

Energy Use Intensity



Noteworthy:

- Alberta's peak total primary energy use (2,559 PJ), and peak primary energy use per person (820 GJ) occurred in 2003.
- The amount of energy used in relation to economic output (i.e., GDP), was fairly steady between 1961 and 1984, averaging 19,950 gigajoules (GJ) per million dollars of GDP. Since then, a slightly higher energy use per dollar of GDP has ensued, for an average of 21,530 GJ/million \$GDP.
- Total secondary energy use increased 39%, or 430.6 petajoules (PJ) between 1990 and 2003. During this time, the industrial sector secondary energy use increased by 52%, and transportation by 39%. Agriculture decreased by 5%, the commercial sector by 20%, and the residential sector by 27%.
- Alberta's secondary energy use increased by 12% from 432 GJ per person in 1990 to 485 GJ per person in 2003. Industrial secondary energy use per person increased 23%, transportation increased 12%, and residential increased by 3%, whereas secondary energy use in the agriculture sector decreased 23% per person and the commercial sector decreased by 3% (see figure at right).
- Statistics Canada data on primary energy use is only available for 1978 to 2003. To complete our GPI time series from 1961 to 1999, we estimated primary energy use between 1961 and 1978 on the basis of the annual percent change in Alberta's gross domestic product.

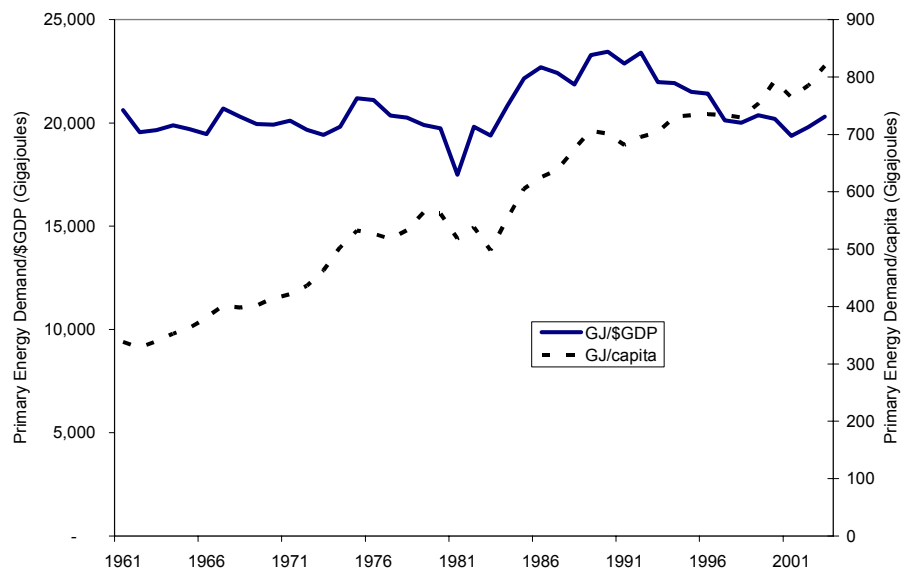
What is the intensity of Alberta's energy use?

There are two types of reporting on energy use — primary energy use and secondary energy use. Primary energy use includes energy used by final consumers (secondary energy use), intermediate uses of energy, energy to convert one form of energy to another (e.g., coal to electricity), and energy used by suppliers in providing energy to the market (e.g., pipeline fuel). Secondary energy use is the portion of primary energy consumed by end users in residential, commercial, industrial, and agricultural sec-

tors. Our study shows that between 1961 and 2003, Alberta's energy use increased by an estimated 474%, from 451 petajoules (PJ) in 1961 to 2,559 PJ in 2003. On a per capita basis, primary energy use intensity increased 142% per Albertan, from 338 gigajoules (GJ) in 1961 to 819 GJ per Albertan in 2003. Secondary energy use is a useful measure of the final consumption or end use of energy, leaving out the energy used to extract sources of energy, transform energy from

one form to another, and transport energy to final consumers. Secondary energy use in Alberta (based on Natural Resources Canada data) increased by 39%, from 1,100 petajoules in 1990 to 1,531 petajoules in 2003; it increased 12% per Albertan over the same period. The greatest increase was in the industrial sector, followed by the transportation sector; secondary energy use per Albertan decreased in the agricultural and commercial sectors.

Alberta's Primary Energy Use per Capita and per Million Dollars of Gross Domestic Product (GDP), 1961 to 2003



Source: Primary energy demand data from Statistics Canada; Calculations by authors; Gigajoule (GJ)=
10⁹ joules

