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TABLE RONDE NATIONALE SUR L'ENVIRONNEMENT ET L'ÉCONOMIE

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National Round Table on the Environment and the Economy (NRTEE)

SUMMARY REPORT FROM A WORKSHOP ON MEASURING SUSTAINABLE DEVELOPMENT: ENERGY PRODUCTION AND USE IN CANADA

February 28 — March 1, 1991
Montreal, Quebec

prepared by

Western Environmental and Social Trends, Inc.

April, 1991

EXECUTIVE SUMMARY

Forty-eight representatives from industry, government (municipal, provincial and federal) and the academic and consulting communities met in Montreal on February 28, 1991 and March 1, 1991 to discuss indicators of sustainable development for energy production and use in Canada. The workshop was sponsored by the Socio-Economic Incentives Committee of the National Round Table on the Environment and the Economy (NRTEE).

Workshop participants generally agreed that a family of indicators at the national level (macro indicators) would be useful in charting and assisting Canada's course towards sustainable development. Furthermore, it was thought that a set of credible measures, ones which are meaningful to both decision makers and the general public, could help to promote consistency and fairness in policy initiatives within Canada and internationally.

Participants considered a preliminary set of indicators related to energy production and use proposed in a discussion paper commissioned by NRTEE. There was a high level of support for indicators of sectoral energy efficiency (energy used per unit of product of service provided) and impacts on environment (air and water emissions and waste). Many participants also stated that measuring the diversity of the national energy mix would be useful.

On the other hand, there was limited support for proposed national indicators of energy intensity (energy use per capita) and energy productivity (GDP per unit of energy used). Some participants thought these indicators could be useful within Canada to track economic reliance on energy. However, most participants agreed these two indicators were inappropriate for international comparisons because they inaccurately portray Canada's performance regarding energy use and efficiency. It was suggested these indicators fail to take into account the energy-intensive nature of Canada's export trade. Many of Canada's products destined for export require energy-intensive development of natural resources. Some participants cautioned Canadian industries would be disadvantaged if policies were developed based on these indicators as measures of sustainable development.

Recognizing that the preliminary set of national indicators discussed at the workshop focused on environmental sustainability, participants proposed expanding indicators to

include socio-economic considerations which also are a vital part of sustainable development.

Participants generally agreed that development and use of micro indicators at the corporate and organizational level should be encouraged. Micro indicators could measure outcomes such as emissions or energy efficiency, as well as contributing factors such as dollars spent on pollution control and environmental training of staff. It was suggested these corporate and organizational level indicators are more likely to motivate changes in behaviour than are macro indicators at the national level. Provincial round tables, industry associations, municipalities and non-government organizations, such as environmental groups, were seen as parties who would be interested in developing and promoting the use of micro indicators.

There was no clear direction from the workshop about who should take primary responsibility for the development of sustainable development indicators of energy production and use. At the national level, previous work on indicators by Environment Canada (State of the Environment Reporting), the Canadian Environmental Advisory Council, and Energy Mines and Resources was recognized as significant. At the corporate and organizational level, professional associations were identified as key players in developing micro indicators. It was suggested that NRTEE should provide criteria and guidelines for developing indicators, promote the development and use of indicators at the macro and micro levels, and collaborate with other groups better suited to do the technical work.

Given all the work currently being done on indicators, the need for a national framework to help determine the essential indicators of sustainable development was recognized as fundamental. This framework would include sustainability criteria which could build upon the preliminary set of criteria developed by the policy group at the workshop. As well, a need to set clearly defined goals and targets for sustainable development was identified. Indicators could be used to measure progress towards these goals. It is noteworthy participants stressed the importance that the policy framework be developed through a consultative process involving all affected sectors.

