilton, Recording Secretary

Update to MMEWG on PEO Georgian Bay Chapter Seminar titled "New Battery Technology and Fire Safety Concerns"

Bill Palmer P. Eng.

Delivered to MMEWG – Nov. 13, 2024

Background to Seminar

- The 90 minute seminar (including questions and discussion) was delivered to ~ 35 Professional Engineers Ontario (PEO) Georgian Bay Chapter members August 22, 2024
- Delivery was by Mr. Iman Yavari, P.Eng. CEO and Principal Engineer
  of Ai Integrated Systems, Richmond Hill, ON
- Mr. Yavari is a registered Professional Engineer in Ontario, BC, Alberta, Quebec, Newfoundland and Labrador, as well as the state of Nevada, with registration pending in the state of Texas
- He is active on the (USA) National Fire Prevention Association (NFPA) 72 Technical Committee and is involved in a number of UL (Underwriters Laboratory) and ULC Technical Committees on Fire Safety, including UL 9540 – Energy Storage Systems and Equipment (and others)

Overview of Seminar Content

- Brief history of storage battery development
- Overview of how Canada's (federal) Net Zero Emissions Accountability Act drives battery implementation
- Overview of Battery Energy Storage System Applications
- Brief discussion of Lithium Ion battery fire history and BESS hazards
- Brief discussion of how code UL 9540 addresses battery safety
- Brief mention of applicable International Electrotechnical Commission (IEC) Codes for Lithium Ion Battery safety

Highlights for MMEWG

- Storage Battery History
  - Lead acid batteries developed ~ 1859, the first rechargeable storage battery
    - Capable of high current output, but relatively low energy density compared to modern
    - Relatively safe from fire, but sulphuric acid electrolyte is toxic and causes skin burns. Lead is toxic heavy metal.
  - Nickel Cadmium battery initial development 1899
    - Higher energy density than lead acid, but suffer from memory effectif charged often and only partially discharged. Cadmium is a toxic heavy metal
    - Refined development ~ 1947 yielded sealed battery. Better in cold than Lead acid.
  - Lithium Ion battery initial development began in 1970's. Have seen many different chemistries.
    - Initial types prone to fire based on "thermal runaway". Newer LiFePO4 is less prone to fire (but not a zero risk). The main choice for BESS today.
    - LiFePO4 costs have fallen from $1191/MWh in 2010 to $137/MWh in 2021

Recent LiFePO4 Battery Issues

- No mention in Ontario Fire Code as of 2024 regarding installation of new batteries
- Fires of LiFePO4 batteries a public concern
  - Fire on TTC subway of E Bike – TTC considering limitation on e bikes – deferred to review impact on gig workers “and equity seeking groups.”
  - June 2024 - Toronto Fire Services, in partnership with the Office of the Ontario Fire Marshal and the Ontario Association of Fire Chiefs, launched a lithium-ion battery public safety and education campaign “This is Your Warning” that highlights the fire risks associated with lithium-ion batteries.
  - MS Chi-Cheemaun ferry bans Chrysler Pacifica hybrid vehicles due to fire concern
  - Fire of LiFePO4 factory in South Korea in June 2024 kills (at least) 22 workers
  - Fire aboard ships and their cargo reported regularly
    - Felicity Ace carrying 4000 cars – some EV’s (off Portugal) Feb. 2022
    - Freemantle Highway carrying 3000 cars – some EV’s (off the Netherlands) July 2023
    - Genius Star XI – carrying Li-Ion batteries (off Alaska) Dec. 2024
    - Truck carrying Li-Ion batteries offloaded ship tipped over on bridge near Los Angeles Harbour Sept. 2024 – shut down highway for 2 days while batteries burned – off and on
    - Cargo unloaded Montreal Harbour Sept. 2024 battery fire – results in evacuation of 100 residents, lockdown of others due to toxic fumes

More LiFePO4 Fire Issues

- Presentation discussed incomplete regulations concerning installation of EV chargers in Condos and parking garages
  - Codes discuss limits of 600 kWh – perhaps 6 EV's today.
  - Limitations of where to locate EV chargers in buildings, particularly underground garages are inconclusive
- LiFePO4 BESS Hazards
  - Discussed risk of batteries (including LiFePO4) "swelling" indicating failure
  - Thermal runaway
  - Toxic and flammable gases
  - Deep Seated fires
  - Cannot be extinguished with water – only use to cool adjacent batteries

Issues Apparent from Presentation

- UL 9540 Code tests for battery safety by charge – discharge – charge – discharge cycle (i.e. 2 complete cycles).
  - Battery deterioration (including swelling) occurs after multiple cycles due to development of “dendrites” (rigid needle and tree like structures) that penetrate anode/cathode separator and result in eventual failure
  - A 2 cycle test to show code compliance is hardly definitive for BESS batteries that may cycle daily for a 20 yearly lifetime (6000+ cycles)
  - Question asked at presentation, does presenter believe the codes provide adequate protection. Response, “there may be gaps.”
- Presenter noted BESS installations have extensive fire protection, such as massive water deluge for fire supression / fire propagation. An array like the 400 MW, 1600 MWh array in Arran Elderslie has no municipal water fire protection supply. Delivery by tanker trucks inadequate.

Fire Crew Training and Risks

- Presentation showed video clip of Arizona 2.16 MWh that critically injured 4 firefighters
  - Report notes, “the design of the ESS complied with the pertinent codes and standards active at the time of its commissioning.”
  - *(contrast to Arran Elderslie 400 MW 1600 MWh installation – over 740 times larger)* Arran Elderslie protection will be provided by the volunteer firefighters of Arran Elderslie – no training provided nor identified by Fire Marshall before approval of facility to ensure safety
- Questions asked at the presentation if the presenter believed the current situation addresses concerns
  - Response given was “there may be gaps”

Final post presentation Comments by Presenter – received by e mail

- “I wanted to take a moment to express my sincere gratitude for your participation in yesterday’s seminar … “
- “The thoughtful questions and vibrant discussion during the Q&A session were truly energizing.”
- In response to my formal submission to him, he noted,
- “Thank you for your constructive feedback and appreciate your time.”

- *W. Palmer final comment – There are gaps in the codes that MMEWG members should be aware of. Do not consider that your communities or protective service personnel are protected.*

MMEWG Report

IESO Activity

- Moving to a series of RFP's with a new round each year starting in Q3 2025 wit decisions in Q1 2026
- Municipal meeting held on November 13. Questions raised include:
    - Consideration of Alternate Sites required before submission/Municipal Support Resolution
    - Fees Allowed for Planning and Zoning work but not for reviews of AIA
        - Need revision of schedule of fees
    - AIA should include protection of growth areas and livestock protection
    - Municipalities should ask for information early including AIA before support resolution
    - Wording of municipal support resolution indicates work with proponent on municipal support resolution – conflict of interest
    - Require application forms with site plans and report on consultation with resident within 500'.
    - Book Council presentation 4 weeks in advance, municipality advises residents by mail.
    - Previous aggregate sites potential sites for projects
    - Cancellation of support resolutions the new multiple wind process.

IESO Contract in Court

- Issue retooling solar projects to increase output within an existing contract
- IESO challenged companies but lost on appeal
- No restrictions on equipment upgrades in existing contracts.

Trillium Power

- Wants to build wind projects in Lake Ontario
- Not allowed in current process

Perth County Official Plan

- Unwilling Host status – included in new Official Plan

Revenue Model

- Proponents declare name plate capacity and output expectations – monthly
- Process based on Day Ahead Markets – proponents commit to future production
    - Need to make it up when if not actually delivered
- Payments based on Day-Ahead market pricing and estimated monthly output based on production factors in contract.
- Additional payments if there is a short fall in revenue required.
- Un-resolved – ability to predict wind output one day in advance
    - Under consideration since March – no resolution

Municipal Activity

- **Zora, Oxford**
    - Mayor supports “renewable energy”
    - Very active opposition from agricultural community
    - Mayor responded with resolution looking for direction; critical of IESO
- **South-west Oxford**
    - ProWind failed with East Zorra-Tavistock; Blanford- Blenheim
    - Now looking for leases in another township
- **Adelaide-Metcalfe, Middlesex**
    - Interest expressed
- **Eastern Middlesex**
    - Some leasing activity underway
- **City of Kawartha Lakes**
    - Pro-renewable energy Councilor proposed repeal of Unwilling Host resolution
        - Motion defeated
    - Councilor then requested a staff report on Unwilling Host resolution.
    - 2 members of Council affected by wind turbines
- **Mapleton**
    - Motion to review projects despite Unwilling Host statues approved
    - Mayor does not support more wind turbines
    - Investigation of local status underway
- **Northern Bruce Peninsula**
    - Leasing activity underway

Update of MMEWG
Regarding Letter sent Dec. 16, 2024 to Fire Marshal

Safety of the Public and First Responders in the Event of a Lithium Ion BESS Fire

Presented by William Palmer P. Eng.

January 9, 2025

Overview of Cover Letter (P1)

- IESO has already approved 1880 MW / 7500 MWh of BESS as LT1-RFP
- LT2-RFP proposes acquisition of contract capacity to generate 14 TWh with 1600 MW of capacity.
  - *14 TWh possible from 5327 MW of wind (at 30% capacity factor) or 1775 MW of nuclear (at 90% capacity factor).*
  - *1600 MW of capacity cannot be assured by wind or solar, so would require BESS if wind or solar selected to supply energy in short term*
- Elected members of councils who are part of MMEWG have expressed concern with safety to public and first responders in event of BESS fires

Overview of Cover Letter (P2)

- IESO provided link to document “Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters” (the Handbook) prepared by the Canadian Renewable Energy Association (CanREA) in collaboration with the Ontario Association of Fire Chiefs (OAFC).
- Review of Handbook identifies many concerns:
  - Handbook provides inadequate consideration of public safety related to fires in BESS facilities , and downplays risk faced by first responders
  - Does having the industry association advocating more BESS prepare the handbook remind of “leaving the fox guarding the henhouse?”
- Fire Marshal is charged by the Fire Protection and Prevention Act *“to co-operate with any body or person interested in developing and promoting the principles and practices of fire protection services, or to take action to remedy or reduce the threat to public safety.”*

Overview of Cover Letter (P3)

- Notes urgency due to pending installation of BESS systems such as 400 MW / 1600 MWh Neoen Ontario Tara BESS (formerly known as the Shift Solar Grey Owl BESS)
  - approval did not even require notification of residents of the municipality of Chatsworth, even though the nearest residence is within 100 metres
  - Approval did not consider capability of 25 Tara volunteer fire fighters to cope with a fire in this 1600 MWh BESS facility, nearly 4 times larger than the 450 MWh Neoen “Victorian Big Battery Facility” in Australia, which required 150 firefighters when that BESS caught fire
  - The handbook identifies, “Water is considered the preferred agent for suppressing lithium-ion battery fires.” Firefighters would need to deliver water by tanker to the site, and the run-off would discharge to the Sauble river, covered by Ontario Source Water Protection, which flows through the site of the BESS.

Overview of Cover Letter (P4)

- Notes concerns identified in Australian Government EV FireSafe Study
  - Toxic vapour cloud of flammable gases pose respiratory and explosion risk (to first responders and the neighbouring public)
  - Thermal runaway makes it difficult to extinguish the fire
  - Even once suppressed, there is a risk of fire re-ignition, hours or days later
  - Lithium ion battery fires are not yet well understood by emergency agencies
- The Tara BESS is equivalent to 16,000 to 26,000 stacked EV batteries
- Cover Letter included 3 attachments
  1. Concerns identified in review of the “Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters.”
  2. Findings identified in the EV FireSafe study conducted for the Australian Government, Department of Defence.
  3. Additional Resources and References for Consideration in Revision of the “Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters.”

Distribution of Letter (Dec. 16, 2024)

- Office of the Fire Marshal (Directed to send to Nancy Macdonald-Duncan Deputy Fire Marshal, Fire Investigations, Midhurst, ON)
- Copies sent to:
  - Rick Byers – MPP Grey Bruce Owen Sound (received auto response it was received)
  - Steve Tiernan – Fire Chief – Arran Elderslie
  - Steve Hammell – Mayor Municipality of Arran Elderslie (plus CAO)
  - Scott Mackey – Mayor Township of Chatsworth (plus CAO)
  - Tom Allwood – Chair Multi-Municipal Energy Working Group (plus Secretary)
  - IESO
  - Ontario Association of Fire Chiefs
- As of Jan. 5, 2025 no acknowledgement from any recipient other than auto response from Rick Byers' office, acknowledging receipt

Attachment 1 – Concerns with “the Handbook” (P1)

- press release states that the handbook, *“addresses the pressing need for up-to-date safety guidelines,”* and continues, *“the handbook prepares firefighters for potential hazards that might arise during emergency situations involving solar PV and battery storage systems,”*
  - BUT - the descriptions, examples, and photographs deal primarily with smaller residential scale systems.
  - The specific electrical hazards of Battery Energy Storage Systems (BESS) connected to high voltage transmission lines, and battery arrays that may cover acres, are very poorly described.
  - A firefighter whose training was based on the handbook would be very inadequately prepared to deal with BESS installations
  - there is no information on the necessity to contact the system operator to ensure BESS shutdown, and for information about hazards (such as toxic gases) before approaching the system.
  - does not address the particular risks of larger scale (farm sized) solar arrays that may incorporate acres of installed PV panels

Attachment 1 – Concerns with “the Handbook” (P2)

- Description of larger BESS inadequate
- Does not identify that Li-Ion batteries are what is found in large BESS
- Does not identify the significant difference between the battery types that impacts the risk of each is the stored energy density of each type
- description does not identify that thermal runaway (and fire) can be caused by charging Li-Ion when too cold, or if the cell gets too hot, or that the risk is enhanced if the cells are maintained at a high state of charge, as they will by design in a BESS.
- Nowhere in the handbook is the requirement to take action to protect citizens, from either the toxic vapour cloud, or the liquid effluent from fire suppression discussed.

