

CACOR's Pathways Study

## Canada's greenhouse gases

### How to set targets and then <u>hit</u> them

### Use a technologically coherent simulation model

Governments must "close the gap between rhetoric and reality".

What is required is "nothing short of a total transformation of the energy systems that underpin" our economies.

Fatih Birol, Executive Director, International Energy Agency

• This CACOR study provides a way of connecting rhetoric and reality, addressing the entire system.

It is an approach that must be adopted by the Government of Canada if it is to succeed in setting achievable targets and then actually hit them.

By **Pathway** is meant the sequence of actions needed to transform an energy system from its present state to a desired state at a given time in the future.

- This study shows how physically and technologically coherent pathways may be designed.
- Every jurisdiction responsible for energy policy needs to develop <u>its own feasible</u> <u>pathway</u> and put in place the programs to follow it.
- Circumstances change, sometimes quickly, for example,
  - Development of technologies more rapid than expected;
  - Failure of a policy tool to deliver what was expected.
- Progress along a pathway must be monitored regularly and adjustments made to policy and programs as necessary.

Governments, as Bill Gates puts it, have been tilting at windmills.

 $\circ~$  The weakness of the approach of the Canadian government is that its thinking is

rooted principally in just one discipline:

- economics.
- It needs to take a much broader, multidisciplinary approach:
  - to understand that the entire socioeconomic system must follow
    - physically and technologically coherent pathways.

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- Seventeen members made personal donations to this project.
- The research was conducted by Bastiaan Straatman, *whatIf? Technologies*
- The research was guided by a Pathways Team of members: Art Hunter, Catherine Smith, David Dougherty, David Pollock, Gordon Kubanek, John Hollins, Nigel Weir, Robert Hoffman, and Ted Manning.

✤ The Team adopted an <u>aggressive</u> approach.

• The Storyline and the Messages have been composed by the authors and editor of the report: Robert Hoffman, John Hollins and Catherine Smith.

# **Storyline**, 1 from CACOR's Pathways Study

- Canadian policy has repeatedly <u>failed</u> to meet Canada's commitments to reduced GHG emissions and is on track to continue to do so.
- Canadian policy is based on the <u>illusion</u> that targets for reductions in greenhouse gas emissions can be met primarily by incentivizing citizens and businesses to take the actions needed and that such actions can be financed by private investors and commercial lenders.

## Storyline, 2

- A new approach is needed, one that engages all stakeholders in understanding and committing to <u>biophysically and technologically coherent pathways</u> with detailed milestones to allow progress to be monitored and policies and programs adapted as need be.
- Canada will continue to fail to meet its commitments if it persists in producing more oil from sand and more gas by fracking. It simply does not add up.
- To support a new approach, there is a need for an <u>agency</u> at arms-length-fromgovernment\_to compile data and develop exploratory computer models and make them freely accessible to all stakeholders.

## **Messages** from CACOR's Pathways Study

The findings of this study using a powerful computer simulation model are presented in the body of the report, province by province:

- 73,000 data points;
- $\circ~$  Reports can be tailored by province and region.

These messages are *broad observations for general audiences* drawn from the findings by the authors and the editor of the report.

