Sustainable Prosperity

# Energy Transitions and Sustainability

## Energy transitions in Canada and the role of low carbon policies

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# The political economy of energy:

- No real national energy policy/strategy in Canada
- Market – in terms of consumption – is either provincial (electricity) or North American (oil and gas)
- Oil and gas seeking diversity of markets, both to avoid US policy risk but also to gain higher price
- Provinces "own" the resource and so have first call on revenues/rents (although federal tax regime does apply)
- Creates mixed policy incentives: the Alberta fiscal model is one every province (at least structurally) seeks to emulate, which complicates negotiation of federal/national policy on either energy or on climate change/environment

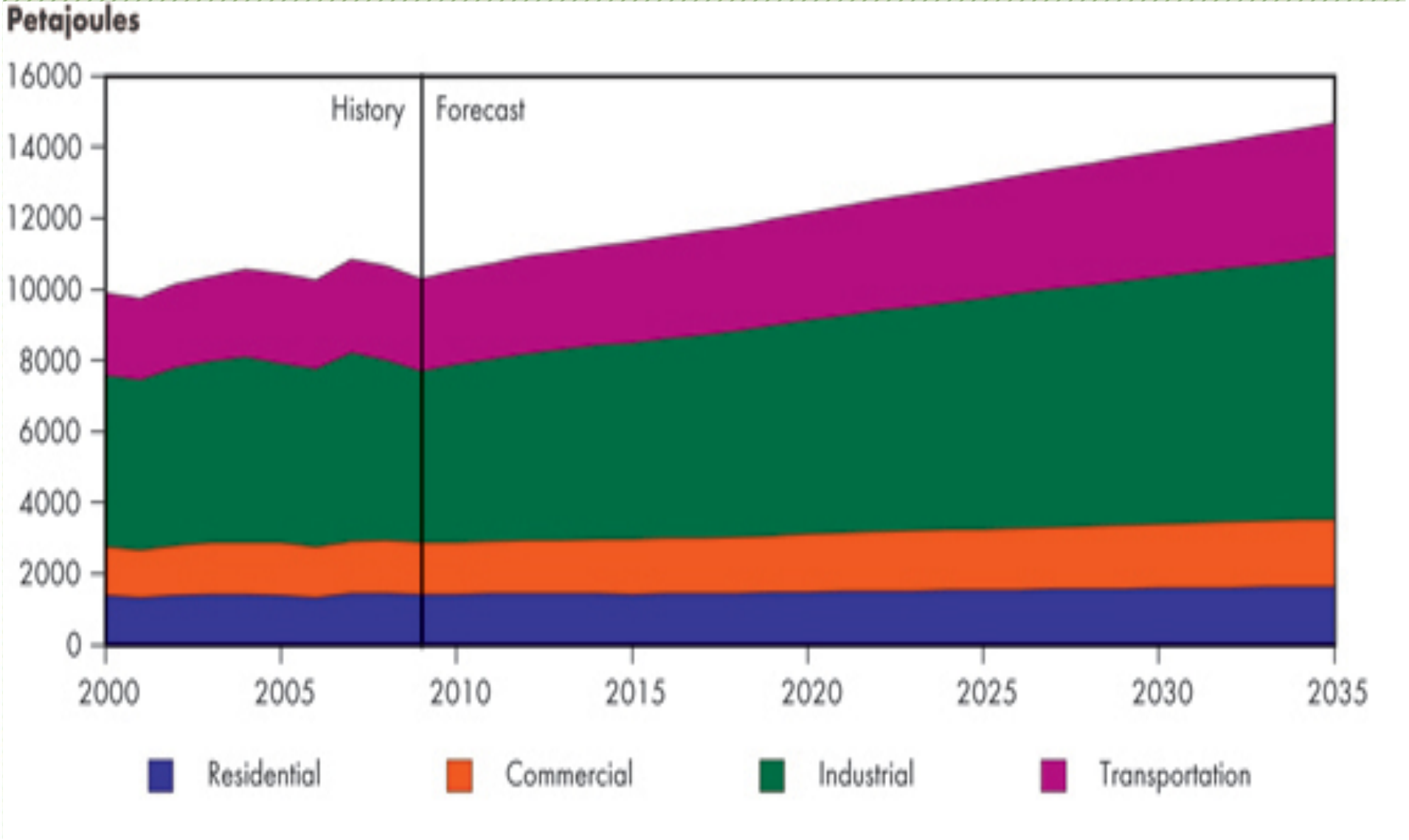
# The political economy of energy (2):

- For Canada, overriding policy objective has gone from ensuring security of supply to seeking security of demand
- Reflects reversal of primary role played by energy in national economic development:
  - Was input into manufacturing-led export model
  - Now key component of commodity-led export model (for which manufacturing is now an input)
  - Manufacturing still a major part of the Canadian export earnings, but declining
  - Policy emphasis on commodities reflects assumptions about booming emerging markets (in which we may not be able to compete on manufacturing) and decline of US market (whach has be been natural market for manufacturing, as part tof NA supply chain dynamic)
- Economic interest has shifted from need for low cost energy (for domestic consumption) to high cost energy (for export earnings)
- Important to distinguish between electricity and oil and gas
- But what is "security of demand"?