Attachment 1 – Concerns with “the Handbook”(P3)

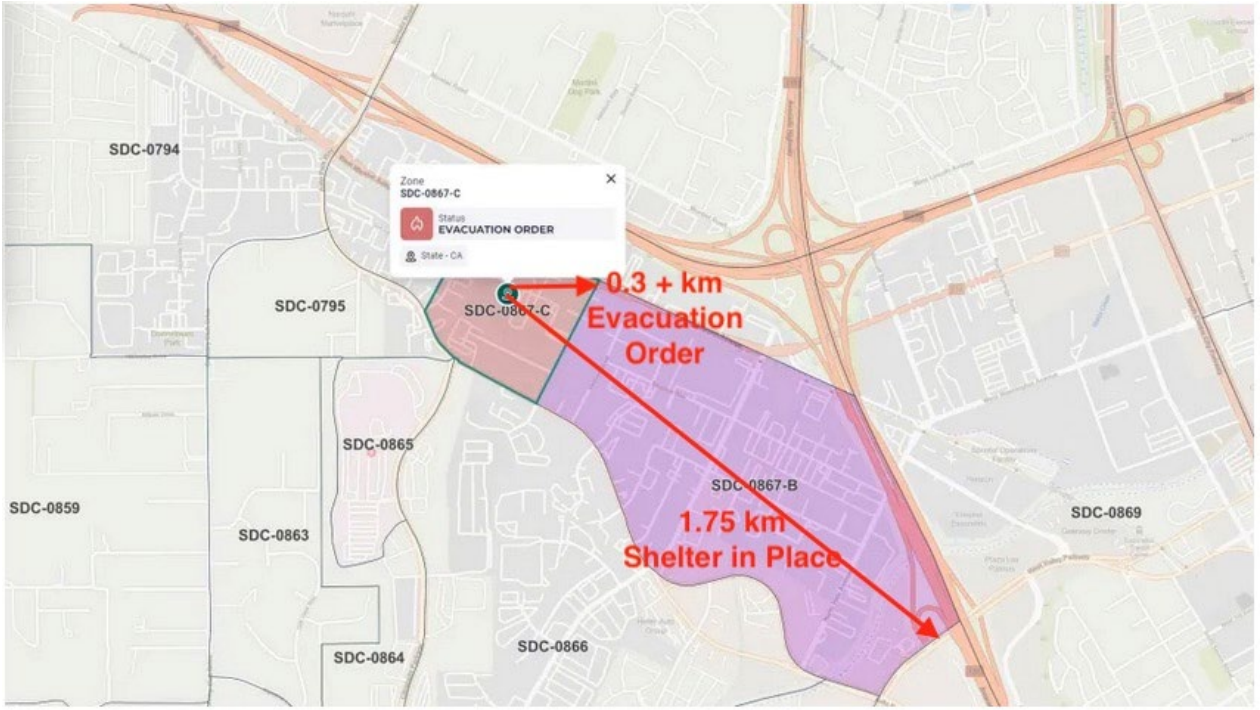
- Attachment shows examples of recent Li-Ion Battery fires
  - Montreal port – Sept 2024.
    - Firefighters evacuate ~ 100 people and warn others in Hochelaga-Maisonneuve to stay in and turn off ventilation (at distance from 1.0 to 1.75 km downwind)
  - Fire at 30 MW, 150 MWh unit at Escondido California, September 2024
    - prompted evacuations (within 0.3 km) of more than 500 businesses and 1,500 SDG&E customer homes and Shelter in place orders out to 1.75 km downwind
- Handbook does not consider toxic liquid effluent from fire fighting
  - Effluent from fire at TARA BESS would run into Sauble River flowing through the site, upstream of the TARA Drinking Water Source Water Protection area

Attachment 1 – Concerns with “the Handbook”(P4)

A fire at a shipping container at the Port of Montreal on Sept. 23, 2024. **Global Montreal**

Attachment 1 – Concerns with “the Handbook”(P5)

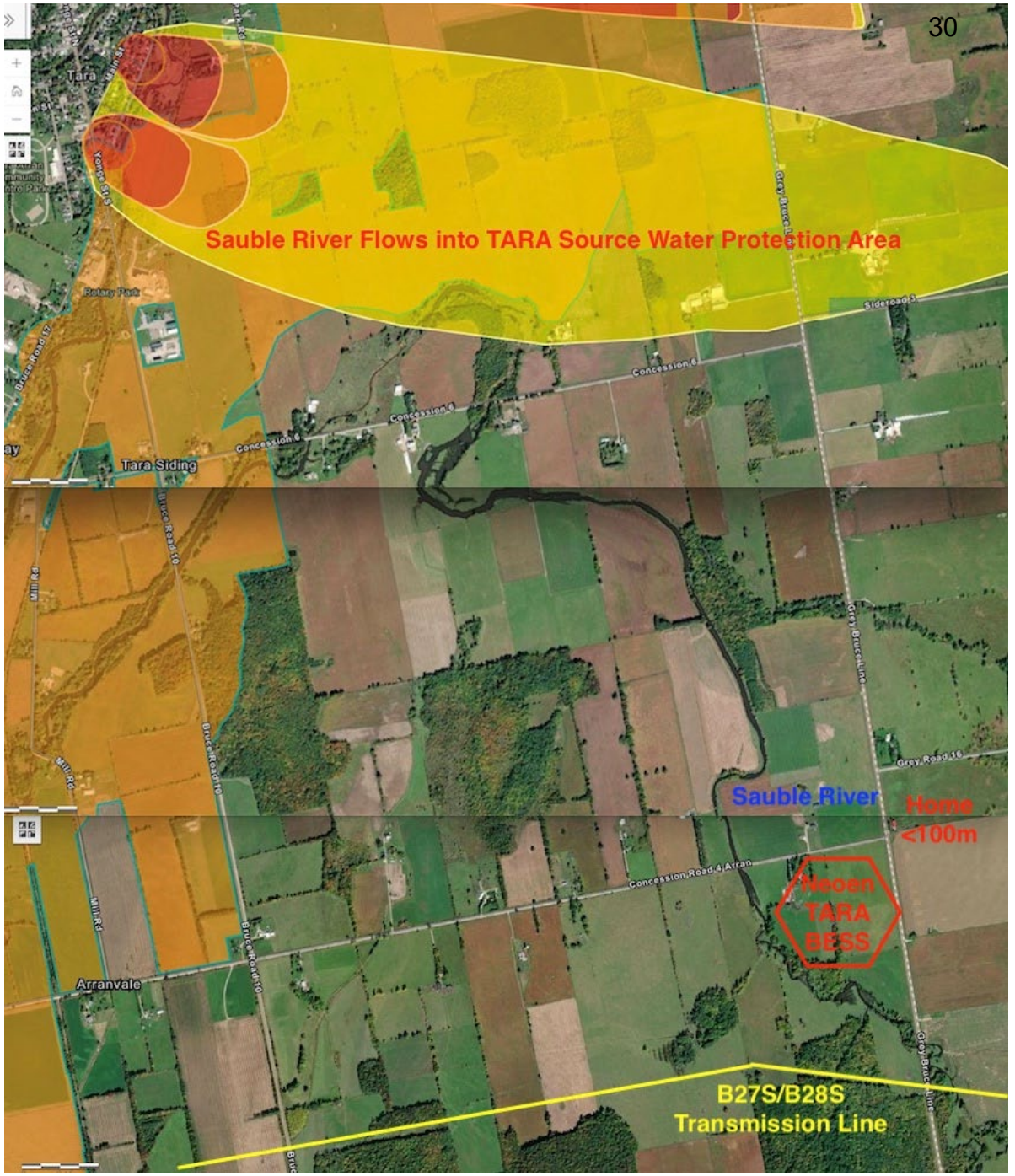
A fire burns at a SDG&E lithium-ion battery facility in Escondido, prompting evacuations, Sept. 5, 2024.



Residents in the pink highlighted area are under a mandatory evacuation order, while those in the purple area have been ordered to shelter in place.

Attachment 1 – Concerns with "the Handbook" (P6)

- The Handbook does not discuss toxic gas hazards to firefighters or neighbours. The handbook does not discuss pressure relief panels on BESS containers, that vent toxic gases to the environment (to prevent bursting the containers - *But immediately venting the gases to neighbours.)*
- The TARA BESS is located within 100m of the nearest neighbour (in adjacent, unconsulted municipality)
- Examples just shown had evacuation of neighbours at distances of about 500m, and shelter in place for neighbours (and presumably livestock) up to 1.75 km downwind. Shelter in place with ventilation turned off is hardly possible for grazing livestock.
- Note also Sauble River flowing through project site.



Attachment 2 – Findings of EV FireSafe Study

- Thermal runaway is how all EV battery fires start
- A battery under 50% charged is less likely to ignite *(hence BESS batteries, normally charged to 100% are more likely to ignite)*
- An EV lithium traction battery burns hotter than an ICE vehicle fire
  - A burning ICE car may reach 815-1000 degrees Celsius, an EV up to 1200 degrees Celsius.
- Fire behaviour is different & presents new challenges
- It's not smoke, it's a vapour cloud of highly flammable *(toxic)* gases
- Best practice; allow a traction battery to burn out
  - EV traction battery fires can reignite, hours or days later

Attachment 3 - Additional Resources and References (P1)

- CTIF – International Association of Fire and Rescue Services website:
  - 12 examples shown (including several that resulted in fatalities)
- Larsson, F., Andersson, P., Blomqvist, P. et al. Toxic fluoride gas emissions from lithium-ion battery fires.
  - The release of hydrogen fluoride from a Li-ion battery fire can therefore be a severe risk and an even greater risk in confined or semi-confined space.
- Bordes, A., Papin, A., Mariar, G. et al. Assessment of Run-Off Waters Resulting from Lithium-Ion Battery Fire-Fighting Operations
  - this water could be potentially hazardous to the environment, depending on the actual situation encountered in the case of thermal runaway propagation

Attachment 3 - Additional Resources and References (P2)

- Quant, M., Willstrand, O., Mallin, T., Hynynen, J., Ecotoxicity Evaluation of Fire-Extinguishing Water from Large Scale Battery and Battery Electric Vehicle Tests
  - analysis of the extinguishing water showed high toxicity toward the tested aquatic species
- Jeevarajan, J.A., Joshi, T., Parhizi, M., Rauhala, T., Juarez-Robles, D., Battery Hazards for Large Energy Storage Systems
  - Li-ion batteries are prone to overheating, swelling, electrolyte leakage venting, fires, smoke, and explosions in worst-case scenarios involving thermal runaway.
  - High and low temperatures can lead to different unsafe conditions in Li-ion cells and batteries.

Attachment 3 - Additional Resources and References (P3)

- Yang Peng, Lizhong Yang, Xiaoyu Ju, Baisheng Liao, Kai Ye, Lun Li, Bei Cao, Yong Ni, A comprehensive investigation on the thermal and toxic hazards of large format lithium-ion batteries with LiFePO4 cathode
  - Toxic gases released from lithium-ion battery (LIB) fires pose a very large threat to human health
  - The LIBs with higher state of charge (SOC) are found to have greater fire risks in terms of their burning behavior
  - Results show that the effects of irritant gases are much more significant than those of asphyxiant gases

Attachment 3 - Additional Resources and References (P4)

- Larsson, F., Andersson, P., Blomqvist, P. *et al.* Toxic fluoride gas emissions from lithium-ion battery fires
  - the emission of toxic gases can be a larger threat than the heat
  - Fluoride gas emission can pose a serious toxic threat and the results are crucial findings for risk assessment and management, especially for large Li-ion battery packs.
  - The release of hydrogen fluoride from a Li-ion battery fire can therefore be a severe risk and an even greater risk in confined or semi-confined spaces.
  - Using water mist resulted in a temporarily increased production rate of HF

Attachment 3 - Additional Resources and References (P5)

- Conzen, J., Lakshmipathy, S., Kapahi, A., Kraft, S., DiDomizio, M., Lithium ion battery energy storage systems (BESS) hazards
  - the industry has also been observing more field failures that resulted in fires and explosions
  - During the exothermic reaction process (i.e., thermal runaway), large amounts of flammable and potentially toxic battery gas will be generated
- Hydro One – BESS Fire Protection – Risk & Response Assessment Standard
- UL Standard 9540A – Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage System

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Dec. 16, 2024

Office of the Fire Marshal (Emergency Management Ontario)
Ministry of the Solicitor General
25 Morton Shulman Avenue
Toronto, Ontario
M3M 0B1

Subject: Safety of the Public and First Responders in the event of a Lithium Ion BESS Fire

In Ontario, the IESO (Independent Electrical System Operator) has already issued approval for the installation of over 1880 MW / 7500 MWh of Battery Energy Storage Systems (BESS) as part of the Long Term – Request for Proposals (LT1 – RFP), and is currently finalizing the next stage of the Long Term – Request for Proposals (LT2-RPF) for an even greater BESS installation.

Elected members of council of municipalities who are part of the Multi Municipal Energy Working Group, which I serve as Technical Advisor have expressed concern for the safety of members of the public and first responders in the event of a fire at a BESS facility. Such fires have occurred already at smaller BESS facilities in Ontario, and at larger facilities internationally. Some of the BESS facilities now approved by the IESO are yet larger, further increasing the risk. Through participation in the IESO RFP Community Engagement webinars, questions were asked regarding risk to public safety and safety of first responders. The IESO responded by forwarding a link to the document, “Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters” (the Handbook) prepared by the Canadian Renewable Energy Association (CanREA) in collaboration with the Ontario Association of Fire Chiefs (OAFC).

Review of the Handbook identifies many concerns. These concerns will be identified in an attachment to this letter. The Handbook provides inadequate consideration of public safety related to fires in BESS facilities, and downplays the risk faced by first responders. Without intending to impugn the integrity of an industry advocacy group which has the stated objective of furthering deployment of BESS systems in preparing the Handbook, it leaves one wondering about the wisdom of the idiom of “leaving the fox guarding the henhouse.”

This request is sent to the Office of the Fire Marshal, of the Ministry of the Solicitor General, charged by the Fire Protection and Prevention Act to co-operate with any body or person interested in developing and promoting the principles and practices of fire protection services, or to take action to remedy or reduce the threat to public safety. This request calls for urgent action, as installation of BESS systems such as the 400 MW / 1600 MWh Neoen Ontario Tara BESS (formerly known as the Shift Solar Grey Owl BESS) have been approved for installation in the municipality of Arran Elderslie. The approval did not even require notification of residents

of the neighbouring municipality of Chatsworth, even though the nearest not-notified residence is within about 100 metres of the optioned land. Neither was consideration required of the capability of the 25 volunteer fire fighters of the Tara detachment of the Municipality of Arran Elderslie Fire Emergency Services to cope with a possible fire in this BESS facility, at 1600 MWh nearly 4 times larger than the 450 MWh Neoen "Victorian Big Battery Facility" in the State of Victoria in Australia, which required deployment of 150 firefighters when part of that BESS caught fire, and burned for 4 days. The handbook identifies, "Water is considered the preferred agent for suppressing lithium-ion battery fires." Firefighters would need to deliver water by tanker to the site, and the run-off would discharge to the Sauble river, covered by Ontario Source Water Protection, which flows through the site of the BESS.

Attachments refer to the findings of the EV FireSafe study, developed for the Defence Science and Technology Group, of the Australian Government, Department of Defence. Findings from that study, identified the risk from lithium-ion batteries (such as the 60 to 100 kWh batteries in current Tesla Electric Vehicles.) However, the risks summarized in the EV FireSafe study are relevant to the much larger battery approved for installation in the Tara BESS. For comparison, in the case of the auto carrier Felicity Ace, which sank off the coast of Portugal in Feb. 2022, an intense fire propagated through the 3,828 carried automobiles (some of which were EV's). This was only one of a number of car carrier fires on ships carrying EV's, some of which resulted in loss of life. The Tara BESS is the equivalent of 16,000 to 26,000 stacked EV batteries. In summary, the EV FireSafe study found:

- Toxic vapour cloud of flammable gases pose respiratory and explosion risk (to first responders and the neighbouring public)
- Thermal runaway makes it difficult to extinguish the fire
- Even once suppressed, there is a risk of fire re-ignition, hours or days later
- Lithium ion battery fires are not yet well understood by emergency agencies

The Office of the Fire Marshal is requested to review the concerns identified in the attachments related to the "Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters" and to give direction to the IESO and impacted municipalities before the ongoing installation of Ontario BESS facilities continues. Possible resources that might be consulted in the Fire Marshal Review are identified in a further attachment.

With respect,

William K.G. Palmer

William K.G. Palmer P. Eng.

Attachments:

1. Concerns identified in review of the “Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters.”
2. Findings identified in the EV FireSafe study conducted for the Australian Government, Department of Defence.
3. Additional Resources and References for Consideration in Revision of the “Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters.”

Copied to:

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Steve Tiernan – Fire Chief – Arran Elderslie Fire and Emergency Services (via website)

Steve Hammell – Mayor Municipality of Arran Elderslie shammell@arran-elderslie.ca
(c/o Emily Dance – Chief Administrative Officer edance@arran-elderslie.ca)

Scott Mackey – Mayor Township of Chatsworth scott.mackey@grey.ca
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Attachment 1 - Concerns Identified With
Solar Electricity and Battery Storage Systems
Safety Handbook for Firefighters

William K. G. Palmer P. Eng.

The "Handbook" developed by the Canadian Renewable Energy Association (CanREA) in partnership with the Ontario Association of Fire Chiefs, was announced in a September 6, 2023 press release.

https://www.oafc.on.ca/sites/default/files/MediaReleases/2023-09-06 Press Release - Solar Electricity and Battery Storage Systems Safety Handbook.pdf

The Handbook itself is available via this link.

https://www.oafc.on.ca/sites/default/files/Solar Safety/FINAL 2022 Solar Electricity and Battery Storage System Safety Handbook for Firefighters April 2023.pdf

A significant challenge is that while the press release states that the handbook, *"addresses the pressing need for up-to-date safety guidelines,"* and continues, *"the handbook prepares firefighters for potential hazards that might arise during emergency situations involving solar PV and battery storage systems,"* the descriptions, examples, and photographs deal primarily with smaller residential scale systems. Other than for a few photos of larger solar arrays of panels, and photos of BESS fires on P25 and P33, the bulk of the material and descriptive photographs of electrical disconnect equipment on Pages 6, 7, 8, 11, 12, 26, and 33 show smaller residential scale equipment. The specific electrical hazards of Battery Energy Storage Systems (BESS) connected to high voltage transmission lines, and battery arrays that may cover acres, are very poorly described. A firefighter whose training was based on the handbook would be very inadequately prepared to deal with BESS installations, in spite of what the press release says.