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1.0 INTRODUCTION

A workshop — "Measuring Sustainable Development: Energy Production and Use in Canada" — was sponsored by the National Round Table on the Environment and the Economy (NRTEE) in Montreal on February 28, 1991 and March 1, 1991. The workshop was designed to discuss indicators of sustainable development related to energy production and use. Indicators provide data that help to monitor and assess a current state or situation and to detect changing conditions and trends. These practical measurement instruments are increasingly seen as important management tools which can be used to chart and track the course towards a sustainable future. The energy sector was chosen as the focus of this first workshop on sustainable development indicators because this sector is fundamental to the Canadian economy and because major global issues such as third world development, global warming and acid deposition are directly linked to energy production and use.

The National Round Table on the Environment and the Economy (NRTEE)

The National Round Table, formed in 1989, was established to advise the Prime Minister on ways of integrating the environment and the economy, commonly referred to as sustainable development. NRTEE is comprised of about twenty-five representatives from environmental organizations, industry, academia and government, including the federal Ministers of Finance, Environment and Science and Technology. More specifically, the Socio-Economic Incentives Committee of NRTEE sponsored this particular workshop. Other committees of NRTEE deal with Education and Communications, Waste Management, Foreign Policy and Decision Making. All NRTEE committees seek a broad-based consideration of issues by stakeholders before advising the Prime Minister.

Goals of the workshop were:

- to provide advice on a draft series of indicators for sustainable development in energy production and use at the national level (macro indicators);
- to identify practical links between macro (national and international level) and micro (individual or corporate level) indicators;
- to identify next steps for progress; and
- to share information and experiences of participants.

Forty-eight individuals representing energy suppliers, energy users and energy policy makers in government and academia participated in the two-day workshop. A list of participants is provided in Appendix 1.

The workshop programme is contained in Appendix 2. The workshop began with a panel discussion on a proposed set of national indicators. This was followed by small group discussions (seven small groups in total) on the need for a national set of indicators and the appropriateness of those proposed. Areas of agreement and disagreement were highlighted in plenary. Participants then divided into four groups — two of energy suppliers, one of energy users and one of policy makers. The energy suppliers and users groups developed lists of indicators which are or can be used at the corporate or organization level and examined their links with the proposed set of macro indicators. The feasibility of aggregating micro indicators into macro indicators was discussed as were gaps in the proposed indicators. The policy group, on the other hand, took a different focus. This group discussed the role of indicators and developed a list of sustainability criteria which would help determine what indicators of sustainable development should measure. Findings of all groups were reported in plenary. On the final day of the workshop, energy suppliers, users and policy-makers groups all discussed next steps or recommended actions to achieve progress in the development and use of indicators.

2.0 ARE NATIONAL INDICATORS USEFUL?

Workshop participants generally agreed that a set of national (macro) indicators is a useful management tool to:

- measure current conditions and trends;
- assist in setting benchmarks and goals;
- measure progress towards policy objectives;
- improve understanding of effects of actions;
- motivate improved performance with respect to sustainable development;
- promote consistency and fairness in policy initiatives; and
- make international comparisons.

Notwithstanding general support for a family of macro indicators, caution was expressed regarding the definition and use of indicators. Specifically, concerns were raised that indicators should not be confused with targets which are end points and need to be set through consultative policy-making processes. As well, it was stated that care should be taken to ensure that indicators are measuring the right thing(s) and not encouraging behaviour that is non-sustainable.

It was thought that indicators could be used for a variety of purposes and thus several different levels of indicators may be required. Levels include national, regional, sectoral, corporate/organizational and individual. Participants stressed, however, the importance of ensuring that indicators are consistent among and within levels of indicators, particularly if comparisons are to be made. Perhaps most importantly, participants cautioned that there is a need to ensure that indicators are indeed measuring progress towards sustainable development.

2.1 The California and Swedish Experiences

Two guest speakers at the workshop, Cynthia Praul Wright of the California Energy Commission and Hans Rode of Sweden's National Energy Administration, provided data on progress in their jurisdictions towards increased energy conservation and efficiency and decreased dependence on fuels which have high levels of environmental impact. Although their energy strategies have not been couched in terms of sustainable development, nor has either jurisdiction systematically developed a set of economic and environmental indicators related to energy production and use, they were able to show data relevant to indicators being discussed at the workshop.

