

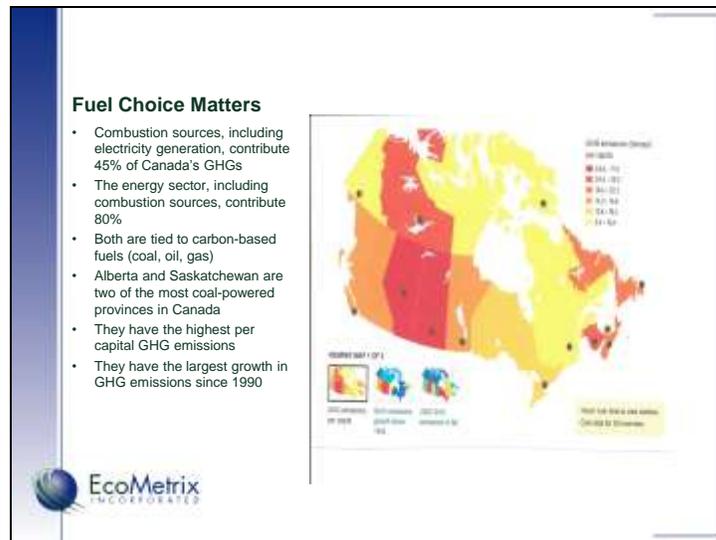
Slide 1



Good morning.

Many of you are likely aware that the laws governing environmental assessment in Canada are about to change, and will become, according to the Government of Canada, more supportive of responsible resource development.

My paper and by extension this presentation argues that if we are truly concerned with questions related to climate and carbon – the carbon problem as some have dubbed it, then our approach to environmental assessment of electricity generation development needs to change.



It needs to change because Fuel Choice Matters.

This slide from the David Suzuki Foundation shows how much fuel choice in electricity generation matters in Canada. The western provinces of Alberta and Saskatchewan, which derive the majority of their electricity from coal-fired generating stations, have the highest per capita emissions of greenhouse gases in Canada (at 62.6 and 69.1 tonnes of CO<sub>2</sub> equivalent per person). They also have had the largest growth in emissions since 1990.

By comparison, the nuclear provinces – Ontario, Quebec and New Brunswick all have lower per capita emissions (12.9 – 10.4 – 24.7 respectively). Canada's per capital emissions are 20.3 tonnes per capita.

## EIA Alone is Ineffective

- Project-specific EIA cannot deal with the climate problem
- Fuel choice matters to the climate problem



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- Project-specific EIA has proven itself to be insufficient to deal with the climate problem generally, and with the connection between climate nuclear in particular.
- At the strategic level, nuclear energy is one of only two primary energy sources found to be favourable across the dimensions of energy accessibility, availability and acceptability by the World Energy Council
- The International Energy Agency has calculated that with less nuclear power there would be greater demand for fossil fuels, making it harder and more expensive to combat climate change
- If one is concerned about the climate problem, then again, fuel choice matters
- SEA can inform fuel choice, particularly when it includes life cycle assessment information



**SEA is Better Suited**

- Complexities of energy developments challenge IA
- SEA extends the aims and principles of EIA
  - Major alternatives are still open
  - Greater scope to integrate environmental considerations
- SEA can address “sources” rather than “symptoms”