While the handbook definitions for BESS on page 2 defines the Battery Management System (BMS) noting that it *"monitors, controls and optimizes performance of an individual or multiple battery modules in an ESS and can control disconnection of the module(s) from the system in the event of abnormal conditions,"* there is no information on the necessity to contact the system operator to ensure BESS shutdown, and for information about hazards (such as toxic gases) before approaching the system. The closing thought of the Introduction on page 3, identifying the desirability *"for Fire Departments to be aware of existing large-scale battery and solar projects operating within their jurisdiction, and work with operators to be sure they are aware of any unique safety and emergency response procedures for projects in their area,"* is a bit understated and should be reinforced.

The handbook provides a reasonable description of individual Photovoltaic (PV) systems on Pages 4 through 13. Although it does not address the particular risks of larger scale (farm sized)

solar arrays that may incorporate acres of installed PV panels, discussing those risks is not the intent of this document, focused on inadequate coverage of BESS concerns in the handbook.

Page 14 initiates the discussion of Battery Energy Storage Systems (BESS). It gives a brief description of the system building blocks of battery cells, battery modules, and battery racks. The description is incomplete as it does not explain that in a larger sized BESS, the battery racks will be typically assembled together into container sized parcels, often with their individual Battery Management Systems, charge controllers, and inverters, whose output is then paralleled to feed into (a) high voltage step up transformer(s), then to connect via appropriate switchgear to the high voltage transmission grid or distribution system.

Pages 15, 16, and 17 briefly outline three types of batteries for a BESS, as Flooded Lead Acid, Valve Regulated Lead Acid, or Lithium Based Batteries. The handbook does not identify that the Flooded Lead Acid batteries or Valve Regulated Lead Acid batteries were the system of choice in older, smaller scale installations, as might be used for starting backup generators, or supplying uninterruptible power supplies for computers or telephone systems, but that lithium Based Batteries are the more likely to be the encountered system in modern larger "utility-scale" Energy Storage Systems.

The handbook fails to identify that the significant difference between the battery types that impacts the risk of each is the stored energy density of each type. While Lead Acid batteries typically have a stored energy density of 30 to 50 Wh/kg, Lithium Based battery can have a stored energy density of 150 to 250 Wh/kg. This up to 8 times greater stored energy density impacts the release of energy (and heat) in combustion, greatly increasing the challenge of suppressing the released heat.

It is only in the last lines of the description of Lithium Based Batteries on Page 17, that the risks of these batteries, as used in BESS currently being installed under the Independent Electricity System Operator (IESO) Long Term – Request for Proposals (LT1-RFP) and (LT2-RFP) are first discussed. *"These batteries are high energy density, but have temperature limitations. There are more safety concerns with lithium-ion batteries since they contain flammable electrolytes, and if damaged or incorrectly charges can lead to explosions and fires."* The description lacks the warning that charging these batteries if too cold, or too hot increases the risk of formation of a sharp crystalline structure (dendrites) that can penetrate the separator between the anode and cathode, and result in the uncontrolled heating of thermal runaway. The description of the hazards is expanded on Page 25, in the continuation that, *"Lithium-ion batteries deliver good energy density in a small, cost-effective footprint, however that comes with a risk. When a lithium-ion cell fails, or is subjected to abuse, a potentially catastrophic event known as thermal runaway can occur, where chemical energy is converted to thermal energy. Once an ignition threshold is reached, the process will continue to propagate, or spread, from cell to cell consuming the BESS, and where adjacent structures are present, potentially facility wide."* Again, this description does not identify that this catastrophic event can be caused by charging when too cold, or if the cell gets too hot, or that the risk is enhanced if the cells are maintained at a high state of charge, as they will by design in a BESS.

The only hazard discussed in the handbook on Page 29 under the heading “Lithium-Ion Batteries” is Thermal Runaway. This significant deficiency neglects many of the risks, even more serious ones, and needs correction. A more comprehensive description of Lithium Battery hazards is found in the report of the EV FireSafe study (Attachment 2) conducted for the Australian Government, Department of Defence, intended to enhance safety for emergency responders at electric vehicle traction battery fires (but applicable to the case of many battery modules collected together in a BESS.) The listing of hazards in the EV FireSafe study includes:

- Toxic vapour cloud of flammable gases poses respiratory and explosion risks.
- Thermal runaway makes it difficult to extinguish a traction battery fire
- Even once suppressed, there is risk of fire re-ignition (hours or days later)
- EV traction battery fires are not yet well understood by emergency agencies
- A traction battery with a state of charge of under 50% is less likely to ignite *(BESS batteries are intended to be maintained at full charge, unless discharging to supply load, when the intent would be to rapidly recharge the battery to 100% as soon as excess generation is available.)*

Nowhere in the handbook is the requirement to take action to protect citizens, from either the toxic vapour cloud, or the liquid effluent from fire suppression discussed. Here are a few recent examples of fire protection services taking action to evacuate citizens, or to advise sheltering in place, with windows closed and ventilation systems isolated in a Lithium battery fire:

- Montreal port fire – September 2024, lithium battery fire in shipping container.
    - Firefighters evacuate ~ 100 people and warn others in Hochelaga-Maisonneuve to stay in and turn off ventilation (at distance from 1.0 to 1.75 km)

Photos from Global television website:

A fire at a shipping container at the Port of Montreal on Sept. 23, 2024. **Global Montreal**

Montreal's fire department goes door to door after a fire involving lithium batteries at the Port of Montreal on Sept. 23, 2024. **Global News**

- The last photo reveals a hint of the concern felt by citizens when firefighters outfitted in full bunker suits and SCBA visited their homes to advise citizens to shelter or evacuate due to toxic fumes in the air they were breathing.

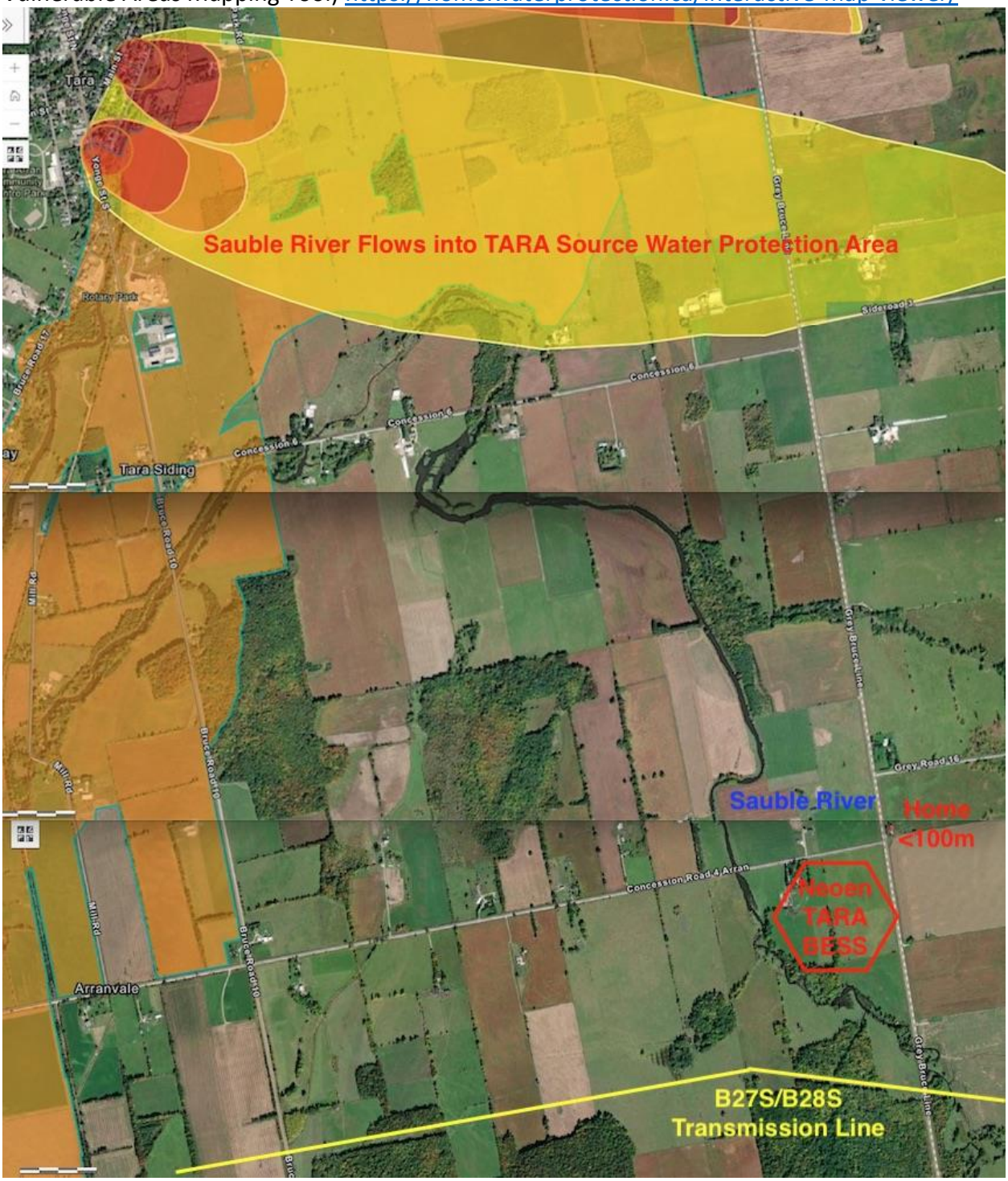
- September 2024, lithium-ion battery fire at SDG&E facility in Escondido (30 MW, 150 MWh) prompted evacuations of more than 500 businesses and 1,500 SDG&E customer homes, according to the electricity agency.

A fire burns at a SDG&E lithium-ion battery facility in Escondido, prompting evacuations, Sept. 5, 2024.

Residents in the pink highlighted area are under a mandatory evacuation order, while those in the purple area have been ordered to shelter in place.

- September 2023, as a result of a fire at the Valley Energy Storage Facility near San Diego, CA, fire officials evacuated citizens within one-quarter of a mile (400 metres) of the facility, and for those within one-quarter to one-half of a mile (800 metres) shelter in place orders were issued.

Neither does the handbook does not consider toxic liquid effluent from firefighting. Here is the NEOEN Tara BESS site (Composite Map from Drinking Water Source Protection Water - Vulnerable Areas Mapping Tool) https://home.waterprotection.ca/interactive-map-viewer/



The approved site for the Neoen TARA BESS is less than 100 m from an offsite home, and water from firefighting will drain directly into the Sauble River, upstream of a source water protected area. The site where the BESS containers will locate grew soybeans this year as an active farm.

Additional Resources and References are identified in Attachment 3 providing links and highlights from a number of relevant current publications that identify why including additional information related to hazards to firefighters and the public are required in the handbook, particularly related to toxic vapours emitted during Lithium battery fires, and to toxic effluents in the runoff water used to fight battery fires.

The handbook description of "Hazards" on Page 29 listing only "Thermal Runaway" is inadequate, as outlined in the description of Toxic gas hazards both to the firefighters and to the public. Consideration of the BESS site location, relative to neighbours, and considerations for immediate protection of downwind neighbours is an immediate concern. The recent examples shown identify evacuation of neighbours at distances in the order of 500 metres, and shelter in place for downwind neighbours, and livestock within distances in the order of 1.75 km have been used. Given that shelter in place with ventilation turned off is often not possible for livestock suggests that location of BESS installations needs to be controlled.

Neither does the handbook mention that the current design for BESS containers includes pressure relief panels. These help the containers themselves to not burst with pressure from emitted gases from the lithium ion batteries undergoing thermal runaway that usually occurs just before fire initiation. While protecting the container structure, the pressure relief panels permit immediate, unprotected release of the toxic gases to the atmosphere to impact the public, before any protective action is possible to ensure evacuation or sheltering in place.

The handbook identifies on Page 29 that "Water is considered the preferred agent for suppressing lithium-ion battery fires." Literature based on actual Lithium-ion battery fires gives alternative opinions regarding this subject. There is general agreement that use of water to cool battery modules surrounding the module on fire may prevent the surrounding modules from heating up to also proceed to thermal runaway and fire. However, the literature identifies that in some cases, the preferred option was to permit modules actually on fire to "burn themselves out," as adding water only extends the duration of the fire and toxic gas emission, while not actually reducing the quantity of toxic gas actually emitted. The literature also gives numerous examples of lithium battery fires which have reignited hours or even days after initially suppressed, if the battery was not fully consumed, as the fire is a result of a chemical reaction. This hazard needs to be more fully discussed in the handbook to prepare firefighters of the possibility. Both the "Best practice" of allowing a lithium battery to burn out, and the possibility of re-ignition risk are discussed in the findings of the Australian EV FireSafe study.

Literature also cautions about the consequence of lithium ion batteries that are immersed in salt water entering thermal runaway at time periods ranging from hours to weeks after the immersion. One of the referenced papers in Attachment 3 from the International Association of Fire and Rescue Services website describes that 11 EV's and 48 lithium batteries caught fire hours or weeks after salt water wetting. The handbook does include on Page 30, under the heading BESS Tactical Considerations, that "Water from drafting or wells maybe more conductive especially if from winter roadway run-off due to contaminants, including those dissolved in water." As water used to suppress fires in rural settings such as the Tara BESS,

would be in all likelihood be derived from drafting from sources near roadways, subject to winter road salt runoff, the risk of subsequent fires in batteries not involved in the initial fire, but cooled with the drafted water needs to be expanded on in the handbook.

Although deficiencies in the handbook on Pages 29 (BESS Fire Safety Considerations) and Page 30 (BESS Tactical Considerations) have been discussed at some length, other conflicts in the material presented are also apparent.

- Page 29 identifies Suppressing Agent Choice (a subject already addressed for Lithium-ion batteries, which identifies "Water is considered the preferred agent"), while Page 30 notes, "Type of extinguishing agent – CO2 best or other inert gas, water, or dry chemical." This conflict needs to be addressed.
- Page 30 identifies, "DO NOT use foam unless electrical hazards are removed" while the literature identifies various agents, such as F-500 EA (described as an "encapsulation agent" as opposed to "foam"), added to water to enhance fire suppression. This potential item of confusion should be addressed.

