

**Hydro Quebec**  
**Project for the construction of Saint-Jean substation at 315-25 kV**  
**and of a 315 kV supply line at Dollard-Des Ormeaux**

**Public hearings – second part**  
**May 17 2016**

**NOISE FROM HIGH-VOLTAGE POWER LINE AND SUBSTATION**

*Brief prepared*  
*by*  
*Augustin Luoras*  
*Dollard-Des-Ormeaux QC*

## Objectives

### ➤ Main objective:

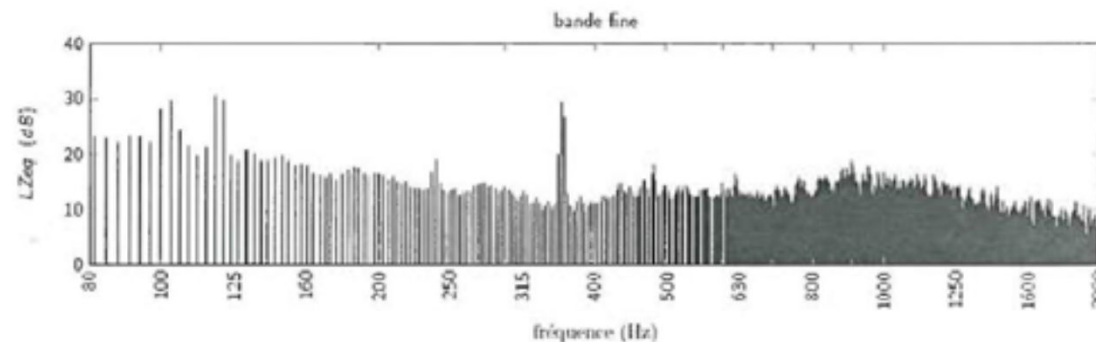
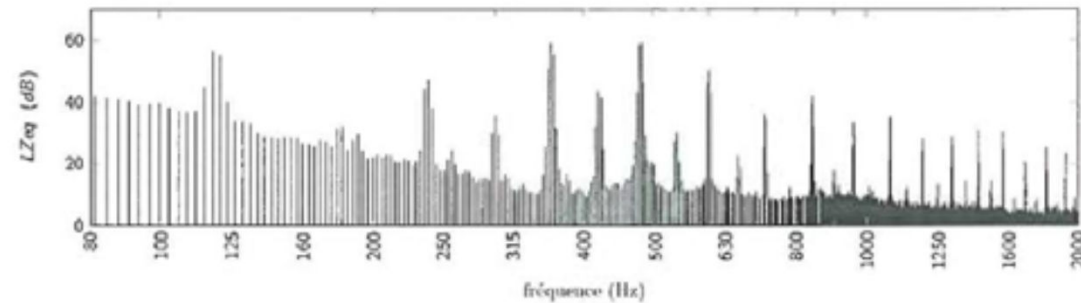
◆ To express my, and my fellow DDO residents` concerns regarding:

- The power/current levels anticipated for the future phases of the project (initial and final) and beyond
- The noise generated by the new 315kV/25kV substation (station for short) and its 315kV supply line, for the future phases and beyond

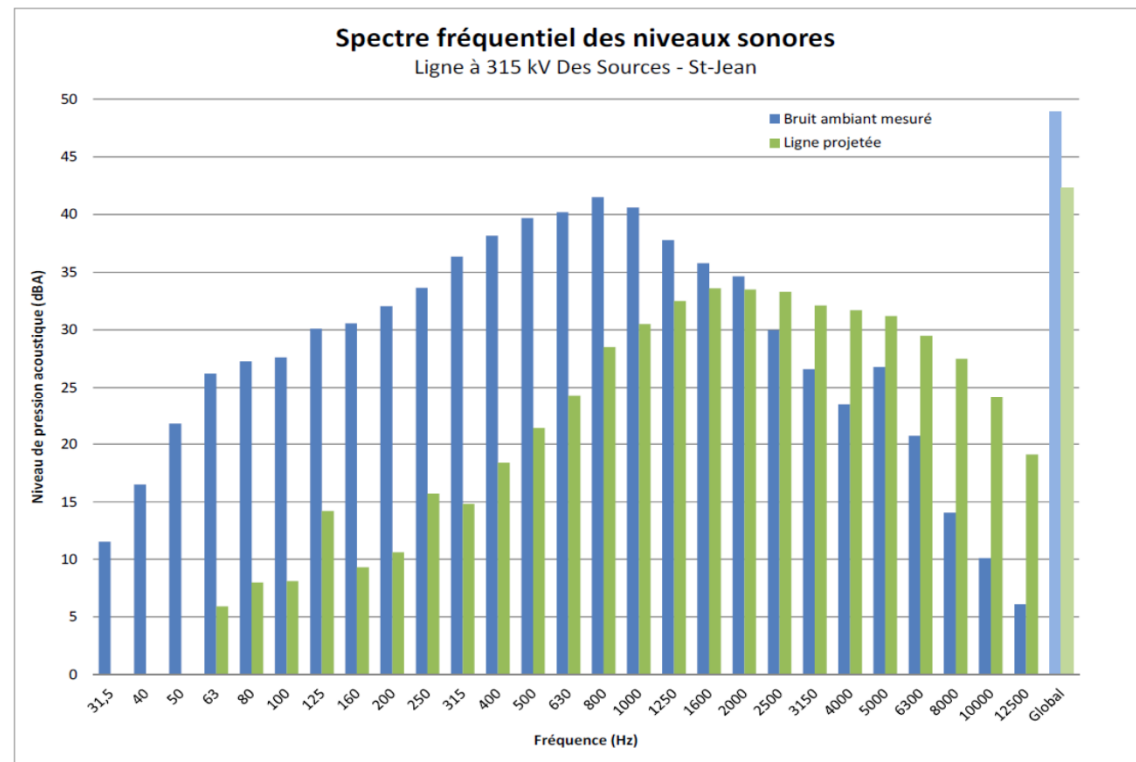
### ➤ Other objectives:

- ◆ To create a context for the brief (noise characteristics and evaluation)
- ◆ To provide analyses to justify our concerns, by proposing new perspectives into the interpretation of the noise evaluation results.

- Characteristics of the noise generated by the station
  - ◆ Buzz (bourdonnement) with notable discrete tones around 120Hz and harmonics thereof (figure below)
  - ◆ Produced mainly by vibration of high-capacity transformers

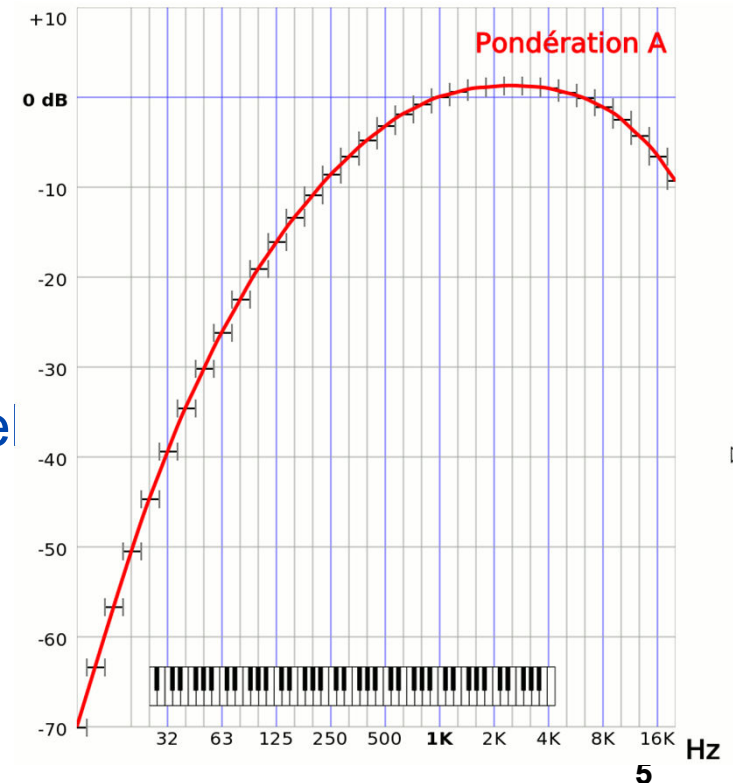


- Characteristics of the noise generated by the 315kV line
  - ◆ Buzz and crackling (crepitement)
  - ◆ Produced primarily by micro-discharges (Corona effect) >>
  - ◆ Broadband, with more important tones at high frequencies



## ➤ A-weighting filtering

- ◆ Commonly used for noise measurement and analysis, including environmental noise
- ◆ Said to capture “equal-loudness contour” by suppressing lower frequency components, to reflect average sensitivity of human ear. It is often forgotten that it was proposed for pure tone loudness >> proposed for pure tone loudness >>
- ◆ Not very appropriate for noise  
(misjudgement of exposure to low freq.)
- ◆ dBA: A-weighted sound pressure level
  - Referenced to 20micropascal (0dBA)
- ◆ Noise from multiple sources:  
addition based on logarithmic laws



- Noise level evaluation methodology
  - ◆ Defined for both power station and line
  - ◆ Based on **combination of measurements and simulations**
  - ◆ Simulations should reflect future exploitation conditions
  - ◆ **Conformance** analyzed with regard to the **most severe evaluation criteria for global noise:**
    - For station: 46dBA – 50dBA, depending on residential zone
    - For line:
      - 46dBA - 49dBA, depending on residential zone and atmospheric conditions (dry/wet conductors)
      - 55dBA under the line (bike trail)
  - ◆ HQ statement: full conformance to evaluation criteria, with noise reduction measures for the station noise during the coexistence of 120/12kV and 315/25kV equipment.