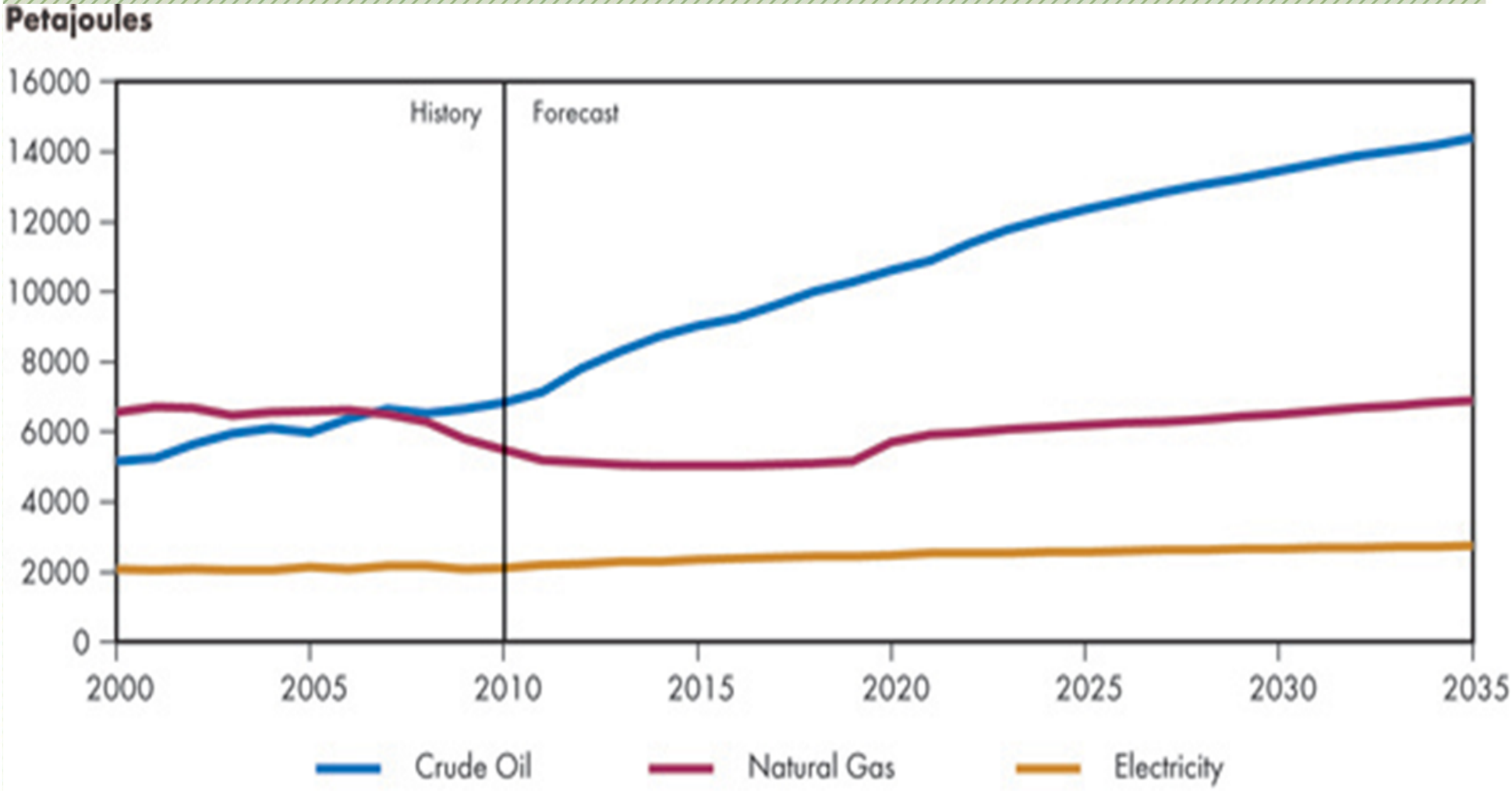
# Canada's Low Carbon Energy Future

- Canada's energy system a "tale of two systems:
  - The electricity sector
  - The oil and gas sector
- At same time, Canada's emissions are "a coat of many colours" (transportation, buildings, etc.)
- Incremental trend to decarbonization of domestic energy system is real, BUT…not enough to offset growth in oil and gas sector
- Need to take account of this duality, and see that real focus must be on potential to build on existing electricity system to push a domestic low carbon energy system