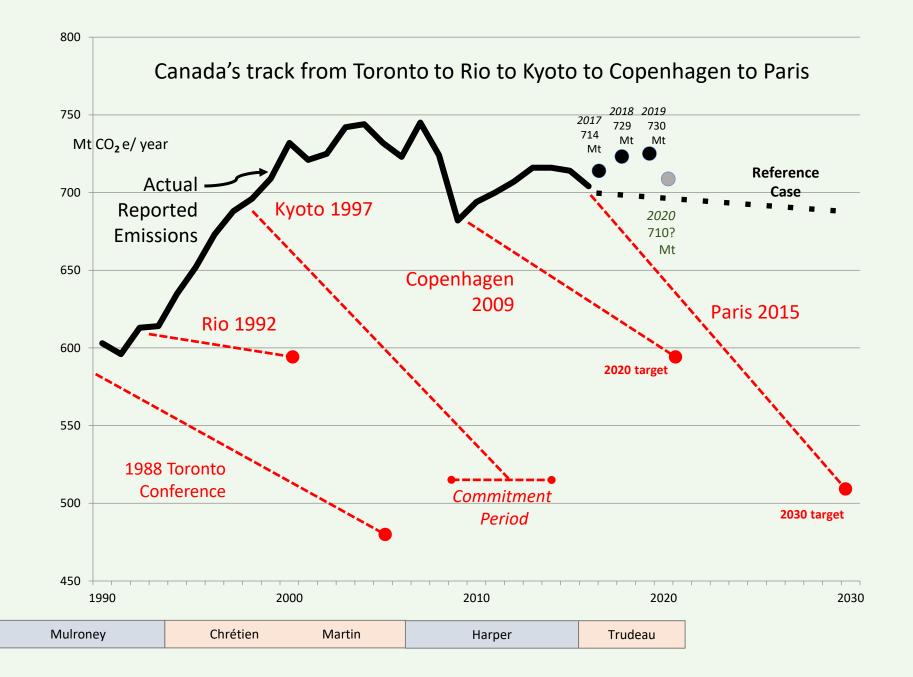
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12 140_REPERINCE SCENARIO     13 140_REPERINCE SCENARIO     14 140_REPERINCE SCENARIO	PE process PE agriculture NS transporta	0.3 0. 0.2 0. 5.9 5. 2.0 2.	1 0.3 2 0.2 5 5.5 1 2.1	0.3 0.3 0.2 0.2 5.7 5.7 2.3 1.7	0.3 0 0.2 0 5.8 5 16 1	0.3 0.3 0.2 0.2 0.4 5.5 1.6 1.9	0.3 0 0.2 0 5.3 5 2.0 1	3 0.3 2 0.2 1 5.1 9 2.1	03 03 02 03 58 55 23 26	0.3	0.3	0.3 0.3 0.1 0.1 4.9 4.9 1.6 1.6	0.3 0.1 4.5 1.5	0.3 0.1 4.5 1.5	0.3 0 0.1 0 4.4 4 1.4 1	3 03 1 01 3 43 4 13	0.3 0.1 4.2 1.3	0.3 0.1 4.1 1.2	0.3 0. 0.1 0. 4.1 4.1 1.2 1.	0.3	0.3 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.3 0.3 0.1 0.1 3.7 3.7 1.1 1.1	0.3 0.1 3.6 1.3	0.3 0.2 3.6 1.1	0.3 0 0.2 0 3.5 1 1.1 1	0.2 0.2 0.2 0.2 0.5 3.5 1.1 1.1	02 02 35	0.2 0 0.2 0 3.4 1 1.1 1	02 02 02 02 14 34 10 10	0.2 0.2 3.4 1.0	02 02 02 02 34 34 10 10	02 02 34 10	0.2 0.2 3.4 1.0	02 02 02 02 34 34 10 10	0.2 0.2 3.4 1.0	0.2 0 0.2 0 3.4 3 0.9 0	12 02 12 02 14 34 19 09	02 02 3.4 0.9	0.2 0 0.2 0 3.4 0 0.9 0	02 02 02 02 34 34 09 09	1 0.2 1 0.2 1 3.4 0 0.9	0.2 0.2 3.4 0.9	0.2 0. 0.2 0. 3.4 3. 0.9 0.	2 0.2 2 0.2 A 3.4 9 0.9	0.2 0.2 3.4 0.9	02 02 34 09	
15 140_REPRINCES DARIO 16 140_REPRINCES DARIO 17 140_REPRINCES DARIO 18 140_REPRINCES DARIO 19 140_REPRINCES DARIO	NS commercial NS otherindus NS oilGaiProd	0.8 11 0.8 01 0.4 01	0 0.8	1.0 1.0 0.7 0.8 0.7 0.6	0.9 0	0.8 0.9 0.5 0.7 0.4 0.4	0.8 0	6 0.7 5 0.4 5 0.6	0.8 0.3 0.5 0.5 0.7 0.6	0.8	0.7	0.7 0.6 0.5 0.5 0.5 0.3	0.6	0.6 0.4 0.2	0.6 0 0.4 0 0.2 0	6 0.6 4 0.4 1 0.1	0.6	0.5	0.6 0.1 0.4 0.4 0.1 0.1	0.6 0.4 0.1	0.6 0.4 0.1 0.1	0.6 0.6 0.4 0.4 0.1 0.1	0.6	0.6 0.4 0.1	0.6 0	0.5 0.5 0.4 0.4 0.1 0.1	0.5	0.5 0.4 0.0	0.5 0.5 0.4 0.4 0.1 0.1	0.5 0.4 0.1	0.5 0.5 0.4 0.4 0.1 0.1	0.5	0.5	0.5 0.5 0.4 0.4 0.4 0.1 0.1	0.5 0.4 0.1	0.5 0 0.4 0 0.1 0	0.5 0.5 0.4 0.4 0.1 0.1	05	0.5 0.4 0.1	05 05 04 04 04 01 01	0.5 0.4 0.1	0.5 0.4 0.1	0.5 0: 0.4 0: 0.1 0:	5 0.5 4 0.4 1 0.1	0.4 0.4 0.1	0.4	
40 140_REFERENCE SCENARIO 41 140_REFERENCE SCENARIO 42 140_REFERENCE SCENARIO	NS elicProd NS otherEnerg NS Fugitive NS process	0.5 0.1 0.0 0.1 0.2 0.1	9.9 7 0.7 0 0.0 1 0.2	87 93 05 08 00 00 02 02	0.7 0 0.0 0 0.2 0	7.3         8.2           0.7         0.7           0.1         0.1           0.2         0.2	0.5 0 0.1 0 0.2 0	6 0.6 1 0.1 1 0.1	0.8 0.3 0.0 0.6 0.2 0.3	0.0 0.0	0.1 0.0 0.2	5.9 5.9 0.1 0.0 0.0 0.0 0.2 0.2	0.0 0.0 0.2	0.0 0.0 0.2	4.8 3 0.0 0 0.0 0 0.2 0	3 33 0 0.0 0 0.0 2 0.2	0.D 0.D 0.2	0.0 0.0 0.2	0.0 01 0.0 01 0.0 01 0.2 01	0.0 0.0 0.2	0.0 0 0.0 0 0.2 0	0.0 0.0 0.0 0.0 0.2 0.2	0.0	0.0 0.0 0.2	0.0 0 0.0 0 0.2 0	10 00 00 00 02 02	0.0 0.0 0.2	0.0 0 0.0 0 0.2 0	00 00 00 00 00 00 02 02	0.0 0.0 0.2	0.0 0.0 0.0 0.0 0.3 0.3	0.0	0.0 0.0 0.3	0.0 0.0 0.0 0.0 0.0 0.0 0.3 0.3	0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	12 12 10 0.0 10 0.0 13 0.3	0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.3 0.3	0 0.0 0 0.0 8 0.3	0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1 11 0 0.0 0 0.0 3 0.3	0.0 0.0 0.3	0.0	
43 140_REPERENCESCENARIO 44 140_REPERENCESCENARIO 45 140_REPERENCESCENARIO 46 140_REPERENCESCENARIO	NS agriculture NB transporta NB residential NB commercial	0.3 0. 5.4 5. 1.0 0.5	2 0.2 3 5.3 9 0.9 8 0.7	03 03 51 52 10 09 08 08	0.3 0 5.3 5 0.9 0 0.7 0	0.3 0.3 6.1 5.0 0.8 0.9 0.6 0.7	0.3 0 4.7 4 1.0 0 0.6 0	3 03 3 47 9 10 5 05	03 03 59 53 11 14 0.6 0.6	0.3 4.2 0.7 0.6	0.2 3.9 0.8	0.2 0.2 4.1 4.6 0.9 0.9 0.6 0.5	0.2 4.2 0.8 0.5	0.2 4.1 0.8 0.5	0.2 0 4.1 4 0.9 0 0.5 0	2 0.2 0 3.9 9 0.9 5 0.5	0.2 3.8 0.9 0.5	0.2 3.8 0.9 0.5	0.2 0.3	0.2 3.6 1.0 0.5	0.2 0 3.5 1.0 0.5 1	0.2 0.2 3.5 3.4 1.0 1.0 0.5 0.5	0.2 3.4 1.0 0.4	0.2 3.3 1.0 0.4	0.2 0	0.2 0.2 0.3 3.3 1.0 1.0 0.4 0.4	0.2 3.3 1.0 0.4	0.2 0	02 02 12 32 10 10	0.2 3.2 1.0 0.4	0.2 0.2 3.3 3.3 1.0 1.0 0.4 0.4	0.2 3.3 1.0 0.4	0.2 3.3 1.0 0.4	0.2 0.2 3.3 3.3 1.0 1.0 0.4 0.4	0.2 3.3 0.9 0.4	0.2 0 3.3 3 0.9 0 0.4 0	02 02 03 03 09 09 04 04	0.2 3.4 0.3	0.2 3.4 0.9	02 02 34 34 09 09 04 04	2 0.2 3.4 9 0.9 4 0.4	0.2 3.4 0.9 0.4	0.2 0. 3A 3. 0.9 0. 0.4 0.	2 0.2 A 3.4 9 0.9 A 0.4	0.2 3.4 0.9	0.2 3.4 0.9	
47 140_REFERENCE SCENARIO 48 140_REFERENCE SCENARIO 49 140_REFERENCE SCENARIO	NB otherindus NB oliGaProd NB electrod NB otherEnerg	2.0 1) 0.0 0) 9.9 9)	8 1.8 0 0.0 8 9.0	1.7 1.5 0.0 0.0 10.0 10.1	13 1 0.0 0 9.5 1	13 14 00 01 72 73	11 1 01 0 6.6 6	0 12 1 01 2 44	12 16 02 02 4.4 4.3	11 0.0 4.3	11 0.0 5.1	11 10 0.0 0.0 4.7 4.7	1.0 0.0 5.3	1.0 0.0 5.1	0.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	9 0.9 0 0.0 2 3.1	0.9	0.9	0.9 0.0	0.9	0.9	0.9 0.9 0.0 0.0 2.7 2.7	0.9	0.9 0.0 2.8	0.9 0	0.9 0.9 0.0 0.0 2.8 2.7	0.9	0.9 0.0	19 0.9 00 0.0 17 2.6	0.9 0.0 2.6	09 0.9 0.0 0.0 22 2.2	0.9	0.9 0.0 1.7	0.9 0.9 0.0 0.0 1.4 1.2	0.9 0.0 1.2	05 0 00 0 12 1	0.9 0.9 0.0 0.0 1.1 1.1	0.9 0.0 1.1	0.9 0.0 1.1	09 09 00 00 11 11	0.0	0.9 0.0 1.1	0.9 0: 0.0 0) 1.1 1.	9 0.9 0 0.0 1 1.1	0.9 0.0 1.1	0.9	
50 140_REPRINCESCIMARO 51 140_REPRINCESCIMARO 52 140_REPRINCESCIMARO 53 140_REPRINCESCIMARO 54 140_REPRINCESCIMARO	NB fugtive NB proces NB agriculture	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1 9 0 0.0 3 0.3 2 0.2	0.0 0.0 0.3 0.3 0.2 0.2	0.0 00 00 00 00 00 00 00 00 00 00 00 00	18 00 00 03 03 02 03	0.1 0 0.3 0 0.3 0	0 0.0 3 0.3 2 0.2	0.0 0.0 0.3 0.3 0.2 0.2	1.5 0.0 0.0 0.2	0.0 0.3 0.2	0.0 0.0 0.3 0.3 0.2 0.2	0.0 0.3 0.2	0.0 0.3 0.2	0.0 0 0.3 0 0.2 0	0 0.0 3 0.3 2 0.2	0.0 0.3 0.2	0.0 0.3 0.2	0.0 0.1 0.3 0.1 0.2 0.1	0.0 0.0 0.3 0.2	0.0 0.3 0.2	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.3 0.2	0.0 0.3 0.2	0.0 00 00 00 00 00 00 00 00 00 00 00 00	00 00 03 03 02 02	0.0 0.3 0.2	0.0 00 00 00 00 00 00 00 00 00 00 00 00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.3 0.2	00 00 03 03 02 02	0.0 0.3 0.2	0.0 0.3 0.2	0.0 0.0 0.3 0.3 0.2 0.2	0.0 0.0 0.3 0.2	00 00 03 0 02 0	00 00 03 03 02 02	0.0 0.3 0.2	0.0 0.3 0.2	0.0 0.0 0.3 0.3 0.2 0.2	0 00 0 00 0 03 0 02	00 03 02	0.0 00 0.3 0. 0.2 0.	0 00 3 03 2 02	0.0 0.3 0.2	0.0 0.2 0.2	
55 140_REFERENCE SCENARIO 56 140_REFERENCE SCENARIO 57 140_REFERENCE SCENARIO	QUE transporta QUE residential QUE commercial QUE otherindus	8.1 7. 5.7 5.	6 332 5 79 6 61	34.2 35.2 8.2 8.4 6.9 5.8 12.3 12.7	35.4 34 7.4 6 5.4 4	1.8 363 59 73 17 47	36.9 36 6.6 6 4.3 5 11.5 11	0 357 3 57 3 5.1 9 10.8	37.7 37.4 5.8 5.3 5.2 4.3 10.0 10.3	365 54 48	34.7 3 5.6 5.9 10.8 1	4.3 34.0 5.5 5.5 6.0 6.2 0.6 10.6	333 55 61 91	33.3 1 55 62 91	33.0 32 5.5 5 6.2 6 9.0 9	7 32A 5 55 3 63 0 89	32.0 5.5 6.4 8.9	317 3 54 64 89	13 30: 5.4 5/ 6.4 6:	30.6 5.4 6.5 8.8	30.2 2 5.4 5 6.6 5	9.8 29.6 5.4 5.4 6.6 6.7 8.8 8.8	29.3 5.4 6.7	29.2 5.4 6.8 8.9	29.0 21 5.4 5 6.8 6	19 28.9 54 5.4 59 6.9	28.9 5.4 7.0 8.9	28.9 21 5.4 5 7.0 1 8.9 0	19 290 A 5.4 1 71 10 90	29.2 5.4 7.2 9.0	293 295 54 54 72 72 90 90	29.7 5.4 7.3	29.9 3 5.4 7.3 9.0	0.1 30.2 5.4 5.4 7.4 7.4 8.0 9.0	30.4 5.4 7.4	30.6 30 5.4 5 7.5 7 9.0 9	0.8 30.9 5.4 5.4 7.5 7.5 8.0 9.0	311 5.4 7.6 9.0	31.3 3 5.4 7.6 9.0	11.4 31.6 5.4 5.4 7.6 7.6 9.0 9.0	5 31.7 5 5.4 5 7.7 9.0	315 54 77 90	32.0 32. 5.4 5. 7.7 7. 9.0 9.	2 323 A 5.4 7 7.8 0 90	32.4 5.4 7.8 9.0	32.6 5.4 7.8 9.1	
58 140_REFERENCE SCENARIO 59 140_REFERENCE SCENARIO 60 140_REFERENCE SCENARIO	QUE oliGesProd QUE elecProd QUE otherEnerg	0.1 0. 0.8 0. 3.5 3.	2 0.3 5 0.6 5 3.8	0.4 0.3 1.8 1.5 4.1 4.2	0.3 0	0.3 0.3 0.3 0.7 4.5 4.6	0.3 0 0.2 0 4.4 4	2 0.2 A 0.2 J 3.8	0.2 0.2 0.0 0.6 4.4 4.3	0.3 0.0 4.3	0.4 0.0 5.2	0.4 0.3 0.0 0.0 4.8 4.6	0.2 0.0 4.5	0.3 0.0 4.6	0.3 0 0.0 0 4.6 4	3 0.3 0 0.0 7 4.7	0.3 0.0 4.7	0.3 0.0 4.8	0.3 0. 0.0 0.1 4.8 4.1	0.3 0.0 4.8	0.3 0.0 4.8	0.3 0.3 0.0 0.0 4.8 4.8	0.3	0.3 0.0 4.8	0.3 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.3 0.4 0.0 0.0 4.8 4.8	0.4 0.0 4.8	0.4 0 0.0 0 4.8 4	0.4 0.4 0.0 0.0 1.8 4.8	0.4 0.0 4.9	0.4 0.4 0.0 0.0 4.9 4.9	0.4	0.4 0.0 4.9	0.4 0.4 0.0 0.0 4.9 4.9	0.4 0.0 4.9	0.4 0 0.0 0 4.9 4	0.4 0.4 0.0 0.0 4.9 4.9	0.4 0.0 4.9	0.4 0.0 4.9	0.4 0.4 0.0 0.0 4.9 4.9	4 0.4 0 0.0 9 5.0	0.4 0.0 5.0	0.4 0 0.0 0 5.0 5	A 0.4 D 0.0 D 5.0	0.4 0.0 5.0	0.4 0.0 5.0	