In Summary:

- The "Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters" does not adequately prepare firefighters for potential hazards that may be met in emergency situations involving Battery Energy Storage Systems, particularly those involving Lithium batteries
- The handbook does not adequately identify that the comparative risk in systems with Lithium batteries (compared to Lead acid batteries) is increased due to significant increase in the stored energy density
- The handbook is inadequate in describing a Lithium BESS that might be encountered by a firefighter where many "racks" of batteries are assembled into a container, and then multiple (hundreds) of containers are collected on the same site.
- The handbook is inadequate in describing that while suppressing the fire in a lithium battery is challenging, it fails to identify that the bigger challenge is to prevent the progression of the fire from module to module, and container to container by cooling batteries not involved in the initial fire.
- The handbook is inadequate at describing protective measures necessary to protect the firefighter and surrounding public from toxic gases emitted from the fire
- The handbook is inadequate at describing the hazard caused by runoff of contaminated fire protective water used to cool adjacent modules, or to suppress the active fire in modules, when that runoff water enters the environment
- The handbook is inadequate at even considering what might be identified as best practices regarding letting a battery on fire to burn itself out, while preventing fire progression to surrounding modules.
- The handbook is inadequate at describing the risk to later failure of lithium batteries if cooled with water containing contaminants, such as road salt.
- The handbook should consider additional resources and references identified in Attachment 3

Attachment 2 – Findings of the EV FireSafe Study

Relevant to the "Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters"

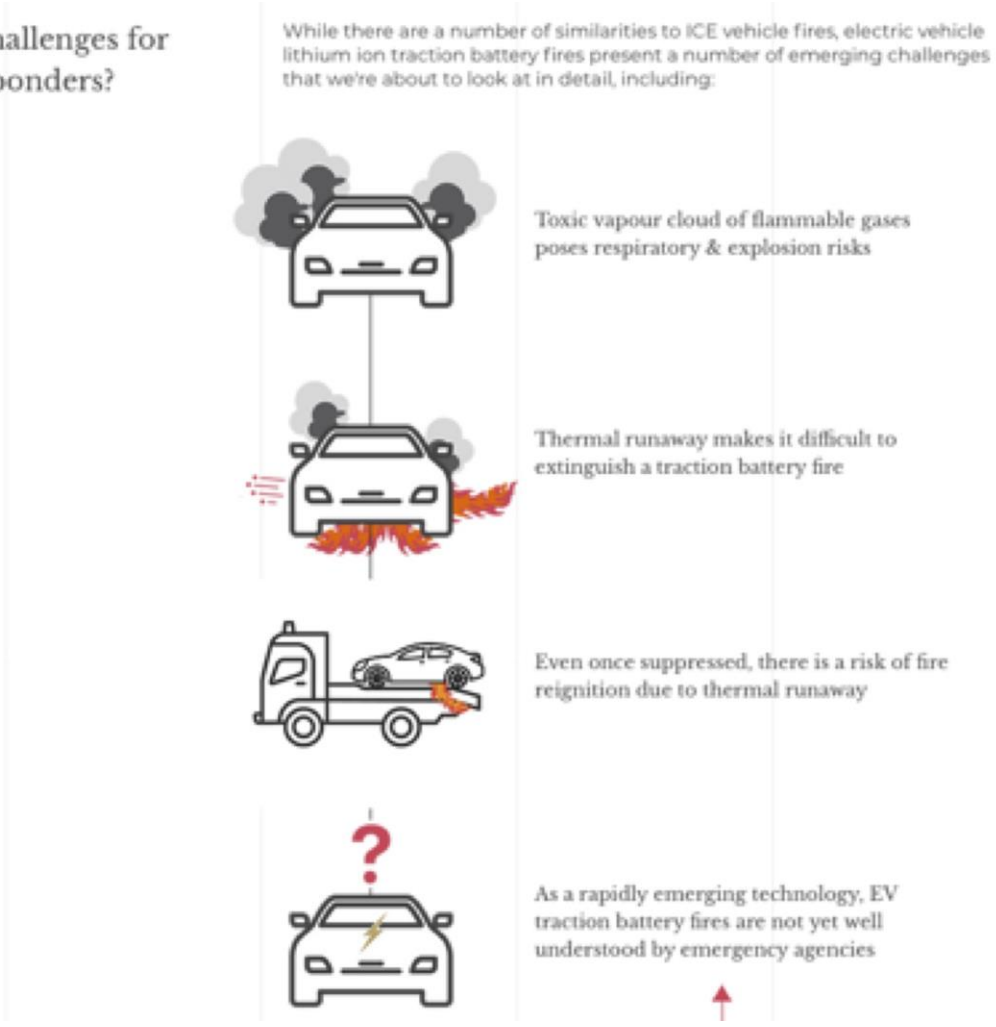
EV FireSafe – Defence Science and Technology Group, Australian Government, Department of Defence

https://www.evfiresafe.com/

Enhancing safety for emergency responders at *electric vehicle* traction battery fires

EV FireSafe is a private company that received seed funding from the Australian Department of Defence to research electric vehicle high voltage battery fires & emergency response, particularly where the EV is connected to energised charging.

https://www.evfiresafe.com/ev-fire-key-findings



02.3 What we know (so far)

Here's what our research found & what we learned from the experts*

There's a lot yet to be discovered regarding electric vehicle lithium traction battery fires - referred to here as 'traction battery fires' - but we've collated a list of the facts we think it's important for emergency responders to know now.

- **Electric vehicles are less likely to catch fire than ICE vehicles**
    a. Studies are ongoing, but evidence suggests a traction battery is less likely to ignite than ICE vehicles.
    b. Jump to EV Fire FAQs

- **Thermal runaway is how all EV battery fires start**
    a. When a battery cell experiences a short circuit, thermal runaway may occur.
    b. Jump to Thermal Runaway

- **A battery under 50% charged is less likely to ignite**
    a. Testing shows that a traction battery with a state of charge (SoC) of under 50% is less likely to ignite.
    b. Jump to Thermal Runaway

- **An EV lithium traction battery burns hotter than an ICE vehicle**
    a. A burning ICE car may reach 815-1000 degrees Celsius, an EV up to 1200 degrees Celsius.
    b. Jump to Risks - EV fires overall

- **Fire behaviour is different & presents new challenges**
    a. Recognising an EV by vapour & fire behaviour assists in early identification & management of the incident.
    b. Jump to EV Fire Behaviour

- **It's not smoke, it's a vapour cloud of highly flammable gases**
    a. When thermal runaway occurs, large clouds of flammable gases are released, primarily hydrogen.
    b. Jump to EV Fire Behaviour

- **Water is the most effective way to extinguish an EV battery fire**
    a. Lots of water to cool the battery & suppress flames is required; at least 4000 litres should be established.
    b. Jump to Suppression Methods

- **EV traction battery fires may require more resources**
    a. A longer suppression time may mean additional people, appliances & water.

- **The location of an EV battery makes fire harder to extinguish**
    a. A traction battery, located along floor pan, means the vehicle may need to be jacked up to apply water.

- **Risk of electrocution via water stream is lower than expected**
    a. An EV is not earthed, presenting low risk when using an unbroken stream of water to suppress fire.
    b. Jump to Risks - EV fires overall

- **Electrocution risk from HV cables is lower than expected**
    a. Orange cabling & components indicate high voltages, from 400V, & can pose a risk if damaged or exposed.

- **A submerged EV does not electrify a body of water**
    a. An electric vehicle underwater does not cause surrounding water to become electrically live.

- **Best practice; allow a traction battery to burn out**
    a. If location & time allow, there is a lower risk to all responders in letting the battery completely burn.
    b. Jump to EV fire reignition

- **EV traction battery fires can reignite, hours or days later**
    a. If it's not possible to allow the traction battery to 'burn out', re-ignition risk should be considered.

04.10 EV battery fire suppression

How do firefighters put out an EV battery fire?
Due to the self-sustaining nature of thermal runaway, we've moved away from using the word 'extinguish' in relation to lithium-ion battery fires and instead prefer to discuss how we suppress & contain them.

We're going to break this page down into three parts:
- Best practice methods
- Challenges of EV battery pack designs for firefighting
- Products coming to market

What are the best practice methods for putting out an EV battery fire?
There is no one method to manage an EV battery fire, rather three methods used globally that have emerged as best practice; Cool, Burn, Submerge.

Each of these EV fire incident management methods are valid options for suppressing & containing an EV in thermal runaway. The Cool or Burn options do not require fire agencies to purchase or use additional tools, which may be cost prohibitive or difficult to carry.

Cool
Burn
Submerge

EV battery fire suppression - cool

Use fog nozzles to knock down flames & provide cooling jets onto battery pack exterior to cool down the exothermic reaction of thermal runaway.

Pros:

- Recommended by all EV manufacturers
- Firefighters are 'seen' to be doing something by public

Cons:

- Doesn't get water where it needs to be
- Like 'putting out a kitchen fire by spraying water on the roof of a house'
- Water usage may be in excess of 10,000 litres *to extinguish a single EV (a typical fire department water tanker can carry 15,000 litres of water)*
- *The Tara Shift Solar BESS is rated at 1600 MWh, equivalent to 16,000 to over 26,000 Tesla EV's*
- Run off will need to be monitored & captured, particularly near waterways

Case study:

A plug-in hybrid EV was accidentally submerged in salt water at a boat ramp, with thermal runaway following removal, which was knocked down by firefighters, & secondary ignition occurring while being towed. Crews used two hose lines to cool the battery pack for an extended period. 15th May 2020, Port Moody, Canada

EV battery fire suppression - burn

Allow the lithium-ion battery pack to burn itself out, hot & fast.

Pros:

- Recommended by some EV manufacturers *(was the recommendation for the Australia Tesla BESS Fire)*

Image credits Fire Rescue Victoria

- *This Australian fire* in 2021, *affected 2 units of a 212 unit Tesla Megapack-based energy storage project in southeastern Australia. It burned for four days, prompting local authorities to send 150 firefighters and more than 30 fire trucks to the scene.*
- *This was a 300 megawatts/450 megawatt-hours capability battery. (Versus the 400 MW, 1600 MWH BESS approved by IESO for Tara, Ontario, some 3½ times larger)*

- Burns through majority of live cells, leaving scrap metal
- Removes stranded energy & secondary ignition risk

Cons:

- Time to burn will depend on battery size, state of charge, ambient temperature & other factors
- Air quality risks - monitoring & warnings for surrounding exposures
- Public / media attention; 'why aren't firefighters DOING something?'

Case study:

An EV went into thermal runaway while fast charging. The fire department opted to let the battery burn out. It was flipped onto it's side for easier monitoring with a thermal imaging camera. Time taken to burn is unknown. 22nd April 2022, Berlin, Germany.

EV battery fire suppression - submerge

Submerge EV in a containment unit that can be filled to pack level with water.

Pros:

- Contains fire spread
- Manages incident relatively quickly
- Firefighters are 'seen' to be doing something by public

Cons:

- Containment units may not be available or in close enough proximity
- Water usage may be in excess of 10,000 litres
- EV may need to remain in water for days/weeks
- Thermal runaway will continue underwater
- Time for thermal runaway to conclude depends on battery capacity & state of charge
- Water will need to be treated for disposal which can be expensive

Case study:

An EV went into thermal runaway with off-gassing, but no visible flame, while at the dealership. Fire crews organised a containment unit & the EV was submerged for several weeks. 25th March 2019, Tilburg, Netherlands.

What are the challenges of suppression using the Cool method?

There are two main challenges with firefighting an EV battery fire: position & access.

The position of the EV battery pack makes firefighting difficult:

We previously looked at how a traction battery is constructed, & how (in most EVs) it is positioned along the floor pan of an electric vehicle, between chassis rails.

If the battery pack goes into thermal runaway, the position means:

- It's difficult to locate the area in the pack thermal runaway is occurring, either visually or with a thermal imaging camera (TIC)
- Spraying water onto the outside of the pack to cool it often means firefighters have to be close to the vehicle & risk exposure to jet like flames

Lithium-ion battery pack underneath an electric vehicle

It's usually impossible to get cooling water onto the battery cells:

The construction of an EV battery pack where individual lithium-ion battery cells are contained

within a module, & modules within the pack, means getting water where it needs to go to cool the cells is almost impossible.

However; we are aware of some cases where an EV has been involved in a collision, & firefighters were able to direct water into the pack where it had torn open, to directly cool the battery cells. This is safe to do & does not carry the risk of electrocution (unless the EV is connected to energised EV charging).
Cells & modules are contained within a pack, which is IP rated & essentially waterproof

What about extinguishment or suppression products?
As with all emerging industries, a range of products claiming to 'extinguish' EV battery fires are being aggressively marketed to both fire agencies & the private sector as the answer to EV battery fires.
We are often asked whether a fire agency should buy a fire blanket, cutting tool or extinguishing agent, & our answer is; no, there is no need to purchase extinguishing tools for EV battery fires.
While this response does not make us popular with those manufacturers, currently (as of 2024):

- EV battery fires are rare
- These tools are typically very expensive
- They may be too large & heavy to be comfortably carried on a truck
- Often come with no manufacturer operating procedure or training

It should also be noted that some of these products may actually increase risk to emergency responders, even when being used correctly.

Having said that, there are some scenarios in which these tools may be useful, & all considerations are outlined in the comparison table here.

Fire blanket
Fire extinguishers
Cutting tools
Underbody sprays

EV battery fire suppression - fire blankets
Large thermal fire blanket that is placed over an EV to contain flame.

Pros:

- If used in time, blanket will contain flames & stop fire spread to exposures
- Can be left on EV as it's moved from scene

Cons:

- ~25kgs for one car-sized blanket, so must be used by two firefighters in breathing apparatus
- Cannot 'extinguish' or stop thermal runaway (despite manufacturer claims!)
- Thermal runaway will continue under blanket & may slow down (as opposed to the Burn

method), the process Vapour cloud (off-gassing) will continue under the blanket
- More independent testing is required to ensure efficacy & safety for responders

Increased risk:
- Where a blanket is lifted by wind or a person, the build up of gases under the blanket may cause a localised vapour cloud explosion
- Blankets often come as single or multi use, but there are no agreed, safe decontamination procedures for multi-use blankets

For responders:
- We do not consider it necessary to buy & make space on a truck for a fire blanket for the sole purpose of EV battery fire management at this time
- Where blankets have been purchased by a high-risk site, fire blankets should be used with caution to avoid causing vapour cloud explosion
- As most thermal runaway events occur prior to fire crew arrival, fire blankets will typically be most useful post-incident to contain a potential secondary ignition

For private sector businesses:
- Sites where EVs are parked, stored or charged in normal operating conditions do not require fire blankets
- Higher risk sites such as where EV or lithium-ion battery repairs, servicing or manufacturer occur may consider purchasing a fire blanket, but;
- A standard operating procedure should be sought from the manufacturer or written by the site, including:
  - NO staff should be trained to cover an EV in active thermal runaway due to high risk of injury or death
  - Blankets should be used by attending fire crews only

Attachment 3 - Additional Resources and References
For Consideration in Revision to "Solar Electricity and Battery Storage Systems Safety Handbook for Firefighters"

CTIF – International Association of Fire and Rescue Services website:

- https://ctif.org/news/large-lithium-battery-fires-created-toxic-smoke-and-evacuations-jacksonville-and-gothenburg
- https://ctif.org/news/accident-analysis-beijing-lithium-battery-explosion-which-killed-two-firefighters
- https://ctif.org/news/large-explosion-and-fire-french-lithium-battery-warehouse
- https://ctif.org/news/900-tonnes-lithium-batteries-fire-french-recycling-plant-north-toulouse
- https://ctif.org/news/california-creates-new-emergency-response-legislation-large-lithium-based-battery-energy
- https://ctif.org/news/norwegian-shipping-company-bans-electric-cars-board-classic-ferry-route
- https://ctif.org/news/lihium-ion-battery-bank-started-offgassing-hospital-80-people-evacuated-due-toxic-fumes
- https://ctif.org/news/despite-fire-hazards-lithium-ion-battery-energy-storage-systems-are-getting-larger-and-larger
- https://ctif.org/news/ev-may-have-started-fire-onboard-cargo-ship-3000-cars-crew-had-jump-water-one-dead
- https://ctif.org/news/150-000-liters-water-needed-put-out-fire-electric-car
- https://ctif.org/news/summary-some-more-severe-lithium-battery-fires-during-last-12-months
- https://ctif.org/news/11-electric-cars-and-48-lithium-batteries-caught-fire-after-exposure-salty-flood-water

Selected relevant scientific papers: (with doi.org links to allow convenient access)

Larsson, F., Andersson, P., Blomqvist, P. et al. Toxic fluoride gas emissions from lithium-ion battery fires. Sci Rep 7, 10018 (2017). https://doi.org/10.1038/s41598-017-09784-z

> Conclusions: This study covered a broad range of commercial Li-ion battery cells with different cell chemistry, cell design and size and included large-sized automotive-classed cells, undergoing fire tests. The method was successful in evaluating fluoride gas emissions for a large variety of battery types and for various test setups.
>
> Significant amounts of HF ranging between 20 and 200 mg/Wh of nominal battery energy capacity were detected from the burning Li-ion batteries. The measured HF levels, verified using two independent measurement methods, indicate that HF can pose a serious toxic threat, especially for large Li-ion batteries and in confined environments. The amounts of HF released from burning Li-ion batteries are presented as mg/Wh. If extrapolated for large battery packs the amounts would be 2-20 kg for a 100 kWh battery system, e.g. an electric vehicle, and 20-200 kg for a 1000 kWh battery system, e.g. a small stationary engine storage. The immediate dangerous to life of health (IDLH) level for HF is 0.025 g/m^3 (30 ppm) and the lethal 10 minute toxicity value (AEGL-3) is 0.0139 g/m^3 (170 ppm). The release of hydrogen fluoride from a Li-ion battery fire can therefore be a severe risk and an even greater risk in confined or semi-confined space.

