

Canada's Energy Future 2013

ENERGY SUPPLY AND DEMAND PROJECTIONS TO 2035



Presentation for Center for Strategic and International Studies
December 6, 2013

Energy Futures 2013: Released November 21st, 2013



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National Energy
Board



Office national
de l'énergie

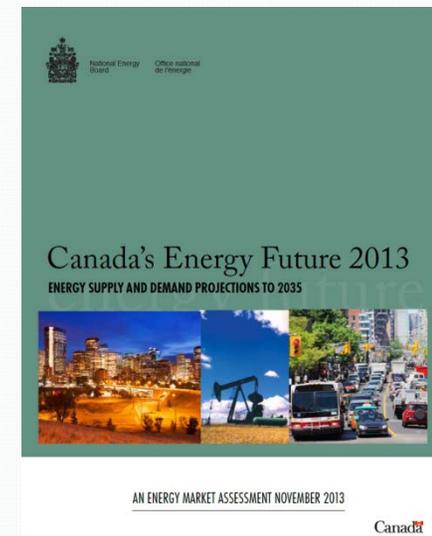
Canada 

The NEB and the Energy Futures Report



- ▶ An independent quasi-judicial regulatory tribunal established in 1959.
- ▶ Reports to Parliament through the Minister of Natural Resources Canada.
- ▶ Two primary functions:
 - ▶ Regulatory mandate
 - ▶ Energy information mandate

- ▶ Flagship energy information product published since 1967.
- ▶ Historical produced every four years, since 2007 it has been released every 2 years. The last release was in 2011.
- ▶ Key Objectives
 - ▶ Provide unbiased, relevant, comprehensive, expert analysis on energy supply, demand and its economic implications and serve as a reference.
 - ▶ Provide stimulus for discussion with and amongst stakeholders.
 - ▶ Inform decision makers of key risks and uncertainties facing the energy future.



Outline

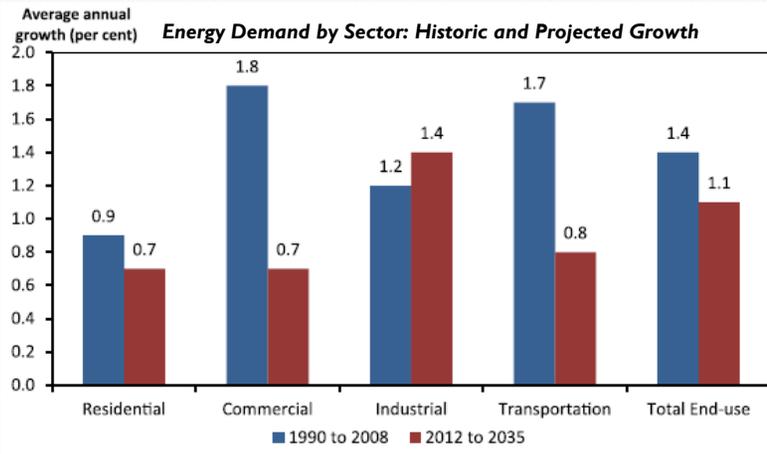
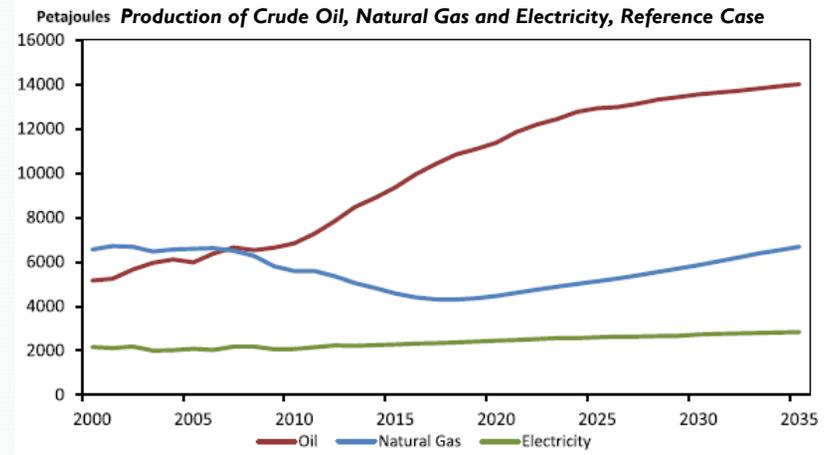
- ▶ Context and Key Findings
- ▶ Price Assumptions and Drivers
- ▶ Oil Supply
- ▶ Natural Gas Supply
- ▶ Electricity Supply
- ▶ Energy Demand
- ▶ Trade
- ▶ Conclusion

Energy Context & Challenges for the 2013 Report

- ▶ Increasing energy supply in the U.S. – shale gas and tight oil
 - ▶ Oil price differentials deviate from historical trends
 - ▶ Changing natural gas flows in NA
 - ▶ Growing interest in liquefied natural gas exports
 - ▶ Continuing export-oriented electricity generation
 - ▶ Demographics and consumer preference trends impact energy demand in Canada and the U.S.
-
- ▶ *The uncertainties to energy transportation and the ability to find markets for exports are increasingly important factors in the Canadian energy production projections.*

Key Findings

- ▶ Total Canadian energy production grows substantially over the projection period.
 - ▶ Led by oil production, which is led by oil sands



- ▶ Total Canadian energy use grows moderately, with strong growth in resource industries, and slowing growth in transportation consumption.
 - ▶ Demand growth all sectors other than industrial slow compared to the historical rate.

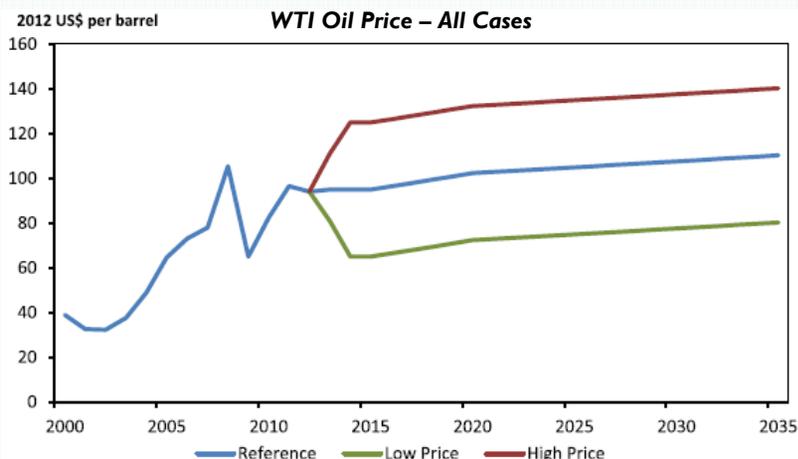
- ▶ Energy available for export increases, but energy market and infrastructure trends are key uncertainties.

Assumptions and Drivers

- ▶ **Key Assumption:** Infrastructure will be built as needed and markets exist for production in excess of Canadian needs.
- ▶ Only policies and programs that are law or near law at the time of the analysis are included.

Macroeconomic Drivers - Reference Case			
Average annual % change (unless otherwise noted)			
	1990-2008	2012-2035	2012-2035 (2011 Report)
Population	1.0	1.0	0.8
Gross Domestic Product	2.6	2.0	2.3
Exchange rate (US\$/C\$)	0.76	0.99	1.00
CPI Inflation (%)	2.3	2.0	2.2
U.S. GDP	2.7	2.5	2.5

Oil production dominated by oil sands growth, conventional production declines.



- ▶ Infrastructure and markets assumptions imply oil price differentials converge to normal levels in the short term.
- ▶ Whether these assumptions hold are key uncertainties and could impact the oil production projections.

Change in oil production from 2012 (Thousand barrels per day)	2016	2020	2035
Oil Sands - In Situ	498	988	2,218
Oil Sands – Mining	255	508	869
Western Canada Conventional (non-tight)	(102)	(191)	(435)
Western Canada Conventional (tight)	206	136	(65)
East Coast Offshore	(24)	(47)	(40)
C5+ and Condensate	32	52	(88)
Total	864	1,447	2,459

Total Canadian Production in 2035 = 5.8 MMb/d

Global Production in 2035 = 105 MMb/d

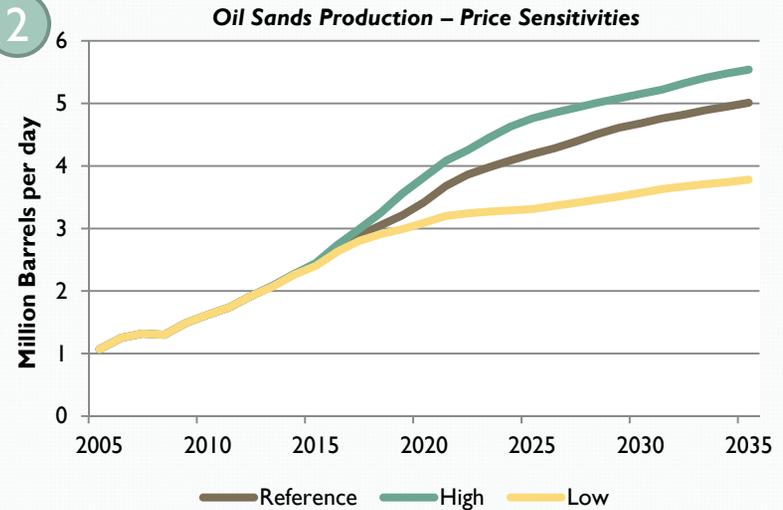
Oil Sands represents growing demand for natural gas and condensate. Production sensitive to sustained low prices in the longer term.