61         140_REFRINCE SCENARIO           62         140_REFRINCE SCENARIO           63         140_REFRINCE SCENARIO           64         140_REFRINCE SCENARIO	GUE Fugtive GUE process QUE agriculture ONT transporta	7.5 8. 4.0 32 55.8 542	0.1 2 8.5 9 3.8 9 56.1	8.6 8.3 4.2 4.5 57.7 59.3		19 95 18 49 10 597	9.4 9 5.0 4 58.8 58	0 93 5 5.0 4 60.4	91 95 49 43 62.8 603	9.3 9.4.9 63.4		9.6 9.5 4.2 4.4 9.8 59.3	9.7 4.4 58.7	9.8 4.4 58.7 1	9.9 10 4.4 4 58.5 58	0 10.0 5 4.5 3 58.0	10.0 4.5 57.5		0.1 0. 10.1 10 4.6 41 16.5 552		10.2 1 4.7 54.9 5	0.3 10.3 4.7 4.7 4.3 53.9	10.4 4.8 53.4	10.4 4.8 53.2	10.5 10 4.8 4 52.9 51	0.5 10.6 4.9 4.9 2.7 52.6	10.6 4.9 52.7	10.7 10 4.9 4 52.7 52	19 5.0 19 53.1	10.8 5.0 53.3	10.9 10.9 5.0 5.0 53.5 53.8	10.9 5.1 54.1	10.9 1 5.1 54.5 5	0.9 11.0 5.1 5.1 4.8 55.2	0.1 11.0 5.1 55.5	11.0 11 5.2 5 55.8 54	1.0 11.0 5.2 5.2 6.2 56.5	11.0 5.2 56.8	0.1 11.0 1 5.2 57.1 5	0.1 0.1 110 110 5.3 5.3 57.4 57.7	0 11.1 8 5.3 7 58.0	11.1 5.3 58.3	0.1 0. 11.1 11. 5.3 5. 58.6 58.	1 0.1 1 111 3 5.4 9 592	0.1 11.1 5.4 59.4	0.1 11.1 5.4 59.7	
	ONT residential ONT commercial ONT otherindue ONT oliGaiProd	20.1 183 13.3 131 20.7 193	8 13.2	21.6 20.3 13.8 13.0 19.8 21.8 3.0 2.7	12.8 11	0.4 21.4 1.4 11.9 0.8 19.9	21.4 19 11.9 11 19.0 16	9 19.5 3 11.0 0 16.1	20.8 18.5 10.9 9.5 15.9 16.5 15. 15	20.7 113 16.6	24.2 2 14.9 1 14.7 1	3.0 20.9 4.2 14.3 5.7 16.4 2.6 1.5	19.6 14.4 13.9	19.7 1 14.4 1 13.7 1	19.8 19 14.5 14 13.5 13 1.8 1	9 19.9 6 14.6 4 13.3 8 1.8	19.9 14.6 13.2	19.9 1 14.6 1 13.1 1	19.9 19.1 14.7 14.1 13.0 13.1	19.8 14.8 13.0	14.8 1	9.8 19.8 4.9 14.9 2.8 12.8 1.8 1.8	19.8 15.0 12.8	19.8 15.0 12.7	19.8 11 15.0 15 12.7 11	9.8 19.9 5.1 15.1 2.7 12.7 1.9 1.9	19.9 15.1 12.7	20.0 20 15.2 15 12.7 12	0.0 20.0 1.2 15.2 1.8 12.8 1.9 1.9	20.0 15.3 12.8	20.0 20.0 15.3 15.3 12.8 12.8 19 19	20.1 15.3 12.7	20.1 2 15.4 1 12.7 1	0.1 20.1 5.4 15.4 2.7 12.7 1.9 1.9	20.1 15.4 12.6	20.1 20 15.4 15 12.6 12	0.1 20.2 5.5 15.5 2.6 12.6	20.2 15.5 12.6	20.2 20 15.5 11 12.6 11	20.2 20.2 155 155 126 126	20.3 5 15.5 5 12.6	20.3 15.5 12.6	20.3 20. 15.5 15. 12.6 12.	3 20.3 5 15.5 7 12.7 9 1.9	20.3 15.5 12.7	20.4 15.5 12.7	
140_REPRINCESCEMARD     140_REPRINCESCEMARD     140_REPRINCESCEMARD     140_REPRINCESCEMARD     140_REPRINCESCEMARD     140_REPRINCESCEMARD     140_REPRINCESCEMARD	ONT electroid ONT otherEnerg ONT fugitive	35.2 343 9.0 9. 1.4 11	5 33.8 1 9.5 5 1.1	34.4 25.1 9.2 10.5 1.1 0.9	27.0 23 9.1 1 1.1 1	8.3 25.8 0.1 9.1 1.1 1.0	21.9 10 8.9 8 0.9 0	5 14.6 1 8.7 5 0.5	7.9 7.4 8.6 8.3 0.5 0.5	5.3 7.5 0.5	5.0 6.8 0.7	49 4.1 6.8 6.5 0.7 0.5	3.9 7.3 0.5	4.2 7.2 0.5	3.9 4 7.1 7 0.5 0	1 4.6 0 6.9 5 0.5	4.4 6.7 0.5	43 67 05	42 4. 66 65 05 05	4.3 6.4 0.5	4.4 6.3 0.5	4.5 4.5 6.3 6.2 0.5 0.5	45 6.2 0.5	4.2 6.1 0.6	4.3 4 6.1 6 0.6 0	4.3 4.4 5.0 6.0 5.6 0.6	4.4 5.9 0.5	4.5 4 5.9 5 0.5 0	15 45 19 59 16 0.6	4.5 5.8 0.6	45 45 58 58 05 05	45	4.6 5.8 0.6	4.6 4.6 5.7 5.7 5.7 0.7	4.6 5.7 0.7	4.6 4 5.7 5 0.7 0	4.6 4.6 5.7 5.7 5.7 0.7	4.7 5.6 0.7	4.7 5.6 0.7	4.7 4.7 5.6 5.6 0.7 0.7	4.7 5.6 7 0.7	4.7 5.6 0.7	4.8 4. 5.6 5. 0.7 0.	8 4.8 6 5.5 7 0.7	4.8 5.5 0.7	4.8 5.5 0.7	
73 140 REFERENCE SCENARIO 74 140 REFERENCE SCENARIO 75 140 REFERENCE SCENARIO	ONT process ONT agriculture MAN transporta MAN residential	5.7 51 5.1 51 1.5 1.	5 5.4 5 5.0 1 1.4	201 223 59 62 53 56 13 13	5.6 S 1.2 1	1A 212 5A 65 56 55 10 11	213 16 64 6 54 5 12 1	2 172 0 63 7 59 1 11	178 173 62 53 62 73 12 13	61 68 13	16.7 1 5.8 6.9 1.4	5.6 17.1 5.4 5.6 6.3 6.5 1.2 1.1	5.7 6.4 0.9	5.8 6.4 1.0	170 17 5.9 6 6.4 6 1.0 1	0 170 0 60 4 64 1 11	6.1 6.4 1.1	61 64 12	62 6. 63 6. 12 1.	63 62 12	6.4 0 6.2 0 1.2	74 174 64 65 61 61 13 13	65 61 13	6.5 6.1 1.3	176 1 6.6 6 6.1 6 1.3 1	7.6 17.8 6.6 6.7 6.1 6.1 1.3 1.3	6.7 6.1 1.4	6.7 6 6.2 6 1.4 1	12 183 18 68 12 63 14 14	6.8 6.3 1.4	184 184 6.8 6.9 6.4 6.4 1.4 1.4	18A 6.5 1.4	18.4 1 6.9 6.6 1.4	8A 18A 7.0 7.0 6.6 6.7 1.4 1.4	7.0 6.8 1.4	71 7 68 6 15 1	18.3         18.5           7.1         7.1           5.9         7.0           1.5         1.5	7.2 7.0 1.5	183 1 72 71 15	18.5         18.5           7.2         7.2           7.1         7.2           1.5         1.5	1876 173 172 1515	73 73 73 15	18.6 18. 7.3 7. 7.3 7. 1.5 1.	7 18.7 3 7.4 A 7.4 5 1.5	7.4 7.4 7.4 1.5	7.4 7.5 1.5	
76         140_REPREDICESCENARIO           77         140_REPREDICESCENARIO           78         140_REPREDICESCENARIO           79         140_REPREDICESCENARIO	MAN commercial MAN otherindus MAN oliGazProd MAN electrod	1.7 1.1 1.3 1.1 0.9 0.1 1.0 0.1	5 1.6 3 1.5 6 0.7 5 0.5	15 15 14 16 05 05 07 04	14 1 18 1 0.6 0 0.5 0	13 14 17 19 07 06 04 05	15 1 2.0 1 0.4 0 0.4 0	A 12 8 17 2 01 2 01	13 12 15 18 01 03 01 03	15 1.8 0.2 0.1	17 17 03 01	14 13 19 19 03 03 01 01	13 19 03 01	13 19 03 01	1.3 1 1.9 1 0.2 0 0.1 0	3 13 9 19 2 02 0 00	13 19 02 0.0	13 19 02 00	13 1. 19 1. 0.2 0. 0.0 0.	1.3 1.9 0.2 0.0	13 19 02 0 00	1.3 1.3 1.9 1.9 0.2 0.2 0.0 0.0	13 19 02 00	1.3 1.9 0.2 0.0	13 1 19 1 02 0 00 0	13 13 19 19 02 03 00 00	13 19 03 00	13 1 19 1 03 0 00 0	13 13 19 19 13 03 10 00	1.4 1.9 0.3 0.0	14 14 19 19 03 03 00 00	14 19 03 00	1.4 1.9 0.3 0.0	1A 1A 19 19 03 03 00 00	14 19 03 00	1A 1 19 1 03 0 00 0	1.4 1.4 1.9 1.9 1.3 0.3 1.0 0.0	1.4 1.9 0.3	14 19 03 00	1A 1A 20 20 03 03 00 00	1 1 A 2 D 8 0.3 0 0.0	1.4 2.0 0.3 0.0	1.4 1. 2.0 2. 0.3 0. 0.0 0.	A 1.4 0 2.0 3 0.3 0 0.0	1.4 2.0 0.3 0.0	1.4 2.0 0.3 0.0	
10         140_REPREDICE SCIMARIO           81         140_REPREDICE SCIMARIO           82         140_REPREDICE SCIMARIO           81         140_REPREDICE SCIMARIO           81         140_REPREDICE SCIMARIO	MAN otherEnerg MAN fugtive MAN process	1.2 1. 0.4 0. 2.8 2.	2 1.2 3 0.3 4 2.5	1.3 1.4 0.2 0.3 2.7 2.7 2.4 3.6	14 1 0.3 0 2.1 1	1.3 1.5 0.3 0.3 2.4 2.7	1.6 1 0.2 0 2.7 2 4.0 3	2 1.2 1 0.1 7 2.7	1.3 1.5 0.1 0.2 2.4 2.4	15 02 30	1.6 0.3 2.7	14 15 03 03 30 30	13 02 27	1.4 0.2 2.7	1A 1 02 0 27 2	4 1.4 2 0.2 7 2.8 4 3.5	1.4 0.2 2.8	1.4 0.2 2.8	15 13 02 03 28 23	1.5 0.2 2.8	1.5 0.2 2.8	1.5 1.5 0.2 0.2 2.8 2.8 9.7 3.7	15 02 28	1.5 0.2 2.8	15 1 0.2 0 2.8 1	15 15 02 02 28 28	15 02 28	15 1 02 0 28 1	15 15 02 02 18 28	15 03 28	15 15 03 03 28 28 41 43	1.5 0.3 2.8	15 03 2.8	15 15 03 03 28 28	15 03 28	15 1 03 0 28 2	15 15 13 03 27 27	15 03 27	1.5 0.3 2.7	15 15 03 03 27 27 45 45	15 0.3 7 2.7	15 03 27 46	15 1. 0.3 0. 2.7 2. 4.6 4	5 15 3 03 7 27 6 46	15 03 2.7	15 03 27	
84 140 REPRENCESCINARO 85 140 REPRENCESCINARO 86 140 REPRENCESCINARO 87 140 REPRENCESCINARO 87 140 REPRENCESCINARO	SASK transportal SASK residential SASK commercial	5.7 5) 2.0 2) 1.7 1)	6 61 0 20 5 1.9	6.6 6.6 1.8 1.7 1.8 1.5	6.8 7 1.6 1 1.5 1	73 77 17 16 14 13	8.1 8 1.7 1 1.4 1	6 93 8 19 6 1.4	8.8 94 1.8 1.8 1.3 1.3	10.4 2.0 1.2	10.1 1 2.0 1.3	0.0 95 1.9 1.8 1.3 1.4	9.8 1.5 1.4	9.9 1 15 14	10.0 10 1.6 1 1.4 1	1 10.1 6 1.6 4 1.4	10.1 1.6 1.5	10.1 1 1.6 1.5	10.1 100 1.7 1 1.5 1.5	10.0 1.7 1.5	99 17 15	9.8 9.7 1.8 1.8 1.5 1.5	9.6 1.8 1.5	9.6 1.8 1.5	9.6 9 1.8 1 1.6 1	95 95 18 18 16 16	95 19 16	9.6 9 1.9 1 1.6 1	16 97 19 19 16 16	9.7 1.9 1.6	98 99 20 20 16 1.7	10.0 2.0 1.7	10.1 1 2.0 1.7	02 103 20 20 1.7 1.7	10.4 2.0 1.7	10.4 10 2.1 2 1.7 1	05 10.6 2.1 2.1 1.7 1.7	107 2.1 1.7	10.8 10 2.1 1.7	108 109 21 21 18 18	9 11.0 1 2.1 8 1.8	110 2.2 1.8	11.1 11. 2.2 2. 1.8 1.	1 112 2 22 8 1.8	112 2.2 1.8	11.3 2.2 1.8	