Their messages to workshop participants were that it is important to set energy goals and to "get on with the job". They identified means to accomplish goals including not only firm, reasonable regulations, but more importantly incentives and subsidies for the private sector and public information and education campaigns to encourage energy conservation initiatives by consumers. They suggested that indicators are useful to measure progress towards goals.

3.0 SUSTAINABILITY CRITERIA

The policy group at the workshop addressed what criteria should be used to assess what we need to measure through indicators of sustainable development. A preliminary set of criteria were identified. These criteria can be divided into three categories — general, resource and energy specific (Table 1). Participants recognized sustainability criteria as a fundamental component of a policy framework for indicators of sustainable development. These criteria could be useful to all sectors and at all levels to assess the appropriateness and adequacy of indicators. However there was no attempt to refine the criteria further at the workshop nor any attempt to achieve consensus on it.

Table 1. Preliminary Set of Sustainability Criteria

General	Stabilize population Improve quality of life Reduce material expectations (make do with less) Maintain international competitiveness Strengthen intellectual capacity and technology availability Enhance employment opportunities
Resource	Respect assimilative capacity, such as ecological thresholds Improve environmental quality Maintain capital stock (natural and man made) Minimize resource waste Reduce resource use
Energy	Improve efficiency of energy use Reduce environmental emissions Use appropriate energy resource pricing (i.e. full cost and full cycle accounting) Enhance energy supply diversity Increase energy production

4.0 WHAT ARE APPROPRIATE ENERGY INDICATORS?

4.1 Preliminary Set of Macro Indicators (NRTEE Discussion Paper)

A discussion paper on a preliminary set of national indicators for measuring sustainable development related to energy production and use served as the focus for initial discussions at the workshop. This paper by Marbek Resource Consultants Ltd., was commissioned by NRTEE in late 1990. The complete paper is provided in Appendix 3. Fifteen indicators were proposed in the Marbek paper, falling into five different categories. A consolidated list of these is found in Table 2.

Several considerations went into Marbek's selection of a preliminary set of indicators. In developing the preliminary set of indicators two caveats were expressed: there is a lack of agreement as to the definition of sustainable development; and there is difficulty in selecting a manageable set of indicators which reflect the complex nature of our society and economy. Nonetheless, the preliminary set of indicators for energy production and use were chosen with the following criteria in mind:

- They present the bottom line — that is, whenever possible they measure outcomes rather than contributing factors.

- They use data that is available or can be acquired, is credible and is a valid representation of the information it is meant to portray.

- They are useful for both senior decision makers and the general public.

- They focus primarily on environmental, and to some extent economic sustainability, indicators and do not include factors such as social equity which were considered to be more appropriately included in general indicators of sustainable development rather than in those designed specifically for the energy sector.

- As much as possible they are suitable for making international comparisons, although this is not always the case due in part to the current variation in data from country to country.

Furthermore, Marbek stressed that these are indicators, not targets. They stated that targets for end points, and for the direction and rate of change of indicators would need to be developed separately.

4.2 Comments Regarding the Preliminary Set of Indicators

Comments on Marbek's preliminary set of indicators were obtained through a panel discussion (for members of the panel see Programme, Appendix 2), small group discussions, and plenary discussions. The overall acceptability of each indicator and specific comments or suggestions are summarized in Table 3. As well, Table 3 provides a list of micro indicators raised by workshop participants which are linked to each of the proposed macro indicators.