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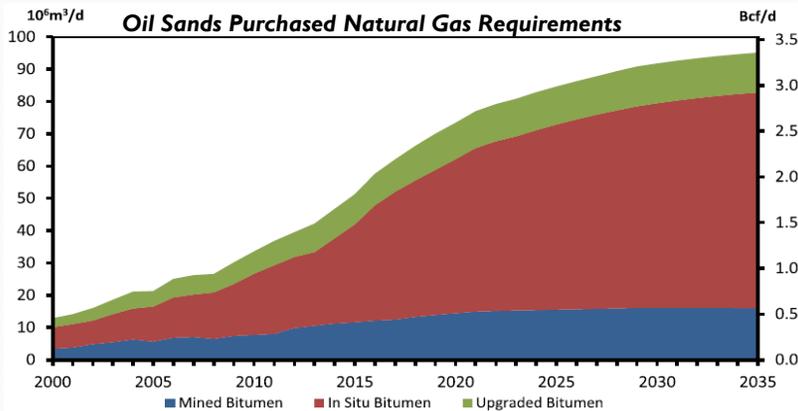
	CAPEX (C\$/bbl of capacity)	Economic Threshold (WTI, US\$/bbl)
Mining, Extraction and Upgrading	\$100,000-\$120,000	\$80-\$100
Stand-Alone Mining and Extraction	\$55,000-\$75,000	\$70-\$100
Standalone Upgrading	\$55,000-\$65,000	\$55-\$65*
SAGD, CSS (In Situ)	\$25,000-\$45,000	\$50-\$80

*Economics largely related to light-heavy oil price differential

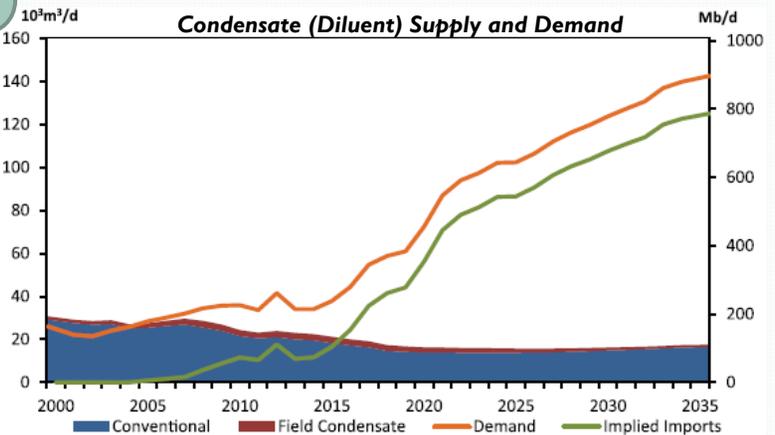
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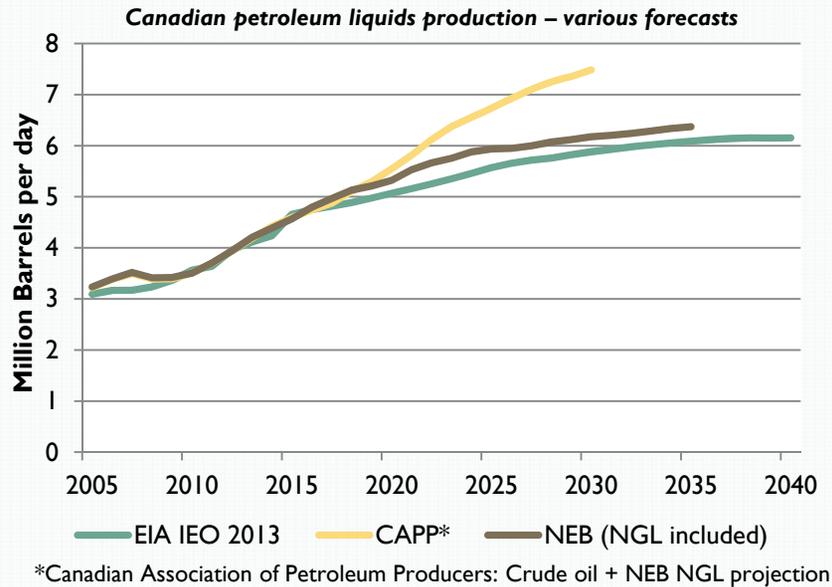
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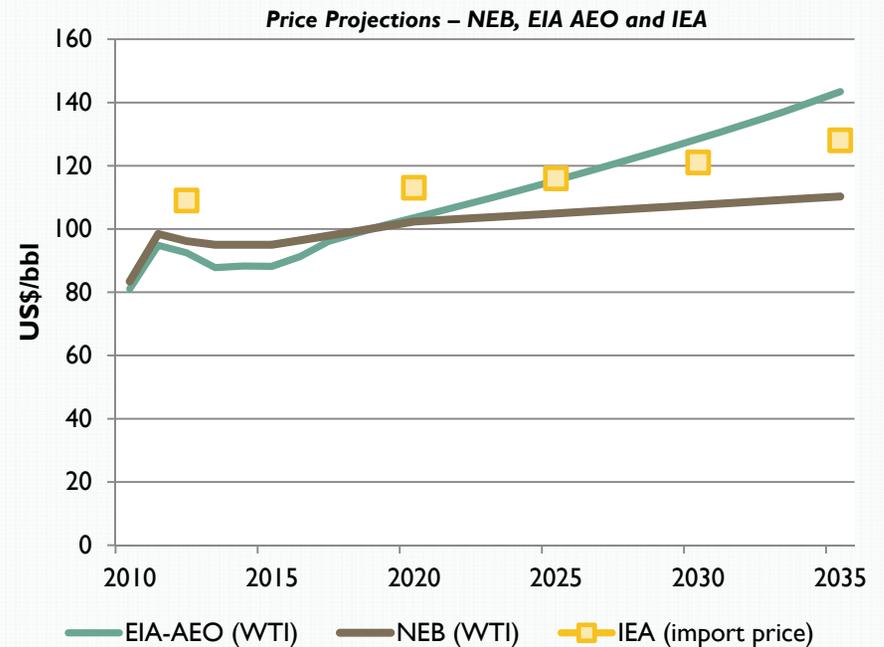


Oil Projection Comparisons

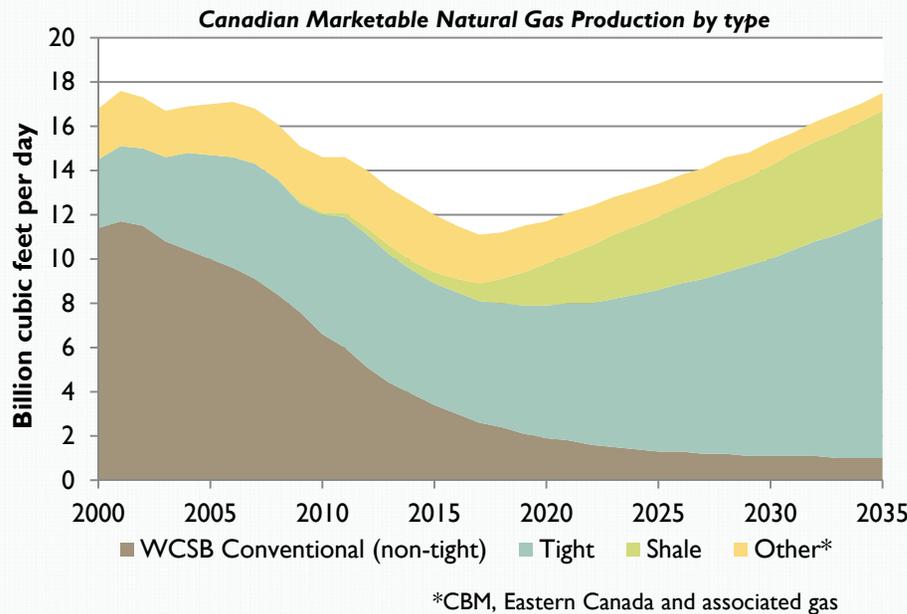


- ▶ Lower price than EIA and IEA
- ▶ NEB prices informed by projections of private consulting agencies, some of which were lower than the EIA and IEA at the time of analysis