88 140_REFERENCE SCINARIO 89 140_REFERENCE SCINARIO 90 140_REFERENCE SCINARIO	SASK otherindur SASK oliGaiProd SASK elecProd SASK otherEnerg	2.6 2. 4.4 30 17.3 173 4.0 3.	3 2.5 6 3.9 9 17.1 7 3.6	23 23 40 42 175 172 38 38	2.2 1 5.6 1 16.1 15 4.0 1	1.7         2.8           5.1         5.2           5.1         16.3           1.9         4.5	2.6 2 5.5 5 15.6 16 4.6 4	0 2.2 7 5.2 4 16.9 5 4.8	2.8 2.8 4.6 4.5 17.3 17.5 4.8 5.3	2.8 4.8 18.0 5.9	2.8 9.0 17.4 1 7.1	2.6 3.7 9.4 8.7 8.7 19.0 7.0 5.8	3.1 8.4 17.3 5.7	3.1 8.8 17.4 1 5.8	3.1 3 8.6 8 17.3 15 5.9 5	0 3.0 5 8.4 2 14.5 9 6.0	3.0 8.3 13.0 6.1	3.0 8.2 13.1 1 6.1	3.0 31 8.1 81 13.2 121 6.2 6.	3.0 7.9 10.5 6.3	3.0 8.1 10.6 6.3	3.0 3.0 7.7 7.8 5.2 4.9 6.3 6.3	3.0 7.7 4.8 6.4	3.0 7.8 4.8 6.4	3.0 1 7.7 1 4.8 4 6.4 6	10 30 78 79 48 49 54 64	3.0 7.5 4.8 6.5	2.9 2 7.6 1 4.9 2 6.5 0	19 29 15 76 12 22 15 65	2.9 7.7 2.2 6.5	29 29 77 77 22 22 65 65	2.9 7.7 2.2 6.6	2.9 7.7 2.2 6.6	2.9 2.9 7.7 7.7 2.2 2.2 5.5 6.6	2.9 7.7 2.2 6.6	29 2 7.6 7 22 2 6.6 6	2.8 2.8 7.6 7.6 2.2 2.2 5.6 6.6	2.8 7.5 2.2 6.6	2.8 7.5 2.2 6.6	28 28 75 74 22 22 65 65	8 2.8 1 7.4 1 2.2 5 6.6	28 74 22 65	2.8 2: 7.3 7. 2.2 2. 6.6 6:	8 28 3 72 2 22 6 66	2.8 7.2 2.2 6.6	28 7.1 2.2 6.6	
11         140_REFERENCE SCENARIO           12         140_REFERENCE SCENARIO           13         140_REFERENCE SCENARIO           141         REFERENCE SCENARIO	SASK otherEnerg SASK fugitive SASK procea SASK agriculture ALTA transporta	5.1 51 4.5 31 5.2 41	0 45 9 33 9 50	47 49 42 45 57 63	4.9 4 4.8 4 6.5 7	1.8 4.6 1.2 4.2 7.0 6.9	4.8 4 5.1 4 6.8 6	5 43 8 45 2 62	4.2 4.4 4.8 5.4 6.0 5.4	43 63 58	4.5 5.7 5.5	42 38 60 63 54 56	45 63 59	4.6 6.3 5.9	4.7 4 6.3 6 6.0 6	7 4.7 3 6.4 0 6.0	4.7 6.4 6.1	4.8 6.4 6.1	4.8 41 6.4 67 6.2 6.	4.9 6.4 6.3	5.0 6.4 6.4	5.0 5.0 6.4 6.4 6.5 6.6	5.1 6.4 6.7	5.1 6.4 6.7	52 1 64 6 68 6	52 53 54 64 59 69	5.3 6.4 7.0	5.4 5 6.4 6 7.0 1	A 5.5 A 6.4 1 7.2	5.5 6.4 7.3	56 5.6 64 6.4 73 7.4	55 6.4 7.5	5.5 6.4 7.5	5.4 5.4 5.4 6.4 7.5 7.6	53 64 77	53 5 64 6 73 7	52 52 54 64 78 78	51 64 79	5.1 5.4 7.9	5.0 5.0 6.4 6.4 8.0 8.0	0 4.9 6.4 0 8.1	4.9 6.3 8.1	4.8 41 6.3 6: 8.1 8.	8 4.7 3 6.3 2 8.2	4.7 6.3 8.2	4.5 6.3 8.3	
95         140_REFERENCE SCENARIO           96         140_REFERENCE SCENARIO           97         140_REFERENCE SCENARIO	ALTA residential ALTA commercial ALTA otherindus	8.4 7. 5.5 5. 12.4 11.	8 8.1 1 5.8 3 10.3	8.4 8.2 6.4 6.0 10.1 9.7	7.5 7 5.4 5 10.3 10	7.6 9.0 5.2 5.3 5.7 10.6	8.8 8 5.4 5 10.7 10	6 83 A 5A 0 10.9	8.8 8.7 5.2 5.2 12.7 13.3	9.0 6.6 14.3	9.6 7.3 13.7 1	87 75 65 71 29 125	8.2 7.0 12.8	83 7.0 12.9 1	8A 8 7.0 7 13.0 13	6 8.8 0 7.0 2 13.2	8.9 6.9 13.4	90 69 13.7 1	9.1 9. 6.9 6. 13.7 13.1	9.3 6.9 13.8	9.4 6.9 13.9 1	9.5 9.6 7.0 7.0 5.9 13.9	9.7 7.0 14.0	9.8 7.0 14.0	9.9 10 7.0 1 14.0 14	0.0 10.1 7.0 6.9 6.1 14.1	10.1 6.9 14.1	10.2 10 6.9 6 14.2 14	13 104 19 6.9 13 143	10.4 6.9 14.4	10.5 10.6 7.0 7.0 14.4 14.4	10.7 7.0 14.4	10.8 1 7.0 14.4 1	7.0 7.0 4.4 14.4	11.0 7.0 14.5	11.1 11 7.0 7 14.5 14	12 112 70 7.0 45 14.6	11.3 6.9 14.6	6.9 1 14.7 1	11.4 11.4 6.9 6.9 14.7 14.7	115 6.9 7 14.8	11.5 6.9 14.8	11.6 111 6.9 6 14.8 14	9 6.8 9 14.9	11.7 6.8 15.0	11.7 6.8 15.0	
38         140_REPRINCESCIMANO           99         140_REPRINCESCIMANO           100         140_REPRINCESCIMANO           101         140_REPRINCESCIMANO           102         140_REPRINCESCIMANO           102         140_REPRINCESCIMANO	ALTA oliKiasProd ALTA ekcProd ALTA otherEnerg ALTA fugities	36.3 383 48.5 48 7.9 71 41.8 39	46A 5 7A 4 37.0	42.4 40.9 44.5 44.5 9.0 8.8 36.8 36.8	39.1 44 44.8 45 8.9 5 35.5 37	1.2 42.5 5.6 45.8 9.6 9.5 7.1 37.6	42.3 42 43.1 42 9.7 8 36.4 34	8 440 6 414 6 92 8 339	44.9 50.3 39.4 37.4 9.4 9.4 33.9 36.4	37.4 10.5 37.8	37.8 3	1.8 68.8 7.9 38.8 1.1 10.7 9.9 37.2	70.8 33.1 11.9 40.0	74.1 30.7 12.2 42.0	75.5 77 29.8 27 12.4 12 42.9 42	9 80A 2 263 6 127 6 41.8	82.8 25.9 12.9 41.1	25.0 2	15.9 87.1 14.4 24. 13.1 13. 19.8 39.	88.7 23.5 13.3 39.5	89.4 8 21.3 1 13.3 1 39.7 3	94 90.2 63 11.8 34 13.4 9.7 39.8	91.7 7.7 13.5 40.1	93.4 7.7 13.5 40.5	94.4 91 7.7 1 13.6 11 40.9 41	7.8 7.8 7.7 13.7 1.3 41.6	94.9 7.9 13.8 41.9	7.6 1 13.9 14 42.2 41	7 94.6 7 7.9 10 14.1 16 42.9	94.4 8.0 14.2 43.2	94.3 95.0 81 81 14.4 14.4 43.6 43.8	95.8 8.1 14.5 44.0	96.2 9 8.2 14.6 1 44.2 4	6.6 97.0 8.2 8.2 4.7 14.8 4.4 44.5	97.4 8.2 14.9 44.6	97.7 98 8.3 8 15.0 15 44.7 44	8.0 98.3 8.3 8.3 5.1 15.2 8.8 44.9	98.5 8.3 15.3 45.0	98.7 9 8.4 1 15.4 1 45.1 4	08.9 99.0 8.4 8.4 15.5 15.6 15.2 45.2	8 99.1 8 8.4 8 15.7 8 45.3	84 157 453	99.3 99. 8.5 8: 15.8 15: 45.3 45.	A 995 5 85 9 160 A 45A	99.5 8.5 16.0 45.4	85 161 45.4	
103 140_REFERENCE SCENARIO 104 140_REFERENCE SCENARIO 105 140_REFERENCE SCENARIO	ALTA process ALTA agriculture BC transporta BC residential	5.9 5. 14.0 13	3 5.1 4 12.7 2 21.3 8 4.6	5.4 5.7 14.3 15.4 23.0 23.5 4.3 4.3	5.7 5 15.3 13 22.7 21 4.7 4	5.7 5.7 5.5 15.1 1.2 22.7 1.8 4.8	62 5 151 13 224 21 47 4	A 6.1 2 13.8 6 22.3 6 3.9	6.4 6.8 13.2 12.3 21.2 22.6 4.7 4.4	7.0 13.5 22.2 4.5	7.0 13.0 1 22.7 2 4.4	7.0 6.7 2.5 13.1 2.8 22.9 4.3 4.4	6.8 13.1 22.1 4.2	6.8 13.3 1 22.0 1 4.2	6.9 7 13.5 13 21.9 21 4.4 4	0 7.0 8 14.1 8 21.7 5 4.5	71 143 215 47	71 145 1 214 2 48	7.2 7. 14.8 15/ 11.1 20: 4.8 4/	7.3 15.2 20.7	73 154 1 205 2 49	7.4 7.4 5.7 15.9 0.2 20.0 5.0 5.0	75 16.1 19.8 5.1	7.5 16.3 19.8 5.1	75 1 165 16 197 11 52 1	7.5 7.5 6.7 16.9 9.8 19.8 5.2 5.2	7.5 17.0 19.9 5.3	7.7 1 17.2 1 20.0 20 5.1 0	7 7.8 A 17.6 D 20.0	7.8 17.8 20.1 5.4	7.9 7.9 18.0 18.2 20.2 20.3 5.4 5.4	7.9 18.4 20.5 5.4	7.9 18.6 1 20.6 2 5.4	8.0 8.0 8.7 18.9 0.8 21.0 5.4 5.5	8.0 19.0 21.1 5.5	8.0 8 19.2 19 21.3 21 5.5 5	8.1 8.1 9.3 19.5 1.4 21.5 5.5 5.5	81 196 217 55	8.1 1 19.7 1 21.8 2 5.5	82 82 199 200 219 220 55 55	8 2 0 20.1 0 22.2 1 5.6	82 202 223 56	8.2 8. 20.3 20/ 22.4 22: 5.6 5/	3 83 A 205 5 226 6 56	8.3 20.6 22.7 5.6	83 20.7 22.8 5.6	
106         140_REPRENCESCENARIO           107         140_REPRENCESCENARIO           108         140_REPRENCESCENARIO           109         140_REPRENCESCENARIO	BC commercial BC otherindus BC oilGasProd	3.5 3. 8.3 8. 5.8 6.	4 3.9 4 7.5 2 6.6	3.3 3.2 7.5 7.4 7.0 8.5	3.1 3 7.7 6 9.8 10	8.0 3.0 5.4 5.8 0.0 8.6	3.1 2 5.1 4 9.1 9	8 2.7 5 4.0 4 9.6	2.9 2.5 4.0 4.8 11.4 11.5	3.0 5.1 12.6	3.0 5.2 9.3	2.6 2.7 5.5 4.8 8.6 10.2	2.6 4.0 10.5	2.5 4.0 11.6 1	2.4 2 4.0 4 11.9 12	4 2.3 0 4.0 0 12.0	2.3 4.0 12.2	2.3 4.0 12.5 1	2.3 2. 4.0 41 13.0 13	2.2 4.0 14.8	2.2 4.0 15.3 1	2.2 2.2 4.0 4.0 5.4 15.5	2.2 4.0 16.2	2.2 4.0 17.3	2.2 1 4.0 4 17.9 11	2.2 2.2 4.0 4.0 8.2 18.4	2.2 4.1 18.7	2.2 1 4.1 4 19.0 15	2 23 1 41 3 19.6	2.3 4.1 20.0	2.3 2.3 4.1 4.1 20.4 20.4	2.3 4.1 20.5	2.3 4.1 20.6 2	2.3 2.3 4.1 4.1 0.6 20.7	2.3 4.1 20.7	2.3 2 4.1 4 20.7 20	2.3 2.4 4.1 4.1 1.7 20.7	2.4 4.1 20.7	2.4 4.1 20.7 2	2A 2A 41 41 207 207	2.4 4.2 7 20.7	2.4 4.2 20.6	2.4 2 4.2 4 20.6 20	A 2.A 2 4.2 6 20.5	2.4 4.2 20.5	2.5 4.2 20.4	
110 140_REFERENCE SCENARIO 111 140_REFERENCE SCENARIO 112 140_REFERENCE SCENARIO	BC elecProd BC otherEnerg BC fugitive BC process	1.5 1. 5.8 6. 2.1 2.	7 1.6 2 6.0 3 2.0	16 15 58 60 24 25	13 1 13 1 61 0 26 1	15 1.6 1.1 5.9 1.2 2.5	15 1 63 6 24 1	3 1.6 5 7.1 8 2.1	1.5 1.5 8.2 7.6 1.9 1.5	18 84 21	17 86 17	2.0 2.0 8.5 8.4 2.0 2.5	21 93 26	22 99 27	22 2 97 9 28 2	2 22 2 8.8 9 2.9	2.3 8.5 3.0	23 82 31	23 23 8.0 8. 3.1 3.1	2.3 8.7 3.0	23 9.0 3.1	24 2A 91 91 32 32	2.4 9.6 3.2	2.4 10.2 3.2	2.4 1 10.6 10 3.2 1	24 2A 08 109 32 33	2.4 11.1 3.3	2.4 2 11.2 11 3.3 1	15 25 14 116 14 3.4	2.5 11.8 3.4	25 25 120 122 34 35	2.5 12.4 3.5	2.5 12.5 1 3.5	25 25 27 128 36 36	25 129 3.6	25 2 13.0 13 3.6 3	2.6 2.6 3.2 13.3 3.7 3.7	2.6 13.4 3.7	2.6 13.3 1 3.7	2.6 2.6 13.5 13.6 3.8 3.8	5 2.6 5 13.7 8 3.8	2.6 13.8 3.8	2.6 2) 13.8 13 3.8 3	5 26 9 13.9 9 3.9	2.5 14.0 3.9	2.6 14.0 3.9	
113 140 REFERENCESCEMARIO 114 140 REFERENCESCEMARIO 115 140 REFERENCESCEMARIO 116 140 REFERENCESCEMARIO	BC agriculture TURR transporta TURR residential TURR commercial	1.6 1) 0.7 0) 0.0 0) 0.3 0)	0 1.6 0.6 0 0.0 3 0.3	17 18 07 07 00 00 03 03	1.8 1 0.8 0 0.0 0 0.3 0	1.8 1.8 0.6 0.8 0.1 0.1 0.3 0.3	18 1 0.8 0 0.1 0 0.3 0	5         1.6           7         0.7           1         0.1           2         0.2	1.6 1.3 0.8 0.8 0.1 0.3 0.2 0.3	18 0.9 0.1 0.3	1.7 0.9 0.1 0.3	1.6 1.7 1.0 0.8 0.1 0.1 0.2 0.2	1.7 0.8 0.1 0.2	1.7 0.8 0.1 0.2	1.7 1 0.8 0 0.1 0 0.2 0	8 02	Jn	<b>@</b> -	te	nt		$f_{0}^{12}$	tņ	<b>e</b> <sup>1,9</sup> <sup>7</sup> <sub>0,2</sub>	1.9 1 0.7 0 0.0 0 0.2 0	20 07 07 00 00 02 02	2.0 0.7 0.0 0.2	2.0 3 0.7 0 0.0 0 0.2 0	2.0 17 0.7 00 0.0 02 0.2	2.0 0.7 0.0 0.2	20 2.1 0.7 0.7 0.0 0.0 0.2 0.2	21 07 0D 02	2.1 0.7 0.0 0.2	2.1 2.1 0.7 0.7 0.0 0.0 0.2 0.2	2.1 0.7 0.0 0.2	2.1 2 0.7 0 0.0 0 0.2 0	2 1 2 2 0 7 0 8 0 0 0 0 0 2 0 2	2.2 0.8 0.0 0.2	2.2 0.8 0.0 0.2	22 22 08 08 00 00 02 02	22 8 0.8 0 0.0 1 0.2	2.2 0.8 0.0 0.2	2.2 2. 0.8 0. 0.0 0. 0.2 0.	2 23 8 0.8 0 0.0 2 0.2	2.3 0.8 0.0 0.2	0.8 0.0 0.2	