Table 2. Preliminary Set of Indicators

1. QUANTITY OF ENERGY USED

   1.1 Energy Use (total energy use in PJ)
   1.2 Energy Intensity (energy use per capita, per amount of product, per area of floor space, or per dollar produced)
   1.3 Efficiency of Primary to Secondary Conversion (primary/secondary ratio)

2. ENVIRONMENTAL IMPACT

   2.1 Greenhouse Gas Emissions (CO_2, N_20 and CH_4 released per unit of energy used)
   2.2 Other Air Emissions (SO_x, NO_x, VOC and particulates released per unit of energy used)
   2.3 Waste Generation (annual generation of waste per unit of energy used)
   2.4 Area of Land Affected by Energy Production (land area committed to production per unit of energy used)

3. LONG TERM RESOURCE AVAILABILITY

   3.1 Proportion of Energy Use met by Less Abundant Resources (% of energy use supplied by non-renewable, limited economically recoverable resources)

4. ENERGY PRODUCTIVITY OF THE ECONOMY

   4.1 Energy Productivity (Gross Domestic Product per unit of energy used)

5. INDICATORS ASSOCIATED WITH ADDITIONAL PRODUCTION FOR EXPORT

   5.1 Net Energy Exports (net volume of energy produced or used to supply export markets)
   5.2 Greenhouse Gas Emissions (net amount of CO_2, N_20 and CH_4 released per unit of energy produced or used to supply export markets)
   5.3 Other Air Emissions (net amount of SO_x, NO_x, VOC and particulates released per unit of energy produced or used to supply export markets)
   5.4 Waste Generation (net annual generation of waste per unit of energy produced or used to supply export markets)
   5.5 Area of Land Affected by Energy Production (net land area committed to production per unit of energy produced or used to supply export markets)
   5.6 Proportion of Net Exports Met by Less Abundant Resources (% of net energy exports supplied by non-renewable, limited economically recoverable resources)

Table 3. Comments on Preliminary Indicators

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
1.1 Energy Use	National energy use (PJ) Regional use (PJ) Sectoral use (PJ)	Moderate	▸ energy use per se is not an indicator of sustainable development ▸ unclear what direction indicator should move ▸ useful if related to units of production or service ▸ distinguish between energy used domestically and amount used for export ▸ easy to measure ▸ could report amount of energy demand potentially provided by conservation efforts or demand side management	▸ Annual energy consumption by company or organization ▸ Reductions in annual energy consumption (cost savings, competitive advantage) ▸ Base load and peak load targets of utilities ▸ Amount of fuel purchased and amount internally generated
1.2 Energy Intensity	National energy use per capita (GJ/capita) Regional intensity (GJ/capita) Sectoral intensity (various, depending on sector)	Low when expressed per capita High when related to sectors and units of production or service	▸ national energy use per capita can be useful to track economic reliance on energy but may be misleading in international comparisons ▸ more useful to measure energy efficiency within sectors ▸ increase in energy efficiency desirable (i.e. decrease in energy use per unit of production or service provided) ▸ important to determine net energy content of exports ▸ could instead track relative change in energy use and population (California example)	▸ Energy use per unit of production ▸ Energy used per unit of service provided ▸ Energy used per unit of energy produced ▸ Energy use per household ▸ Energy use per area of floorspace ▸ Energy use per vehicle miles travelled

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
1.3 Efficiency of Primary to Secondary Conversion	Ratio of primary to secondary energy	Low as presently defined Moderate if accounts for full fuel cycle	▸ more useful if look at full fuel cycle i.e. efficiency of conversion at every step in process from when leaves plant to when leaves burner tip ▸ difficult definitional and double counting problems, particularly for electricity ▸ non-energy products (i.e. asphalt, petrochemicals) must be subtracted from national primary energy before ratio is calculated ▸ could show as efficiency staircase for each step of conversion from natural gas resources to electric furnace, to gas furnace or to heat pump (California example)	▸ Co-generated/purchased electricity ratio
2.1 Greenhouse Gases	Greenhouse gases released per TJ of energy used (Tonnes of CO_2 equivalent/TJ)	High at both macro and micro level	▸ should include at least carbon dioxide, nitrous oxide and methane ▸ need to establish credible equivalency definitions (e.g. CO_2 equivalents) for the various gases; may change with science and public opinion ▸ some greenhouse gas emissions are not energy related; important to inventory all sources ▸ measure releases during energy production, transportation and use	▸ Greenhouse gas emissions per unit of energy used ▸ Greenhouse gas emissions per unit of energy (including electricity) produced ▸ Greenhouse gas emissions for various fuel types ▸ Greenhouse gas emissions from individual point sources (plants, vehicles, etc.) ▸ Carbon dioxide emissions in urban areas ▸ Reduction in greenhouse gases (e.g. CFC phaseout)

