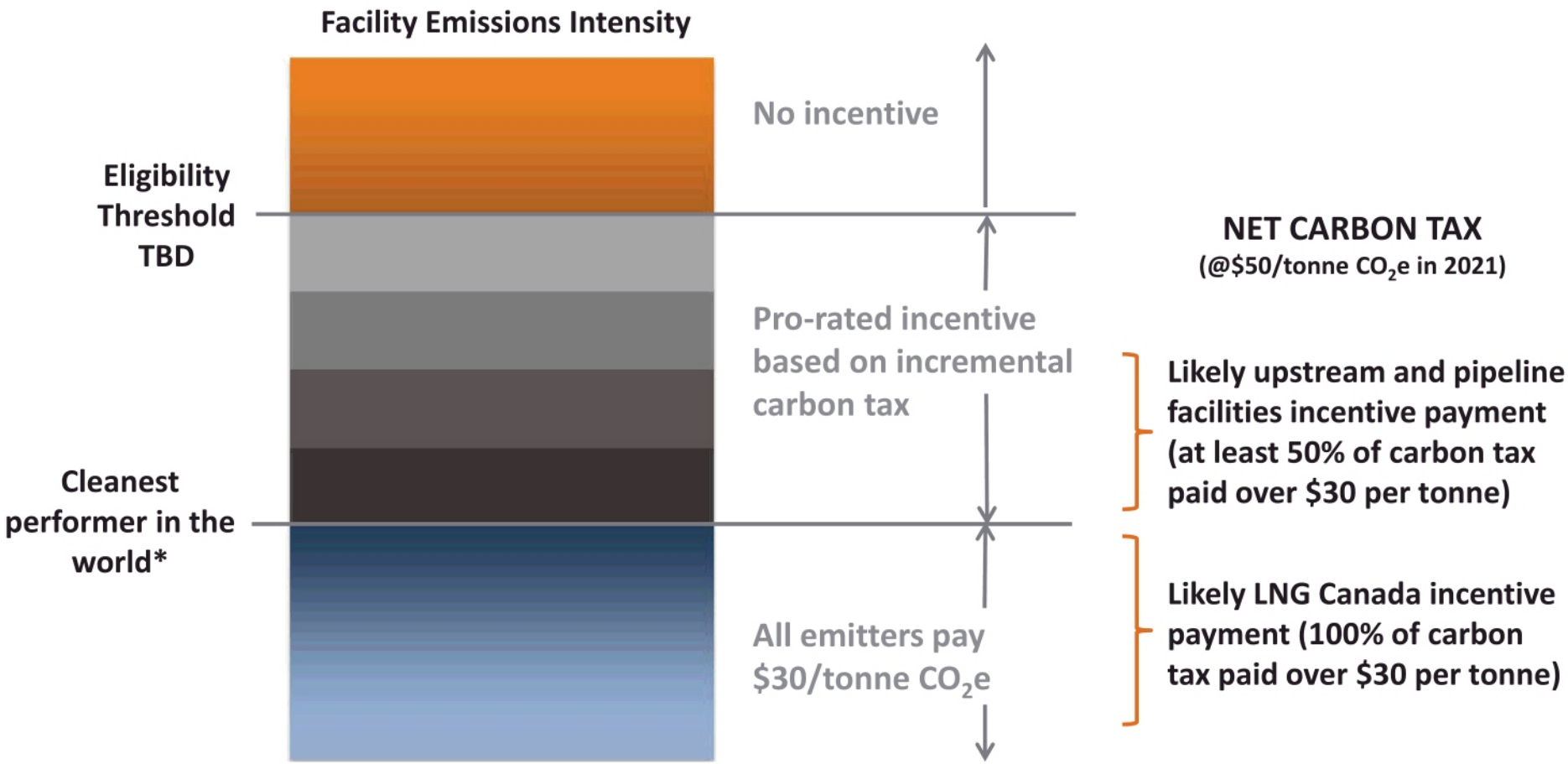
Proposed incentive program design



* Benchmarks updated every five years

Proposed LNG treatment

- Establish world leading benchmarks for LNG production, pipeline and upstream natural gas production
- LNG Canada forecast to be below benchmark and would likely receive 100% of carbon tax paid over $30 per tonne
- Pipeline uses turbo-compressor technology and would likely receive 50% of carbon tax paid over $30 per tonne
- Upstream (Montnay) low CO_2 and electrification would likely receive 50% of carbon tax paid over $30 per tonne