117         140_RUPRINCI SCINARIO           118         140_RUPRINCI SCINARIO           119         140_RUPRINCI SCINARIO           120         140_RUPRINCI SCINARIO	TURR otherindus TURR oliGasProd TURR electrod TURR otherEnerg	0.3 0.	3 0.3 5 2.2 0 0.0	0.3 0.2 1.7 1.7 0.0 0.0 0.0 0.0	0.2 0	02 02 00 30 00 00	0.3 0 2.1 1 0.0 0 0.0 0	3 03 A 14 D 00 0 00	0.4 0.3 1.8 2.6 0.0 0.6 0.0 0.6	0.4	0.4 2.1 0.0	0.3 1.0 2.5 0.4 0.0 0.0 0.0 0.0	0.0	0.0 0.1 0.0 0.0	0.0 0 1.2 1 0.0 0 0.0 0					hie			0.0	0.0 1.1 0.0 0.0	0.0 0	00 00 11 10 00 00 00 00	0.0 1.0 0.0 0.0	0.0 00	00 00 19 09 00 00	0.0 0.9 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0	0.0 0.8 0.0 0.0	0.0 0.0 0.8 0.8 0.0 0.0 0.0 0.0	0.0	0 00 0 80 0 00	00 00 00 00 00 00 00 00 00 00 00 00 00	0.0 8.0 0.0	0.0 0.7 0.0	0.0 0.0 0.7 0.7 0.0 0.0 0.0 0.0	0 0.0	00 07 00 00	0.0 01 0.7 0. 0.0 01 0.0 01	0 00 7 07 0 00 0 00	0.0 0.7 0.0 0.0	0.0	
121 140_REFERENCE SCENARIO 122 140_REFERENCE SCENARIO 123 140_REFERENCE SCENARIO	TERR Fugitive TERR process TERR agriculture		0.0	03 02 00 00 00 00	0.2 0	01 01 00 00 00 00 00	0.1 0		0.1 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	01	0.1	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0	0.0	00 00 00 00 00 00 00 00 00 00 00 00 00	0.0	0.0	0.0	0.0 0.0	0.0	0.0	0.0 0.0	0.0	0.0 0.0 0.0	0 00		00	0.0 0.0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.0 0.0 0.0	00 00 00 00 00 00 00 00	0.0	0.0		0.0	0 00	00 00	00 00	0.0 0.0 0.0	00 00 00 00 00 00 00 00	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	00	0.0 0.0 0.0 0.0	0 00 0 00 0 00	0.0	00	
124         141_ELIC TRIFED RESIDENTIAL           125         141_ELIC TRIFED RESIDENTIAL           126         141_ELIC TRIFED RESIDENTIAL           127         141_ELIC TRIFED RESIDENTIAL	Canada transporta Canada residential Canada commercial Canada otherindui	48.8 45.1	8 160.6 8 48.4 8 35.0 5 58.0	166.2         171.3           49.9         47.9           36.4         33.8           56.8         59.2           60.2         59.7	173.5 171 46.7 44 32.1 25 57.0 55	1.3 176.9 1.7 49.1 1.3 30.0 1.8 56.2	175.7 171 48.5 46 29.8 29 53.7 48	5 1782 3 447 6 287 8 485	483.7 184.3 47.6 43.5 28.9 26.3 49.7 52.3	186.1 46.4 30.5 54.3	184.1 17 50.5 4 36.0 3 51.6 5	175.3           7.8         44.4           3.9         34.8           1.8         53.7	1732 43.0 34.5 47.0	43.3 4 34.6 3 46.8 4	72.7 172 43.6 43 34.6 34 46.7 46	a 171A 8 43.5 6 34.7 6 46.6	169.9 42.9 34.7 46.5	108.8 16 41.9 4 34.7 3 46.7 4	17.2 165/ 10.5 382 14.8 342 16.7 467 10.7 113/	183.9 36.3 34.9 46.5	1623 160 338 3 350 3 465 40 1166 110	0.5 159.1 1.0 28.1 5.1 35.2 6.6 46.7 6.2 117.2	157.9 24.8 35.3 46.7	157.2 21.6 35.4 46.6	18.4 154 18.4 15 35.5 35 46.6 44	6.1 156.1 5.4 12.6 5.6 35.7 6.6 46.7 4.6 124.8	1562 10.2 35.8 46.8	156.3 156 8.1 6 35.9 35 46.9 45 125.0 125	17 1573 13 48 19 360 1 472	158.1 1 3.6 36.1 47.2	2.7 2.2 36.2 36.3 47.3 47.2	160.9 1.9 36.4 47.1	102.1 16 1.7 36.5 3 47.1 4	12 1643 16 16 65 367 71 471 85 1289	165.4 1.6 36.7 47.1 129.3	166 A 167 1.6 1 36.8 36 47.1 47	7.5 168.5 1.6 1.6 5.8 36.9 7.1 47.2	1693 16 369 472	170.5 17 1.6 36.9 3 47.3 4	16 16 172 370 173 474	173.2 5 1.7 0 37.0 4 47.4 5 130.6	37.0 47.5	174.9 175 1.7 1. 37.0 37 47.5 47	7 1764 7 17 1 37.1 6 47.6	37.1	177.9 1.7 37.1 47.7	
128 141 ELCTRFED RESONTAL 129 141 ELCTRFED RESONTAL 130 141 ELCTRFED RESONTAL 131 141 ELCTRFED RESONTAL	Canada oliGasProd Canada elecProd Canada otherEnerg Canada fuetue	159.2 158.8 48.8 453 33.5 333. 61.8 572 54.1 555. 125.5 125.5 29.8 293 55.4 522 44.7 422 34.3 33. 8.5 3. 0.6 0.	6         160.6           8         35.0           5         580.5           5         57.1           7         119.8           8         350.3           6         41.6           7         0.8           5         0.5           8         0.5           9         50.3           6         41.6           7         0.8           5         0.5           8         0.6           8         0.0           5         0.9           5         0.9           5         0.9           0         0.0	164.2         171.3           449.3         47.9           36.4         33.8           56.8         59.2           60.2         59.7           32.5         34.1           50.0         50.2           36.1         38.6           36.1         38.6           36.1         38.6           36.1         38.6           0.7         0.7           0.6         0.6           0.5         1.3           1.3         1.3           1.0         0.9           1.0         1.0           0.0         0.0	32.1         23           57.0         53           64.1         66           109.4         101           32.6         33           49.3         55           45.9         41           35.1         46           0.5         0           0.5         0           0.5         0           0.5         0           0.5         0           0.5         0           0.5         0           0.5         0           0.0         0           0.0         0           0.0         0	67 63.7 1.0 106.9 1.5 34.6 0.5 50.5	175/2         171           445.5         455           45.5         452           97.8         85           34.1         345.           45.5         462           97.8         85           34.1         354           35.7         38           37         3           0.7         0           0.4         0           0.5         0           0.4         0           0.5         0           0.6         0           0.8         0           0.7         0           0.8         0           0.7         0           0.8         0           0.7         0           0.8         0           0.7         0           0.8         0           0.7         0           0.8         0           0.7         0           0.8         0           0.7         0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	183.7         184.3           47.6         43.3           47.6         43.3           47.7         52.3           49.7         52.3           55.9         72.4           34.0         33.3           41.2         44.4           35.1         34.2           41.2         44.4           36.1         34.2           41.3         36.4           36.0         0.4           0.5         0.4           0.5         0.4           0.3         11.6           0.7         0.3           0.6         0.4           0.6         0.4           0.6         0.4	186.1 46.4 30.5 54.3 78.0 73.1 33.9 51.9 43.9 35.2 3.5 0.6 0.4 0.7 0.0 0.8 0.5	184.1 17 50.6 4 36.0 3 51.6 5 83.3 8 73.1 7 35.0 3 54.7 5 43.7 4 34.1 3	6.1 905 4.2 74.3 3.4 31.7 4.3 50.7	1732 430 345 470 921 664 333 551 455 551 455 358 358 04 03 07 00 00 00 00 01 05 00 00	173.2 11 43.3 4 45.8 4 46.9 4 97.1 5 64.9 4 54.2 5 54.2 5 55.2 5 3.5 3.5 0.4 0.3 0.0 0.0 0.0 0.0 0.0	72.7         172           43.6         43           44.6         43           44.6         44           99.7         102           60.3         54           34.5         34           55.2         58           55.5         35           3.6         3           0.4         0           0.7         0           0.0         0           0.1         0           0.1         0           0.1         0           0.0         0           0.0         0           0.1         0           0.0         0	3 1714 8 435 6 347 8 445 1 1047 2 530 6 350 6 350 6 350 6 350 7 469 3 364 8 36 3 03 3 03 3 03 7 07 0 000 0 000 1 011 1 13 0 000 0 000	169 9 42 9 34 7 46 5 107 1 51 2 35 1 56 5 47 1 36 9 35 0 3	166.8         16           41.9         4           44.7         3           46.7         4           109.3         11           50.7         5           55.6         5           47.4         3           35.5         5           47.4         4           47.3         3           3.5         0.3           0.3         0.7           0.0         0.1           1.3         0.0	172         165.           