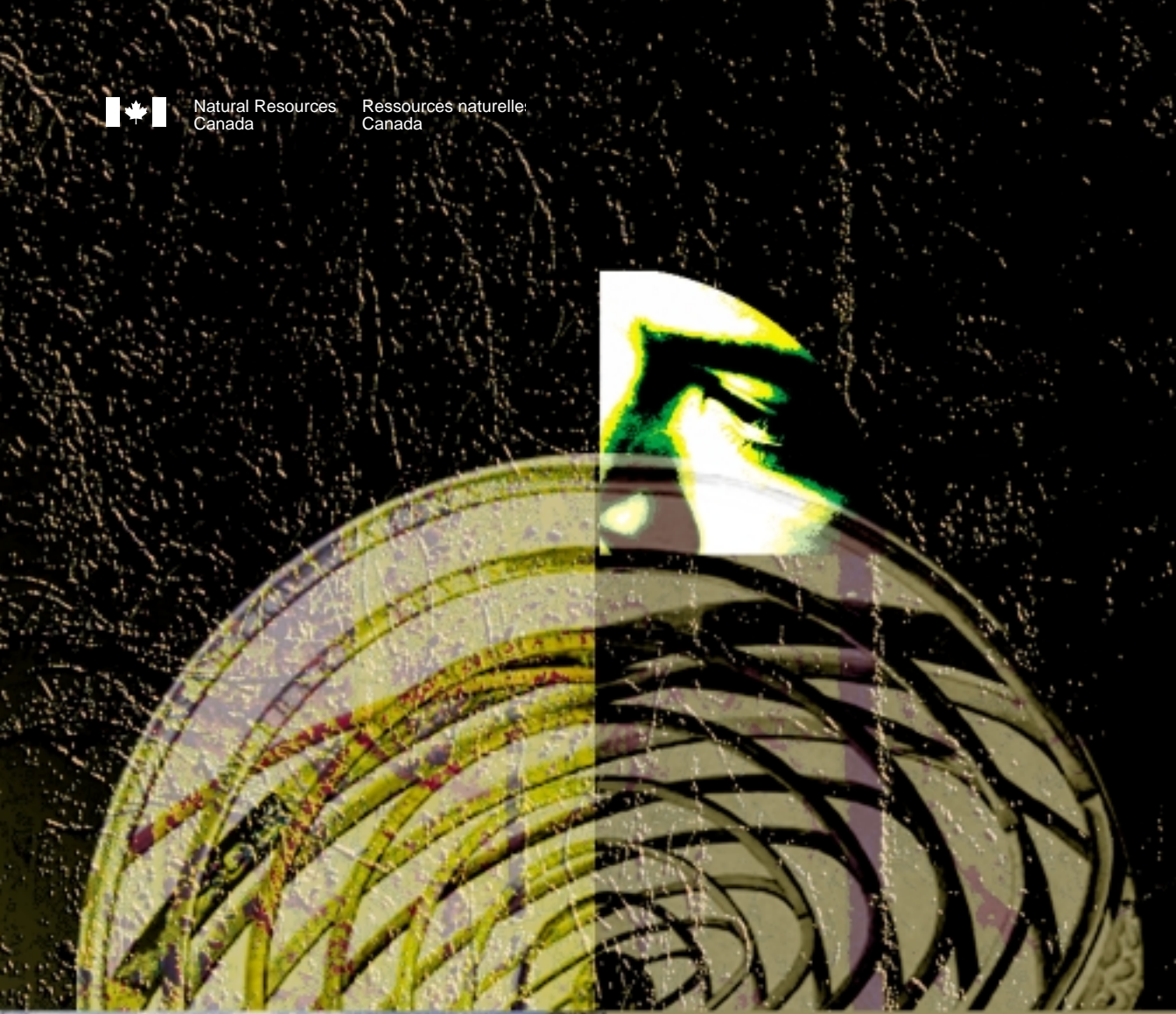




Natural Resources
Canada

Ressources naturelles
Canada



Canada 2050

FOUR LONG-TERM SCENARIOS FOR CANADA'S ENERGY SYSTEM

Canada 

CANADA IN 2050

IN 2050, CANADA'S POPULATION IS EXPECTED TO REACH 44 MILLION. WITH THIS GROWING POPULATION, CANADIANS WILL BE GETTING OLDER. THESE DEMOGRAPHICS WILL HAVE A GROWING IMPACT ON OUR ENERGY SYSTEM AND ON OUR ENVIRONMENT BECAUSE CURRENT TRENDS IN ENERGY SERVICE DEMANDS, SUCH AS MOBILITY, HEATING AND COOLING, WILL BE SUBSTANTIALLY ALTERED.