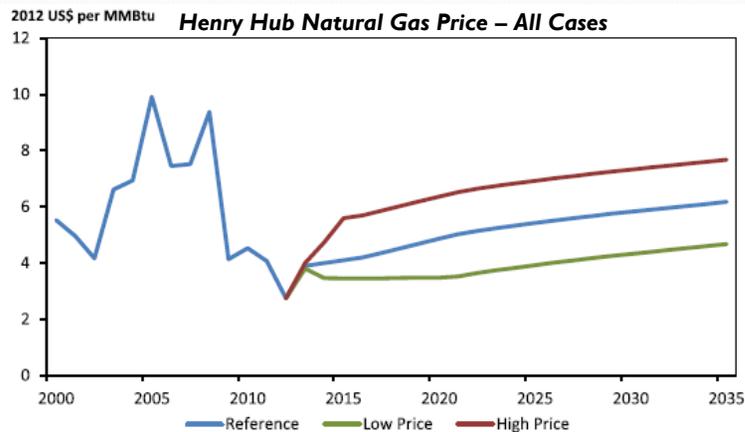
- ▶ Early part of projections similar – oil sands production often rely on announced/under construction projects
- ▶ Different Canadian tight oil outlooks
- ▶ Assumptions on infrastructure and access to markets (?)



Tight and shale gas main source of production growth, conventional largely uneconomic given prices



Share of Production	2012	2035
WCSB Conventional	36%	6%
Tight	43%	63%
Shale	2%	28%
Other	19%	5%

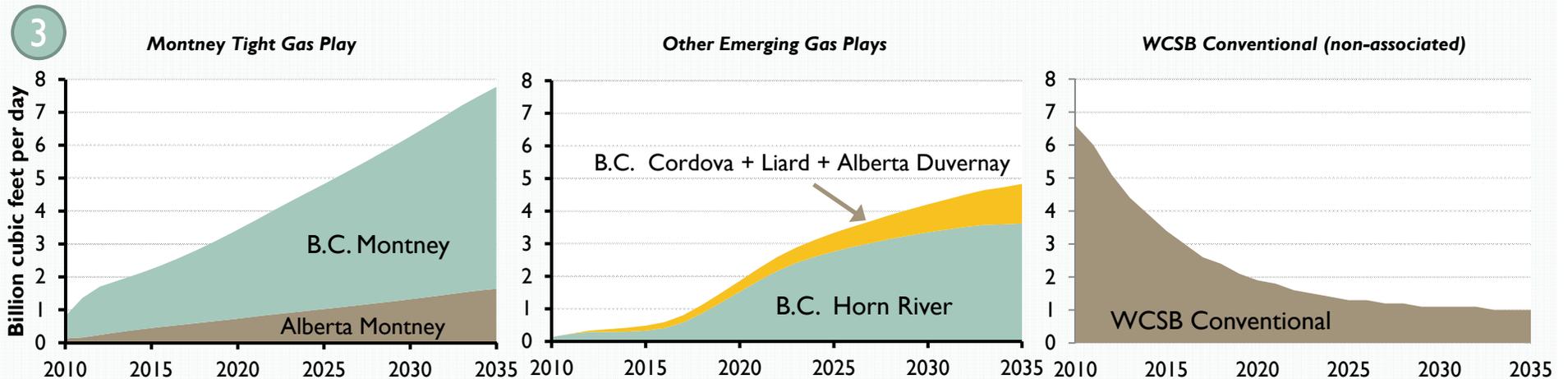
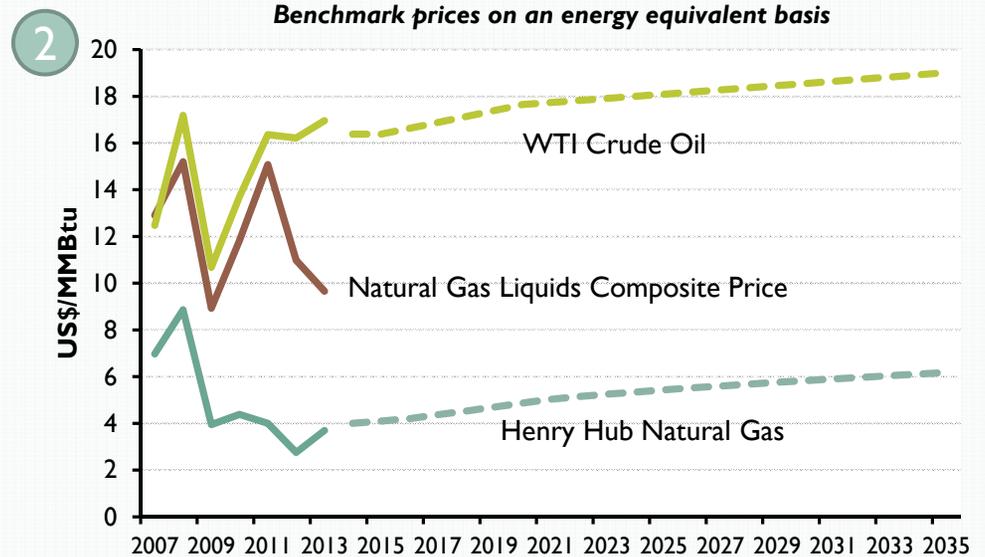
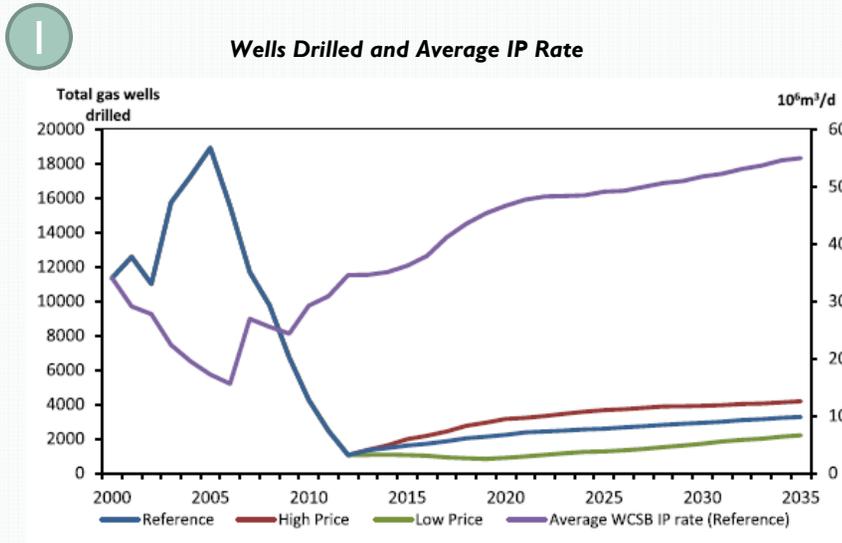


LNG Assumptions

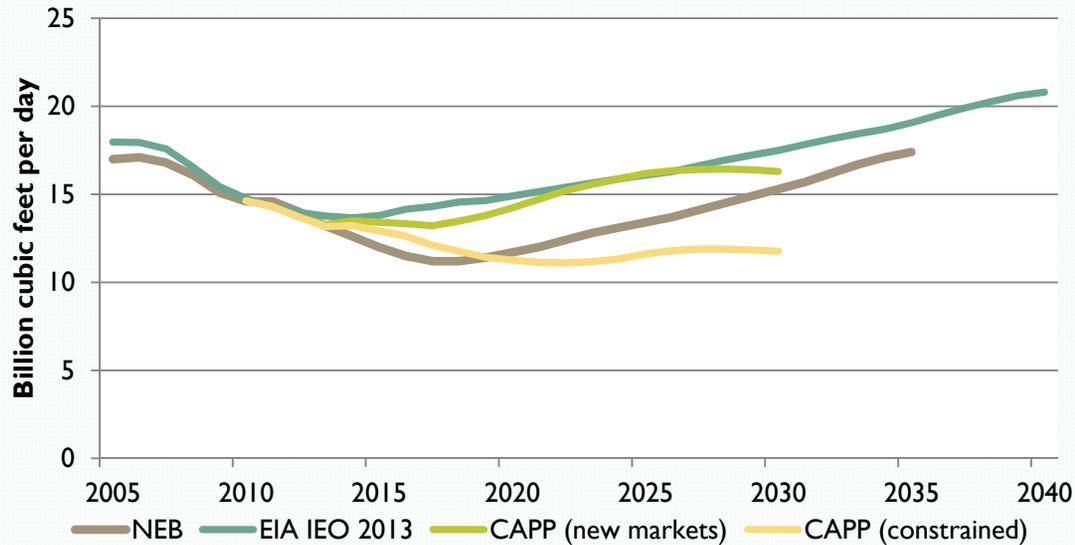
- 1 Bcf/d in 2019
- 2 Bcf/d in 2021
- 3 Bcf/d in 2023

Impacts upstream investment and production, B.C. energy demand, flows for NGL production, etc.

