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# Industry Energy Demand: The Next 10 Years

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# Change in Energy in Industry in Canada, the Next 10 years

- Different than last 10 years?
- Three components
  - Demand for product
  - Fuel prices and availability – Industry long run elasticity
  - Environmental (GHG) issues
- What might demand look like?

# Energy and Emissions Data

- Data on energy in the past:
  - Relatively well scrutinized data only since 1990
  - Reliable?
  - Representative?
- Many questions, issues
  - Historically no or low benefit to data provider
  - Data collector unaware of the issues
  - CIEEDAC has spent much of its time and effort to review, refine and make recommendations re: the data
  - Poor data on upstream oil and gas nationally

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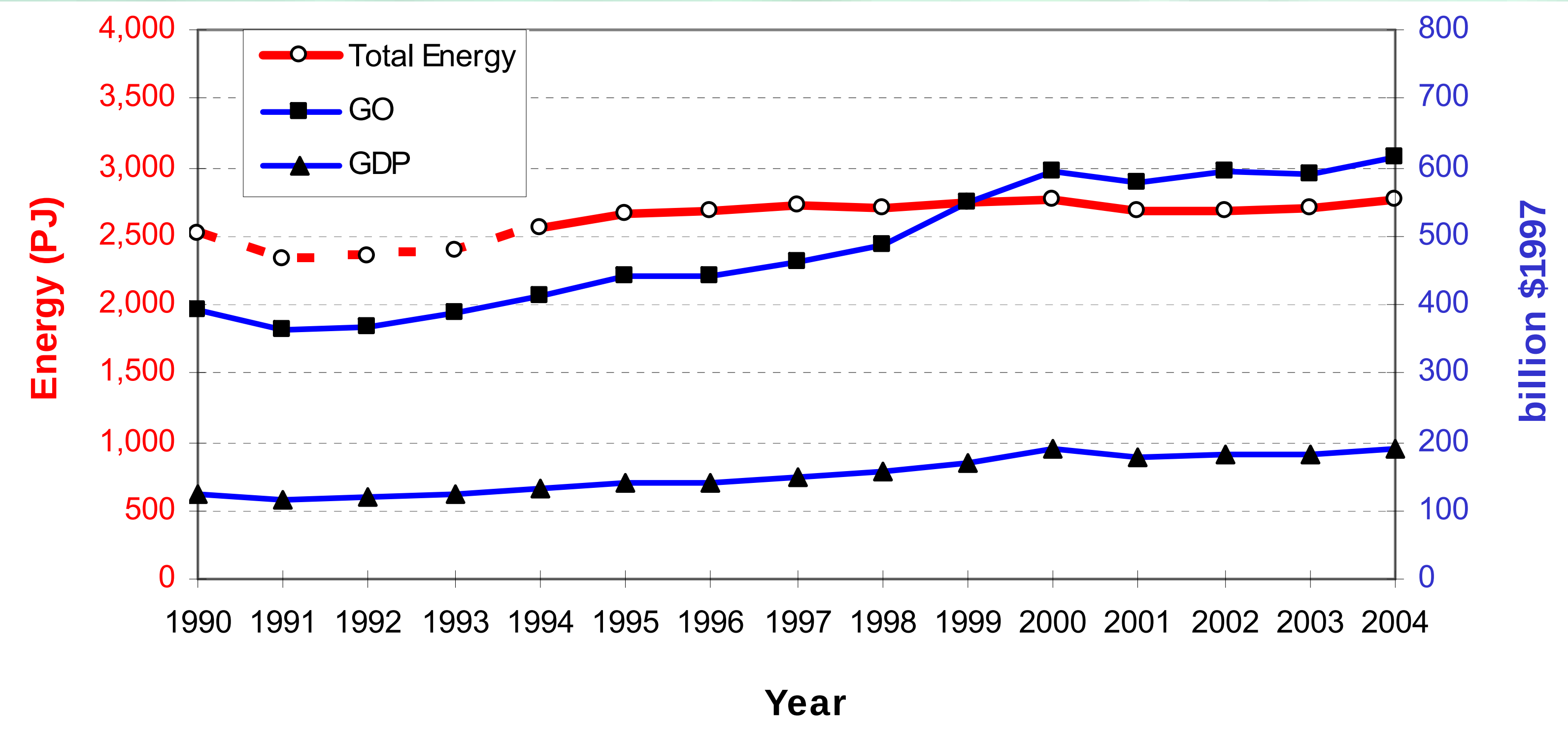
# Data: Energy and Production*