105         38:           105         38:           106         38:           107         113:           107         113:           107         113:           107         113:           104         50.           154         35:           175         47:           177         38:           33         3.           03         0.           03         0.           00         0.           00         0.           133         1.           00         0.           01         0.           02         0.	163.9 363 34.9 46.5 115.2 48.3 35.6 55.1 47.7 38.6 33.0 0.3 0.3 0.3 0.0 0.0 0.0 0.	116.6 11 46.2 3 35.6 3 55.6 5	0.5 159.1 10 28.1 5.1 35.2 4.6 44.7 5.2 117.2 4.3 31.3 5.6 35.6 5.6 35.7 8.1 48.7 9.3 32.9 3.2 3.2 0.2 0.2 0.3 0.3 0.7 0.8 0.0	1579 248 353 467 1193 356 554 483 483 403 202 02 03 08 00 00 00 01 08 00 00 00	0.0 157.2 21.6 35.4 46.6 122.2 27.1 35.7 57.6 48.6 40.7	156.4 154 18.4 12 35.5 35 46.6 44 27.5 21 35.7 35 58.3 54 48.8 45 41.1 42	6.1 156.1 5.4 12.6 5.6 35.7 6.6 46.7 4.6 124.8 79 28.3 5.8 35.9 8.8 59.3 9.0 49.2 1.5 41.8	1562 102 358 468 1248 283 360 598 494 422	35.9 35 46.9 41 125.0 125 28.5 21 36.0 36 60.3 60 49.7 50 42.5 42	0 125.3	1584.1 2 3.6 3.6 4.72 25.9 36.4 4.72 25.9 36.4 62.0 50.4 4.3.6 0.0 0.0 0.0 0.0 0.1 0.4 0.0 0.0 0.0 0.0 0.0 0.0 0.0	158.9         159.9           2.7         2.2           36.2         36.3           47.3         47.2           25.0         125.7           25.7         25.7           36.5         36.6           62.6         63.0           50.8         50.6           43.9         44.3           3.1         31.1           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.1         0.1           0.4         0.4           0.0         0.0	1609 19 364 471 1274 251 367 633 507 447 31 00 03 00 00 00 00 00 00 00 00 00 00	128.0 12 24.3 2 36.8 3 63.6 4	12         164.3           1.6         1.6           6         36.7           7.1         47.1           8.5         128.9           1.5         128.9           1.5         128.9           1.5         128.9           1.6         38.6           1.7         1.8           1.8         3.3           1.9         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0	1293 225 372 643 509 460	129.5 129	7.5 18485 1.6 1.6 5.8 36.9 7.1 47.2 7.4 37.5 1.6 64.8 1.0 51.1 1.3 1.4 1.5 1.6	1693 16 359 472 1303 224 375 549 512 471	130.4 139 22.4 2 37.7 3 65.0 6 51.2 5 47.4 4	71.4         172.3           1.6         1.6           37.0         37.0           37.1         47.4           30.5         120.6           22.4         22.3           37.7         57.8           55.1         65.2           51.3         51.4           37.5         47.8           31.3         31.0           0.0         0.0	5 130.6 8 22.3 8 37.9 2 65.3 8 51.4 8 48.1	130.7 1 22.3 38.0 65.3 51.5 48.3	37.0 37 47.5 47 130.7 130 22.2 22 38.1 38 65.4 65 51.6 51 48.5 48	6 1306 2 221 1 382 A 65A 6 51.7 7 489	1.7 37.1 47.7 130.5 22.1 38.3 65.4 51.8 49.1	130.4 22.1 38.3 65.4 51.8 49.3	
131 141_ELECTRIFED RESIDENTIAL 132 141_ELECTRIFED RESIDENTIAL 133 141_ELECTRIFED RESIDENTIAL 134 141_ELECTRIFED RESIDENTIAL	Canada process Canada agriculture NFLO transporta	1255 125: 29.8 29: 55.4 52: 44.7 42: 43.3 33: 0.5 0: 0.5 0: 0.3 0: 0.7 11: 0.6 0: 0.7 0: 0.6 0: 0.5 0: 0.0 0: 0.	6 41.6 0 32.2 1 3.4	44.1 46.7 36.1 38.6 3.4 3.4	45.9 45 39.1 40 35 3	17 467 02 399 12 38	48.0 40 39.8 36 3.7 3	6 426 1 373 5 3.9	43.2 44.4 36.1 34.2 4.1 3.8	41.9 36.2 3.2	43.7 4 34.1 3 3.6	4.0 45.9 2.9 34.2 3.8 3.7	45.9 35.8 3.7	46.2 4 35.0 1 3.6	46.5 46 35.5 35 3.6 3	7 469 9 364 6 3.6	47.1 36.9 3.5	47.4 4 37.3 3 3.5	17.6 471 17.7 38. 3.5 30	47.7 38.6 3.3	462 3 35.6 3 55.6 3 55.6 5 3.3 3 0.3 3 0.3 3 0.3 0 0.7 0 0.0 0 0.0 0 0.1 1 1.0 0 0.0 0	43         31.3           55         35.5           56         55.7           81         48.4           95         39.9           31         32           02         0.2           03         0.3           0.0         0.0           0.0         0.0           0.1         0.1           0.9         0.9           0.0         0.0           0.0         0.0           0.0         0.0	48.5 40.3 3.2	48.6 40.7 3.1 0.2		9.0 49.2 15 41.8 3.1 3.1	49.4 42.2 3.1 0.1	49.7 50 42.5 41 3.0 1 0.1 0	37         260           11         363           88         61.4           9.0         50.2           18         432           10         3.0           30         0.3           33         0.3           37         0.7           0.0         0.0           3.0         0.3           3.0         0.3           0.0         0.0           0.1         0.1           3.5         0.5           0.0         0.0	50.4 43.6 3.0	50.6 50.6 43.9 44.3 3.1 3.1	50.7 44.7 3.1	\$0.7 \$ 45.0 4 3.1	0.8 50.8 5.3 45.7 3.1 3.1	\$0.9 46.0 3.1	51.0 51 46.3 46 3.1 3	10 51.1 6.6 46.8 9.1 3.1	\$1.2 47.1 3.1	51.2 5 47.4 4 3.1	13 514 175 478 31 31	51A 481 1 32	51.5 48.3 3.2	516 511 485 48 32 3. 0.0 01	A 65A 6 517 7 489 2 32 0 0.0	51.8 49.1 3.2 0.0	51.8 49.3 3.2	
136 141_ELECTRIFED RESIDENTIAL 137 141_ELECTRIFED RESIDENTIAL 138 141_ELECTRIFED RESIDENTIAL	NFLD residential NFLD commercial NFLD otherindur NFLD ol/GasProd	0.5 0. 0.5 0. 0.6 0. 0.3 0.	0.8 6 0.5 6 0.6 3 0.3	0.7 0.7 0.6 0.6 0.6 0.6 0.6 0.5	0.5 0 0.5 0 2.1 0	0.5 0.7 0.5 0.5 0.6 0.7 0.4 0.2	0.7 0 0.4 0 0.6 0 0.3 0	5 0.6 3 0.4 5 0.5 A 0.4	0.5 0.4 0.4 0.4 0.5 0.4 0.3 1.6	0.6 0.4 0.7	3.6 0.6 0.4 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.5 0.5 0.5 0.4 0.3 0.8 1.0 0.0 0.0	0.4 0.3 0.7 0.0	0.4 0.3 0.7 0.0	0.4 0 0.3 0 0.7 0 0.0 0	3 0.3 3 0.3 7 0.7 0 0.0	0.3 0.3 0.7 0.0	03 03 07 00	0.3 0. 0.3 0. 0.7 0. 0.0 0.	0.3 0.3 0.7 0.0	0.3 0 0.3 0 0.7 0	0.1 0.2 0.3 0.3 0.7 0.8 0.0 0.0	0.2 0.3 0.8 0.0		0.1 0	31         31           01         01           03         03           07         07           00         00           01         01           02         00           03         00           04         00           05         00           06         06           00         00           00         00	0.1 0.3 0.7 0.0	0.1 0 0.3 0 0.7 0 0.0 0	10         3.0           10         0.0           13         0.3           17         0.7           10         0.0           11         0.1	0.0 0.3 0.7 0.0	31         3.1           0.0         0.0           0.3         0.3           0.7         0.7           0.0         0.0           0.0         0.0           0.1         0.1           0.4         0.4           0.0         0.0	0.0	0.0 0.3 0.7 0.0	3.1         3.1           3.0         0.0           0.3         0.3           0.7         0.7           0.0         0.0           0.1         0.1           0.3         0.3           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0           0.0         0.0	31 0.0 0.3 0.7 0.0 0.0 0.1 0.3 0.0 0.0 0.0	0.0 0 0.3 0 0.7 0 0.0 0	1         3.1           00         0.0           0.3         0.3           0.7         0.7           0.0         0.0           0.1         0.1           0.3         0.3           0.4         0.0           0.5         0.3           0.0         0.0           0.1         0.1           0.3         0.3           0.0         0.0	0.0 0.3 0.7 0.0	0.0 0.3 0.7 0.0	31         31           00         00           03         03           07         06           08         00           01         01           03         03           04         01           05         03           00         00           01         01           03         03           04         00           05         00	0 0.0 8 0.3 6 0.6 0 0.0 0 0.0 1 0.1	0.0 0.3 0.6 0.0 0.0 0.0 0.1	0.0 01 0.3 01 0.6 01 0.0 01 0.0 01 0.1 01		0.0 0.3 0.6 0.0 0.0 0.0 0.1	0.0 0.2 0.6 0.0	
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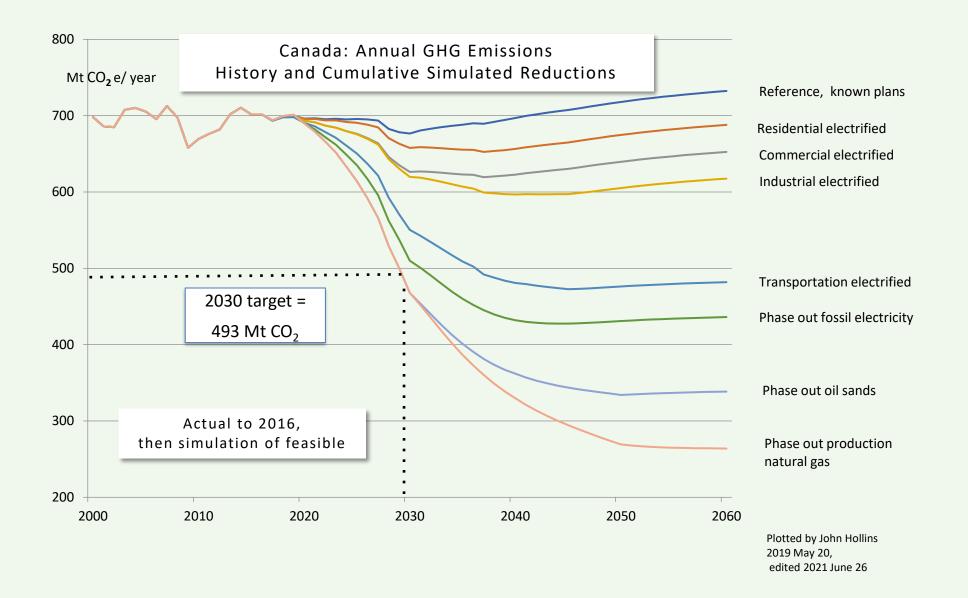
#### Issue