Higher production rates and NGL content drive activity in certain areas

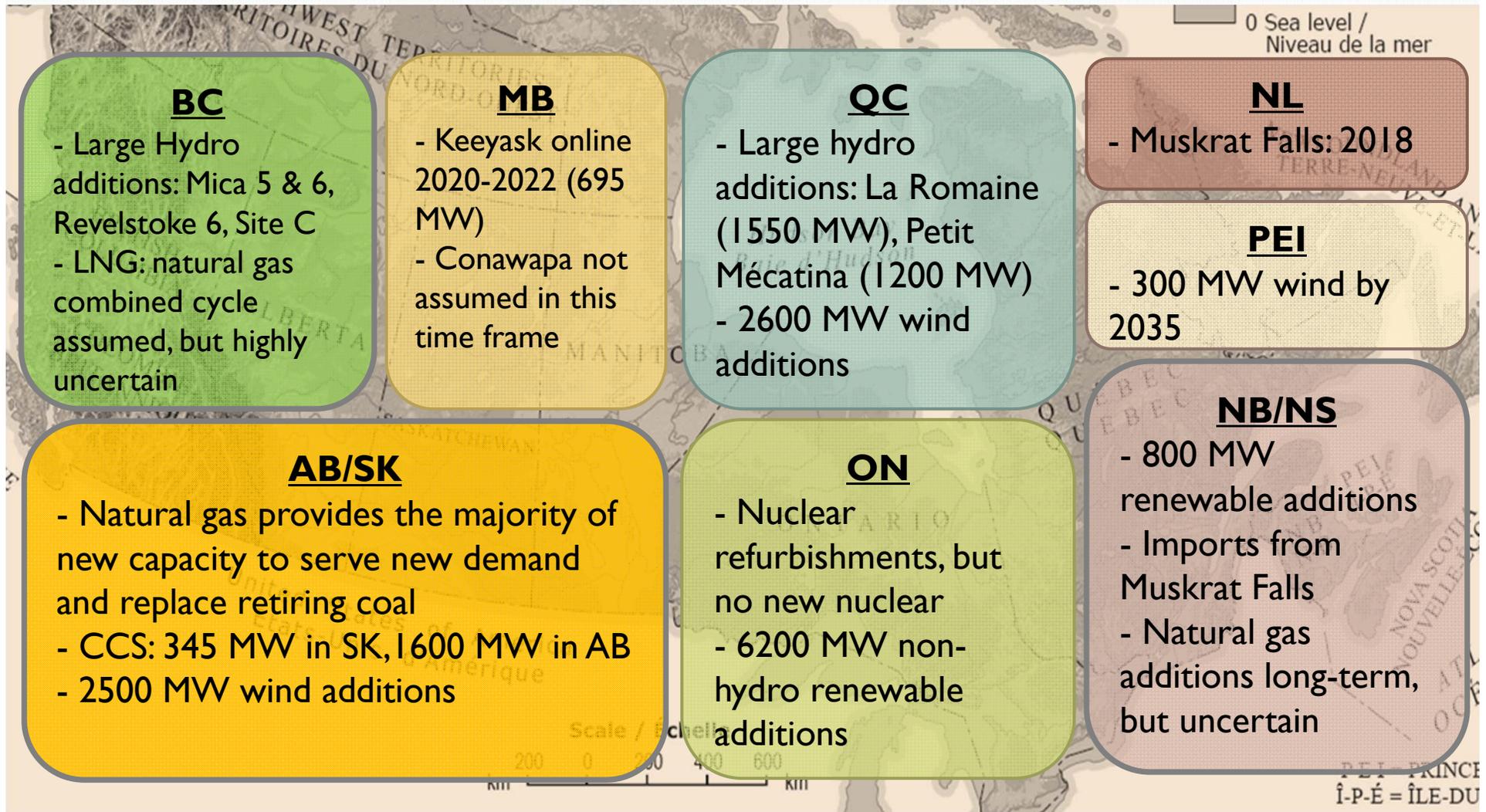


Natural Gas Projection Comparisons



Canada LNG Exports	
NEB Assumption	1 Bcf/d in 2019, 2 Bcf/d in 2021, 3 Bcf/d in 2023
EIA IEO	~0.75 Bcf/d in 2020, ~1 Bcf/d in 2030, ~3.75 Bcf/d in 2040
CAPP (new markets)	0.7 Bcf/d in 2018, 0.7 Bcf/d to 2023 for a total of 3.5 Bcf/d
CAPP (constrained)	No LNG

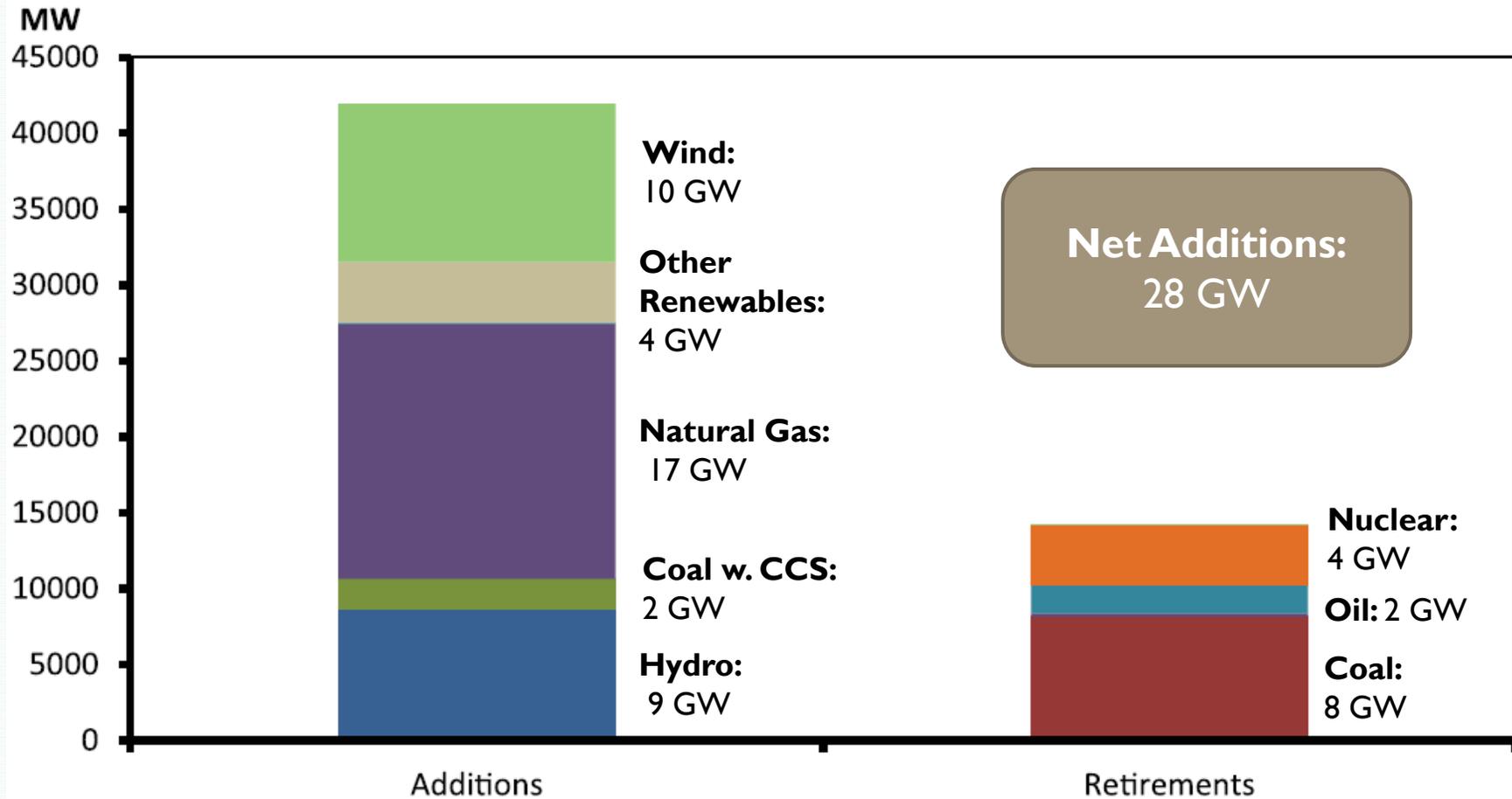
Electricity Supply: Regional Projections