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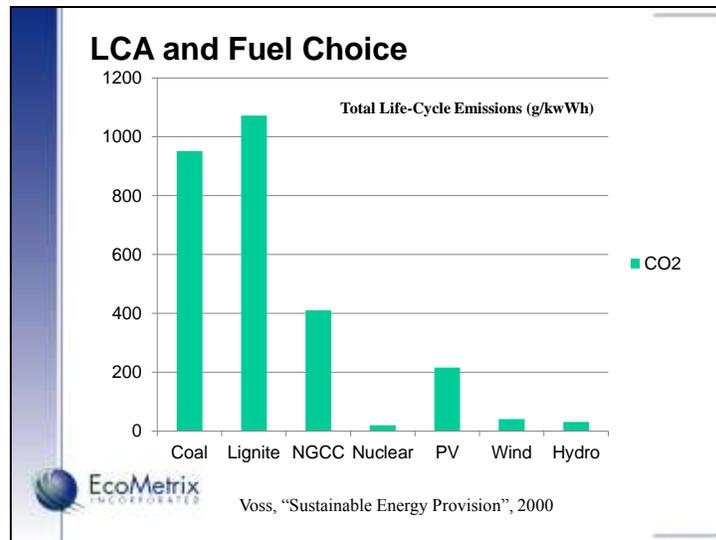
- My paper argues that strategic environmental assessment, and particularly ones informed by life cycle assessment information, is better suited to dealing with the complexities of energy developments than project-specific IA alone
- SEA extends the aims and principles of EIA to the higher levels of decision-making when major alternatives are still open and there is far greater scope than at the project level to integrate environmental considerations into development goals and objectives.
- It allows problems of environmental deterioration to be addressed at their “upstream source” in policy and plan-making processes, rather than mitigating their “downstream symptoms” or project-level impacts.
- As such, SEA fulfills a fundamental role in promoting sustainable principles and practices and the consideration of cumulative effects – both of which are necessary when considering energy developments

## LCA Adds Value

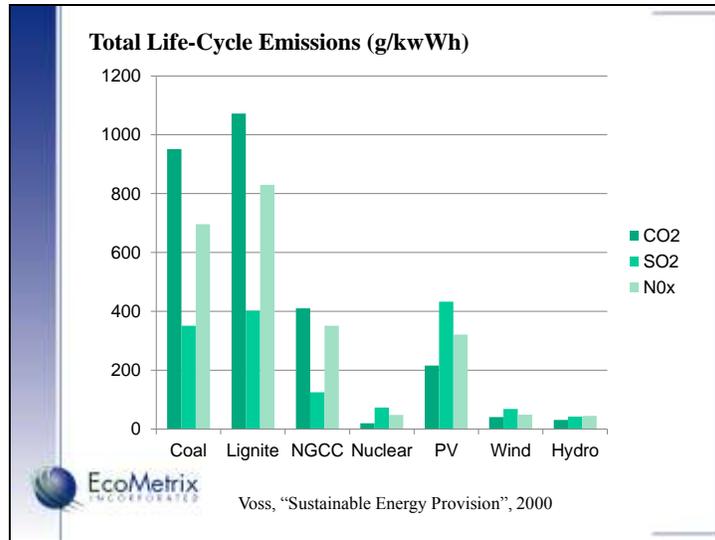
- Choose the least burdensome
- Can assist SEA with
  - The comparison and assessment of alternatives
  - The identification of strategic options



- Life cycle assessment (LCA) is “a systematic set of procedures for compiling and examining the inputs and outputs of materials and energy and the associated environmental impacts directly attributable to the functioning of a product or service system throughout its life cycle” (ISO 14040)
- In the context of this paper and issue, a LCA is the assessment of the environmental impact of electricity as a product throughout its lifespan
- LCA can help a government or society choose “the least burdensome” option
- LCA can act as a source of information to aid with
  - Baselines studies (points of reference for valued ecosystem components)
  - Formulating options (comparative risk assessments)
  - Impact analysis (environmental indicators and criteria)
  - Documentation for decision-makers (cross-impact matrices)
- It can assist SEA with the comparison and assessment of alternatives, and the identification of strategic options