Warwick, Alexei ENV:EX

From: Lesiuk, Tim ENV:EX
Sent: Thursday, March 8, 2018 4:20 PM
To: Laaksonen-Craig, Susanna ENV:EX
Subject: FW: slides
Attachments: LNG forecast 180306.7.pptx; ATT00001.htm

Categories: ACTION

Tim Lesiuk
Executive Director, Business Development and Chief Negotiator
Climate Action Secretariat, Province of British Columbia
Mobile: 250.216.5893
Email: tim.lesiuk@gov.bc.ca

From: Lesiuk, Tim ENV:EX
Sent: Wednesday, March 7, 2018 6:34 AM
To: Laaksonen-Craig, Susanna ENV:EX; Plecas, Bobbi ENV:EX; Piccinino, Ines MNGD:EX
Cc: Dobson, Neil ENV:EX
Subject: Fwd: slides

s.13

Tim

Tim Lesiuk
Executive Director, Business Development and Chief Negotiator
Climate Action Secretariat, Province of British Columbia
Mobile: 250.216.5893
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Begin forwarded message:

> **From:** "Dobson, Neil ENV:EX" <Neil.Dobson@gov.bc.ca>
> **Date:** March 6, 2018 at 11:13:12 PM PST
> **To:** "Lesiuk, Tim ENV:EX" <Tim.Lesiuk@gov.bc.ca>
> **Cc:** "Peyman, Hurrian ENV:EX" <Hurrian.Peyman@gov.bc.ca>
> **Subject: slides**
>
> Tim,

Attached the first deck. I have made the proposed changes to the table and also adjusted the notes in #2 to explain how the bottom line is calculated and taken the piece about other resource emissions to a new bullet at the bottom and expanded on it a little.
I have also added some notes to #3 to explain why the gap between the lines is different to the numbers on the previous charts.

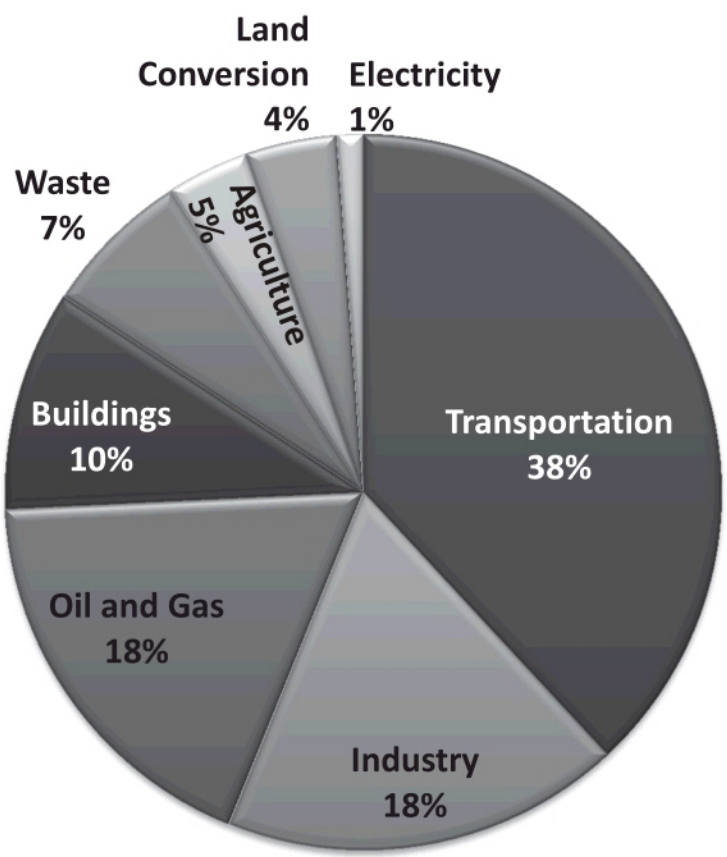
s.22

Thanks
Neil

Neil Dobson
Director, Economics and Analysis | Climate Action Secretariat, Province of British Columbia
M: 250 893-8567 |O: 778 698-4064
Email: neil.dobson@gov.bc.ca