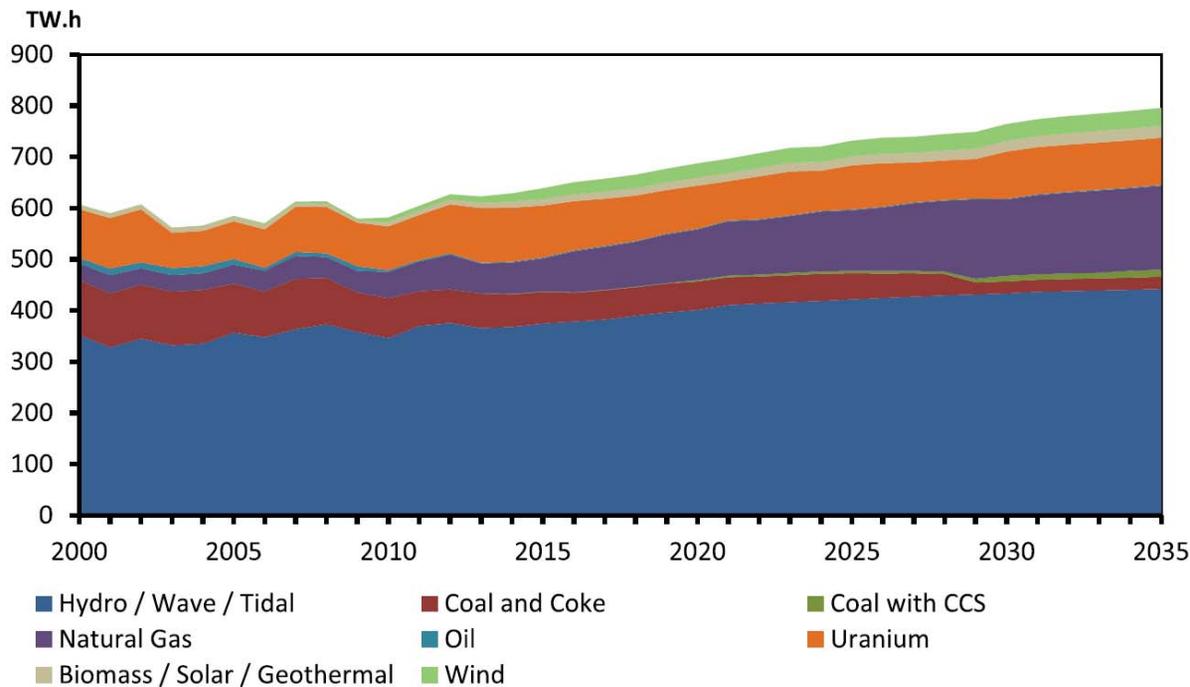
Total capacity additions and retirements

Total Additions:
42 GW

Total Retirements:
14 GW



Electricity generation increases by 27%



- ▶ Total generation grows to 795 TW.h
- ▶ Increase of 169 TW.h from 2012 levels
- ▶ Average annual growth of one per cent over projection period
- ▶ Growth led by Hydro and Gas additions

EF 2013 vs. EF 2011:

- ▶ Total generation in 2035 is **40 TW.h higher in EF 2013**
- ▶ Difference due to higher projection of electricity demand
- ▶ EF 2013: More generation from hydro and natural gas, less from coal and non-hydro renewables

Energy use grows moderately

- ▶ Energy consumed by Canadians grows, but at a slower rate than in the past

▶ Increasing growth:

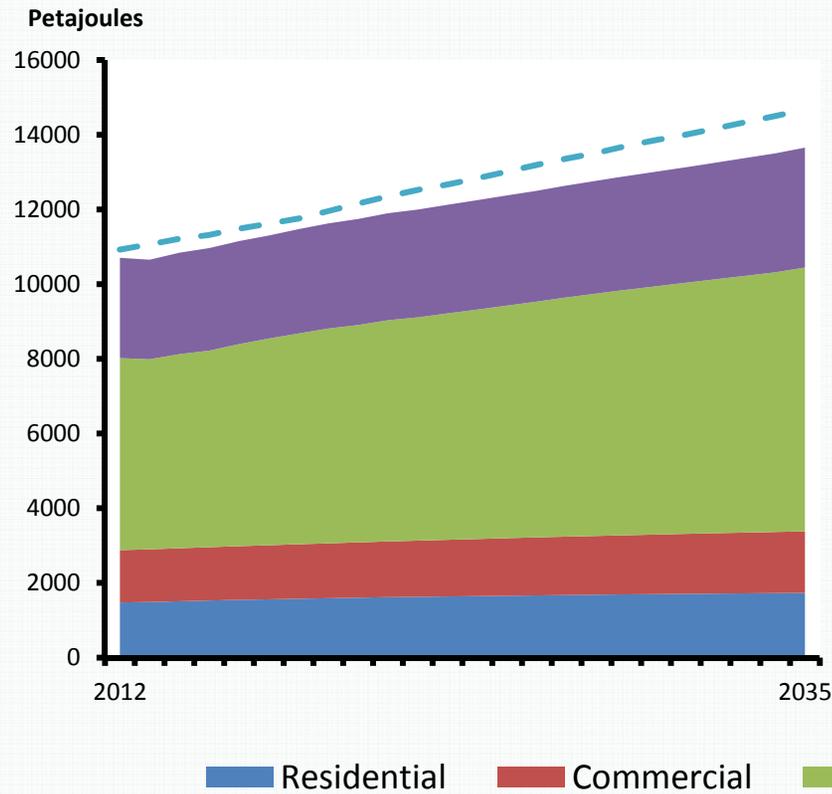
- ▶ Growth in natural resource industries such as oil sands, gas production and processing, and mining
- ▶ Continued economic growth, gradual recovery from economic downturn

▶ Decreasing growth:

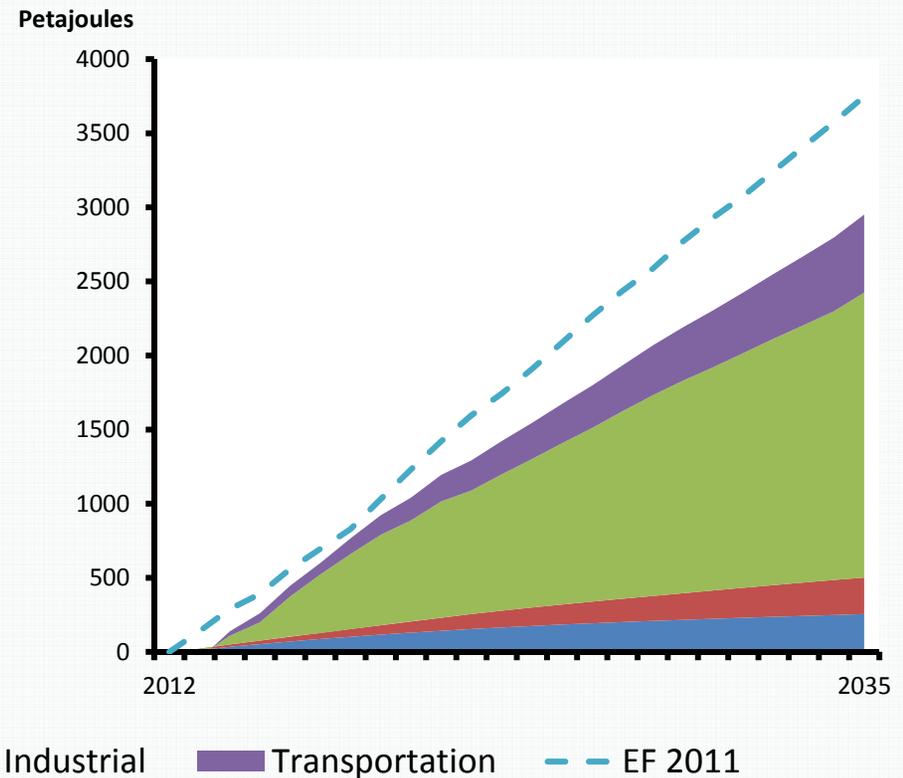
- ▶ Slower GDP growth (2%)
- ▶ Demographics, population
- ▶ Federal and Provincial policies, programs, and regulations
- ▶ Increasing energy prices