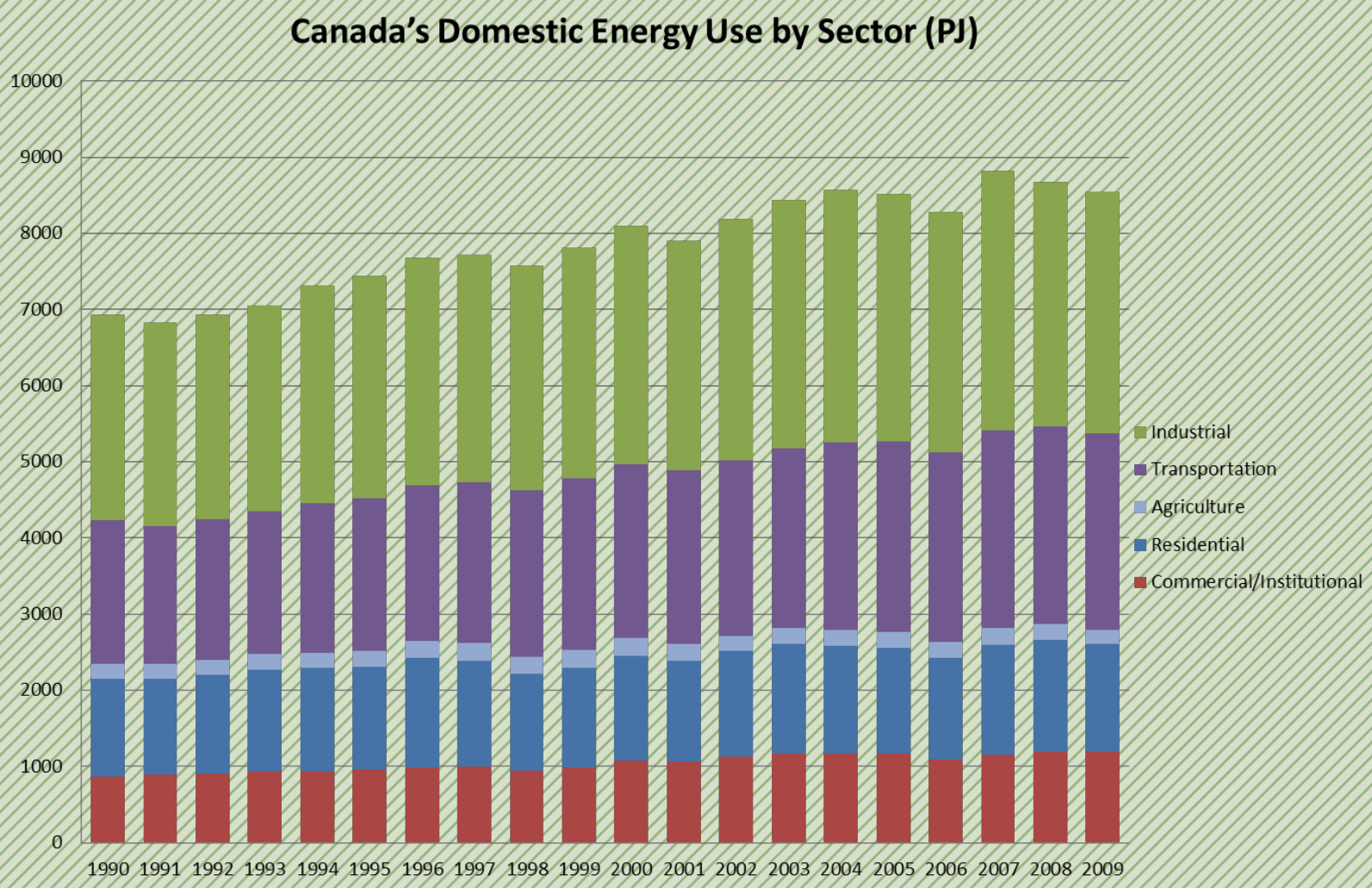
# Domestic energy demand



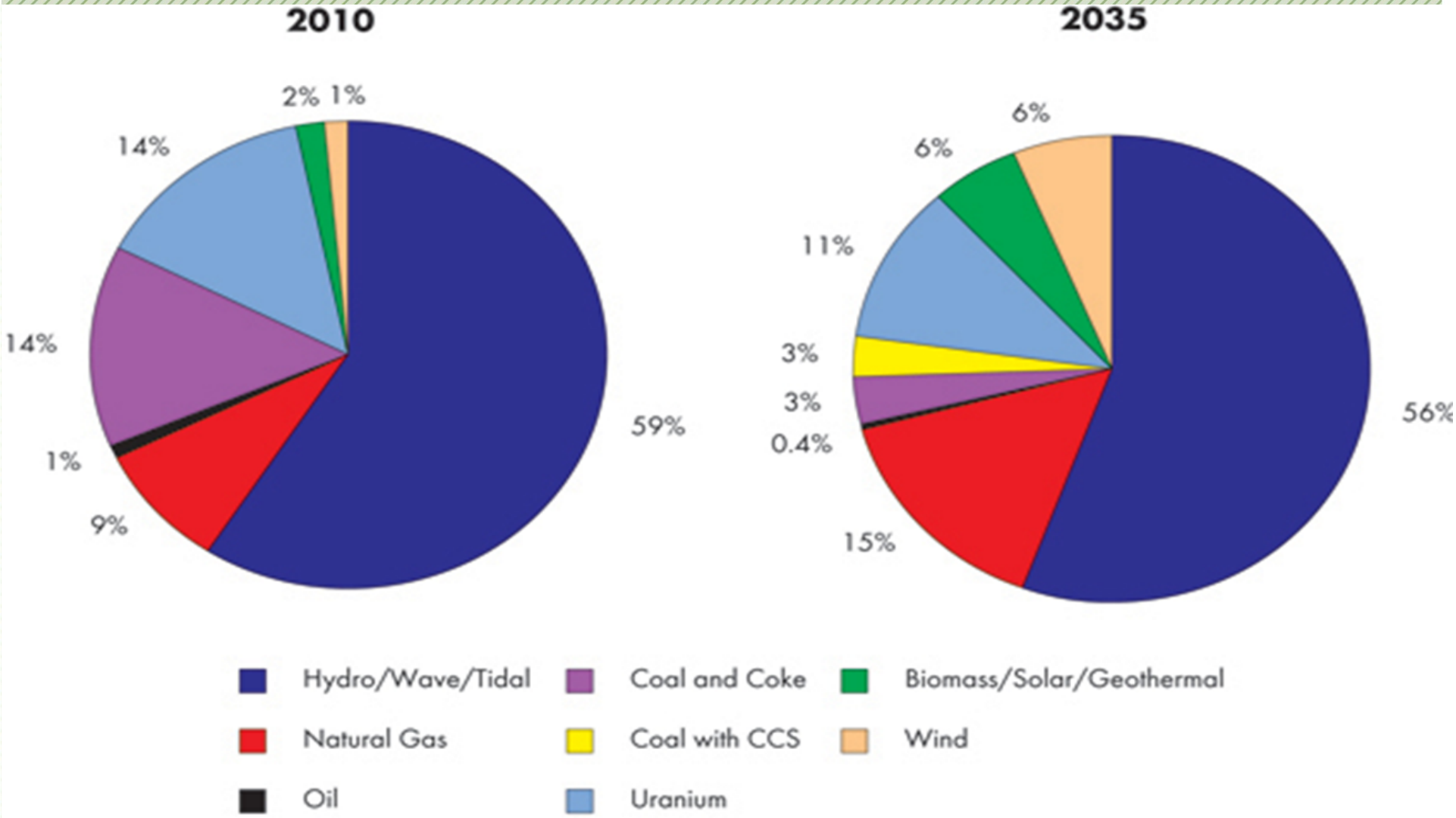
# Domestic primary energy production

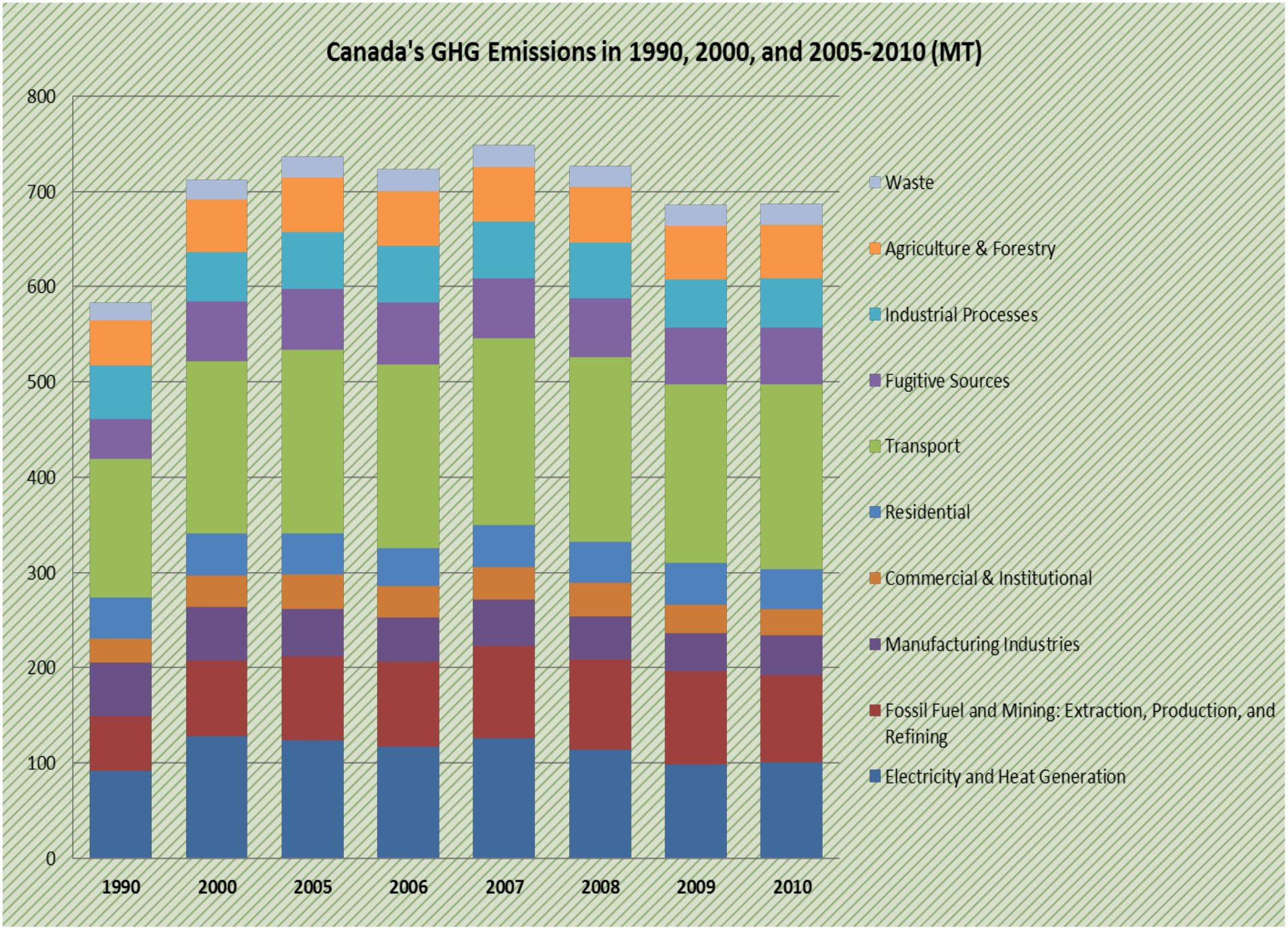


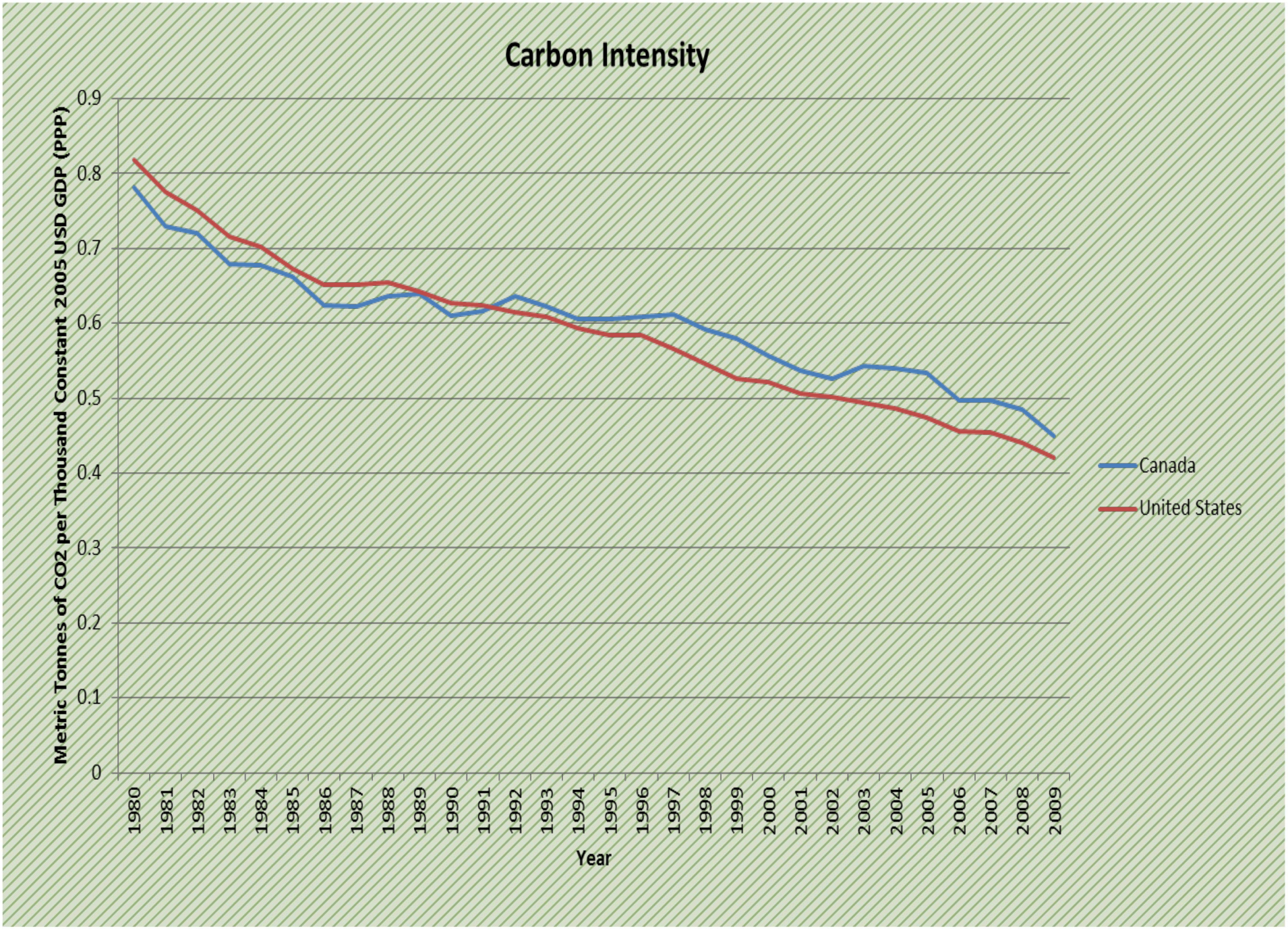
# Domestic energy use, by sector

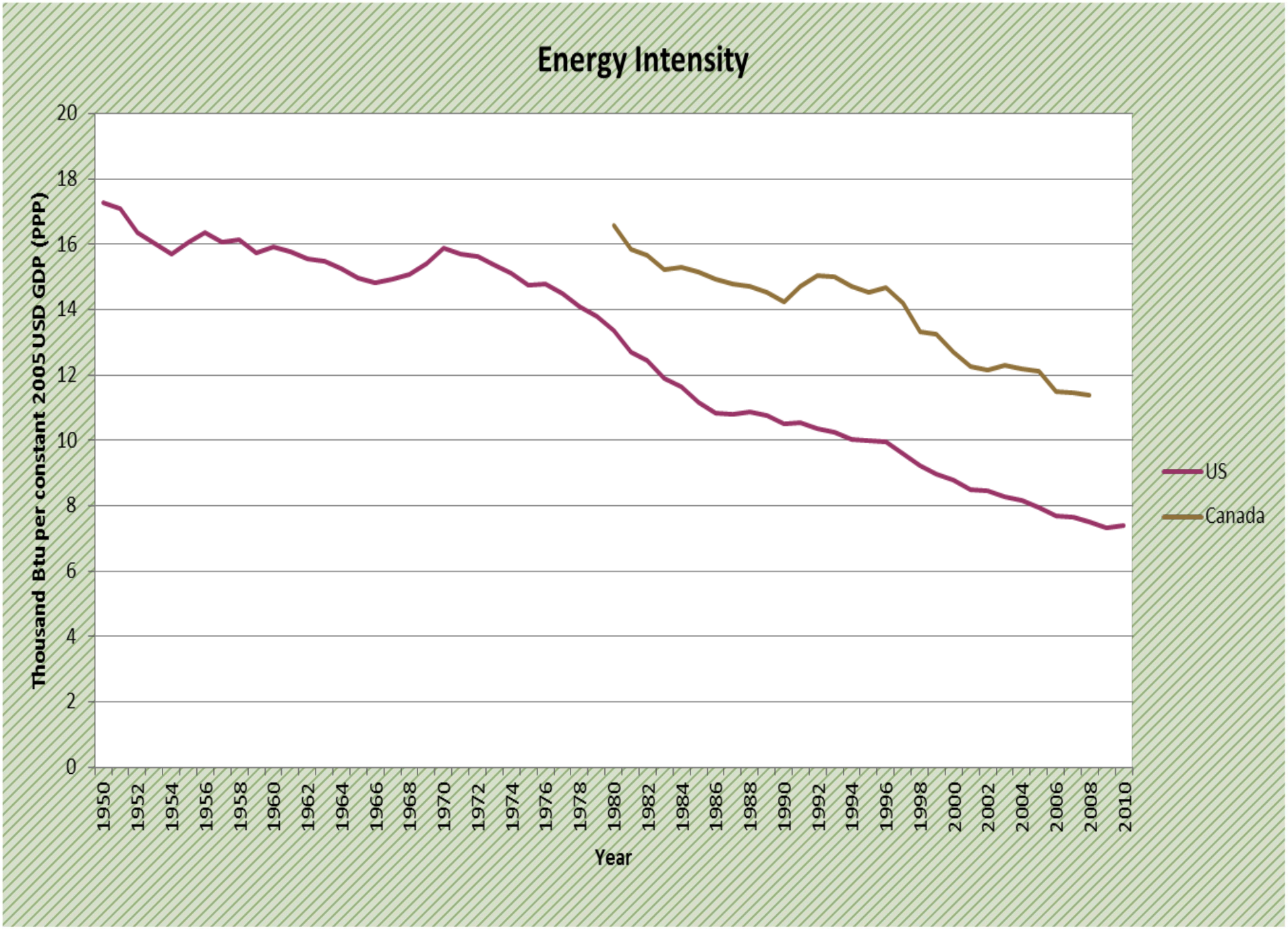