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
2.2 Other Air Emissions (SO_x, NO_x, VOC, particulate)	Aggregate emissions per TJ of energy used (adjusted tonnes/TJ)	High at both macro and micro level	▸ need to determine relative importance or impact of various emissions ▸ may have difficulty getting consensus on weighting system; weighting may change with science and public opinion ▸ might be preferable to measure individually rather than aggregate ▸ some difficulty in gathering accurate data ▸ measure releases during energy production, transportation and use ▸ not all emissions energy-related; inventory of emissions from all sources important ▸ need to develop consistent approach ▸ links to NO_x/VOC Management Plan need to be identified	▸ Emissions per unit of energy used ▸ Emissions per unit of energy (including electricity) produced ▸ Emissions for various fuel types ▸ Emissions from various point sources (plants, vehicles, etc.) ▸ Emissions in urban areas

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF REL[illegible]ED MICRO INDICATORS
2.3 Waste Generation (radioactive, mine tailings, refinery waste, ash, emission control waste, etc.)	Annual generation of wastes per TJ of energy used (adjusted tonnes/TJ) Waste generation by energy source Waste generation by region	Moderate as cumulative index High when expressed by category	▸ weighting or ranking required (i.e. re toxicity, half life, degree of hazard) ▸ may have difficulty developing weighting system; may change with science and public opinion ▸ also important is amount of recycling of waste ▸ most useful at sectoral level or as micro indicator and not necessarily associated only with energy production or use ▸ usefulness questionable in some sectors such as mining which requires high volume of waste production (i.e. spoil piles)	▸ Waste per unit of energy produced or used ▸ Amount of waste by categories (toxic, radioactive, landfill, hazardous etc.) ▸ Amount of waste recycled ▸ Amount of waste disposed safely ▸ Amount of waste lost or unaccounted ▸ Total annual amount of oil spilled ▸ Paper use (total and per employee) ▸ Toxicity level of waste ▸ Return ratio of used products (e.g. oil, containers) ▸ Recyclable or recycled content of product

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
2.4 Land Affected by Energy Production	Land area committed to energy production per TJ of energy used (adjusted hectares/TJ) Land area affected by energy source Land area affected by region	Low	▸ not clear indicator of sustainable development ▸ need to weight impacts of different types of energy production (e.g. permanent flooding of land by hydro vs temporary impacts of oil & gas) ▸ need to account for area potentially affected (e.g. by nuclear accident or large oil spill) ▸ need to consider existing uses of land affected (urban vs agricultural vs wildland) ▸ need to weight sensitivity of land affected (tundra vs forest vs grassland) ▸ has limited value at macro level but may be more useful at micro level	▸ Amount of land reclaimed ▸ Relative amount of land displacement for various energy sources (e.g. wind vs coal) ▸ Target of no net loss of land available for non-energy uses ▸ Land required to dispose of waste and value of that land (e.g. recycling desirable if cost of land for landfills high)

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
3.1 Proportion of Energy Use met by Less Abundant Resources	Non-renewable resources for which economically recoverable reserves will meet current levels of Canadian use of less than 50 years (%) Regional proportion (%) Sectoral proportion (%)	Low as presently defined Moderate if redefined as energy mix or energy diversity	▸ varies with changing technology and market prices (need resource cost curves) ▸ also depends on health of various industry sectors ▸ very problematic to measure; would require frequent readjustments ▸ 50 year time frame arbitrary ▸ not very useful in Canada where abundant energy resources ▸ a more useful indicator might be energy mix or energy diversity (e.g. % contribution of various energy sources); however diversity indicates protection from supply interruption and price increase rather than sustainability ▸ proportion of energy mix met by renewables or sources with low or mitigable environmental impacts may be useful indicator of sustainable development	▸ Proportion of energy supplied by renewables ▸ Amount of substitution by fuels with lower environmental impact