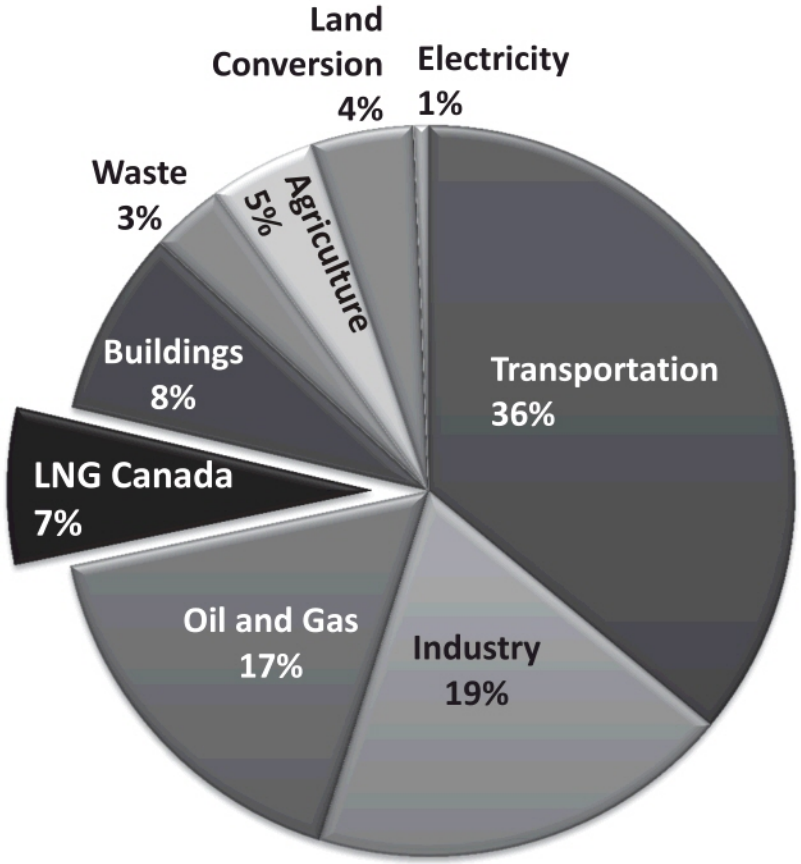
BC GHG emissions

2015 emissions
63.3 Mt CO_2e



O&G emissions
11.5 Mt CO_2e

2030 forecast - current policy
55.6 Mt CO_2e



O&G forecast (including LNG Canada)
13.5 Mt CO_2e

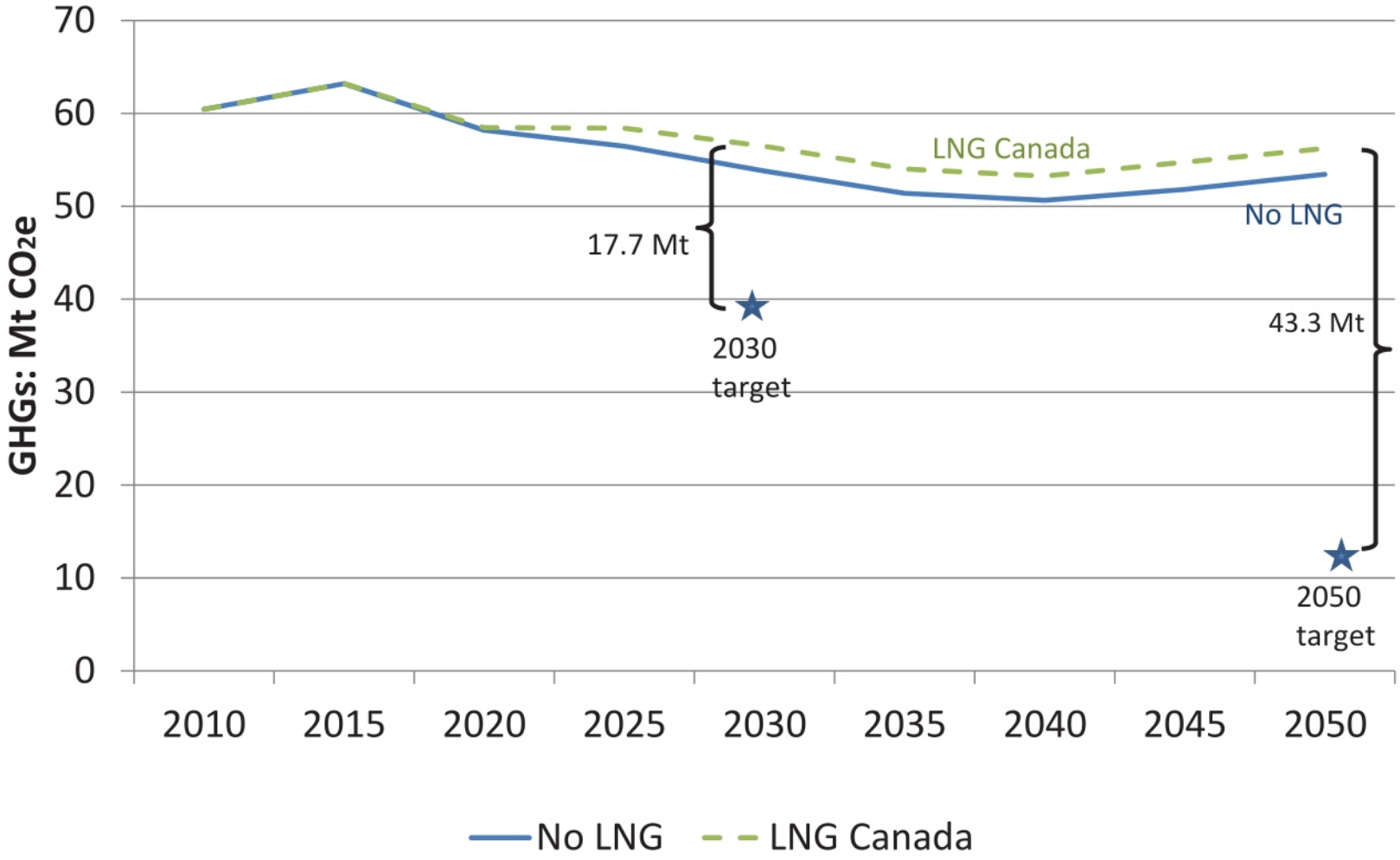
Forecast LNG Canada GHG Emissions

- 2015 Large industrial emissions were 19 $MtCO_2e$ (M) total

Case	Upstream GHGs	Facility GHGs	Total GHGs
LNG Canada 2 Trains	2.27 M	1.8 M	4.07 M
Aggressive upstream electrification (-0.6 M)	1.67 M	1.8 M	3.47 M
Lower incremental BC gas supply (-1.86 M)	0.41 M	1.8 M	2.21 M
Aggressive upstream electrification and lower incremental BC gas supply (-1.97M)	0.3 M	1.8 M	2.1 M

GHG Emissions Forecast - Current Policy

No LNG and LNG Canada



Page 08 to/à Page 10

Withheld pursuant to/removed as

s.14

Warwick, Alexei ENV:EX

From: Peyman, Hurrian ENV:EX
Sent: Wednesday, March 21, 2018 12:21 PM
To: Plecas, Bobbi ENV:EX
Cc: Dobson, Neil ENV:EX; Lesiuk, Tim ENV:EX; Laaksonen-Craig, Susanna ENV:EX; Fradley, Adria N ENV:EX
Subject: RE: Climate effects of LNG Canada
Attachments: Climate effects of LNG Canada.docx

Hi,

I just spoke with Susanna and we decided to include one more question.

Let me know if you have any questions.

Hurrian

From: Peyman, Hurrian ENV:EX
Sent: Wednesday, March 21, 2018 9:30 AM
To: Plecas, Bobbi ENV:EX
Cc: Dobson, Neil ENV:EX; Lesiuk, Tim ENV:EX; Laaksonen-Craig, Susanna ENV:EX; Fradley, Adria N ENV:EX
Subject: Climate effects of LNG Canada

Hi,

As requested, please find attached a summary of the climate effects of LNG Canada in Q&A format. Please let me know if you have any feedback/revisions.