## *Electrical power consideration*

- Electrical power considerations are intended to:
  - ◆ Consolidate all the information obtained from HQ to date, regarding electrical powers/capacities and currents pertinent to the power station and line, for future situation and beyond
  - ◆ Clearly identify the configuration parameters (currents) for performance evaluation at different phases of the project
- Current situation:
  - ◆ 120kV line (two circuits) and 125/12kV station (4 transformers of 33MAV each) >>
  - ◆ Maximum line capacity **usable**: 133MVA (at 1100A)
  - ◆ Average currents used for EMF and noise **simulation**:
    - Circuit 1253: 241A; circuit 1254: 141A, for line total line current of 382A, corresponding to line capacity **usage** of 56MVA

## *Electrical power consideration*

### ➤ Initial future situation:

- ◆ **315kV** line (two circuits) and **315/25kV** station with two transformers (140MVA each)
- ◆ **Maximum line capacity usable**: 280MVA (at 890A)
- ◆ **Average** currents used for EMF and noise **simulation**:
  - Circuits 3046 & 3047: 147A each, for a line total of approx. **300A**
  - Corresponding average line capacity **usage**: approx. **100MVA**

### ➤ Final (ultime) future situation:

- ◆ **315V** line and **315/25kV** station with four transformers
- ◆ **Maximum line capacity usable**: 560MVA (at 1780A)
- ◆ **Average** currents used for EMF and noise **simulation**:
  - Circuits 3046 & 3047: 300A each, for a line total of **600A**
  - Corresponding average line capacity **usage**: aprox. **200MVA**



## Electrical power consideration

### ➤ Summary of electrical power/current data

	Voltage	Maximum values for 315kV line		Average values for simulation (also assumed for exploitation)	
		Maximum transport capacity (usable)	Maximum transport current	Line capacity (used)	Average Current
Present	120/12kV	133MVA	1100A <sup>^</sup>	56MVA <sup>^</sup>	382A
Future initial	315/25kV	280MVA	890A <sup>^</sup>	100MVA <sup>^</sup>	300A
Future final	315/25kV	560MVA	1780A <sup>^</sup>	200MVA <sup>^</sup>	600A
Beyond (DA28)*	315kV	1920MVA	3500A	?	?

\* for emergency mode of operation;

<sup>^</sup> derived values (from HQ-provided data)

➤ **Comments:** It is crystal clear that the 315kV line is dimensioned to carry much more current than needed for the Saint-John station

◆ The corresponding EMF values will be substantial higher, reason for great concern for DDO residents

## *Electrical power consideration*

### ➤ Conclusions

- ◆ The **conditions** for which the electromagnetic field and the noise power generated by the projected 315kV line have been evaluated (corresponding to future initial phase / 300A) **are not representative for the exploitation conditions of the line** for the final phase and beyond. Immediate implication:
- ◆ **The results of evaluation are also non-representative. These results have been included in the Impact Study submitted to the Regie de l'Energy for the approval of Saint-John project!**
- ◆ Hydro Quebec lacked transparency in clearly presenting to DDO residents their intentions for the exploitation of the projected 315kV line, especially in long term. These intentions have only been clarified through the first round of public hearings. **The fact that **today** there is no “**planned**” transport of energy beyond Saint-John station is no consolation for DDO concerned residents.**