# Domestic power generation:




Canada's GHG Emissions in 1990, 2000, and 2005-2010 (MT)
800
700
600
500
400
300
200
100
0
1990
2000
2005
2006
2007
2008
2009
2010
Waste
Agriculture & Forestry
Industrial Processes
Fugitive Sources
Transport
Residential
Commercial & Institutional
Manufacturing Industries
Fossil Fuel and Mining: Extraction, Production, and Refining
Electricity and Heat Generation


Carbon Intensity
Metric Tonnes of CO2 per Thousand Constant 2005 USD GDP (PPP)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year
Canada
United States


Energy Intensity
Thousand Btu per constant 2005 USD GDP (PPP)
0
2
4
6
8
10
12
14
16
18
20
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
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2004
2006
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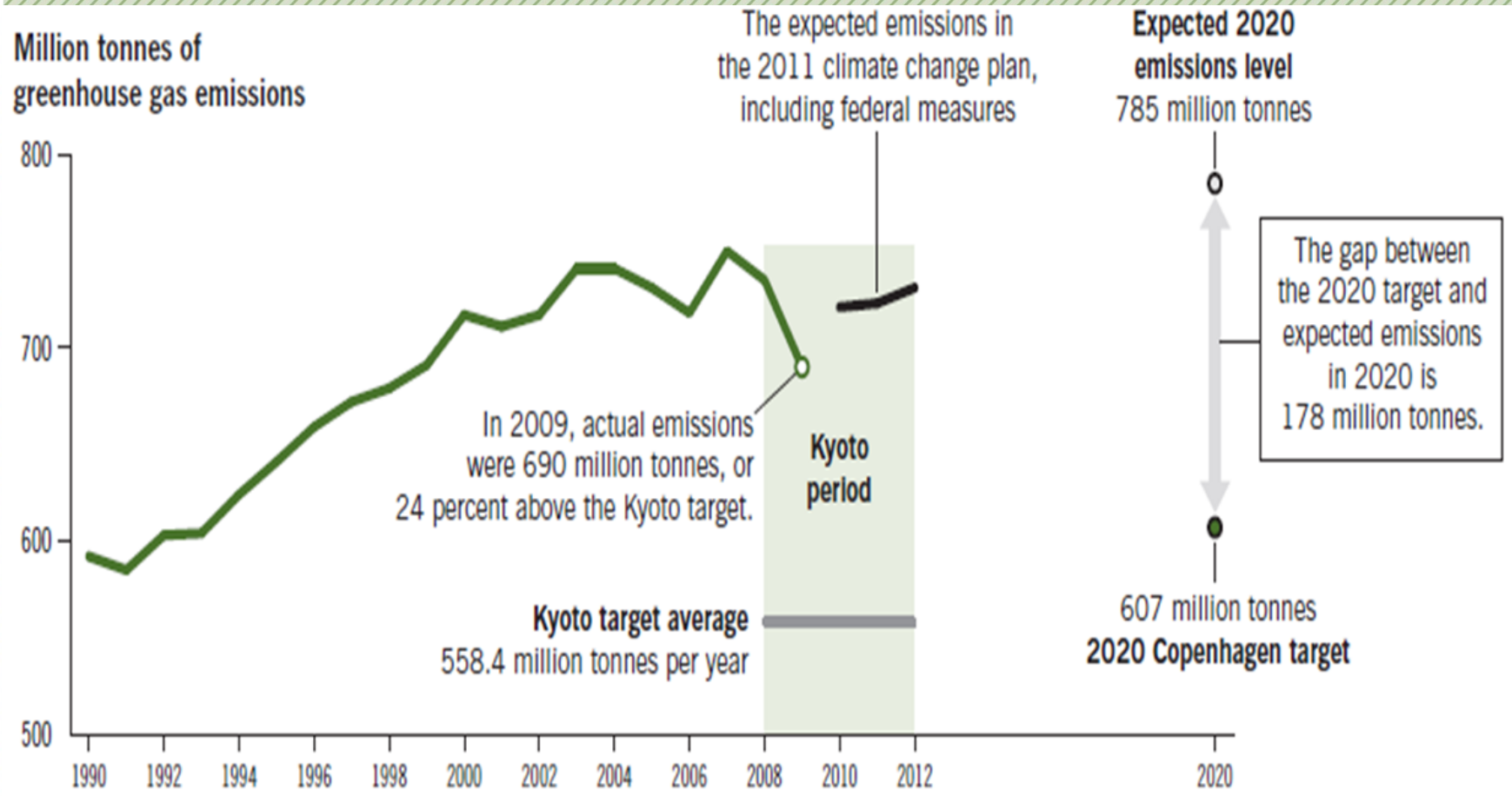
2010
Year
US
Canada