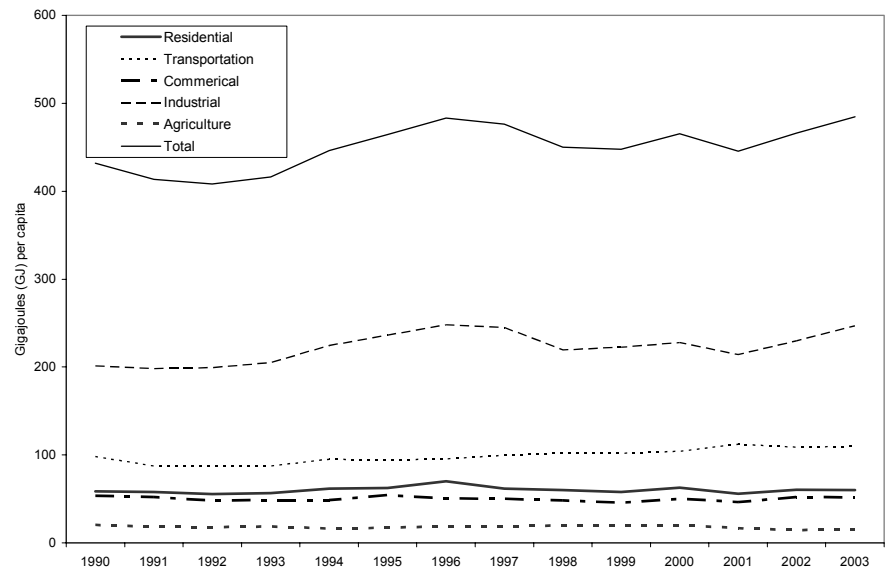
So What?

Energy use in Canada and Alberta is increasing steadily, particularly from industrial and transportation sources. If no significant changes occur in the patterns of energy production and use, Alberta's total greenhouse gas emissions will be 40.4% higher by 2010. Our current energy resources are mainly from non-renewable sources, for which several sources are being depleted (see "Oil, Gas and Oil Sands Reserve Life" summary). About 2.5% of Alberta's energy is from low-impact renewable sources, and another 9.5% is from large-scale hydro. However, recent estimates suggest that, in general, low impact renewable energy capacity (i.e., wind, micro-hydro and solar) could be increased to 30% of current total energy production, and if we include biomass and large-scale hydro sources, it could be increased to 100%. A shift to more renewable energy sources would diversify Alberta's energy economy and reduce the future financial liabilities associated with greenhouse gas emissions.

The continuing increase in fossil fuel burning has now been linked to increasing temperatures and is projected to cause radical global climate changes over the next decade, according to the Intergovernmental Panel on Climate Change. More fossil fuel burning also results in more air pollution and associated health problems and costs.

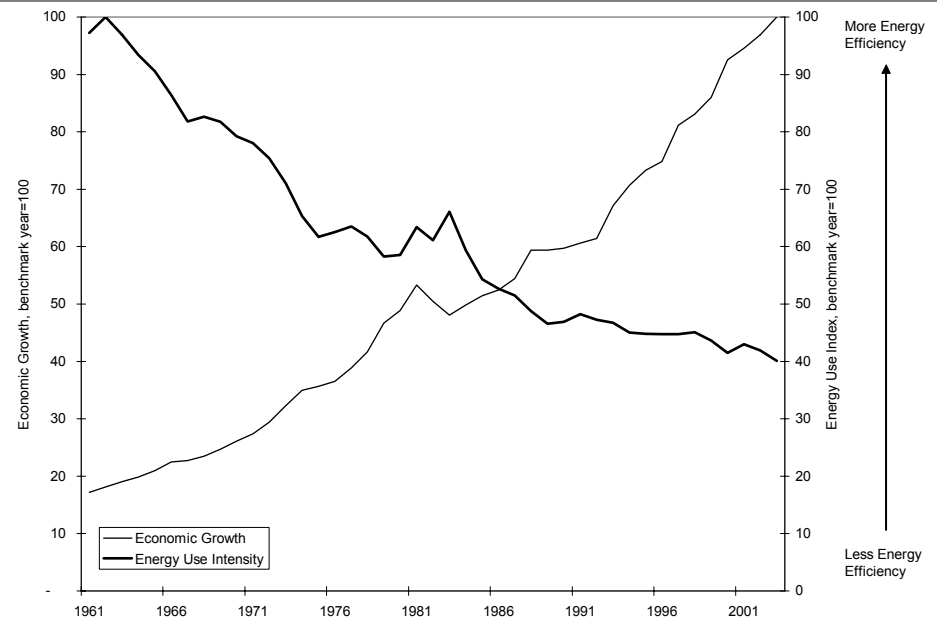
Because primary energy use is a more comprehensive measure of energy use intensity, we used it to construct the GPI energy use intensity index. The index is based on the primary energy use per Albertan from 1961 to 1999. The index uses 1962, the best year in terms of the least primary energy use per capita (328.7 GJ per person), as the benchmark. Therefore, 1962 is 100 on the index, and the other years are measured as changes from that benchmark year. The index has declined from a high in 1962 (100 on the index), to 40 in 2003.

Alberta's Secondary Energy Use per Person, by Sector, 1990 to 2003



Source: Natural Resources Canada, Office of Energy Efficiency

Alberta's Primary Energy Use Intensity Index, 1961 to 2003



On a scale of 0 to 100, where 100 is the year in which primary energy use intensity was lowest per Albertan, the status of primary energy use intensity ranks 40 in 2003 compared to 100 in 1962.

For price, see related costs of greenhouse gas emissions and air pollutants.