*Excludes upstream oil and gas, electricity supply

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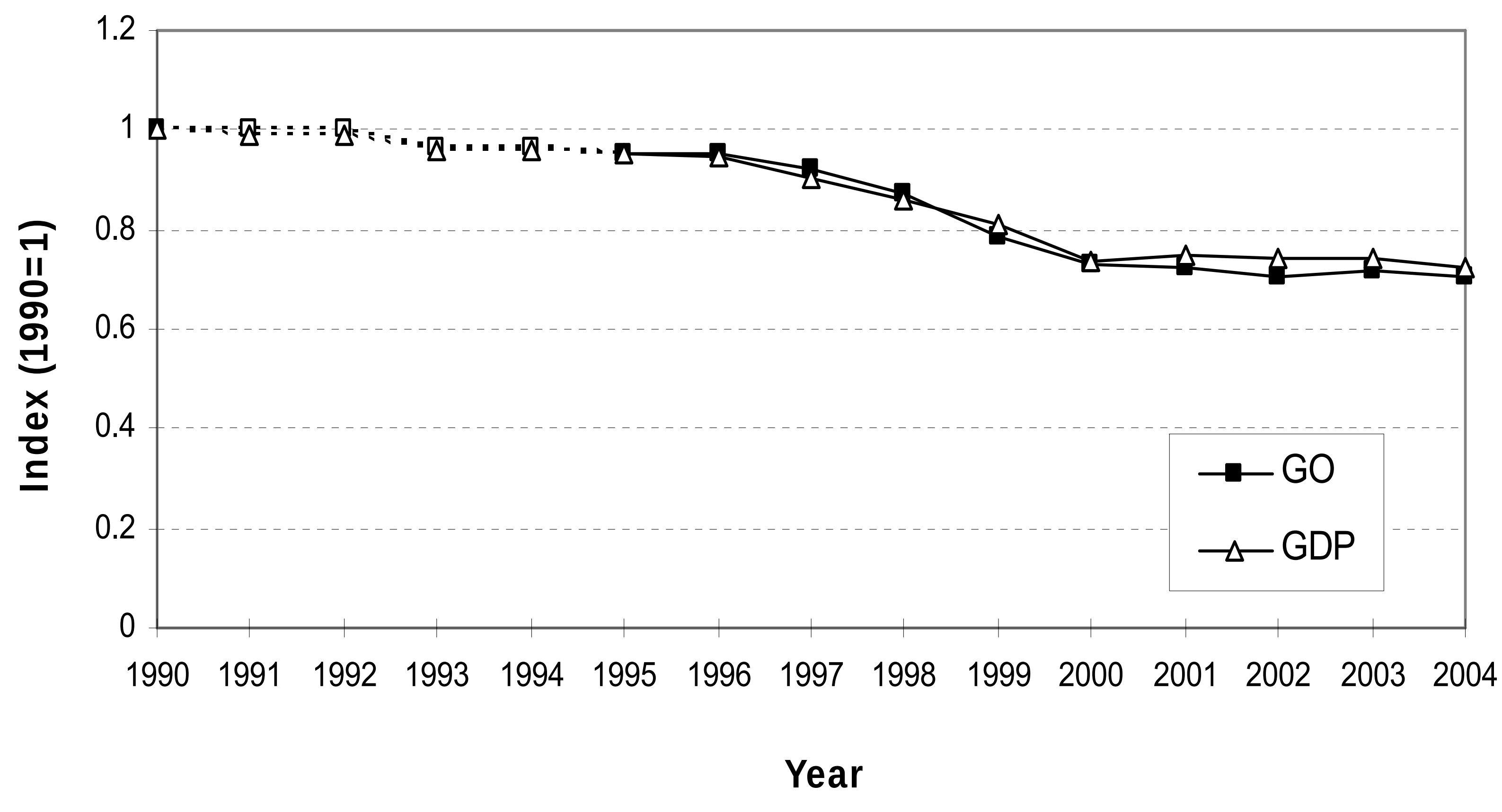
# Data: Intensity