Bordes, A., Papin, A., Mariar, G. et al. Assessment of Run-Off Waters Resulting from Lithium-Ion Battery Fire-Fighting Operations, Batteries (2024), 10 (4), 118; https://doi.org/10.3390/batteries10040118

> Conclusions: In the present work, the two battery modules were triggered in thermal runaway and subsequent degassing and fire. Water was applied to mock-up firefighting operations in order to analyze the composition of the extinguishing water.
>
> The tests presented in this paper highlight that waters used for firefighting on NMC Li-ion batteries are susceptible to containing many metals, including Ni, Mn, Co, Li and Al. Those metals are mixed with other carbonaceous species (soots, tarballs). It is also important to note that particles present in the water can be nanometric or in the form of nanostructured clusters. In addition to the solid contaminants, liquid compounds can be present, especially organic carbonates coming from the electrolyte (EC and EMC in this case) and also gaseous species such as PAH. A comparison with PNEC values showed that this water could be potentially hazardous to the environment, depending on the actual situation encountered in the case of thermal runaway propagation with a Li-ion battery-based system.
>
> As large Li-ion batteries are fast spreading (in so-called Battery Energy Storage Systems, BESS, for example), and only few data on the environmental impact of fires in those

systems are available, it is crucial to further develop consolidated knowledge in this field.

Quant, M., Willstrand, O., Mallin, T., Hynynen, J., Ecotoxicity Evaluation of Fire-Extinguishing Water from Large Scale Battery and Battery Electric Vehicle Tests, ACS Publications, Environmental Science & Technology, Vol 57 (12)
https://pubs.acs.org/doi/10.1021/acs.est.2c08581

Conclusions: Electrified transport has multiple benefits but has also raised some concerns, for example, the flammable formulations used in lithium-ion batteries. Fires in traction batteries can be difficult to extinguish because the battery cells are well protected and hard to reach. To control the fire, firefighters must prolong the application of extinguishing media.

In this work, extinguishing water from three vehicles and one battery pack fire test were analyzed for inorganic and organic pollutants, including particle-bound polycyclic aromatic hydrocarbons and soot content. Additionally, the acute toxicity of the collected extinguishing water on three aquatic species was determined. The vehicles used in the fire tests were both conventional petrol-fueled and battery electric.

For all of the tests, the analysis of the extinguishing water showed high toxicity toward the tested aquatic species. Several metals and ions were found in concentrations above the corresponding surface water guideline values. Per- and polyfluoroalkyl substances were detected in concentrations ranging between 200 and 1400 ng L^{-1}. Flushing the battery increased the concentration of per- and polyfluoroalkyl substances to 4700 ng L^{-1}. Extinguishing water from the battery electric vehicle and the battery pack contained a higher concentration of nickel, cobalt, lithium, manganese, and fluoride compared with the water samples analyzed from the conventional vehicle.

Jeevarajan, J.A., Joshi, T., Parhizi, M., Rauhala, T., Juarez-Robles, D., Battery Hazards for Large Energy Storage Systems, ACS Energy Letters, Vol 7 (8),
https://pubs.acs.org/doi/10.1021/acsenergylett.2c01400?ref=recommended

Highlights: Hazards for Li-ion batteries can vary with the size and volume of the battery, since the tolerance of a single cell to a set of off-nominal conditions does not translate to a tolerance of the larger battery system to the same conditions. Li-ion batteries are prone to overheating, swelling, electrolyte leakage venting, fires, smoke, and explosions in worst-case scenarios involving thermal runaway. Failures associated with Li-ion batteries are described to be deflagration in nature. However, the gases produced as a result of a fire, smoke, and/or thermal runaway can accumulate to a combustible level in the installation location and cause an explosion (detonation). In general, the off-nominal conditions that can cause the occurrence of catastrophic events with Li-ion batteries can be categorized into electrical, mechanical, and environmental types. The most common electrical hazards are over-charge, over-discharge, and external and

internal short circuits. Of the environmental hazards, off-nominal conditions such as temperatures beyond the manufacturer's recommended range are those that are well understood. The influence of other environmental hazard causes, such as changes in altitudes, pressures, salt fog, floods, rain, etc., are not as well understood. Mechanical hazards such as those caused by vibration, shock, and impact are understood to a certain level, especially those encountered under transportation conditions.

High and low temperatures can lead to different unsafe conditions in Li-ion cells and batteries. High temperatures can lead to decomposition of the electrolyte and the solid-electrolyte interface (SEI) layer, destabilization of the cathode and anode that eventually lead to a violent venting, fire, and thermal runaway. Low temperatures increase the viscosity of the electrolyte in a Li-ion cell, reducing the mobility of the lithium ions in the electrolyte. The reduction in ionic conductivity causes the deposition of the ions as dendritic lithium metal due to the reduced ease of intercalation into the anode. This subsequently leads to increased internal cell temperatures, and in the presence of high temperatures due to increased internal resistance, growth of lithium metal dendrites, and the organic flammable electrolytes, the inevitable thermal runaway and fire occurs. Hazardous conditions due to low-temperature charging or operation can be mitigated in large ESS battery designs by including a sensing logic that determines the temperature of the battery and provides heat to the battery and cells until it reaches a value that would be safe for charge as recommended by the battery manufacturer. When heaters are used, the power to the heaters should be controlled to prevent uncontrolled heating due to heater failures.

Yang Peng, Lizhong Yang, Xiaoyu Ju, Baisheng Liao, Kai Ye, Lun Li, Bei Cao, Yong Ni, A comprehensive investigation on the thermal and toxic hazards of large format lithium-ion batteries with LiFePO4 cathode, Journal of Hazardous Materials, Volume 381, 2020, 120916, ISSN 0304-3894, https://doi.org/10.1016/j.jhazmat.2019.120916.

Toxic gases released from lithium-ion battery (LIB) fires pose a very large threat to human health, yet they are poorly studied, and the knowledge of LIB fire toxicity is limited. In this paper, the thermal and toxic hazards resulting from the thermally-induced failure of a 68 Ah pouch LIB are systematically investigated.

The LIBs with higher state of charge (SOC) are found to have greater fire risks in terms of their burning behavior, normalized heat release rate, and fire radiation, as well as the concentration of toxic gases.

The major toxic gases detected from the online analysis are CO, HF, SO_2, NO_2, NO and HCl.

Results show that the effects of irritant gases are much more significant than those of asphyxiant gases. HF and SO_2 have much greater toxicity than the other fire gases. The maximum FEC value is approaching the critical threshold in such fire scenarios.

Larsson, F., Andersson, P., Blomqvist, P. *et al.* Toxic fluoride gas emissions from lithium-ion battery fires. *Sci Rep* **7**, 10018 (2017). https://doi.org/10.1038/s41598-017-09784-z

> Lithium-ion battery fires generate intense heat and considerable amounts of gas and smoke. Although the emission of toxic gases can be a larger threat than the heat, the knowledge of such emissions is limited. This paper presents quantitative measurements of heat release and fluoride gas emissions during battery fires for seven different types of commercial lithium-ion batteries. The results have been validated using two independent measurement techniques and show that large amounts of hydrogen fluoride (HF) may be generated, ranging between 20 and 200 mg/Wh of nominal battery energy capacity. In addition, 15–22 mg/Wh of another potentially toxic gas, phosphoryl fluoride (POF_3), was measured in some of the fire tests. Gas emissions when using water mist as extinguishing agent were also investigated. Fluoride gas emission can pose a serious toxic threat and the results are crucial findings for risk assessment and management, especially for large Li-ion battery packs.
>
> Significant amounts of HF, ranging between 20 and 200 mg/Wh of nominal battery energy capacity, were detected from the burning Li-ion batteries. The measured HF levels, verified using two independent measurement methods, indicate that HF can pose a serious toxic threat, especially for large Li-ion batteries and in confined environments. The amounts of HF released from burning Li-ion batteries are presented as mg/Wh. If extrapolated for large battery packs the amounts would be 2–20 kg for a 100 kWh battery system, e.g. an electric vehicle and 20–200 kg for a 1000 kWh battery system, e.g. a small stationary energy storage. The immediate dangerous to life or health (IDLH) level for HF is 0.025 g/m^3 (30 ppm)22 and the lethal 10 minutes HF toxicity value (AEGL-3) is 0.0139 g/m^3 (170 ppm)23. The release of hydrogen fluoride from a Li-ion battery fire can therefore be a severe risk and an even greater risk in confined or semi-confined spaces.
>
> Using water mist resulted in a temporarily increased production rate of HF but the application of water mist had no significant effect on the total amount of released HF.

Conzen, J., Lakshmipathy, S., Kapahi, A., Kraft, S., DiDomizio, M., Lithium ion battery energy storage systems (BESS) hazards, Journal of Loss Prevention in the Process Industries, Vol 81, Feb. 2023, 104932
https://doi.org/10.1016/j.jlp.2022.104932

> Highlights: There has been an increase in the development and deployment of battery energy storage systems (BESS) in recent years. In particular, BESS using lithium-ion batteries have been prevalent, which is mainly due to their power density, performance, and economical aspects. BESS have been increasingly used in residential, commercial, industrial, and utility applications for peak shaving or grid support. As the number of installed systems is increasing, the industry has also been observing more field failures

that resulted in fires and explosions. Lithium-ion batteries contain flammable electrolytes, which can create unique hazards when the battery cell becomes compromised and enters thermal runaway. The initiating event is frequently a short circuit which may be a result of overcharging, overheating, or mechanical abuse. During the exothermic reaction process (i.e., thermal runaway), large amounts of flammable and potentially toxic battery gas will be generated. The released gas largely contains hydrogen, which is highly flammable under a wide range of conditions. This may create an explosive atmosphere in the battery room or storage container. As a result, a number of the recent incidents resulted in significant consequences highlighting the difficulties on how to safely deal with the hazard. This paper identifies fire and explosion hazards that exist in commercial/industrial BESS applications and presents mitigation measures.

Other relevant reference considerations:

Hydro One – BESS Fire Protection – Risk & Response Assessment Standard

- prepared by Fire & Risk Alliance, LLC, Rockville, MD for Hydro One, July 19, 2023
    - While this standard is not directly related to protection of firefighters or the public, the approach taken is relevant for reference
- goal is to ensure operation of Hydro One high voltage transmission facilities is not affected by any BESS event
- sets two step approach to achieve this:
    - first step is to design and test BESS equipment based on existing standards and industry experience to minimize the adverse effects from a BESS event, along with adequate protection and control and spatial separation within the BESS facility itself
    - second step is to establish and maintain appropriate spatial separation of BESS facility from the transmission facilities to ensure BESS facility results in minimal or no impact on the present and/or future expansion of Hydro One transmission facilities and in the event of an event is confined to the immediate BESS area.
        - setback of BESS from Hydro One – 500 kV Right of Way to be 150 metres
        - setback of BESS from Hydro One – 230 kV Right of Way to be 100 metres
        - setback of BESS from Hydro One – 115 kV Right of Way to be 60 metres
        - setback from 500 kV substation to be 300 metres, 230 kV substation to be 200 metres, 115 kV substation to be 120 metres
- these setbacks make it clear that BESS events are considered capable of causing an equipment impact at a distance from BESS equipment, and suggest consideration be made when siting BESS facilities impacting the public, which may not be as robust to injury as is transmission towers or substations when considering an impact
- what these setbacks do not consider, that is very relevant to public safety, is the issue of toxicity of vapour emissions, or of liquid emissions to waterways that may impact drinking water

- an additional fact that is not apparent from these Hydro One setbacks when considering public safety, is that a major consideration for setbacks to Hydro One equipment is the impact on the overall system on loss of the particular piece of equipment considering redundancy. Loss of a single 115 kV transmission will impact far fewer customers than loss of a 500 kV circuit. Thus, setbacks to prevent loss of a 500 kV circuit are greater than setbacks to prevent loss of a 115 kV circuit. In contrast, when considering public safety, we consider that loss of "a few lives" is still relevant, and society does not consider that we should take no protective action until considering protection against loss of an entire community. Both individual and population effects are relevant, and we would not want to tell a citizen (as for the Neoen Tara BESS site) who unfortunately lives close to the site where a BESS facility will be located, that their life does not matter.

UL Standard 9540A – Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage System

- It is of note that the UL 9540A Test Method permits certification of a battery that passes a test of charge-discharge-charge-discharge without initiating thermal runaway
- In practice, thermal runaway is unlikely to occur in 2-cycles of charge-discharge, but only after repeated cycles, particularly following damage, overcharging, or charging beyond lower or higher temperature limits
- A BESS system may experience charge and discharge cycles on a daily basis over it's lifetime, far exceeding a 2-cycle test, and BESS batteries may be expected to be charged to their full charge value to be able to supply load for their design period (typically full load for 4-hours)
- This suggests that consideration of the test success criterion of UL 9540A may require reconsideration to assure that certification gives assurance that the BESS will not fail during normally anticipated operation

Multi-Municipal Energy Working Group Meeting Schedule

2025 Calendar

JANUARY

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FEBRUARY

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DECEMBER

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Feedback Form

Long-Term 2 RFP – November 21, 2024

Feedback Provided by:

Name: Tom Allwood

Title: Chairman

Organization: Multi-Municipal Energy Working Group

Email: Click or tap here to enter text.

Date: December 6, 2024

Following the LT2 RFP November 21, 2024, engagement webinar, the Independent Electricity System Operator (IESO) is seeking feedback from stakeholders on the items discussed. The presentation and recording can be accessed from the LT RFP engagement web page.

To promote transparency, feedback submitted will be posted on the Long-Term RFP engagement page unless otherwise requested by the sender. If you wish to provide confidential feedback, please mark "Yes" below:

- ☐ **Yes – there is confidential information, do not post**
- ☒ **No – comfortable to publish to the IESO web page**

Please submit feedback to engagement@ieso.ca by December 6, 2024.

Agricultural Impact Assessment Process

IESO Presentation	Feedback
Do you have any comments for the IESO to consider regarding the timing of the AIA requirement in the LT2 RFP and LT2 Contract	
OMAFA Presentation	**Feedback**
Are there any specific aspects outlined in the session that you would like further clarification on?	
Is there any additional information related to agricultural considerations that would be helpful?	

General Comments/Feedback

See attached letter summarizing concerns.

MULTI-MUNICIPAL ENERGY WORKING GROUP
TOM ALLWOOD, COUNCILLOR, GREY HIGHLANDS, CHAIR
JIM HANNA, DEPUTY MAYOR, HURON-KINLOSS, VICE-CHAIR
1925 BRUCE ROAD 10, BOX 70, CHESLEY, ON NOG 1L0
519-363-3039 FAX: 519-363-2203
jhamilton@arran-elderslie.ca

December 6, 2024

IESO Community Engagement

Via email: engagement@IESO.ca

The Multi-Municipal Energy Working Group (MMEWG) is a municipal committee that was formed in 2009 to deal with the issues created for municipalities by the Green Energy Act which imposed a number of wind turbine projects on our communities. As the program expanded, residents affected by their operation started the MMEWG for assistance in solving problems that were not being addressed by the Ministry of Environment, Conservation and Parks. The Ministry's District Staff along with other experts were invited to make presentations to the working group. When energy storage systems became an issue in member municipalities, the mandate of the group was expanded.

The MMEWG has shared the information gathered with local MPP's as well as other municipalities involved with these issues. In this context, we have tried to provide feedback to the IESO on proposals being considered. Originally a meeting was scheduled for early July, but this was cancelled by the IESO at the last minute. It took some time for a meeting to be rescheduled for December 5. Again, the IESO cancelled the meeting at the last minute.