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
4.1 Energy Productivity	Real gross domestic product per GJ of energy use ($/GJ) Regional ratio ($/GJ) Sectoral ratio ($/GJ)	Moderate for national use Low for international comparisons	▸ relationship between sustainable development and GDP not clear (e.g. Exxon oil spill increased GDP) ▸ must account for feedback effects within GDP; what affects GDP (e.g. commodity prices) will also affect or be affected by changes in energy use ▸ recommend averaging over several years rather than one year to correct for anomalies in GDP ▸ favoured by policy makers as GDP is best measure of economic activity nationally and able to make international comparisons, however may not lead to behavioural changes ▸ Canada has lowest energy productivity in world partly because of relatively high proportion of energy intensive resource-based industries; may result in displacing production from Canada to other countries without contributing to sustainable development globally ▸ closely linked to energy intensity and energy efficiency (see comments re Indicator 1.2) ▸ need to consider amount of energy used and amount of GDP directed to produce goods for export ▸ may be useful when applied sectorally ▸ could instead track relative change in energy use and gross domestic product (California example)	▸ Value of services provided per unit of energy used ▸ Value of product produced or sold per unit of energy used

Table 3. Comments on Preliminary Indicators (Cont'd)

REFERENCE NO. & NAME OF INDICATOR	DEFINITION (UNITS) AND DISAGGREGATION	WORKSHOP SUPPORT	DISCUSSION COMMENTS	EXAMPLES OF RELATED MICRO INDICATORS
5.1 Net Energy Exports	Net energy exports (PJ) Net exports by energy source	Low	▸ net energy exports per se are not an indicator of sustainable development ▸ unclear what direction indicator should move ▸ more useful indicators would be embodied energy in net exports or efficiency of energy production for export	▸ No examples provided
5.2-5.5 Environmental Impacts of Net Energy Exports	Same as indicators 2.1-2.4 in concept however actual data would be different as it would exclude impacts of energy use	Moderate	▸ same comments as for Indicators 2.1-2.4 ▸ focus on pollutants that are important internationally	▸ No examples provided
5.3 Net Exports met by Less Abundant Resources		Low	▸ some comments as for Indicator 3.1	▸ No examples provided

General comments on the complete set of indicators follow.

a) Support for Preliminary Indicators

Workshop participants agreed that the preliminary set of indicators provided a useful basis for discussion and that work is needed to develop a second generation based on workshop discussions. Some indicators were better received that others. Improvements were suggested for all of the proposed indicators and some were considered more useful at the sectoral or corporate level than at the national or macro level.

Indicators receiving a high level of support were those of sectoral energy efficiency (energy used per unit of product or service provided), air emissions and waste (by category). Indicators of total energy use and diversity of the energy mix received moderate support. Participants felt it useful to know this information, but stated that these data by themselves were not indicators of sustainable development. Efficiency of energy conversion for the full fuel cycle also received moderate support as an indicator although it was cautioned that there may be difficult definitional and double counting problems.

There was limited support for proposed national indicators of energy intensity (energy use per capita) and energy productivity (GDP per unit of energy used). Some participants, particularly in the policy group, thought these two indicators could be useful within Canada to track economic reliance on energy. However, most participants, including energy suppliers and users, agreed these two indicators were inappropriate for international comparisons because they inaccurately portray Canada's performance regarding energy efficiency. This is because a large part of Canada's economy, particularly our export market, is tied to energy-intensive development of natural resources.