## **1. Repeated failure**

Canada has failed repeatedly during three decades to meet every emission targets to which it formally committed.

It is evident from the simulation experiments performed during the course of this project that the target for 2030 that Canada accepted in the Paris Agreement in 2015 will be missed.





Context

## 2. Strategic issue

This issue is about much more than simply reducing emissions.

- It is about changing paths of social and economic development.
- It involves the entire economy, the extraction and processing of primary resources, manufacturing, commerce, trade, and the behaviour of consumers.
- The emissions of the national economy are embedded in stocks of plant and equipment, buildings and consumer goods in which substantial investments have been made.
  - ✤ There is inevitable inertia.
  - Major changes to infrastructure take decades rather than years.

Diagnosis

## 3. Approach

Canada has pursued the same approach to the reduction of

greenhouse gases during the three decades since it went to Kyoto in 1997.

This approach has been based only on conventional short-term economic and political thinking.

It has not worked.

✤ If Canada wishes to succeed, it has to understand the practically feasible options.

Diagnosis

## 4. Targets without a way to hit them

Targets have been set simply in terms of policy prescriptions, in the absence of understanding of physically coherent pathways from current high-emitting activities to those that would be low or non-emitting. Without such understanding:

- it is not possible to know what progress is being made along the way.
- Milestones cannot be set and used to assess the effectiveness of policies and programs in a timely manner.
  - By the time it becomes clear that a target will be missed, it is too late to adjust policies and programs to recover.

Solution

## 5. Tools fit for purpose

A competent Canadian strategy can be built only by using tools fit for the task.

- $\circ$   $\,$  That has not been the case.
- Canada's policy has relied exclusively on tools based on conventional micro- and macro-economic theory; they have not been fit for purpose.
  - They provide a short-term approach without understanding of practical feasibility, inadequate to deal competently with the long-term issue of global heating and technological development and deployment.
- Despite being an early leader, the Government of Canada for the past two decades has failed to recognize the long-term and systemic nature of the issue of global heating;
  - it has not invested in appropriate tools.

## 6. Public good

The climate crisis is a collective-action problem addressing the public good.

- o It imposes costs on future generations that the current set of economic agents
  - households and corporations have no direct incentive to fix. [Carney 2021].
    - The resolution of the crisis will require that coordinated and purposeful actions be taken by most if not all economic agents.

Solution

Public good, 2

- The engagement of all stakeholders is essential.
  - Stakeholders must be informed by clear science and modelling of options.
- A new approach is essential, one that is:
  - participatory and adaptive;
  - that creates an informed public.
    - Simulation modelling enables the engagement of participants in such an approach.

## 7. Provincial considerations

Canada's practical options can be understood only in the context of vastly different provincial circumstances.

 The Pan-Canadian Framework does not specify how the commitment made for the entire country in Paris in 2015 is to be met collectively by the individual provinces and territories, other than alluding to the same percentage target.

#### Issue

Provincial, 2

One basic conclusion is that

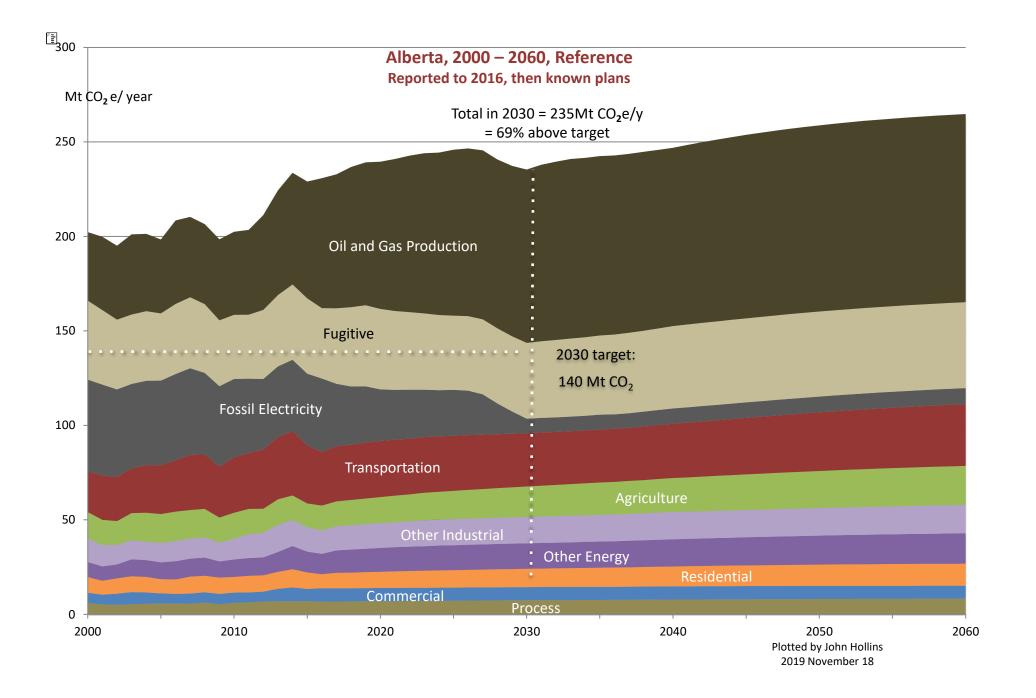
- Canada will never be able to meet its commitments as long as it continues to produce huge and increasing quantities of oil and gas. It simply does not add up.
- With known plans, the emissions of two large producers of fossil fuels,
   Alberta and British Columbia, continue to increase for four decades.
  - The level of emissions and the trends are such that it would not be possible to counter balance them by reductions of greater than 30% in other provinces that start from a lower base.
    - It is evident from the analysis reported here that a piecemeal approach is not going to work.

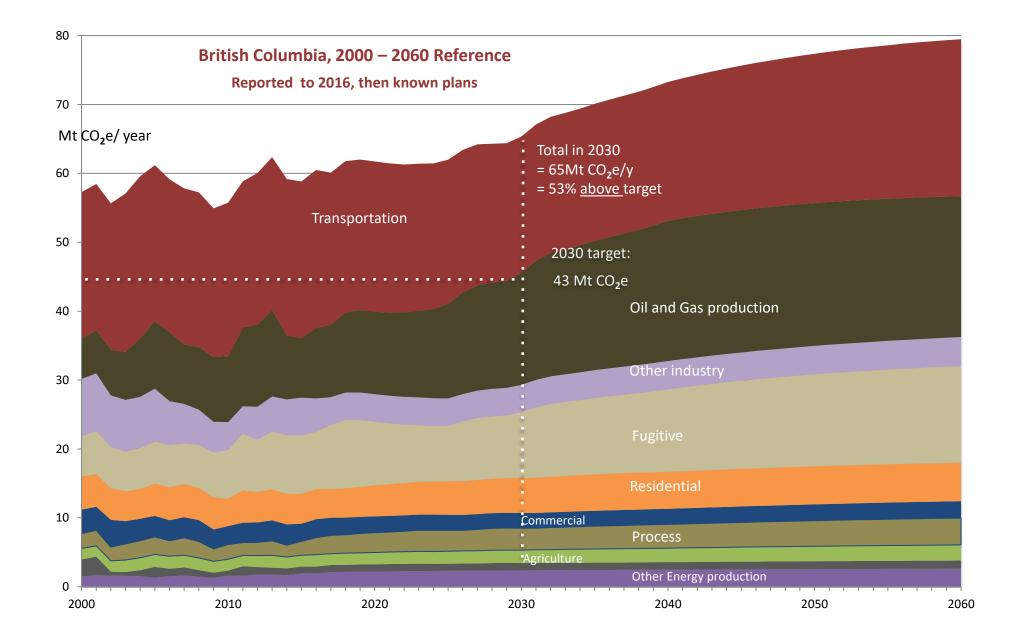
*If you (Canadians) are going to meet those targets, you will have to stop financing fossil fuels very, very soon.* 

Eric Usher, Head, UNEP Finance Initiative

Corporate Knights, Summer 2021

CACOR Pathways is able to make this case with a picture.





Seven natural gas producers have teamed up with the Nisga'a Nation to submit a plan to export gas.