Given the deadline for responses related to the LT 2 RFP is December 6, we decided that it was appropriate to formally table this input to the IESO so that it could be considered as part of this process.

As municipal leaders, we are mandated by the *Municipal Act* to provide measures necessary for the health, safety and well-being of citizens within our jurisdiction. This mandate is of prime importance in developing our responses to energy projects in our communities and drives the following comments.

Setbacks - It is clear from the feedback from our residents that the current setbacks between wind turbines and residents is not sufficient as a significant number of our residents living close to the turbines have identified irritation and health impacts. Details of these issues were also provided to the MECP and the project operator through formal complaints under the process set out in the Renewable Energy Approvals for the projects. There

has been virtually no response to these concerns.

The derived 550 metre setback was based on audible turbine sound output of early 2000's. In response to this situation, other jurisdictions have increased required setbacks. Larger turbines currently being used also have greater low frequency component and the setback needs to be based on the full turbine sound power profile.

Municipalities know that current setbacks do not protect residents and are resisting new installations until they are fixed. While setbacks are within the authority of the MECP, it would be to the benefit of the IESO to get these changed. Otherwise, it will find very limited interest in hosting wind turbine projects.

Protection for Emergency Situations - Similarly setbacks for tower collapse remain insufficient. The current blade length plus 10 metres requirement is not a strong enough protective measure for existing projects, let alone repowered turbines on existing footprints.
Setbacks for ice throw are also insufficient, as the blade length plus 10 metre setback is less than the ice throw distance witnessed in Ontario. Ontario has witnessed turbine fires and flaming debris on the ground at 200 metres, while the setback was 50 metres. A Ministry review failed to recommend industry standard protective barriers for fire suppression in wind turbines despite examples of fires in similar turbines.

Contract Extensions - Extending life based on approvals granted 20 years ago for regulations that are not even within todays' inadequate regulations should not be a foregone conclusion. The project's owner's record in responding to resident's complaints and the results of noise audits need to be reviewed as they will point to problems that need to be addressed. We've heard from citizens impacted in those communities, such as Kingsbridge 1, Acciona Ripley and Enbridge Underwood will come up for extension soon. Before any contract extension is granted, the IESO needs to confirm with MECP that these projects are operating within the noise limits. These discussions need to be open and transparent to residents involving at least one public meeting.

Municipal Support Requirement - The requirement for municipal support resolutions to be provided for all energy projects is an important component of the IESO's RFP processes. The current documentation around the LT2 process provides no direction to participants on how they should approach beyond a requirement to notify the municipality. While municipalities need the ability add additional requirements, additional direction on the processes to be used to request municipal direction are required. The current absence of direction is open to abuse by participants in the process.

The IESO needs to provide basic guidance on the steps that RFP participants should be taking and make arrangements for this information

to be shared with all municipalities in the province. This should not preclude them from establishing additional requirements. Municipalities provided some good input on a multi-step in the webinar of November 13 that the IESO should adopt. It should be noted that formal notices of projects should be directed to the Clerk of the lower tier municipality. This individual is responsible for ensuring that the Council and the appropriate members of staff are advised of the initiative.

Agricultural Impact Assessment - Current instructions for preparation of Agricultural Impact Assessments need updating as they do not apply to energy projects. The most important change will be the instructions for assessing the land area used in the context of the "limited area" requirement in the Provincial Policy Statement related to wind turbine and BESS projects in prime agricultural areas. The definition of the study area needs to include the full area affected by the project. In addition, plans to address well issues, fire safety, municipal/farm drainage and stray voltage.

Decommissioning Projects
The decommissioning report as defined for Regulation 359/09 has been a concern for host municipalities throughout the life of the Green Energy Project. It was seen as a boiler plate exercise which did not address key issues involved in the decommissioning process. Some municipalities have negotiated separate arrangements with the proponent during the permitting process.
Continuing with a process where a plan is drafted by the proponent and approved by MECP with no input or sign-off from the affected municipality will not be acceptable. Projects are constantly flipped and there needs to be a process to ensure that the original applicant either continues to be responsible or where new owners formally take on decommissioning responsibilities.

Unwilling Host Municipalities – A substantial number of municipalities across Ontario have declared themselves to be "Unwilling Hosts' to new wind turbine projects. In response to actions by the IESO, some new municipalities have added their names to this list.
Even though the IESO is aware of these municipalities, the information does not appear to have been provided to participants in your RFP process as prospecting continues in Unwilling Host communities. The issue was specifically raised by the Deputy Mayor of Southgate in one of the webinars.

Guidance on BESS safety - The guidance provided by Hydro One on setbacks needed to protect their infrastructure from fires in BESS projects provides good direction in their context. The guidance from the Ontario Fire Marshall is inadequate for the wider issues, and since it seems to meet the requirements of the IESO, municipalities will have to follow up with the Fire Marshall's office to get their direction on setbacks and onsite facility requirements.
Based on the tracking of responses to real emergency situations with energy storage situations, the MMEWG is recommending that setbacks of 800 metres are required.

Representatives of the MMEWG look forward to a fulsome discussion on these important factors with the IESO and relevant Ministries as proposed by IESO

representatives and await the rescheduling of the cancelled meetings noted earlier in this correspondence. We anticipate that discussion taking place in the not-so-distant future.

Warm Regards,

p.p.

Tom Allwood,
Chair, Multi-Municipal Energy Working Group
Councillor, Municipality of Grey Highlands

cc.
Hon. Stephan Lecce, Minister of Energy and Electrification
Hon. Lisa Thompson, Minister of Rural Affairs and MPP for Huron-Bruce
Rick Byers, MPP Bruce-Grey Owen Sound

TARA BATTERY

COMMUNITY OPEN HOUSE

Tara BESS, formerly Grey Owl Storage, is a 400-megawatt (MW), 1600-megawatt hours (MWh) battery energy storage system proposed for development on 39 Concession Road 4, in the Municipality of Arran-Elderslie.

Awarded a 20-year contract by Ontario's Independent Electricity System Operator (IESO), Tara BESS is one of ten battery energy storage systems procured by IESO through its long-term 1 (LT1) RFP in May 2024.

Tara BESS will store and discharge electricity directly to Ontario's electrical grid, adding 400 MW of capacity – equivalent to the daily energy consumption of approximately 640,000 households in Ontario.

The project responds directly to the Government of Ontario's plan to procure up to 7,500 MW of power to meet the province's projected 2050 energy needs.

To learn more about Tara BESS, visit www.tarabattery.ca

Community Open House

Consultation for Tara BESS is now underway, and we want to hear from you!

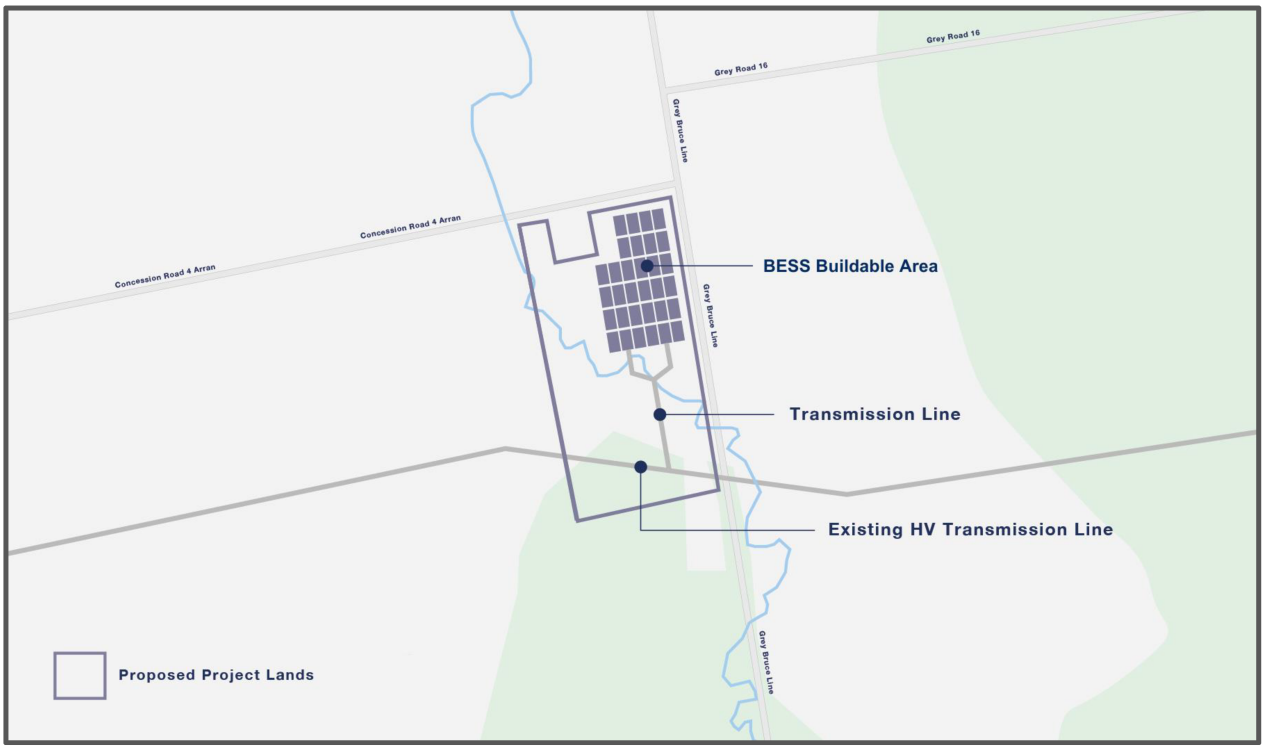
Join us for a drop-in open house on **Tuesday January 21, 2025.** Meet the project team and learn about:

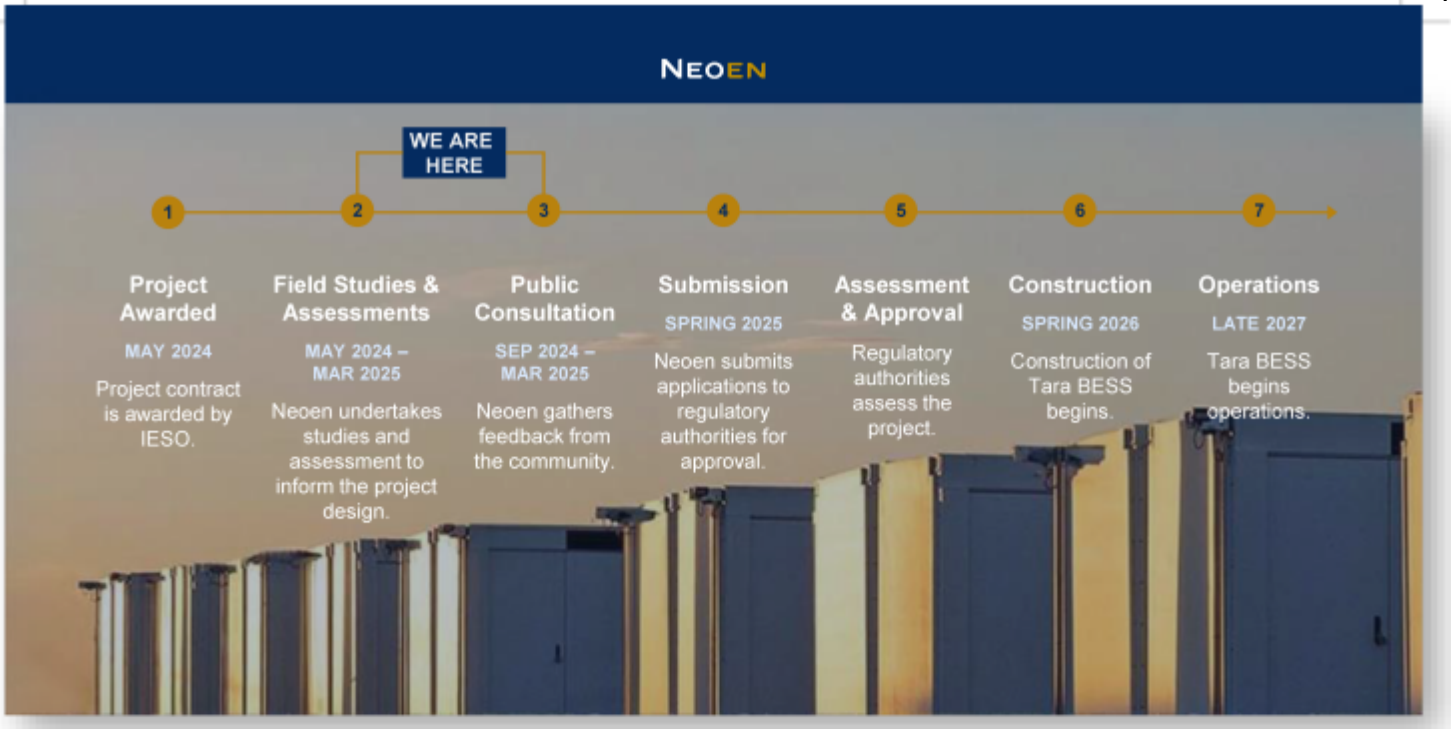
- Project Layout
- BESS Technology
- Environmental Assessment
- Development Process

Feedback will be collected and included in a public consultation record that will form part of Neoen's development applications for Tara BESS.

12:00 pm – 2:00 pm
6:00 pm – 8:00 pm
Community Hall – Tara Community Centre
150 Hamilton St, Tara, ON

In the event of inclement weather, the open house will be rescheduled for Tuesday January 28, and notice will be posted on www.tarabattery.ca.





Contact Us

Can't attend the open house?

You can request information, ask questions, and share feedback by:

- Phone
- E-mail
- Mail
- Online (via Feedback Form)
- Request a 1-on-1 meeting

(416) 312-0057
info@tarabattery.ca
Suite 319 – 150 King Street West, Toronto, ON M5H 1J9
www.tarabattery.ca

WCO | WIND CONCERNS ONTARIO

December 16, 2024

The Hon. Andrea Khanjin

Minister of Environment, Conservation and Parks

By email

Re: Urgent action needed on wind turbine regulations

Dear Minister Khanjin:

We are writing to you as we are concerned that with a new Request For Proposals imminent from the IESO, which will include proposals for new industrial wind power sites, Ontario is in dire need of updated regulations for these installations.

We are not alone in this request: municipal officials have commented repeatedly during the IESO engagement process about concerns, and some officials have told the media that municipalities' declaration of being "Unwilling Hosts" to new wind power sites is because they feel they have no other choice, given the lack of action.

In comments filed with the IESO by the municipal coalition the Multi-Municipal Energy Working Group, are these statements from Chair Tom Allwood [emphasis ours]:

> It is clear from the feedback from our residents that **the current setbacks between wind turbines and residents is not sufficient** as a significant number of our residents living close to the turbines have identified irritation and **health impacts**. Details of these issues were also provided to the MECP and the project operator through formal complaints under the process set out in the Renewable Energy Approvals for the projects. **There has been virtually no response to these concerns.** The derived 550-metre setback was based on audible turbine sound output of early 2000s. In response to this situation, **other jurisdictions have increased required setbacks**. Larger turbines currently being used also have greater low frequency component and the setback needs to be based on the full turbine sound power profile.
>
> **Municipalities know that current setbacks do not protect residents and are resisting new installations until they are fixed.** While setbacks are within the authority of the MECP, it would be to the benefit of the IESO to get these changed. Otherwise, it will find very limited interest in hosting wind turbine projects.

And just in the last few days, Christopher Ollson PhD, a person much relied on by the wind power industry and your own ministry as an expert witness at Environmental Review Tribunals to disavow any ill effects from wind turbine noise emissions, spoke at a public meeting in Saskatchewan about a proposed new project. He is reported to have said this:

> "There are certainly older projects, primarily in the U.S., some in Canada, where turbines were, quite frankly, sited too close."

He also now confirms health impacts from wind turbine noise emissions, and is reported to have said "research conducted throughout early European projects also verifies this close-proximity siting did lead to health concerns. However, **over the last 20 years, there has been more research done** to inform the industry on what proper setbacks and proper selection look like."