## *Global vs. tonal noise values & noise perception*

### ➤ General

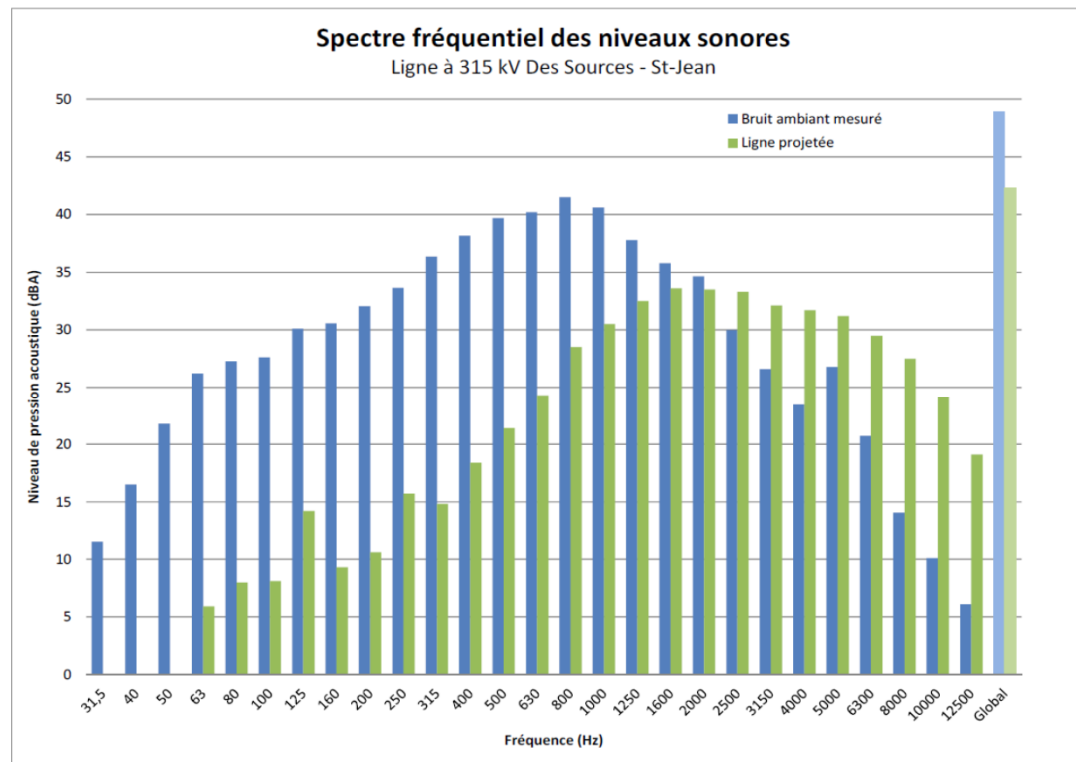
- ◆ In the methodologies used for noise evaluation, whether by measurement or simulation, the noise levels have been expressed as **global values** in dBA (across the entire audible spectrum) for the purpose of assessing acoustic conformance to applicable criteria, also expressed as global values.
- ◆ The global noise includes contribution from the ambient noise and from the power line and/or station (“electrical noise”).
- ◆ **The lower the ambient noise, the more important the impact from the electrical noise will be, and vice-versa.**
- ◆ The ambient noise and the electrical noise have different spectral characteristics and therefore are differently affected by the A-weighting filtering. **This may result in significant audible tones from the electrical noise** (especially at high frequencies, where the electrical noise is very penetrating/disturbing), **even when the global electrical noise seems negligible.**

## *Global vs. tonal noise values & noise perception*

- The noise generated by the station
  - ◆ In the project evaluation phase, MDDELCC requested (PR6) the addition of a 5dB corrective term for the tonal nature of the noise.
  - ◆ Hydro Quebec did not follow the directive, claiming that, **given the high level of the residual noise** and by implementing special attenuation measures, the project is conform to the defined criteria (46dBA). More specifically they stated that “*Ce bruit résiduel élevé limite l’émergence des tons purs émis par les équipements du poste et masque en quelque sorte le bruit du poste*”
  - ◆ Ambient /residual noise was measured on the night of 11 to 12 August 2014, and was dominated by the song of insects (Table 2.2 in Annex E of PR3.2). **It is therefore not representative for the most part of the year.**
  - ◆ **The arguments invoked by HQ to dismiss the MDDELCC directive are therefore not valid, and concerned DDO resident request that the directive should be uphold by HQ.**

## Global vs. tonal noise values & noise perception

- The noise generated by the 315kV line (1)
  - ◆ Measured ambient noise / simulated electrical noise
  - ◆ On the night of measurement (12-13 August 2014) under fable rain, the second contributor to the ambient noise was the song of insects. The measured levels are therefore **not necessarily representative for most of the year.**