THE GLOBE AND MAIL

OTTAWA/QUEBEC EDITION = MONDAY, JULY 19, 2021 = GLOBEANDMAIL.COM

## LNG firms, Nisga'a Nation unite on \$55-billion venture

**REPORT ON BUSIN** 

Energy megaproject in British Columbia plans to export liquefied natural gas to Asia

#### BRENT JANG VANCOUVER

to materialize over the past decade.

iquefied natural gas to Asia.

bia, saying they have learned valuable les- electric-motor technology in refrigerant proposal. sons from other initiatives that have failed compressors, using electricity from BC Hy-

Calgary-based Birchcliff Energy Ltd. is of the LNG industry's traditional reliance Pearse Island in the Portland Canal in leading the group of producers known as on turbines powered by natural gas. Rockies LNG, which has enlisted Houston- "As set out in the Nisga'a treaty, the Nis- mote, located approximately 15 kilometres based Western LNG LLC to help carry out ga'a Nation owns and controls Nisga'a west of the Nisga'a community of Gingolx plans to construct the B.C. project to export lands, which includes approximately 2,000 at the mouth of the Nass River," the docusquare kilometres at the lower end of the ment said. Their Ksi Lisims LNG project is named af- Nass River," according to a 135-page docu-

ter the Nass River in the Nisga'a language. ment, dated July 2, filed by the proponents Ksi Lisims LNG's filing to regulators to the B.C. Environmental Assessment Ofdoesn't provide a detailed breakdown of fice. The proponents say they anticipate Seven natural gas producers have teamed the costs, but the total price tag includes a the provincial regulator will likely lead the up with the Nisga'a Nation to submit a plan wide range of items, including floating environmental review, in a collaborative to regulators for approval to build a \$55-bil- modules to supercool natural gas into liq- process with the Impact Assessment Agenlion energy megaproject in British Colum- uid form. The project will rely heavily on cy of Canada, which will also scrutinize the

> The property where the terminal would dro during the liquefaction process instead be located is called Wil Milit, situated near northwestern B.C. "The project site is re-

'MUCH HARDER RETAIL GAME NOW'

CANNABIS H

As the number of legal pot stores in Ontario has exploded over the past seven months, experts warn the mushrooming growth could lead to a wave of closures = B2

**OPEC**, allies end dispute after five countries get higher limits

#### JON GAMBRELL DUBAI

OPEC and allied countries agreed Sunday to raise the production limits imposed on five countries next year and boost their production by two million barrels per day by the end of this year. ending a dispute that roiled oil markets.

The disagreement, sparked by a demand by the United Arab Emirates to increase its own production, temporarily upended an earlier meeting of the cartel. In a statement Sunday, the cartel announced that Iraq, Kuwait, Russia, Saudi Arabia and the UAE would see their limits rise.

"What bonds us together is ... much beyond what you may imagine," Saudi Energy Minister Prince Abdulaziz bin Salman said. "We differ here and there but we bond."

Prince Abdulaziz declined to elaborate on how they came to that consensus, saying it would see the cartel "lose our advantage of being mysterious and

Globe and Mail, 2021 July 19

## Provincial, 3

Issue

Tasking each province with the same percentage reduction,
 even if that were possible, would not be the most cost-effective way
 to achieve the commitment made by Canada.

Solution

- Reductions in each province need to be negotiated to secure a competent plan for the entire country of Canada:
  - > The task would no doubt be politically challenging;
  - > It requires governments to collaborate, as in wartime:
  - ➤ A <u>national</u> commitment is essential.

Solution

## 8. Energy information

The analyst for this Pathways project assembled data from a wide array of sources.

- A model without data is like a Tesla without a battery.
- There is a need for a Canadian energy information agency with a mandate:
  - to inform public policy on energy and emissions;
    - It should be at arms-length from government and be provided with stable funding for a significant term.

#### Solution

## Energy information, 2

- It would compile data from a wide range of sources.
- It would invest in the development of modelling tools appropriate for delineating biophysically coherent pathways for energy and emissions within the context of the structure of the Canadian economy.
  - It would make the data and the tools transparent and freely accessible to all stakeholders.

## Messages

- 1. Repeated failure, issue
- 2. Strategic issue, context
- 3. Approach, diagnosis
- 4. Targets without a way to hit them, diagnosis
- 5. Tools fit for purpose, solution
- 6. Public good, *context and solution*
- 7. Provincial considerations, issue and solution
- 8. Energy information, issue and solution

#### Contacts

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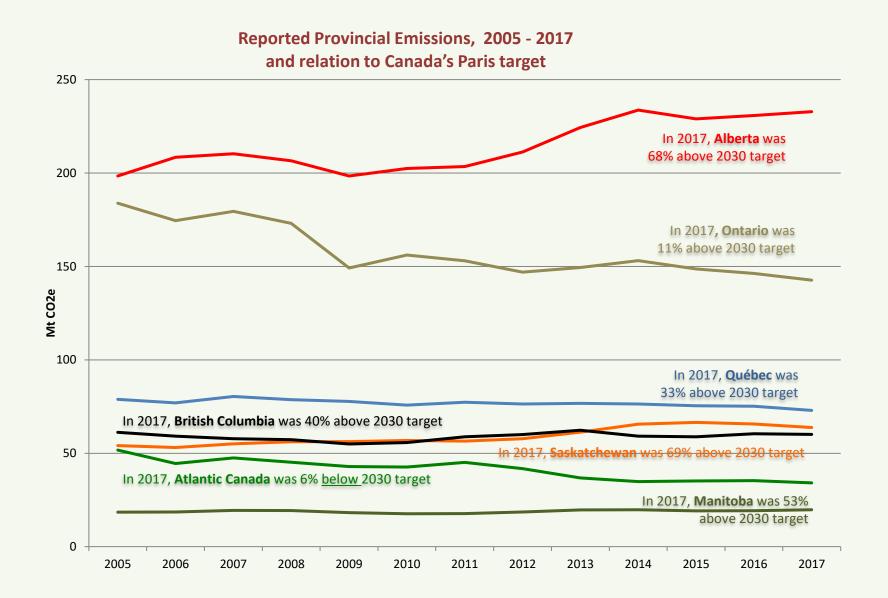
John Hollins, Ph.D., biophysicist and energy analyst hollinsjg@gmail.com; (613) 824-8837

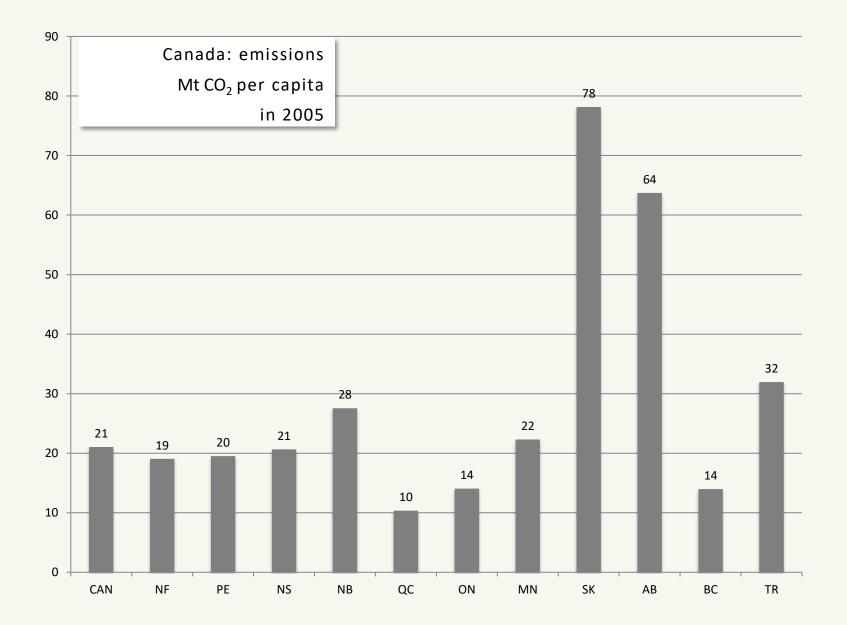
Catherine Smith, Ph.D., anthropologist, Secretary, CACOR <u>catherinecsmith@gmail.com</u>; (613) 733-5555

Jean Dougherty, zoologist, President, Canadian Association for the Club or Rome <u>bjdougher55@gmail.com</u>; (613) 798-2412

## **SPARES**

DRAFT 2019 November 24





# Good news

• New Brunswick

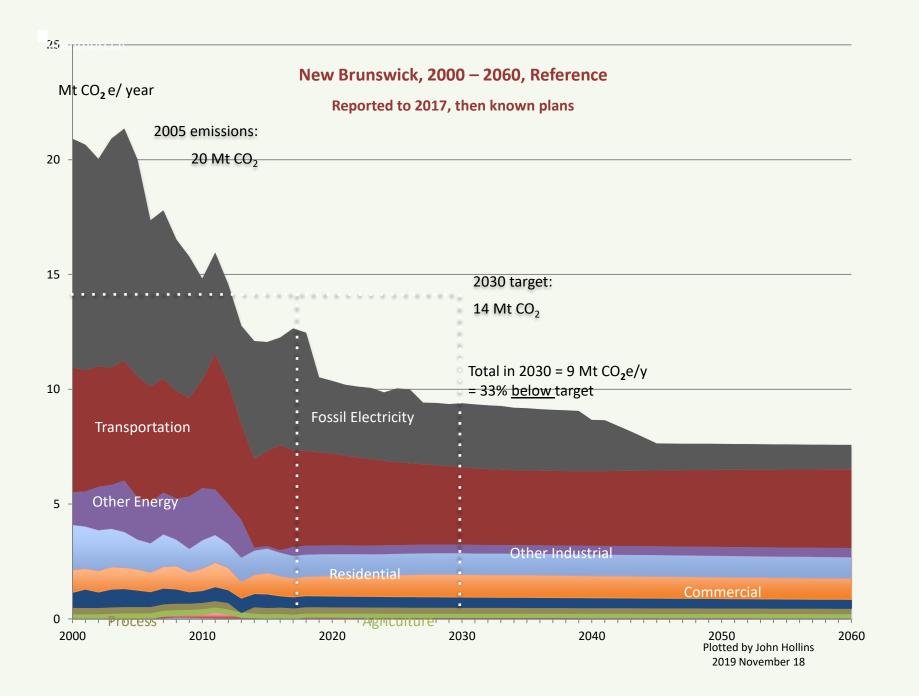
- Provincially-owned electrical utility
  - With foresight; has

-already closed two of four oil and coal-fired generating stations

-already met Canada's Paris target

 $\circ$  Nova Scotia similar

has also closed coal-fired generating stations



## Sorted by rating by Corporate Knights, 2021 Spring

	Rating	Mt/cap	Mt	%
NB	А	16.0	16.0	2.2%
NS	А	17.7	17.0	2.4%
QC	A-	9.4	83.0	11.7%
YU	В	14.8	0.6	0.1%
NWT	В	26.9	1.2	0.2%
NU	B-	18.2	0.7	0.1%
вс	B+	13.2	66.0	9.3%
PEI	B+	11.4	1.7	0.2%
MN	C-	16.3	22.0	3.1%
ON	C-	11.5	165.0	23.2%
AB	D-	63.4	273.0	38.4%
SK	D+	65.4	65.4	9.2%

## Sorted by emissions by province, Corporate Knights, 2021 Spring

	Rating	Mt/cap	Mt	%
AB	D-	63.4	273.0	38.4%
ON	C-	11.5	165.0	23.2%
QC	A-	9.4	83.0	11.7%
ВС	B+	13.2	66.0	9.3%
SK	D+	65.4	65.4	9.2%
MN	C-	16.3	22.0	3.1%
NS	А	17.7	17.0	2.4%
NB	А	16.0	16.0	2.2%
PEI	B+	11.4	1.7	0.2%
NWT	В	26.9	1.2	0.2%
NU	B-	18.2	0.7	0.1%
YU	В	14.8	0.6	0.1%