However, in Ontario, as you know, regulations have been unchanged since 2009, despite world-wide changes to noise limits and setbacks, and thousands of citizen complaints filed with your ministry.

We offer an example of a single wind power project for your consideration. Last year, Wind Concerns Ontario requested any correspondence related to noise complaints for the last industrial wind power project approved by the Wynne government, the "Nation Rise" project near the villages of Finch, Crysler and Berwick.

To be frank, the results were startling. The 1,300 pages of documents, mostly emails between local residents and your staff, as well as internal emails, showed that as the number of complaints rose steadily—before the project received final approval from the IESO—the policy direction seemed to be that staff would only log complaints but take no action.

Also worrying are indications that staff were not prepared, not only with regard to your ministry's own processes and procedures, but for responsibilities associated with the environmental legislation and the Renewable Energy Approvals or REAs. Staff seemed to be so poorly prepared that even as the *regulator*, they asked the wind power operator what they should do.

All this has been documented in an academic article, which was recently published, and which I attach for you.

In an IESO online engagement event held in the last few months, IESO staff asked a representative of your ministry how the noise complaint process for wind turbines was working. It is running smoothly, was the response.

That cannot be an accurate response given the content of these documents, and the fact that your ministry has at least 7,000 files of noise complaints, few with resolution. We have heard from multiple families who are members of our coalition, some of whom have had to take the drastic step of leaving their homes because of noise, even though complaints were made.

This is an untenable situation moving forward. Without substantive change to regulations in view of the evidence at hand, and the expressed concerns by municipal officials and others such as our coalition, the Ontario government will be repeating past mistakes with new wind power projects.

I would be happy to discuss these issues with you or your staff and to provide anything you need.

Sincerely,

Jane Wilson

President

WIND CONCERNS ONTARIO

Ottawa, ON

president@windconcernsontario.ca

www.windconcernsontario.ca

Attachment: “No action likely”, also available at: “No Action likely”: An Exploration of Institutional Bias Against Citizen Complaints about Wind Turbine Noise and Adverse Health Effects as Demonstrated by the Government in Ontario, Canada

Copy to: Brock Hamley, Chief of Staff;

Tom Allwood, Chair, Multi Municipal Energy Working Group;

Amanda Brodhagen, Deputy Chief of Staff

Leslie Gallinger, CEO IESO

Dave Barreca, Resource Acquisition, IESO

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"No Action likely": An Exploration of Institutional Bias Against Citizen Complaints about Wind Turbine Noise and Adverse Health Effects as Demonstrated by the Government in Ontario, Canada

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Abstract

The Nation Rise wind power project was the last industrial-scale or grid-scale wind power project approved in Ontario, Canada despite controversy, opposition and legal action from the "host" community, and even an attempt by the environment minister himself to stop it. Problems surfaced early for the project, months before it was granted a formal commercial operation date, as residents complained of noise from the wind turbines. Documents including email correspondence referencing noise complaints made to the provincial government's environment ministry were obtained via Freedom of Information legislation. The Ontario Ministry of Environment, Conservation and Parks has a mandate to protect the environment and to enforce existing regulations. The documents appear to show that the environment ministry of the Government of Ontario had no intention of taking action on the citizen complaints. The only action evident was cursory responses to complaints, and simply logging events; no other action appears to have been taken by the staff in the environment ministry, which is the regulator for wind turbine power projects. Email correspondence between ministry staff and the wind power developer/operator demonstrates a casual, even cosy relationship, so much so that a senior environmental officer, representing the government as a regulator, actually asked the power plant operator what to do about the noise complaints. The correspondence may indicate institutional bias toward the operator, and against the public. Our findings: 1) Complaints about noise from wind turbines arose early on in this power generation project, before Commercial Operation date was determined as part of its contract. 2) Ministry staff seem

unprepared in terms of wind turbine noise, how to deal with the public, and on the ministry's own noise complaint process. 3) Ministry staff seem to lack support from upper levels in the ministry. 4) Correspondence indicates a preferential relationship between the ministry, which is the regulator, and the wind power operators.

Subject Areas

Renewable Energy, Government, Health, Social Justice, Institutional Bias, Noise

Keywords

Noise, Wind Turbines, Adverse Health Effects, Institutional Bias, Social Justice, Canada

1. Introduction

The Government of Ontario, Canada, passed the *Green Energy and Green Economy Act* in 2009, which was designed to encourage the growth of "green" or "renewable" power generation technology via a number of incentives, including subsidized rates for power developers. Described as "sweeping legislation", the act required amendments to numerous other pieces of legislation including the Planning Act and the Municipal Act [1].

A number of wind power projects were approved by the provincial government under a Renewable Energy Approval or REA process, before procurement was halted in 2016. The last project approved was called "Nation Rise".

The approval process for the Nation Rise wind power project is well known in Ontario, as the 100-megawatt power facility was controversially approved by the Ontario government in the last days of the regime under Premier Kathleen Wynne, prior to that government's fall in an election. The high profile is due to several legal actions taken by members of the community in North Stormont, and because, on appeal to the new Minister of the Environment filed by citizens, the Minister revoked the project approval due to concerns about the risk to wildlife [2]. His decision as a Minister of the Crown was overturned by the courts [3].

News media carried reports of numerous complaints during the development of this project, including complaints about disturbances to local water wells and then, when the turbines were erected and operating in test mode, there were complaints about noise, vibration and associated health impacts [4].

The Ontario government has a process in place to receive and act on complaints about activities that may be harmful to the environment [5]. The government's goal as a regulator as expressed in 2023: "The Ministry of the Environment, Conservation and Parks works to protect and sustain the quality of Ontario's air, land, and water."

To facilitate citizen concerns about possible pollution from a variety of sources,

including noise, the complaint process features an online reporting tool and a 24/7 telephone line.

2. Noise and Human Health

It is well known that environmental noise can have an impact on health. In the case of industrial-scale or grid-scale wind turbines, the noise emissions from the power generators are often associated with sleep disturbance (different from sleep deprivation) and can result in serious health impacts due to long-term exposure. In a literature review published in 2014, several Canadian authors (among them, two Medical Officers of Health in Ontario, Canada) concluded that the studies reviewed "found an association between wind turbines and one or more types of human distress". The studies reviewed "provide reasonable evidence that an association exists between wind turbines and distress in humans" [6].

Similarly, the Council of Canadian Academies (CCA) published a review titled in 2015, and stated "The available evidence suggests that a direct causal relationship or an indirect (via annoyance) relationship between exposure to wind turbine noise and sleep disturbance might exist" [7].

Wind turbines emit a distinct sound, the CCA said, describing the emissions as follows:

> "Wind turbines also emit sound with the following characteristics, which are less common than other sources of community noise:
> • Sounds from wind turbines may extend down to the infrasonic range and, in some cases, may include peaks or tonal components at low frequencies.
> • Sound emissions from a wind turbine increase with greater wind speed at the height of the blades, up to the turbine's rated wind speed (speed at which it generates maximum power), above which sound does not increase.
> • Sound from wind turbines can exhibit periodic amplitude modulation, often described as a "swishing" or "thumping" sound" [7].
> The mechanism of effect has been described as follows:
>
> "The aerodynamic noise generated by wind turbines has a large low frequency and infrasound component that is attenuated less with distance than higher frequency noise. Current noise measurement techniques and metrics tend to obscure the contribution of impulsive low frequency noise and infrasound. A laboratory study has shown that low frequency noise is considerably more annoying than higher frequency noise and is harmful to health—it can cause nausea, headaches, disturbed sleep, and cognitive and psychological impairment" [8].

Not all people exposed to wind turbine noise emissions experience adverse health effects, but it has been reported that some individuals experience "adverse health effects which include physiological and psychological symptoms as well as negative impacts on quality of life. In some cases, the adverse impacts have been so significant that some individuals felt forced to leave their homes" [9].

Acoustics specialists who have studied the nature of wind turbine noise emissions note that exposure to wind turbine noise may have different impacts than exposure to other forms of environmental noise.

> "One important aspect of wind turbine noise that is relevant to its physiological consequences is that the duration of exposure can be extremely long, 24 hours a day and lasting for days or longer, depending on prevailing wind conditions. It is considerably different from most industrial noise where 8-hour exposures are typically considered, interspersed by prolonged periods of quiet (i.e., quiet for 16 hours per day plus all weekends) [10]."

Although environmental noise is recognized as a potential health hazard, the Ontario government has not demonstrated a robust response to complaints. After tracking formal complaints records filed with the government by citizens, community group coalition Wind Concerns Ontario reported that for complaints filed in calendar year 2018, "there were only seven Incident Reports out of 595 that noted a field response by ministry staff. That represents 1.1 percent" [11].

3. Methodology

3.1. Accessing Documents

Under Freedom of Information legislation, all "Incident Reports, summaries, emails and other documentation" related to the project between January and July, 2021, were requested by community group coalition Wind Concerns Ontario; June was the expected date when Ontario's Independent Electricity System Operator or IESO could grant final approval for the project in the form of a Commercial Operation Date.

3.2. Document Review

The request was made in October of 2021, and file number A-2021-03739 was assigned by the Ministry of Environment; fulfillment of the document request was achieved in April of 2023 [12]. The delay in fulfillment was perhaps due to an appeal filed by an unknown third party to prevent the government from releasing the documents; the appeal failed, and the documents were released.

The 1300 pages of documents were reviewed to determine: whether there were any complaints about noise or other environmental concerns; what response the government staff made; whether health impacts or adverse health effects were noted; what discussion took place internally about response to complaints; and, whether there was resolution of the complaints, as required by the Renewable Energy Approval (REA).

4. Results

Key themes were identified from the review of the documents supplied:

- Noise
- Health impacts from noise

- Environment ministry (MECP) response to complaints
- Role of the contracting authority IESO and connection with the environment ministry

Although the request was for copies of formal Incident Reports, which is how the ministry records complaints made to offices and the government pollution reporting telephone line, there was not a single formal Incident Report document for the seven-month period. What was provided was chiefly emails from the public, and emails referring to complaints. Because of the absence of the formal Incident Report documents, it was not advisable to create a "count" of complaints.

Records received had been redacted, and from the context of the excerpts' redactions were apparently where health impacts are noted. It is our understanding that redactions may be made to protect the privacy of the person or persons' reporting, but it is difficult to understand how reports of descriptions of physical symptoms betray privacy.

Another deficiency in the records provided is that while emails indicate there were 149 noise complaints made during the prescribed time period, again, no records of formal Incident Reports were provided. The documents consisted chiefly of emails.

The most frequently cited reason for complaints received by the environment ministry staff was noise from the operation of the wind turbines, which in several instances was accompanied by descriptions of physical complaints. Other reasons for complaints were: construction noise, water well disturbance, lack of aviation safety lights, and concerns about wildlife deaths.

Excerpts of actual complaints are presented below, with a notation referring to page numbers within the tranche of documents.

4.1. Noise

The noise complaints provided by the environment ministry were chiefly records of emails sent to ministry district staff or the central Spills Line. Documents included actual emails from residents living nearby the wind turbines, as well as emails between and among staff discussing the content of the complaint emails. As time progressed over the seven-month period, the tone of the complaints evolved from a "what is going on" query to expressions of frustration and concern.

Pages numbers cited refer to the location of the complaints in the tranche of documents provided in response to the Freedom of Information request. Redactions (seen as blacked out type) are presumed to have been made by government staff.

In January 2021, one person expressed surprise at the level of noise and said:

"I cannot bear the thought of living through this in the summer." (P.000078)

Also in January,

"whooshing and hum…jet-like noise outside and feels like hum in house…"

The same person filed a complaint in March and said he/she felt "generally

unwell if in the house" and "had to leave the house due to nois [sic]" followed by another complaint in April "excessive noise" and again through April to June, "humm in house continually," and "at night brutal". (PP. 000555-000556)

In March:

"I am logging my third noise complaint and Nation Rise is not even operational yet." (P. 000334)

In April:

"…was quite concerned about the noise levels at 4:30 am yesterday as [redacted]…I find the sound absolutely annoying and unacceptable this morning." (PP. 000180-000181)

In May:
(Report prepared by staff at the pollution reporting line)

"May 21,11 pm—noise from [redacted] described by Caller as 'brutal'. Caller noted very high winds and had to shut the windows to block noise. Caller reports noise is there 24/7…"

And,

"May 23rd: Caller reports noise from [redacted] is loud and that it was causing physical pain. Caller stated 'noise is like a jet plane that don't go anywhere'." (P. 000320)

In June:

"…there is no escape from the constant noise. It sounds like a jet passing over ALL THE TIME….it has become a nightmare to live here." (P. 000529)

4.2. Health Impacts from Noise

Many of the complaints featured mentions of health impacts or used words like "feel", which could be taken to mean the presence of adverse health effects. As well, most of the complaints were made at night, or during the day referring to the experience at night, which suggests sleep disturbance [13], another cause of adverse health impacts if experienced over time.

"I am so tired I am [redacted] almost every day feeling the need to rest and worst of all when the turbine is running I am having [redacted]" (P. 000562)
"I have repeatedly reported sleep annoyance and heart issues when the turbines are running…" (P. 000644)
"At times the noise is unbearable. I have developed health issues to where I am now [redacted] and am seeing [redacted]. I don't even have to be outside to know when the turbines start [redacted];" (P. 000668)

As early as February, people were reporting adverse health effects and commenting on the lack of response by the government staff. An example is this complaint mentioning ear pain.

> "What is the root cause of this and how do I stop the hum which is causing pressure/pain in my inner ears when the turbines spin?" (P. 000108)

In response to this specific complaint about ear pain, clearly an adverse health effect, the Environmental Officer responded, "I understand that changes such as tree planting to provide addiotnal [sic] shielding etc. are the types of things that would be considered." (P.000131)

The response also stated that action was being taken as the project operator was conducting noise testing, (as a mandatory routine requirement of the Renewable Energy Approval) to which one person said,

> "Why is it that the wind turbine company gets a free pass until summer of [sic] later when noise monitoring will be completed? …I am requesting that turbines not spin until real live noise monitoring (as limited as it is) is conducted. That is only fair." (P.000145)

Some complaints reported experiences with "pressure" which suggests exposure to tonal sounds. Tonal sounds are commonly produced by machinery such as fans and compressors, and are also produced by electrical power equipment. Tonal sound may be easily perceived, result in more "annoyance" for people, and requires different methods of measurement [14]. If there is a suggestion that tonal sound may be present, ministry acoustic measurement protocol dictates that a 5 dB "penalty" should be applied to any noise monitoring. However, at this stage the company was simply carrying out its mandatory acoustic audit on "worst case" turbine locations, not responding to specific complaints, despite the requirements of the REA It is unclear whether the "penalty" would have been required but as a result, tonality was not demonstrated.

Nevertheless, complaints made to the ministry did suggest the presence of tonal sound, as in this example:

The Environmental Officer emailed a complaint to the power project operator and says:

> "The Caller reported to me on April 26th that [redacted] has been feeling a lot of pressure in [redacted] ears the past week. *Not noise so much as vibration or pressure*." [P. 000242] [Emphasis theirs]

In June, an email was sent to the local office which was also copied to the local health unit, the Independent Electricity System Operator (the contracting authority), and the local provincial parliamentarian, clearing state health impacts:

> "…feeling very dizzy pressure in my chest is bad feels like ready to explode I can now feel the presure rushing to my head giving me a headacke my heart is racing even after I [redacted] I may have to leave my home today I cant take this I feel like im going to have a heart attack." [P. 000618]

No response to this was supplied, nor any evidence of referral to supervisory staff, the local health unit, or any other agency. No response from the contracting authority was supplied.

4.3. Environment Ministry Response to Complaints

It is part of the Renewable Energy Approval (REA) for the Nation Rise power project that the operator must create a record of each complaint made about the operation including information on the date and time of the event. The REA states that "a description of the *measures taken to address the cause of each incident to which the complaint relates and to prevent a similar occurrence in the future*" [15]. [Emphasis ours]

The intent of the REA is well understood: in the event the operator receives complaints, it is to investigate and take action so that complaints do not re-occur. The Ministry's role is to oversee this process and ensure compliance with regulations.