There was little support for an indicator based on the amount of land affected by energy development. There were questions raised about the usefulness of this indicator because of the variabilities regarding the degree, longevity, and risk of impacts. As well, there was little — if any — support for measuring the proportion of energy use met by less abundant resources because of high variability due to changing technology and market prices.

b) Energy Exports

There was low to moderate support for the preliminary indicators related to export proposed by Marbek. No agreement was reached on how to define and report energy export indicators.

Some participants argued that what is important is the overall level of energy production, efficiency of production and resulting environmental impact(s), whether energy is produced for export or not. They stated Canada did not need separate indicators for energy exports.

Others argued that because Canada provides energy and other natural resources to the rest of the world, Canada should explicitly state the amount of energy use, efficiency of production and environmental impact(s) (e.g. greenhouse gas emissions) related to that export. Failure to do so could result in a distorted picture of Canada's performance regarding sustainable development.

Still others argued that if energy embodied in products destined for export had separate indicators, the energy embodied in imports should also be identified and net energy imported or exported used as the basis for these export indicators.

c) Additional Indicators

Several participants stated that the proposed set of indicators is based on available data and is not a complete list. The need for a more comprehensive list and supporting data was identified. Two additional areas where suggested:

- Water Quality and Use — e.g. water contaminants, water consumption, efficiency of water use, amount of water recycled

- Socio-Economic Factors — e.g. jobs and other spin-off benefits provided by energy production and environmental clean-up, cost of environmental clean-up, economic health of industry (e.g. cash flow, return on investment), intellectual capital, technology availability, quality of life considerations, human health considerations.

It was not clear from the discussion whether participants considered these indicators important at the national (macro) level or at the corporate/organization (micro) level or both.

d) Linking Micro Indicators with Macro Indicators

Participants identified about 50 indicators currently in use or being considered by corporations or organizations. The majority of these micro indicators could be linked to proposed macro indicators. These obvious linkages confirm that there is a "real world" foundation for many of the preliminary macro indicators (Table 3). Those corporate/organizational level indicators which could not be linked to a proposed national indicator suggested a need for additional macro indicators (see sections on Additional Indicators and Contributing Factors). There were no indicators identified at the corporate/organization level that could be linked to national indicators dealing with energy export (Indicators 5.1-5.3).

It was suggested by several participants that attempts to systematically aggregate micro indicators from individual companies or organizations into macro indicators would pose unrealistic accounting problems. Micro indicators currently are in their very early formative stages and they are not yet standardized nor widely adopted within industry sectors. As well, many organizations are currently focusing on the actions required to integrate environmental considerations into business planning rather than on actual outcomes, which is the focus of the proposed macro indicators. Nevertheless, participants agreed that macro indicators should be sensitive to general changes measured through micro indicators and act as a national gauge of actions towards sustainable development at the corporate or organization level. The question was raised as to how to nationally measure efficiency by product or sector. A representative from the government-industry program called Canadian Industry Program for Energy Conservation (CIPEC) suggested that CIPEC might be an avenue for accomplishing this.

e) Indicators of Contributing Factors

Many participants over the course of the two-day workshop identified a need to measure factors contributing to sustainable development outcomes rather than only the outcomes

themselves, particularly at the micro level. Contributing factors were defined as the actions or policies required to achieve sustainable development. It was argued that indicators of contributing factors are more likely to motivate changes in behaviour at the micro level than are indicators of outcomes. Examples of contributing factors provided by workshop participants include:

- market penetration of energy efficient products
- market penetration of emission reducing technologies
- acceptance and implementation of procurement policies, such as energy efficiency and waste reduction
- acceptance and implementation of energy efficiency audits
- acceptance and implementation of environmental audits
- acceptance and implementation of demand side management programs by electric utilities
- investments in research and development
- acceptance and implementation of full cost and full cycle accounting methodologies

5.0 NEXT STEPS AND FUTURE DIRECTIONS

Workshop participants were asked to identify and discuss future directions in developing indicators of sustainable development in energy production and use. Key suggestions arising from these discussions follow.