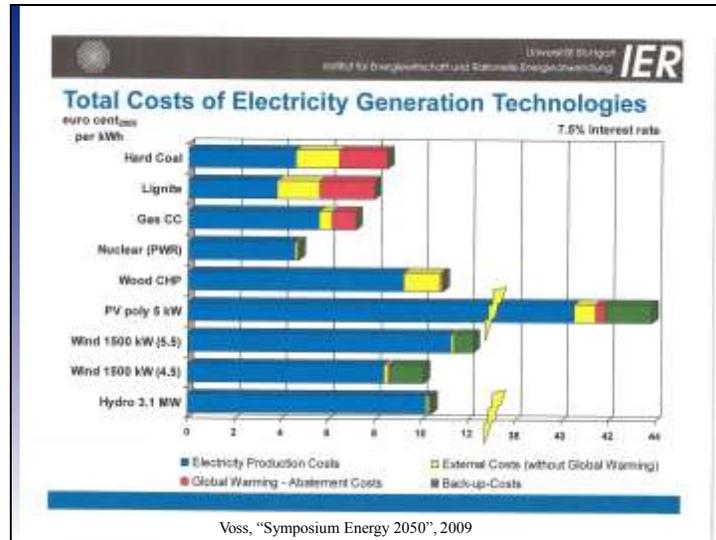


- My paper offers a table with a range of LCA information for nuclear and its carbon footprint – this slide presents one of the sources used in the table and provides a comparison of nuclear and its total life cycle emissions for GHGs
- The LCAs for electricity generation indicate that life cycle emissions of GHG from nuclear are significantly lower than with fossil fuels by several orders of magnitude
- They also show that in general they are in the same range as renewable sources such as hydro and wind
- Replacing fossil fuel electricity with low carbon sources, such as nuclear, wind and hydro, has significant potential for abating GHG emissions in the electricity generating sector
- In fact, the IPCC's Fourth Assessment Report showed that nuclear power has the largest mitigation potential at the lowest average cost in the energy supply sector



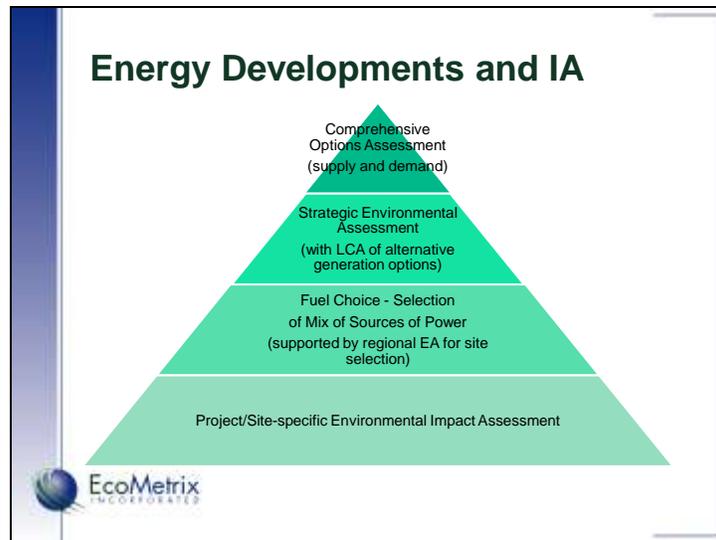
This slide provides a comparison of the life cycle emissions of CO<sub>2</sub> and other releases to the air of other components of concern – sulfur and nitrogen oxides which contribute to acid rain/acidification of waterways and soils and photochemical smog respectively. Life cycle information exists for a wide variety of valued environmental, social and economic components including: stratospheric ozone depletion, eutrophication of waters, terrestrial toxicity, aquatic toxicity, human health impacts, water use, land use, biodiversity, raw material/resource depletion and energy payback.

SEA informed by LCA information provides for the incorporation of such information better than project-focussed EIA as it concentrates on key issues of sustainable development.



LCA can also provide insights into the total costs of electricity generating options. This slide is taken from a paper presented by Voss to a symposium in Sweden in 2009 and referenced in my paper.

He presents the results of a life cycle analysis for different energy sources. As you can see, nuclear as a PWR is presented as having the lowest total costs in the European context.



- This slide is not in my paper but is an attempt at showing how Impact Assessment may be able to deal with the complexities of energy development by using SEA with LCA information
- Address supply and demand through a Comprehensive Options Assessment (a supply/demand plan as Ontario tried some 30 years ago)
- Undertake a Strategic Environmental Assessment of alternative generation (supply) options
- Make Fuel Choices through the selection of the mix of sources of power (the siting of which could be supported by regional EAs)
- Finally, project/site-specific EAs would complete the process

## Conclusion

- SEA + LCA = good practice
- Help deal with the climate problem by helping us make our fuel choice
- Help nuclear by increasing public support



The slide features a 3x3 grid of green circular icons. The top row contains icons for nuclear power (a reactor), wind energy (a turbine), and solar energy (a sun with rays). The middle row contains icons for water (a drop), recycling (a circular arrow), and a globe. The bottom row contains icons for a hand holding a globe, a crown, and a globe with a hand. The EcoMetrix logo is located in the bottom left corner of the slide.