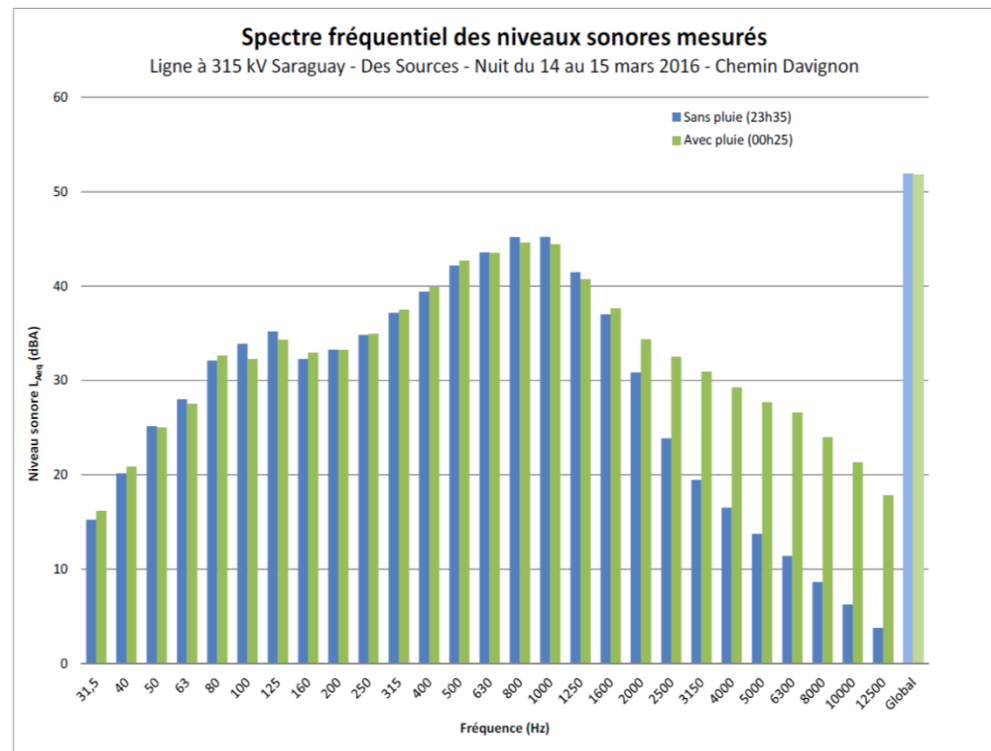


## *Global vs. tonal noise values & noise perception*

- The noise generated by the 315 kV Line (2)
  - ◆ The graph indicates that:
    - The spectrum of the line noise is concentrated at higher frequency compared to the spectrum of the ambient noise, which is more evenly distributed across the audible spectrum. For frequencies between 8000Hz and 12500Hz, the differences in amplitude are approximately 12dBA, which is not negligible.
    - **The global noise from the line is about 5dBA lower than the global ambient noise**; this is partially due to the fact that line noise is suppressed more (globally) by A-weighting filtering, given its concentration towards higher frequencies. **However, the line noise is audible** even at 5dB difference, as reported by the operator.
  - ◆ Had the measurement of the ambient noise been performed at another time, without the contribution from the insects' song (e.g. in June), the difference would have been higher, and so would have been the impact (perception) of the line noise.

## Global vs. tonal noise values & noise perception

- The noise generated by the 315 kV Line (3)
  - ◆ The graph below represent results of noise **measurements** under the 312kV line east of Des Sources station (as per DA36), in dry and wet conditions. **The global values are quasi-identical, but the noise in wet condition was still audible.** This demonstrates without any doubt the **importance of tonal noise vs global noise for noise perception.**



## *Global vs. tonal noise values & noise perception*

- The noise generated by the 315 kV Line (4)
  - ◆ The above analysis demonstrates why the global values do not tell the whole story, and conformance to evaluation criteria (“acceptable levels”) of the noise level produced by the high-voltage line is not enough to prevent subjecting the residents living close to power lines to inconveniences and disruptions; “acceptable” is not the same as “desirable” or “comfortable”.
  - ◆ Testimony of DDO resident Talar Chahinian:
    - “For having lived next to high-power lines for over 10 years, I can attest to the disruptive nature of buzzing from a high-voltage power line. I have often had to close the windows, with hopes for a respite, and most often the noise still seeped into the house was strong enough to perturb my sleep”.
  - ◆ Given the deterioration of the quality of life of the residents living in the vicinity of the projected 315kV line, we request, as concerned citizens, that alternative options be seriously considered by Hydro Quebec, such as underground lines.



## *Final conclusions*

- The fact that Hydro Quebec has submitted the Impact Study for approval to the Regie de l'Energy, with results regarding the projected EMF and noise levels not-representative even for the 5-year future period (from future initial to future final), is totally unacceptable.
- The results for future final, made available after the first round of public hearings (in DA35), are rather limited and not very conclusive, but DDO residents are even more concerned about what's coming next, when the projected 315kV line will be exploited at its full capacity (1920MVA/3500A), whether in normal operation mode or in emergency operation mode.
- **To alleviate all the concerns expressed throughout this brief, DDO residents stand firm in their request that the new line be built underground.**