# Canada's emissions gap

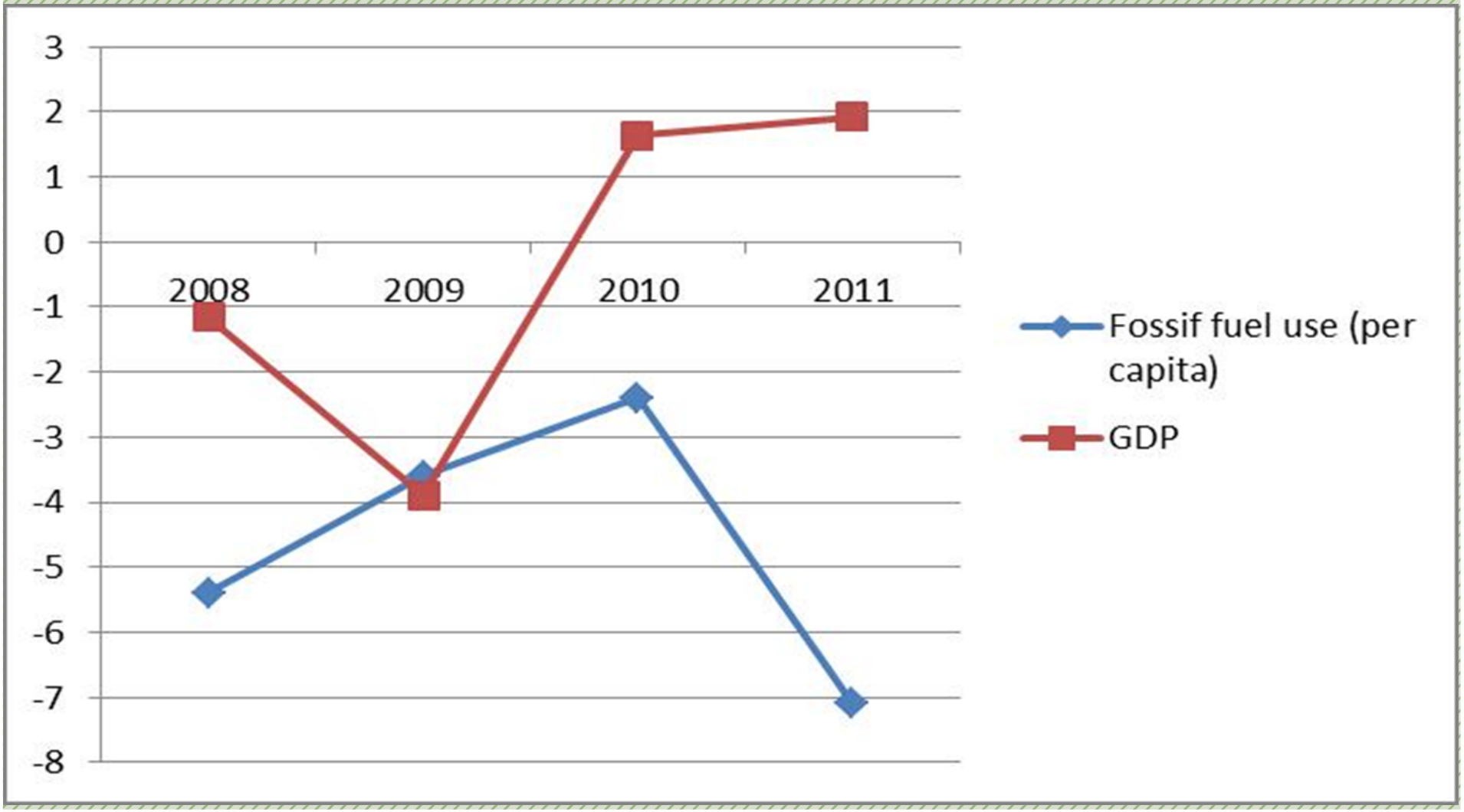



Source: Compiled with information from Environment Canada's National Inventory Report, 1990–2009: Greenhouse Gas Sources and Sinks in Canada (2011), A Climate Change Plan for the Purposes of the *Kyoto Protocol Implementation Act* (May 2011), and Canada's Emissions Trends (July 2011)