One caveat:

- When discussing the proposed facility and forecasted emissions, it's important to regularly include the qualifier "approximately" for two reasons:
    - In previous decks, some numbers had been "rounded" (e.g. According to environmental assessment, the first two trains from LNG Canada would have closer to 13 Mt LNG production rather than the 12 Mt production usually cited)
    - Modelled future emissions rely on different modelling runs which have slightly different assumptions. As a result, some data needed to be adjusted to compensate for the different assumptions.

Once again, let me know if you want to see any edits. If other questions come up on this, I'm reachable at 604 862-1996
s.22

Hurrian

Climate effects of LNG Canada

What are BC's current upstream oil and gas sector greenhouse gas emissions?

- In 2015, oil and gas sector upstream greenhouse gas (GHG) emissions were 11.5 million tonnes of carbon dioxide equivalent (Mt CO_2e)
- The large majority of these GHGs were from gas wells, batteries and processing plants (10.7 Mt CO2e) with the remainder coming from natural gas transmission (0.24 Mt CO2e) and oil refineries (0.58 Mt CO2e)
- Of these emissions, 6.8 Mt CO2e were from combustion, 0.6 Mt CO2e from flaring, 3.0 Mt CO2e from carbon dioxide and methane venting, 0.8 Mt CO2e from fugitives (methane leaks) and 0.2 Mt CO2e from process emissions

What are the upstream oil and gas sector GHGs expected to be in 2030 in the absence of LNG development?

- Modelling indicates that upstream emissions would be approximately 13.4 Mt CO2e in 2030. These would be from upstream oil and gas production (10 Mt CO2e), natural gas transmission (1.6 Mt CO2e) and oil refining (1.8 Mt CO2e).
- This increase in emissions in 2030 is largely due to higher forecasted natural gas production (31% above 2015 levels)
- Of these GHG emissions, approximately 9.8 Mt CO2e are from combustion, 2.0 Mt CO2e are from CO2 venting, 1.1 Mt CO2e are from methane venting and fugitives, 0.7 Mt CO2e are from process emissions

What are the expected emissions of the LNG Canada facility? How does its emissions intensity compare with other global LNG facilities?

- The first two production units ("trains") of LNG Canada will produce approximately 12 Mt of LNG at an emission intensity of 0.15 tonnes carbon dioxide equivalent for each tonne of LNG produced for total emissions of 1.8 Mt CO2e.
- According to independent research on leading LNG facilities, LNG Canada will have the lowest emissions intensity of any LNG export facility in the world.

What are the related upstream emissions from that facility

- The extraction, processing and transmission emissions associated with the LNG production would be approximately 2.27 Mt CO2e.

- This assumes that 75% of the feedstock gas would come from BC. (GHG emissions that occur in other jurisdictions to extract, process and transmit the feedstock gas are not included within BC's emissions inventory.)
- It is estimated that 25% of the gas production and processing for the LNG Canada plant would be electrified.

Is there any way to further mitigate the emissions that remain?

- Aggressive electrification could bring upstream emissions as low as 0.97 Mt CO2e.
- s.13

So, if facility emissions are 1.8 Mt CO2e and upstream (without aggressive electrification) are 2.27 Mt CO2e, is it fair to say that BC's emissions will be 4 Mt higher with an LNG facility?

- No. Modelling has shown that when BC produces natural gas for LNG production, it is offset by reductions in gas produced for other purposes, like pipeline export.
- Of the 1.5 billion cubic feet/day required to supply LNG Canada, only 20% of this comes from new production; the remainder is from gas diverted from pipeline exports or increased imports.
- Modelling has suggested that upstream emissions under LNG Canada would only increase by 0.3 Mt CO2e over a scenario where no LNG is produced

What are the downstream emissions (end use combustion) from the LNG from LNG Canada?

- End use GHG emissions depend on the efficiency of the power plant that is converting the LNG into electricity or heat. One meta-study found that each tonne of LNG would have approximately 2.66 tonnes CO2e emissions from end use combustion.
- If this LNG is displacing higher emission fuels like diesel or coal, there could be significant global lifecycle emission reductions from LNG Canada's exports.
- A recent study by the University of Calgary and M.I.T. determined that, pro-rated, 12 Mt of BC LNG (i.e. LNG Canada's output) would lead to 16 to 34 global lifecycle GHG emission reductions.