The records provided via the Freedom of Information request did not include information on how the operator documented and managed complaints. In many of the emails between the MECP and Nation Rise staff are references to telephone meetings to discuss issues and responses, for which records were not provided.

Comments included in documents early on in the progression of emails and other documents suggest that the staff associated with the local ministry District Office who were responsible to respond to complaints about the Nation Rise power project were not prepared. In January of 2021, the officer assigned wrote to staff at the wind power operator, thanking them for their help, and made this admission:

> "While I have a significant amount of experience with a wide range of industrial facilities, as you can imagine, the opportunity to be involved in the industry of 'wind farming' was not one. The discussions and correspondence help me address the complaints/concerns brought forward by the public." [P. 000016]

In other words, the staff of the *regulator* appears to be asking for help from the power developer to do her job.

About a week after that email, the same senior environmental officer again contacts the power developer to ask whether the on-site workers think the noise being produced by the Nation Rise wind turbines is unusual. She also appears to have little understanding of the ministry's process.

> "Can you please ask those experienced on site workers their perception of the noise levels? I am especially interested in off-site levels and observations. It is my experience that a sound that is not observed at the source is often observed remotely. I presume that when there is a complaint that the person tasked with assessing the validity of the complaint travel down wind and listen as well? Please confirm that going forward noise assessment will includes [sic] some level of a 'stop and listen' 500 metres down wind, if possible, and especially if the complainant identifies a new or odd noise in characteristic or intensity."
>
> "Please ask a few of the most experienced staff as to their general sense of

whether noise/sound generated is similar or significantly different from other sites." [P. 000063]

Only if the staff think the noise is louder, she says, will "other work" be done "before all 28 [turbines] are constructed". [P. 000063]

The essence of this exchange is that apparently, the Environmental Officer, a staff person whose role is to enforce regulations on behalf of the ministry and the government, is actually asking the business itself, the subject of citizen complaints, whether it thinks regulations might be being violated.

The officer describes her understanding of sound or noise and says this:

"Obviously, the perception of noise levels is subjective." [P. 000063]

Again, in this particular interchange, the officer thanks the power developer for "continued assistance" and apologizes for her inquiries adding that she hopes there will be "less onerous drawing on your time in the near future".

The nature of these remarks points to an unusual relationship between the regulator and the business, and hints at bias.

Response to complaints gradually became so erratic that one person resorted to creating a multi-page table documenting the complaints complete with Incident Report numbers and details, requesting that he/she get some help [P. 000377-000379]. One line item described response from the operator as "basically a brush-off".

The essence of these responses was that the complaints about noise, which more than one resident described as "unbearable" or "brutal", and which were frequently associated with reports of health impacts, were never going to be acted on. The rationale, as explained, was to say it was the ministry's "position".

For example, the Senior Environmental Officer assigned to the Nation Rise power project out of the local office responded to a person who filed complaints by email in June with this comment:

"With respect to general health impacts being reported from noise or infrasound, the ministry will continue to log those calls. However, the expectation is that no other action is likely to be taken, given the ministry positions". [P. 000605] [Emphasis ours.]

And,

"…the MECP is not qualified to assess or diagnose an individuals [sic] health concerns. Anyone experiencing feelings of unwellness, are strongly encouraged to see a Health Care professional."

The staff officer referred to several studies,[1] published in 2010 and 2014 to support the claim that the environment ministry has based its position not to act on clear authority.

[1]Given the dates, these documents are likely the statement by the Ontario Chief Medical Officer of Health, which was a policy statement, not a "study", published in 2010, and the wind turbine and community noise study published by Health Canada in 2014.

There is also evidence that the ministry did not adequately prepare the "Senior" Environmental Officer assigned to deal with the public on Nation Rise; neither did the ministry provide preparation or clarification on the complaint handling process.

The process appears not to have been clear to staff, and there was discussion about how to proceed. In one email interchange in May between the local Environmental Officer and a Divisional Program Specialist, the latter schools the Officer on how she is responding to, and logging, complaints.

> "Unfortunately, the way you are currently capturing complaints does not allow us to roll up the complaint data as accurately as possible as we only see a single complaint. Actually, I have been capturing complaints properly. I have been capturing them with an event for every call." [P. 000293]

And,

> "I don't know why you would be calling in complaints received by the ministry to the company only to have them report them back to us…this seems redundant."

Nevertheless, a few weeks later in June, the Officer tells a resident following a complaint:

> "I encourage Callers being impacted by noise or other Turbine concerns to (also) contact the company directly when possible. …By contacting the company directly they can at that time (or call you back) to collect additional details if needed; it increases the likelihood of a site visit by the technicians/company to the turbine when the noise or impact is ongoing; *you are not relying on a third party* to forward the email/call…" [P. 000408] [Emphasis ours]

The use of the phrase "Third party" in interesting in that the Environmental Officer is acting as the *regulator*.

The district office response to citizen complaints varied over time. In January, the Officer advised people they could call the wind power operator directly, and/or the government Spills Action line, but only for "unusual noise rather than normal operating noise". [P. 000031] There does not appear to be evidence of an understanding that "normal operating noise" could in fact be exceeding noise standards.

Inconsistencies in the process were apparently noticed by people making repeat complaints. In June, one resident sent these comments to the Environmental Officer by email:

> "You had told me not to call the Spills Line but yet on the Report pollution online page they do have an option to report by calling 1-800-MOE-TIPS. Could you explain why it says on the website we can call to make a complaint and you say not to?" [P. 000407]

The resident added:

> "You make a naïve, incompetent or neglectful assumption that people who suffer with noise or shadow flicker from the industrial wind turbines…should first reach out to their abusers, and wait their feedback? This is like asking people who have been robbed to call the robbers and complain to them and ask for justice." [P. 000407]

The company's response to noise complaints is not included in this tranche of documents but in one case, in response to complaints made in January, the company spokesperson claimed to have done "a visual inspection of turbine [redacted] …indicate the turbine was operating normally." [P.00039]

The company then said no action would be taken and

> "Furthermore, we do not intend to stop or limit the turbine's operation in any wind direction." [P.000039]

There was no record of response from the ministry. Residents were clearly disappointed by the lack of response. In May:

> "…no one has ever come out waiting instead for the proponents own measurements sometime in the next years or so." [P.000334]

From other emails from residents, it appears there were attempts to discourage further complaints. At least one person may have been told "You are the only one complaining" because he/she wrote back:

> "I cannot be the only one complaining about the turbine noise. I personally know of others that are experiencing same and if I am the only person reporting…this means the residents of North Stormont have lost complete faith in the MECP's ability or willingness to do anything about it." [P.000321]

In another email exchange between a resident and staff in both the local and regional offices, a report apparently from the project operator is referred to which said a site visit had been done in response to the complaint:

> "…observed that it was still windy. That is our sole observation. *We did not consider the excessive noise unusual* or even mention anything about noise in our report so no corrective action will be taken. We claim not to know the complainant's contact info in this report and did not go to his location even though we documented his address…"

And, incredibly,

> "Please disregard this complaint and close this file as *we are ignoring it* and hope you will too." [000270] [Emphasis ours]

Choosing to "ignore" a complaint would be in violation of the Renewable Energy Approval for the power project. There was no response from the regulator provided in the documents.

With regard to health effects the Senior Environmental Officer at Cornwall opined in an email:

> "I report what people advise is the 'impact'. It is not my role to discriminate and remove information." [P. 000445)

She then went on to do exactly that, however, and expressed an opinion on the cause of health effects.

> "The issues could be due to many factors—and most ar [sic] already pre-existing (tinnitus and anxiety as example). Complaints of health primarily at one residence where both adults report issues. Other complaints tend to be 'noise and being awakened at night' The MECP has responded many times indicating nuisance could occur *but no health impacts*." [P. 000445] [Emphasis ours]

In this response, the Officer seems to be stating she has made her own determination as to the validity and seriousness of health impacts, and ultimately dismissed them.

As late as June 10, some six months into the testing phase but still prior to Commercial Operation Date, is an email from an MECP manager setting up a meeting to review the protocol for logging complaints, and what the response should be. [P. 000446] Clearly, awareness of the complaint process is not consistent among all staff, or there would be no need for such a meeting. There was a concern on how to respond to individual complaints, and how to deal with "disrespectful, harassing and/or abusive communication".

4.4. Role of the Contracting Authority and Other Government Departments

As the date for the final stage in the contracting process approached for Nation Rise, where the Independent Electricity System Operator or IESO granted Commercial Operation Date, some residents questioned the MECP on whether this should happen, given the number of noise complaints. On June 16 a resident sent an email to the IESO and copied the local Member of Provincial Parliament.

On June 17, the local Environmental Officer emailed the Regional Office management staff with this comment:

> "IESO has never reached out to us and I suspect are well acquainted with the concerns of other wind farms—which went ahead to CO status. Not familiar with IESO…I did tell [name withheld] that it was likely that yourself … or a team may reach out to see how these emails might be best addressed. [redacted] we may need a longer meeting to update…as hope to have a complete, legible, summary of issues and proposed actions/responses". [P. 000533]

So, although the staff acknowledge the noise complaints and the citizen concerns, they did not take it upon themselves to go further or to contact the contracting authority which, they presume, is "well acquainted" with noise problems all over Ontario.

Questions also arose in the documents about the role of the local health unit. In one email the staff officer referred to the authority of Medical Officers of Health, but the reality is that they have no authority as regards wind turbines, as was revealed in a report from a health unit responding to local noise complaints. The epidemiologist leading the study said this:

> "It is likely that Ontario public health units will continue to be asked to examine potential health hazards which the *Ontario Ministry of Health does not have the legislative authority to regulate*. Also, there will likely be more instances where a consistent data collection system is needed to better understand the experiences of those experiencing the potential health hazard. Further work is needed to examine how these issues can be addressed [16]." [Emphasis ours]

Although the Green Energy Act was repealed in 2018 [17], the government has not returned authority for reports of adverse health effects to the health ministry but instead, has continued to allow it to rest with the environment ministry, and the corporate wind power operators.

5. Discussion: A Question of Bias

Complaint resolution and communication with customers are regarded by the corporate world as important functions, and key to success. In a publication aimed at the banking industry, for example, international management consulting firm KPMG says that organizations should "Consider a customer complaint as a gift. It highlights a problem, provides an opportunity to investigate and put it right, not just for one customer but for all customers" [18].

KPMG goes on to advise organizations to "make your customers' issue your priority". Failure to achieve resolution of problems, KPMG says, may result in negative comments in social media and "brand damage."

While it may be a stretch to equate taxpayers and citizens with "customers," governments nevertheless are concerned about their image and whether they are seen to be fulfilling their mandates. Failure to resolve complaints is important to a regulatory body, as complaints suggest regulations are not being enforced, and that one group is being favoured over another.

There is another important aspect to the complaints being filed with government: they are an indication of problems, perhaps serious ones, with a government program, that may even have relevance to public health. Health authorities all conduct surveillance programs to monitor health and safety; complaints, even anecdotal reports, serve as a key indicator [19].

Problems with industrial-scale or grid-scale wind turbines in Ontario, Canada, have been well documented. Countless media articles and academic papers refer to the experiences in Ontario and one government minister ceded that there had been problems, particularly with siting of the power projects.

Glen Thibeault, energy minister in 2017, said in a speech that "allocating the

precise mix of technology types has largely been arbitrary and led to sub-optimal siting, uncompetitive prices, and heightened community concern" [20].

A paper by Fast et al. in 2016 acknowledged the problems with developing wind power in Ontario and said that "public policy takes an 'innocent until proven guilty' view of this evidence [complaints, studies documenting noise impacts] rather than a more precautionary approach" [21]. The authors said the "top-down" approach to approving and siting wind turbines was a problem for people in the communities that were then forced to "host" the power projects. They recommended that, "rather than dismissing health claims as groundless or inconsequential, policy-makers should take a precautionary approach so as to more thoroughly address the factors that contribute to frustration". The authors pointed to regulation as a factor: "This must be coupled with diligent enforcement of the responsibility of wind companies to respond to noise complaints throughout the life of the project" [21].

That is not what happened with the government and the Nation Rise power project, despite the government's 15 years of experience with projects and citizen complaints. Internal emails clearly show that staff had no intention of taking any action on residents' complaints, even where there was mention of health impacts.

Why?

According to the Oxford Dictionary, "institutional bias" may be defined as:

> "A tendency for the procedures and practices of particular institutions to operate in ways which result in certain social groups being advantaged or favoured and others being disadvantaged or devalued. This need not be the result of any conscious prejudice or discrimination but rather of the majority simply following existing rules or norms. Institutional racism and institutional sexism are the most common examples" [22].

Authors Whiteley *et al.* looked at the situation of complaints and government response in Ontario and determined that it was a situation demonstrating "administrative bias." The government, Whiteley et al. said, has not proven the efficacy of prescribed safety levels or setback distances to protect health. Worse, there were actual examples of the government ignoring its own rules, as was the case where non-compliance in siting of turbines was identified and the government took no action; and another where a property was incorrectly identified as "vacant" but in reality did have a home on it, and although the occupant detailed numerous complaints about noise and attendant adverse health effects, there was no resolution to the complaints [23].

The authors further proposed a set of questions with regard to the Ontario complaints management process:

Are letters [complaints] from citizens received by senior officials?

Are employees and senior officials in particular discouraged from responding on controversial topics?

Is there proof of the safety of current regulations, and is there verification that these regulations are being followed [23]?

The role of government as regulator

From the review of the documents provided on the Nation Rise wind power project, more questions can be asked. There are serious issues raised by the content of the correspondence such as, for example, when the wind power operator told the environment ministry as regulator that it was choosing to "ignore" a complaint, and advised the regulator that it should ignore the complaint, too.

What is the relationship between the regulator and the corporate wind power operator that such a statement could be made? Who is in control?

A general question:

What is the basis for the government policy (or "position" as stated by employees) that there are no harmful effects from wind turbine noise emissions, therefore complaints have no merit and do not warrant response?

And for the Nation Rise wind power site in particular:

Why were staff apparently not adequately prepared in the basics of environmental noise, and on the government's own response or complaint management process, such that they turned to the corporation they were regulating for help and advice? Why were there no formal Incident Reports, which is the ministry's process for noise complaint management?

And, why did the local environment ministry staff not discuss the fact that noise complaints had been made with the contracting authority, rather than assuming the agency would be "aware"?

6. Conclusions

The review of the set of documents that consisted of communications inside government, with and from citizens, and with and from the corporation that was subject to government regulation, revealed problems not only with environmental noise produced by a wind power project, but also the possibility that the government as regulator was, frankly, not doing its job. Correspondence contained statements about government "policy" or "position", that were used to justify a lack of action. This occurred despite clear requirements for action in the regulator's own agreement with the corporate wind power operator.

At this stage, the Government of Ontario had more than 15 years' experience with wind power projects and a history of receiving thousands of complaints about wind turbine noise and health effects, yet in this collection of documents there is no apparent commitment to seeing the matter as important enough to respond, or to ensure that staff charged with this responsibility were adequately prepared.

There appears to have been no genuine effort to determine the cause of citizen complaints, nor to evaluate the information, or to follow the process required by formal agreement with the power operator.

In fact, the balance of power in this regulator-operator relationship could be said to lie with the power operators, not with the government. That is substantiated by requests by government employees as to what their course of action should

be, and by their apparent reliance on the operator for information and knowledge. Ensuring that employees were fully prepared appears not to have been a priority for the government, as regulator, with regard to wind turbine noise complaints.

The obvious steps forward would be to: conduct a review in the environment ministry of wind turbine noise complaints and the complaint management process; and to institute a consistent and comprehensive training program for employees carrying out regulatory roles.

The question of institutional bias should also be examined and resolved.

The documents reviewed reveal a lack of commitment to scientific rigor in understanding environmental noise which would be critical to a regulator charged with ensuring health and the environment are protected, and to take effective action where needed.

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Conflicts of Interest

The authors declare no conflicts of interest.

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