- In conclusion, I believe the use of strategic environmental assessments, informed by life cycle assessments, would represent a good practice with respect to energy developments and impact assessment
- Most crucially, applying both SEA and LCA to energy development would allow for a comparison of current and future energy supply options with respect to their health and environmental impacts, resource requirements and with respect to their compliance with sustainability indicators
- That is, together they would help us make the most important choice – fuel choice, and deal with the climate problem
- This combination may also help nuclear by increasing public support as such support rises when the public understand the climate benefits of nuclear

**Recommendation**

- Invest in an industry-wide data collection effort
- Provide a more detailed and complete base for the use of LCA



The slide features a blue vertical bar on the left side. The main content is on a white background. The title 'Recommendation' is in bold black text. Below it are two bullet points. To the right of the text is a green square containing a glowing lightbulb with a green atomic symbol inside. In the bottom left corner of the slide is the EcoMetrix logo, which includes a globe icon and the text 'EcoMetrix INCORPORATED'.

I will now bring my presentation to a close with the one recommendation I make in my paper. And it is not a self-serving one for even though I am now a consultant LCA is not an area I practice. The industry should invest in an industry-wide effort to collect and present a more detailed and complete database of LCA information pertaining to it and the other primary energy options. I am confident that while there will be some differences in the numbers, the results will robustly show the environmental and health impact and other benefits associated with including nuclear in the transition to a low-carbon electricity future.

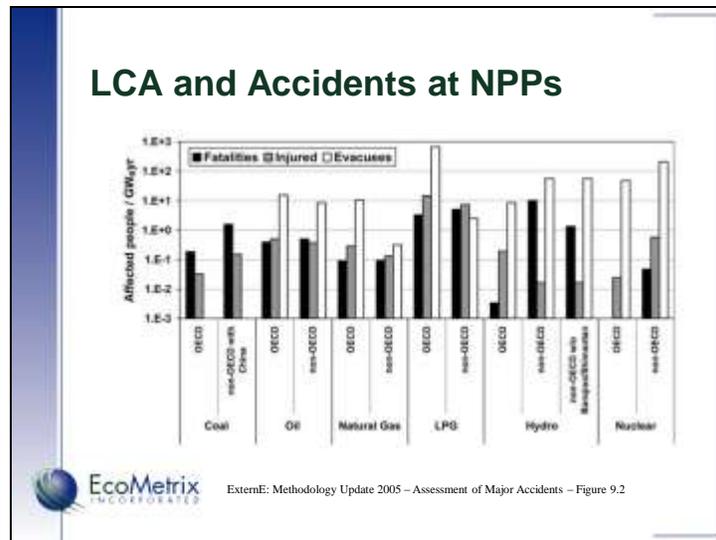
Thank you for your attention.



### Env'l Assessment & Management

Development Phase	Impact assessment/management tool
Policy/strategy (fuel choice)	Strategic environmental assessment (sector) or policy appraisal with input into project selection and environmental assessment
Project design (power station) and approval	Environmental impact assessment with input into environmental protection plans
Project construction/early operation	EPPs with input into environmental management systems
Project operational period (and reclamation)	"Progressive" environmental management systems with a focus on continuing environmental improvements (and liability reduction)
Decommissioning	EIA update or new EIA with links to "progressive" EMS

EA/M = environmental assessment/management (SEA/EIA/EMS)  
Inspiration from UNEP authors' elaboration: 115



- LCAs for electricity generation also indicate that on most criteria considered nuclear energy has among the lowest adverse impacts, and again often comparable to renewables such as wind and hydro
- Notwithstanding, there are still real and perceived risks with nuclear power
- The truth is, all energy options have pros and cons
- Nuclear has been impacted by its risk of accidents – likely to a greater degree than any other energy options
- LCA can inform us of the comparative risk of accidents in addition to GHGs and other environmental matters
- The EU’s ExternE project released a report in 2005 which specifically addressed the risks associated with accidents at NPPs
- Nuclear had among the lowest expected fatality and injury rates among OECD countries
- The risk that exists with nuclear, has evidenced last year with Fukushima, is evacuation and resettlement
- Fukushima also provide evidence in support of the ExternE’s findings that the damages caused by severe accidents in the energy sector can be substantial, but small when compared to those caused by natural disasters