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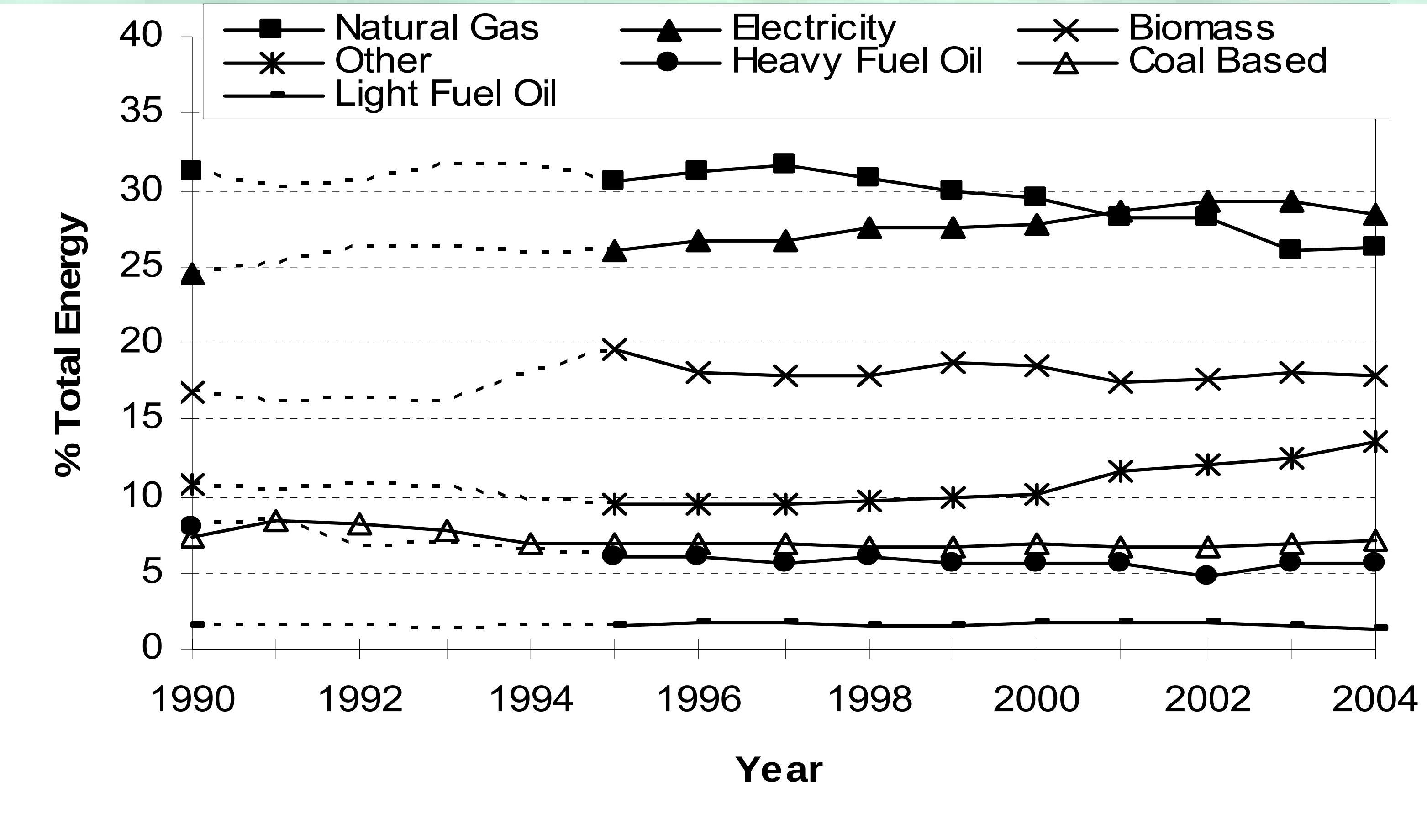
# Data: Fuel Mix



# General Trends

- Non-physical production in intensity indicator misleading – factorization shows “allocation” , not cause.
- GDP or GO based indicator suggests leveling of intensity. Yet individual industries with physical production often show intensity (efficiency?) improvement.
- Growth (activity) and new service demands overwhelm efficiency improvements – energy climbs. With supply (electricity and upstream) energy climbs quickly
- Move toward more “secondary” electricity is energy intense
- Poorer crude (oil sands) increases intensity

# Demand for Product

- World wide product demand changing, including structural change internationally and nationally
  - International market place
    - China GDP growth over 7% since 1991, nearly 10% for the last three years (2005 – 9.9%), with 10% expected in 2006
    - India GDP growth 7.6%, expects to be #3 shortly
  - Increases cost of commodities, other goods
- Canada: Resource Rich, People Poor
  - Export of commodities increasing, commodity industries strong
  - Energy intensive mining (upstream oil and gas), metals, pulp and paper
- Some structural change toward services, finished products

# Cost of Energy

- Long run elasticity
  - Developed by EMRG / MKJA
    - estimated from detailed hybrid model CIMS
    - indication of response to price changes
    - based on CEOU forecasts and prices
  - $E_{sub}$ calculation
  - Own and Cross price elasticities
- No other source for long run elasticity estimates.