EACH ETF SCENARIO DESCRIBES A WORLD CONTEXT AND HOW CANADA FITS INTO THAT WORLD. EACH SCENARIO LOOKS AT OUR ENERGY SYSTEM IN TERMS OF HOW WE LIVE AND WORK, AND HOW WE MOVE PEOPLE, GOODS AND RESOURCES THROUGHOUT THE ECONOMY. FINALLY, EACH PRESENTS AN ESTIMATE OF ENERGY DEMANDS, FUEL MIX AND THE LEVEL OF GHG EMISSIONS IN 2050.

Why Scenarios?

Scenarios are structured stories that provoke and stimulate thought of what could happen in the future. They are not predic-

tive, nor are they built on extrapolations of today. Scenarios allow us to have a better understanding of the factors that might influence changes in the way in which the world evolves, identify opportunities for Canada within these future worlds, and allow us to be more creative and productive within those futures.

The Energy Technology Futures project (ETF), an initiative of the Energy Sector of Natural Resources Canada, was initiated in July 1998. Its objective was to develop a set of distinct and plausible scenarios of what Canada's energy system could look like three to five decades in the future. The intent is to identify the effect that new and innovative technologies could have in reducing our greenhouse gas emissions.

The Planning *Space*

3

GRASPING

In developing the scenarios, the ETF team sought the assistance and input of experts from around the world to help identify potential technologies for inclusion in the project, their possible application and issues that could impact on what our future might look like.

After the issues were analysed, a planning space was developed to manage the information gathered. Three independent drivers were used for this planning space and they added discipline to the design and structure of the scenarios.

ENVIRONMENTAL ETIQUETTE reflects how business and the public choose to build environmental issues into their decision-making processes. When reaction to environmental concerns is low, environmental etiquette is grey. When awareness is high, and business and the public incorporate environmental concerns into their day-to-day thinking, environmental etiquette is green.

MARKETS measure globalisation of world markets and the success of market transition and reform. When products and capital flow freely, markets are open. When countries focus only on internal issues, markets are closed.

THE PACE OF INNOVATION reflects the speed at which Canadians generate and develop new ideas and move these through to the market place. As the pace of innovation accelerates so does the rate of capital stock turnover in the economy, and the ability to integrate technologies across varied applications.

Four extremes of the planning space were chosen as scenarios for the project. The selection of these sites was based on their plausibility, interest value, and distinctiveness. These scenarios also allowed the project to incorporate the widest possible range of technologies.