Growth led by – but not limited to – the industrial sector

End-use energy demand by sector, 2012-2035

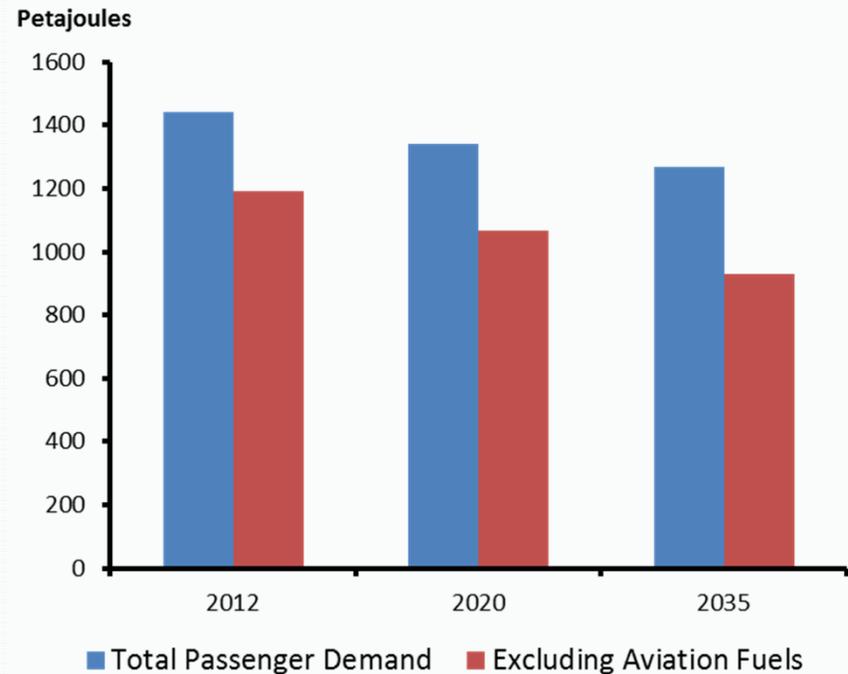
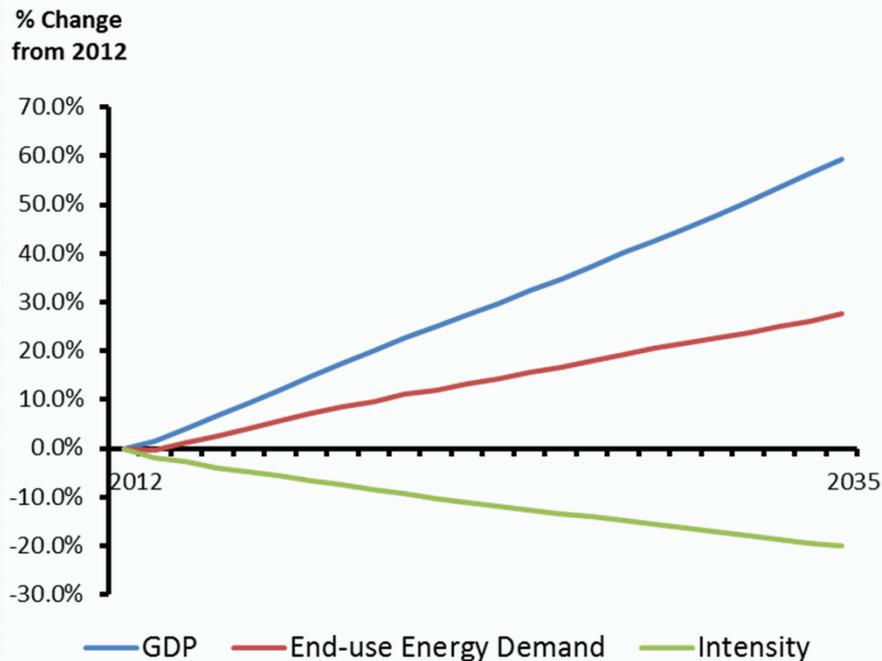


Demand growth over the projection period, relative to 2012

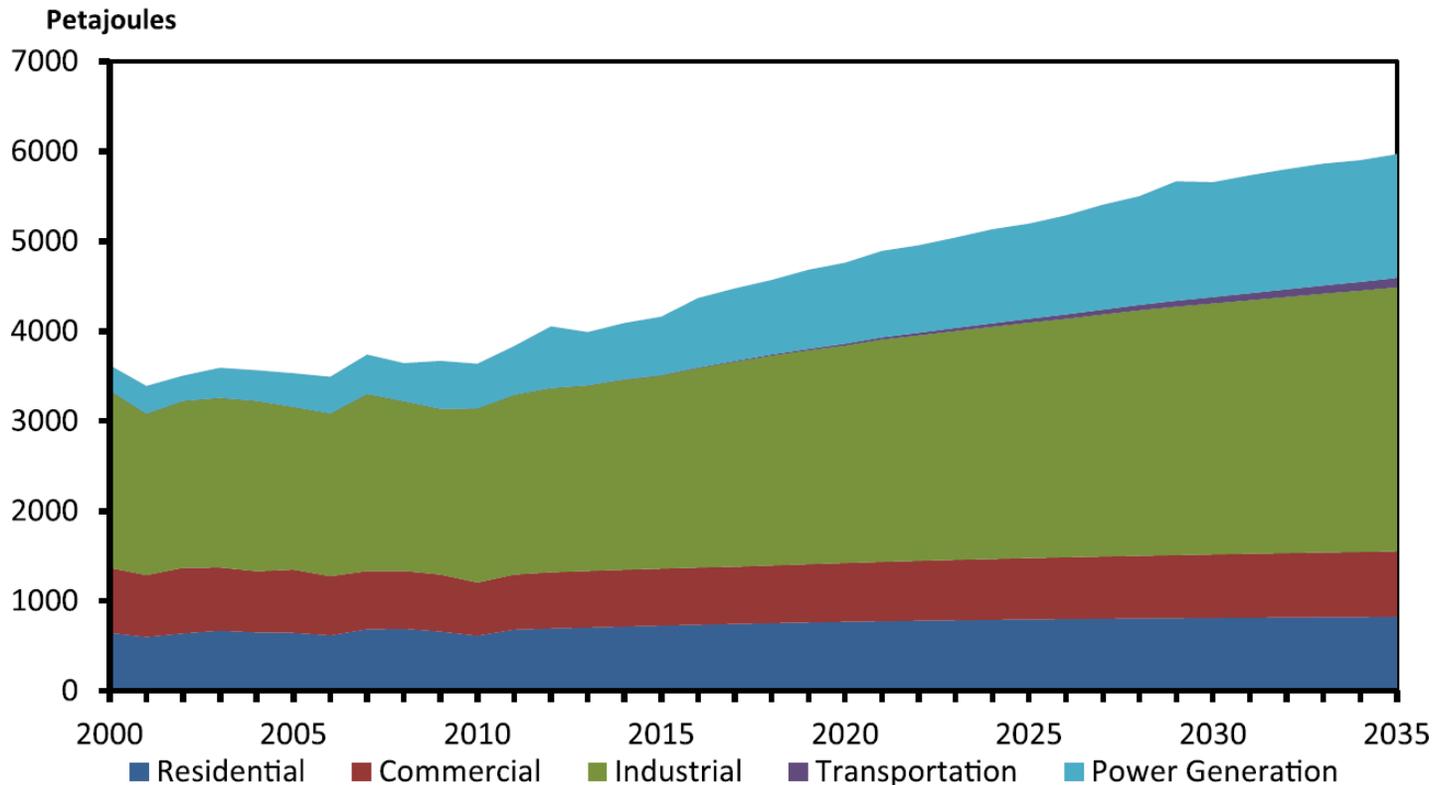


Canadians use energy more efficiently

- ▶ Energy intensity in 2035 is 20% lower than in 2012
- ▶ Passenger transportation energy use declines, impacted by emission standards



Natural Gas leads demand growth



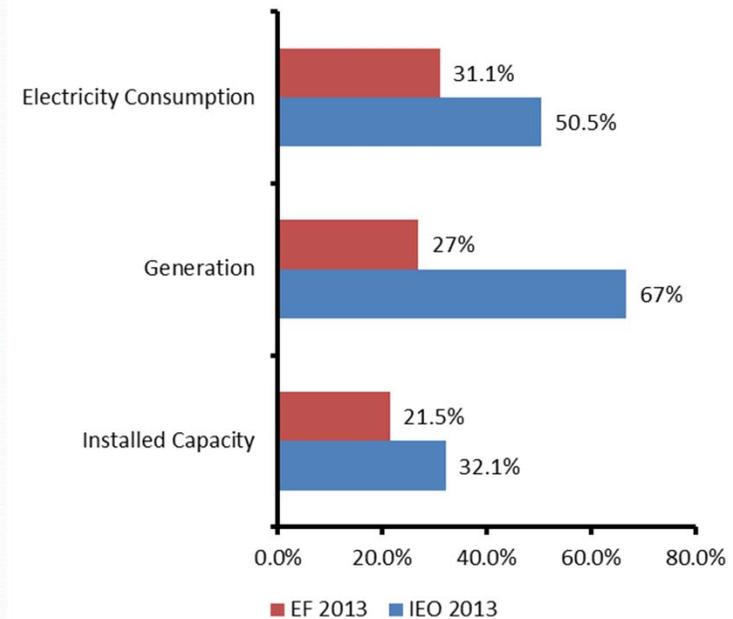
- ▶ Primary natural gas demand (includes gas used for power generation) grows an average of 1.7% per year in the projection
- ▶ Increase of 148 million m³/d (5.2 Bcf/d) between 2012 and 2035

EF 2013 vs. the U.S. EIA's *International Energy Outlook 2013*

Energy Demand Growth: 2012-2035

	EF 2013	IEO 2013
Total Delivered Energy Demand		
Annual Average Growth	1.1%	0.9%
Total	28%	21%
Key Difference: Transportation Sector		
Annual Average Growth	0.8%	-1.2%
Total	20%	-24%

Electricity Growth: 2012-2035



Global Context:

- ▶ IEO predicts 2035 global primary energy demand of **813,000 PJ**, electricity generation of **38,000 TW.h**, and installed capacity of nearly **7752 GW**.