# $E_{sub}$ Calculation Procedure

Potential Prices

Simulation model (CIMS)

Pseudo Data Set

Econometric model

Regression

Parameters

Calculate elasticities

Elasticities

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# Elasticities of Substitution

Long run (35 yrs) Allen partial (between cost shares, K for E)

| Regions / Sectors | |
|---|---|
| Canada | 0.26 |
| Transportation | 0.31 |
| Residences | 0.30 |
| Commercial & Institutional | 0.27 |
| Industry (can be disaggregated) | 0.13 |

Typical values from expert judgment = 0.2 to 0.5

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# Elasticities of Substitution

Industry $E_{subs}$ (K for E)

| | |
|---|---|
| Industry (all) | 0.13 |
| Chemical Products | 0.04 |
| Industrial Minerals | 0.33 |
| Iron and Steel | 0.12 |
| Metal Smelting | 0.02 |
| Mining | 0.18 |
| Other Manufacturing | 0.03 |
| Pulp and Paper | 0.32 |

# Elasticities of Substitution

## K for $E_i$ and Inter-Fuel $E_{subs}$

| | |
|---|---|
| Capital for electricity | 0.32 |
| Capital for NG | -0.05 |
| Capital for Petroleum Products | 0.13 |
| Capital for Coal | 0.09 |
| Electricity for NG | 1.91 |
| Electricity for Petroleum Products | 1.73 |
| Electricity for Coal | 0.01 |
| Petroleum Products for NG | 1.27 |
| Petroleum Products for Coal | 1.29 |
| NG for Coal | 0.95 |

# Electricity Elasticities

Long run (35 yrs) elasticities log(Q) = $\alpha$ + $\beta$(log Price)

| Electricity consumption for all Canada | | Residential electricity consumption | |
|---|---|---|---|
| All regions | -0.469 | All regions | -1.027 |
| BC | -0.351 | BC | -1.033 |
| AB | -0.470 | AB | -1.405 |
| SK | -0.631 | SK | -1.326 |
| MB | -0.468 | MB | -0.894 |
| ON | -0.530 | ON | -1.104 |
| PQ | -0.410 | PQ | -0.789 |
| Atlantic | -0.648 | Atlantic | -1.203 |

Short run econometric estimates = -0.2 to -0.5

# Cost of Energy

- Increased oil, gas, electricity prices
  - Technology change
  - Increase efficiency, reduce demand
  - Competitive substitutes, fuel switching
  - Rebound effect down
- Increase demand for Canadian supply
  - Oils sands replacing conventional oil
  - Biomass and wood fibre for energy
- Increase in renewable supply

# Environmental Considerations

- GHG costs and Kyoto-supporting policies
  - Air as emission waste receptacle unacceptable
  - Cost of Carbon Management
    - Sequestration – increased energy demand
    - Cap and Trade, Permit costs – declining energy demand
  - Economic consequence, national product demand down
  - Efficiency improvement,  energy demand down
- Criteria Air Contaminants
  - Air quality issues
  - Co-benefits to GHG reduction

# What could happen?

- Energy demand rises (considerably?) as
  - production (demand) grows
  - dependence on electricity grows
  - crude oil quality declines
  - environmental impacts / regulations are felt (e.g., sequestration)
- Energy demand declines (marginally?) as
  - efficiency improves
  - intensity diminishes (process or structure)
  - price increases
  - cap and trade
- Net effect will be
  - Energy demand in industry will rise, GHG emissions decline
  - Energy services (energy needed to meet demand) will increase
  - Renewable energy supply increases

# What will happen if…

1. We continue to act as a resource supplier, especially of energy…
   - commodity industries increase
   - export of oil (and coal?) up
   - metals, potash, pulp and paper
2. Effect of increasing energy prices dampened…
   - subsidy / tax breaks for development of all resources (including renewable supply)
   - reduce impacts of price changes through refunds, special long-term subsidy for certain industries
3. And no environmental costs assigned …

There will be significant increases in both energy and GHG emissions in the short and long term.