MARKETS

AT STRAWS

**ENVIRONMENTAL
ETIQUETTE**

4

COME TOGETHER



1

LIFE GOES ON



INNOVATION

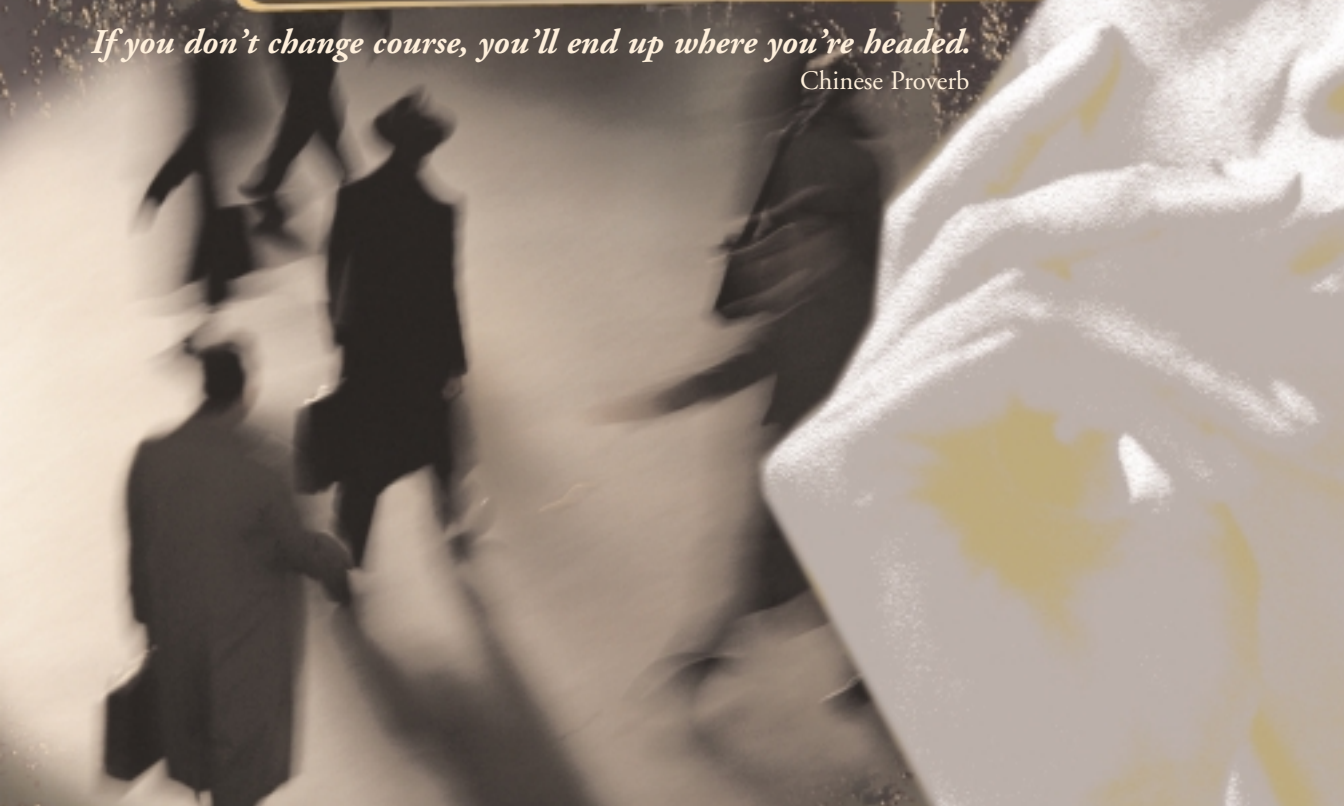
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TAKING CARE OF BUSINESS



If you don't change course, you'll end up where you're headed.

Chinese Proverb



Life Goes On


This is a world of marginal technology improvement. Restricted markets limit the flow of goods and information. It is a world of where the attitude is, “if it ain’t broke, don’t fix it”.

Canada is slow to adopt new technology. Industry focuses on cutting costs through incremental investments that increase process efficiency. The focus is on issues related to the standard of living and other social considerations to deal with our demographic issues, such as education and health care. Investment in research and development lags and few innovative technologies are developed.

Canada’s infrastructure starts to show signs of wear and tear. In many instances, bridges, dams, pipelines and roads need substantial investment to keep them operating effectively.

The bulk of our energy needs are met by fossil fuels, with heavy oil and oil sands providing most of our liquid fuel needs, and gas and coal meeting much of our electricity demand.

The pace of innovation is slow, markets are closed and the environmental etiquette is grey.



We tend to do the things we know how to do, instead of trying to do the things we ought to do.

R. Anshen

GHG EMISSIONS INITIALLY EXHIBIT A DOWNWARD TREND TO 2020. AS THE WORLD EVOLVES BEYOND THAT POINT, GHG EMISSIONS GRADUALLY BEGIN TO RISE AS THERE ARE FEW NEW TECHNOLOGIES TO OFFSET THE GROWTH IN POPULATION AND INCREASED ECONOMIC ACTIVITY.

Grasping at Straws

Pressure for immediate action on climate change has led governments of developed countries, including Canada, to adopt a series of no regrets actions. The actions included the rapid deployment of a variety of off-the-shelf technologies in the hope of finding a quick fix solution to the climate change issue. Renewable energy technologies in buildings, hybrid vehicles, ethanol-blended fuels and electricity generation using natural gas are some examples of the technologies deployed.

Moving technologies off the shelf and into the market generated short-term benefits, both economic and environmental. Unfortunately, this focus on deployment and nearer term activities resulted in a very uneven pattern of investment along the innovation chain. Research and development investment in new technologies was limited, and by 2020, very few innovative technologies were available to address the growing emission problem.