# Policy opportunities

- Many sectorally-based policies will promote and accelerate domestic decarbonisation (vehicle regs., coal power, pending oil and gas…)
- Similarly, many provincial initiatives are pushing in the same way (AB SGER, ON GEGEA, Quebec EVs, etc.)
- But real test – and opportunities – rest in structural policies to decouple economic growth from carbon-based energy

# BC carbon tax impact: fuel use vs. GDP growth (BC)



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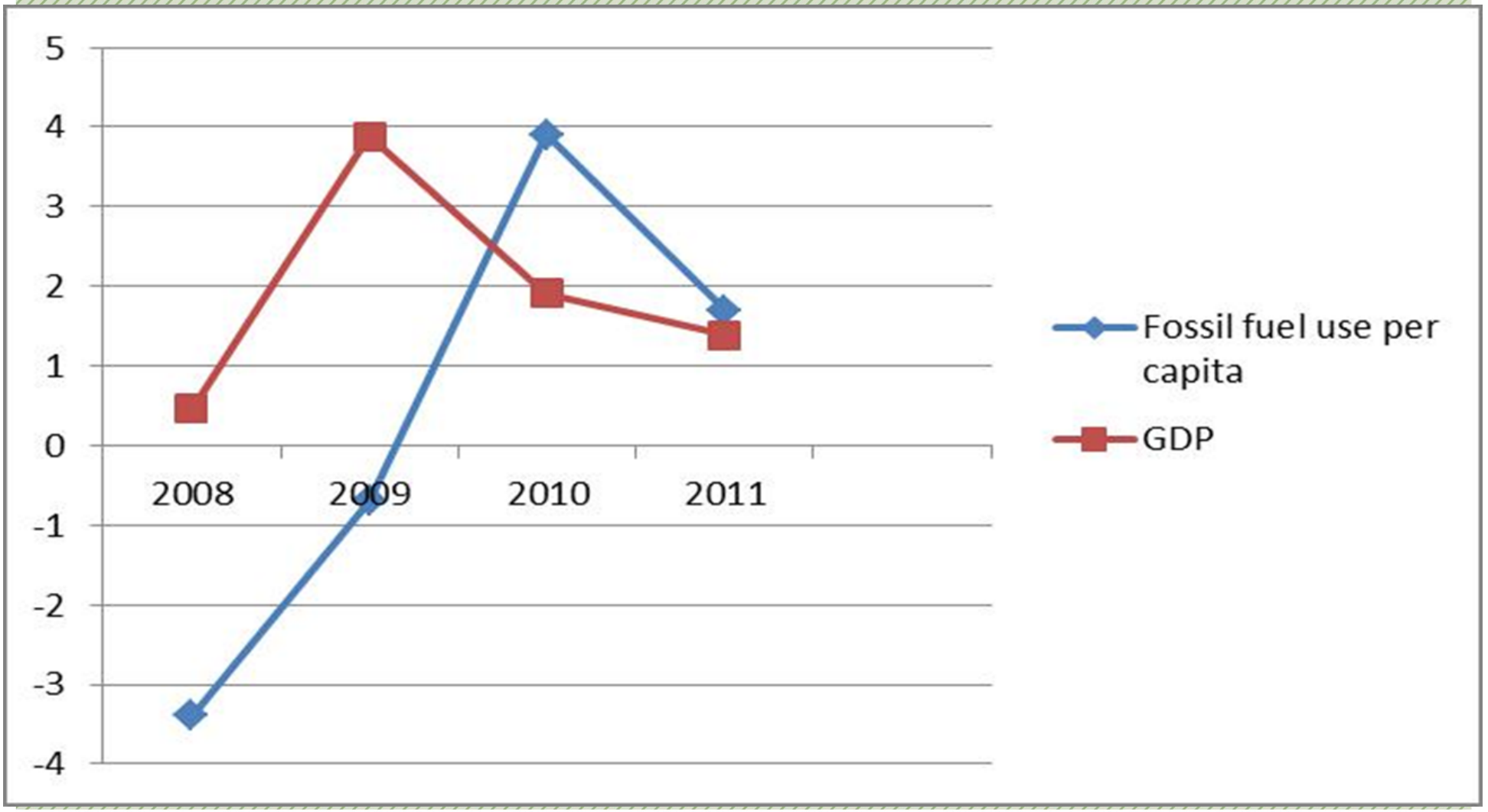
# BC carbon tax: fossil fuel use vs. GDP growth (RoC)



# A low carbon energy system: Electrification?

*Reminder of hypothesis: low carbon energy system in Canada goes through electrification of much of our domestic energy system.*

**Builds on where we have comparative advantage:**

**-Already substantial hydro/low carbon advantage (more because of US NG glut)**

**-Anticipated growth in renewables – particularly in solar**

**-Focus on automotive/transportation opportunity ties in nicely with still-vacant market niches in electric vehicles, battery storage, etc.**

**-Other opportunity is around "smart grid", where Canada has considerable expertise and existing investments in things like smart meters**

**At same time, technology changes could have substantial impacts in basic economics and structure of power sector (i.e. German electricity and DG)**

# Conclusion

- We need to separate domestic system – where electrification is possible – from international exports of oil and gas
- We are likely oversupplied in energy over next 25-35 years, and so exports are going to continue to be viable
- We have policy models – such as BC carbon tax – which show potential for "decoupling" of carbon-intensive energy from economic growth, and pursue things like electrification
- The "rub" on national electrification is provincial parochialism on power sector policies
- A national approach has substantial promise and payoff… but can we do it?