Energy Available for Export Increases

- ▶ Net Available for Export in 2035:

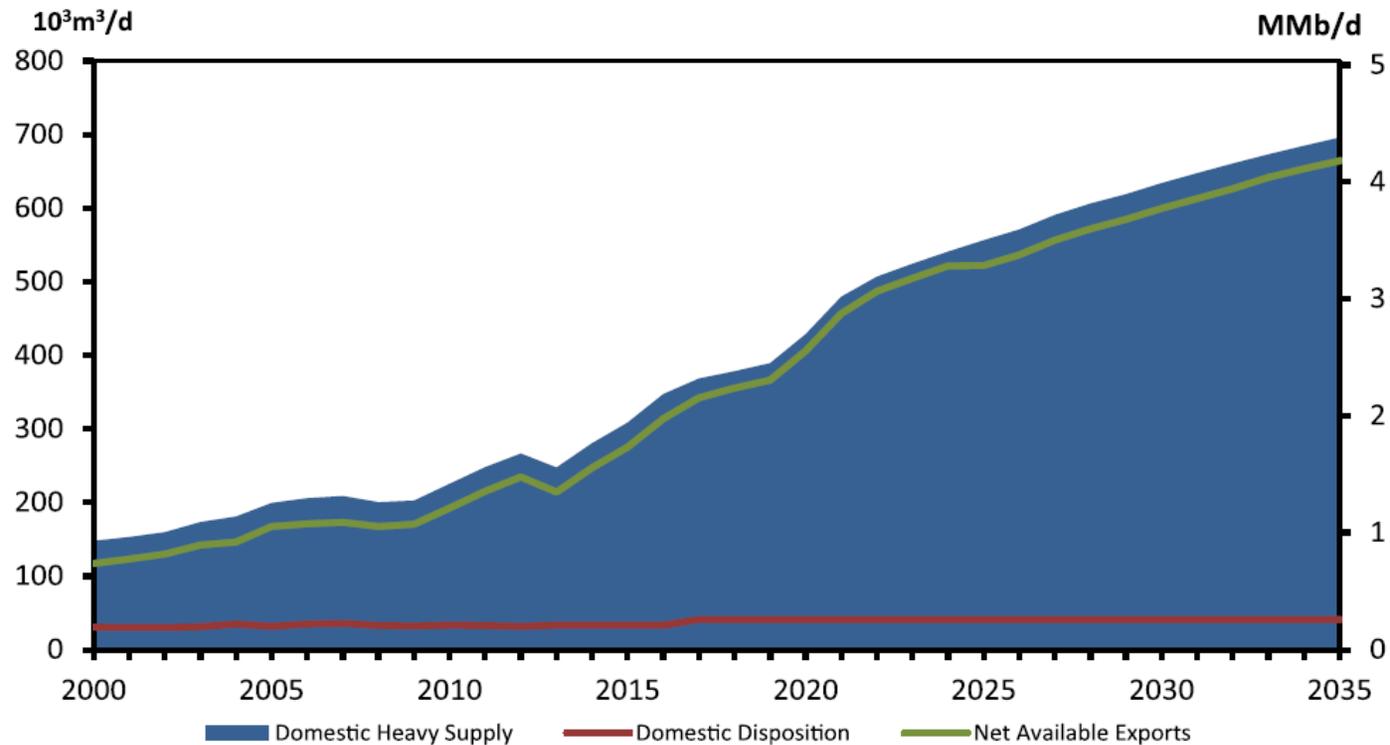
Crude Oil:
883 $10^3\text{m}^3/\text{d}$
(5.5 MMbbl/d)

Natural Gas:
128 $10^6\text{m}^3/\text{d}$
(4.5 Bcf/d)

Electricity:
30 TW.h
(108 Petajoules)

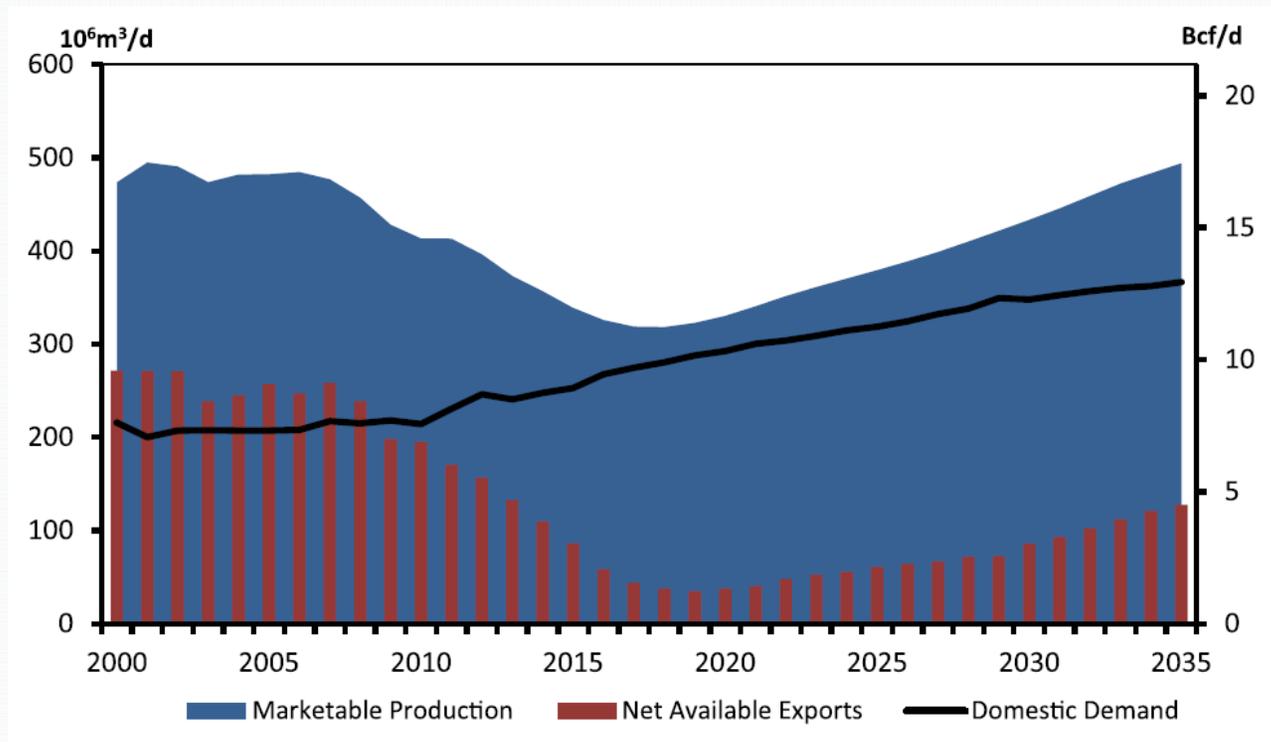
- ▶ Combined on an energy equivalent basis: crude oil, natural gas and electricity net available for export **nearly doubles** over the projection period
- ▶ Growth in export markets and the infrastructure to access them are key uncertainties

Crude Oil: Growth comes from Heavy



- ▶ Heavy crude oil net available for export increases to 4.2 million barrels per day by 2035, 182% above 2012 levels
- ▶ Light crude oil accounts for the remainder, and is fairly flat over the projection period