5.1 Set National Framework

All small groups identified a need to develop a coherent national policy framework to help determine indicators of sustainable development. This would apply to all levels of indicators — national, regional, sectoral, corporate/organizational and individual. As part of this recommendation participants recognized the need to develop sustainability criteria which could be used to determine appropriateness and adequacy of indicators. This work could build on the sustainability criteria proposed by the policy group at the workshop and on other work currently being done by the Socio-Economic Incentives Committee of NRTEE.

The need to develop clearly defined goals or targets for sustainable development also was identified by workshop participants. Indicators could then be used to assess progress towards these goals. Noteworthy, however, is the widespread concern expressed about the process for defining criteria and goals. Participants stressed that definition of criteria and goals should not occur unilaterally or through bilateral negotiation but rather through a consultative process involving all affected sectors.

5.2 Continue to Develop National Indicators

There was general support for having a set of national indicators of sustainable development related to energy production and use. All groups identified a need to more clearly define the preliminary set of energy indicators as discussed at the workshop. This would include reassessing and revising the indicators of energy intensity and productivity to place more emphasis on indicators of energy efficiency. Participants strongly suggested there is some urgency for accomplishing this so that it could be included as part of Canada's position for the United Nations Conference in Brazil in June, 1992. There also was overall agreement that indicators of water quality and socio-economic indicators needed to be factored into developing a comprehensive set of indicators.

5.3 Encourage Development of Micro Indicators

All small groups recognized the importance of developing micro indicators, particularly within corporations and organizations. It was suggested that these are the indicators most likely to motivate changes in individual and corporate behaviour and ensure accountability. Although workshop participants proposed few specific pilot projects on micro indicators, most of the energy suppliers and users represented at the workshop indicated they are beginning to define and develop performance indicators related to environment and sustainable development. Another suggestion to assist the development of micro indicators was for an ongoing exchange of information on indicators among the national and provincial round tables, government agencies (federal, provincial, municipal), industry and public interest organizations, such as consumer and environmental groups. One specific suggestion was to provide NRTEE's report on this workshop to the parties mentioned above and another was to set up a centralized information base on sustainable development indicators. Several participants stated that the workshop helped provide a context for their work on indicators and stimulated their thinking on the matter. The workshop also set the stage for future consultation.

5.4 NRTEE Role in Development of Sustainable Development Indicators

The National Round Table on the Environment and the Economy (NRTEE) was identified by all small groups as the body which should help provide the policy framework for indicators, promote the development and use of indicators and collaborate with other groups better suited to do the technical work. NRTEE is structured to draw on the expertise of several federal government departments, including the Departments of Environment, Finance and Energy Mines and Resources. Moreover, NRTEE is structured to include representatives of industry and environmental organizations, whose advice and support is essential. Also NRTEE has ties to provincial and territorial round tables which also provide avenues for public consultation. Finally, NRTEE advises the Prime Minister. And political support for the concepts of sustainable development is essential in setting the policy framework for national indicators.

APPENDIX 1

LIST OF WORKSHOP PARTICIPANTS

APPENDIX 2

WORKSHOP PROGRAM

APPENDIX 3

MARBECK DISCUSSION PAPER

W.e.s.t.

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original to ~~CRT~~ Colli

24 April 1991

Liza Will
NRTEE Secretariat
1 Nicholas Street
Ottawa, Ontario
K1N 7B7

Dear Ms. Will:

Re: Contract Number KA171-0-9655
NRTEE Energy Indicators' Workshop Report

Enclosed the final Energy Indicators' Workshop Report with the necessary revisions incorporated as required. Also we are enclosing a disk containing this report prepared on WordPerfect 5.1. Prior to distribution, please include the appendices, as follows:

- List of Workshop Participants
- Workshop Program
- Marbek Discussion Paper

This completes our requirements under this contract and our invoice has been forwarded to Mike Kelly. If you have any questions please feel free to call.

Sincerely,

Cheryl Bradley

c: Ann Dale
Environment Canada