Canada's energy system is regionally diverse. Different areas of the country focus on those fuels and technologies that give them a comparative advantage. There is a focus on improving end use efficiencies, reducing, reusing, and recycling waste materials and manufacturing new, value-added products from old. In terms of energy, Canada relies largely on fossil fuels, with natural gas being the fuel of choice. The electricity system is showing signs of becoming more dispersed in nature with local systems fuelled by a variety of sources.

The pace of innovation is slow, markets are open, and the environmental etiquette is green.



It is not that they cannot see the solution. It is that they cannot see the problem.

G.K. Chesterton

GHG EMISSIONS DECREASE AS NEW EFFICIENT TECHNOLOGIES REPLACE GHG INTENSIVE PROCESSES. GREATER ELECTRIFICATION OF THE ECONOMY, THE USE OF NUCLEAR ENERGY AND RAPID CAPITAL STOCK TURNOVER IN THIS SCENARIO TEND TO REDUCE OVERALL EMISSIONS BY THE YEAR 2050.

Taking Care of Business

This is a world in which Canada builds on its expertise in information systems, high-voltage electrical transmission and distribution, and its natural resource endowment. In this world, social and environmental issues are secondary to expanded economic growth and prosperity. Environmental issues are dealt with only when they affect the “bottom line” of a company.

Canada, like the rest of world, experiences a strong and sustained level of economic growth. Information technologies and high degrees of interconnectedness have led to rapid innovation and rapid capital stock turnover. A strong knowledge-based economy emerges in Canada that enables it to produce high value-added products.

Canada’s electricity system provides the high quality and reliable power demanded by individuals and industry through a combination of central and distributed sources. Grid electricity is provided largely by hydroelectric and nuclear power, with distributed systems using mainly natural gas.

*The pace of innovation is rapid,
markets are open, and
environmental etiquette is grey.*



The problems that exist in the world today cannot be solved by the level of thinking that created them.

GHG EMISSIONS ARE SUBSTANTIALLY REDUCED IN ALL AREAS OF THE ECONOMY. THESE REDUCTIONS WERE DUE IN PART TO THE APPLICATION OF NEW TECHNOLOGIES FOR GHG MANAGEMENT, ADVANCED INDUSTRIAL PROCESSES, INCLUDING BIOTECHNOLOGY, AND THE INTEGRATION OF RENEWABLE ENERGY SOURCES THROUGHOUT THE ECONOMY

Come Together

This is a GHG responsive world. There is a strong cohesion of views among government, industry, and the public regarding environmental issues.

The extensive interconnectedness of the world allows new technology to be openly developed, traded, and applied in innovative ways across all sectors. Canada is well placed in this global market. Industry, government and universities work together to create regional technology centres where new ideas move rapidly from the laboratory into the marketplace.

This is a proactive world that uses a systems approach to minimise waste, energy use and emissions. New and innovative technologies have allowed us to build a designer world with customised processes and products. Information technologies are wide-spread as is the use of biotechnologies, artificial intelligence, and robotics applications. The rapid pace of innovation and the integration of technologies across varied disciplines have provided us with a wider range of problem-solving options.

Canada's energy system is highly integrated and relies on a wide variety of fuels to meet energy service needs. Renewable energy technologies are well-integrated into building design and into the mix of distributed power systems. Canada's reliance on fossil fuels has decreased, but the fuels that are used are produced in a more efficient and emission reduced manner. Canada also relies heavily on the use of GHG capture and disposal technologies that permit their permanent fixation and storage.

The pace of innovation is high, markets are open, and environmental etiquette is green.

4

More on ETF

The scenarios developed under the project are designed to promote thought and discussion. They are also designed to influence our science and technology directions and investments. The use of scenario planning is also aimed at influencing nearer term thinking and our overall approach to policy issues.

The work clearly highlights the need to develop a longer-term perspective on the climate change issue. Long-term policy, program development and patient science and technology investment will be needed to ensure the timely development of the types of technologies identified within the four scenarios. Some of that investment needs to be made now. Research, development and deployment. The scenarios point to the need for greater integration

of technologies across sectors and applications. Not only is this an important element in the design of a well-functioning innovation system, but it is essential if we are to ensure the on-going development of Canadian scientific and technical capabilities.

The work of this project has been recognised and discussed with the European Union, the International Energy Agency, and at a number of international fora. The scenarios are designed to stimulate dialogue and debate on how we move from where we are now to where we could be.

We invite you to be a part of that debate by visiting our Web site at www.nrcan.gc.ca/es/etf where you can obtain more information on the ETF project and its scenarios and technologies.