Natural Gas: Production catches up to demand in the long-term

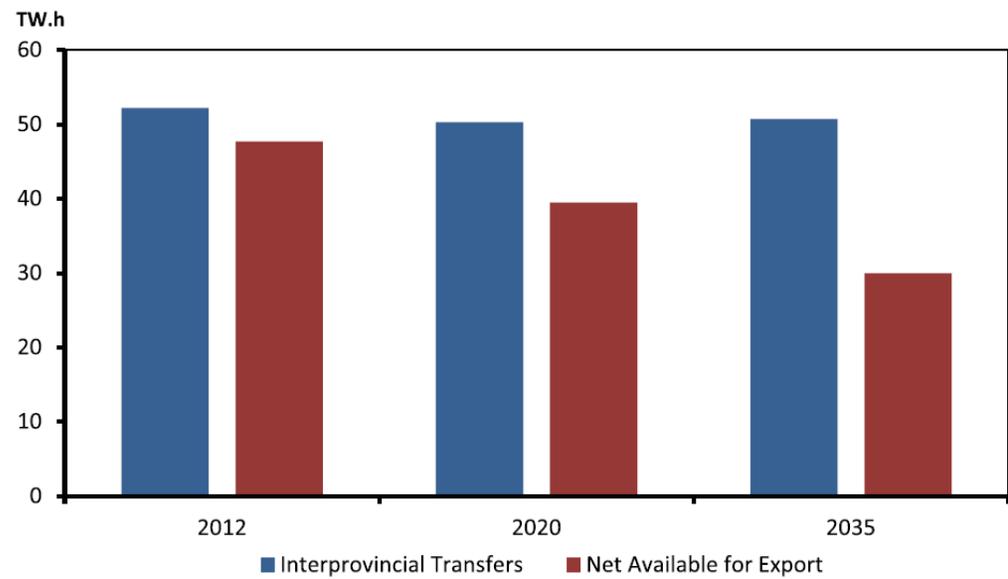
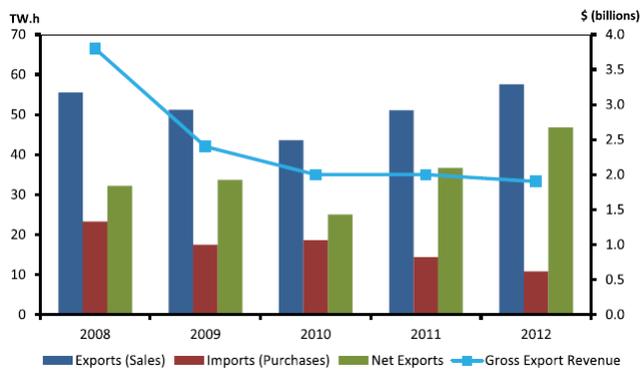


- ▶ Near-term: production declines while demand increases, leading to declines in net available for export
- ▶ Longer-term: production rebounds, eventually outpacing demand growth

Electricity: Moderates from record levels in 2012

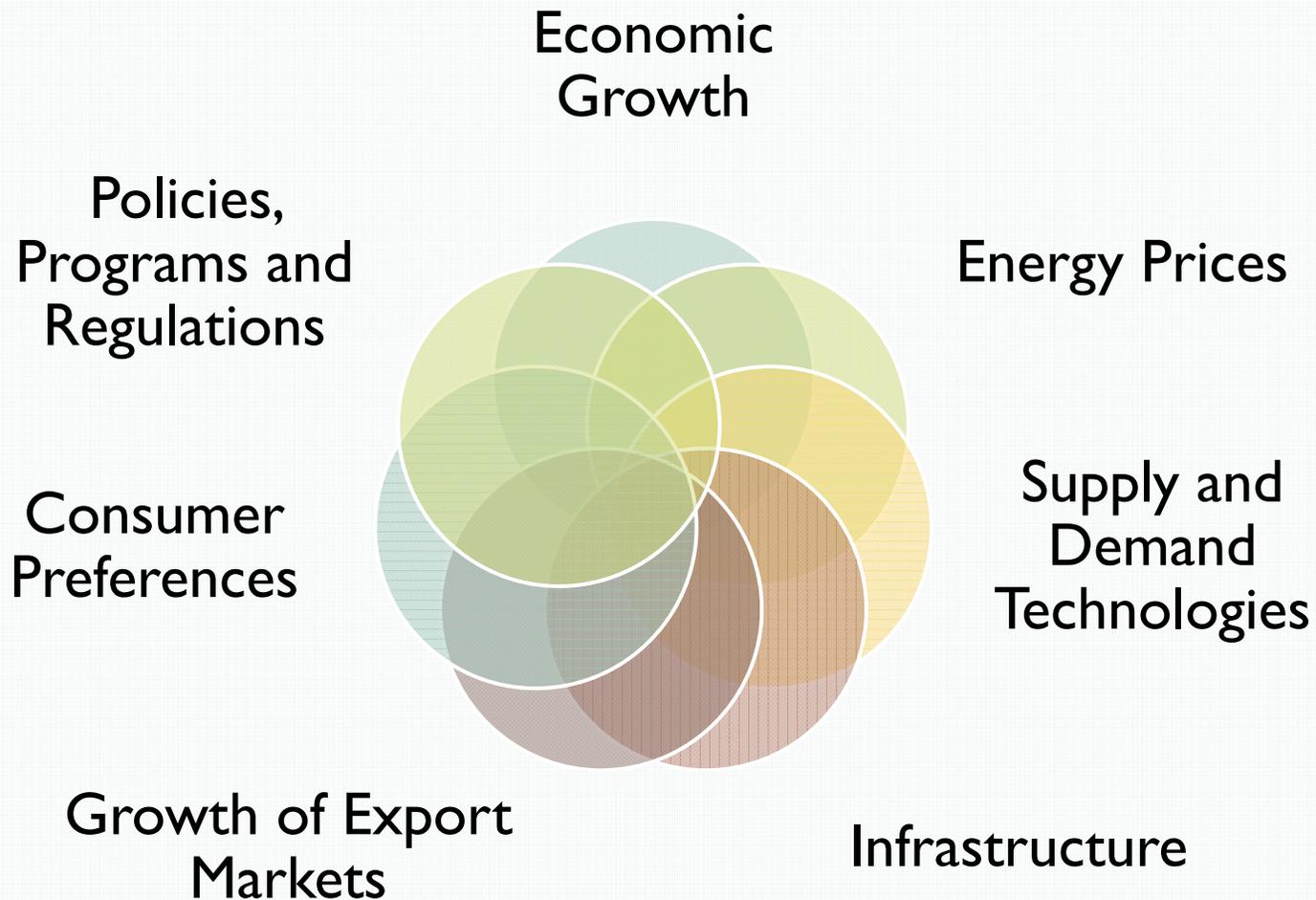
Recent History:

- ▶ Record high exports in 2012, but low prices dampen export revenues
- ▶ Leads to uncertainties for export oriented generation/transmission



- ▶ Net available for export: Moderates from 2012 peak, but remains at historical norms
- ▶ Interprovincial transfers fairly steady over the projection

Key Uncertainties: An important part of the NEB's *Energy Futures* reports



Questions?

- ▶ Energy Futures e-mail: energyfutures@neb-one.gc.ca
- ▶ Full report and data available at: www.neb-one.gc.ca

Click “Energy Futures” link on the NEB homepage

The screenshot shows the NEB homepage with a navigation menu at the top: Français, Home, Contact Us, Help, Search, and canada.gc.ca. The main content area is divided into three columns. The left column contains a sidebar with links: The NEB, Who we are & our governance, Temporary Board Member Opportunities, Public Participation, News, Careers, Hearings and Information Sessions, Major Applications and Projects, Regulatory Documents, Cost Recovery, North / Offshore, Site Map, Links, Energy Information (circled in red), Pricing, Energy Reports, Energy Futures, Statistics, Energy Outlooks, Safety and the Environment, and Emergency. The middle column, titled 'What's New', features a news item from 2013-11-25 about TransCanada Pipelines Limited's decision on RH-001-2013, and another from 2013-11-25 about the Regulatory Document Index. The right column, titled 'Regulatory Documents', includes links for 'View applications, hearing orders, transcripts, reasons for decision or Submit Documents', 'View Recent Decisions', 'Land', 'Safety forum 2013', and 'Administrative Monetary Penalties'. Below this is a 'Regulatory Applications' section with links for 'Companies click here to apply', 'Major Applications and Projects', 'Set-Aside and Collection Mechanisms', 'Arctic Offshore Drilling Review', and 'Enbridge Edmonton to'.

New data appendices and downloadable Excel tables

The screenshot shows the 'Canada's Energy Future 2013 - Energy Supply and Demand Projections to 2035 - Appendices' page. The left sidebar contains a navigation menu: The NEB, Who we are & our governance, Temporary Board Member Opportunities, Public Participation, News, Careers, Hearings and Information Sessions, Major Applications and Projects, Regulatory Documents, Cost Recovery, North / Offshore, Site Map, Links, Energy Information (circled in red), Pricing, Energy Reports, Energy Futures, Statistics, Energy Outlooks, Safety and the Environment, Emergency Management, Environment, Safety, Compliance and Enforcement, and Damage Prevention. The main content area is titled 'Canada's Energy Future 2013 - Energy Supply and Demand Projections to 2035 - Appendices' and lists several data appendices and Excel tables: Drivers and Prices - Drivers and Prices [EXCEL 517 KB], Energy Demand - Energy Demand [EXCEL 926 KB], Oil and Natural Gas Liquids - Oil and Natural Gas Liquids [EXCEL 607 KB], and Natural Gas - Natural Gas [EXCEL 219 KB].