Energy Council of Canada
Conseil canadien de l'énergie

WORLD ENERGY COUNCIL

Brief Description and Main Messages

2016 World Energy Scenarios: The Grand Transition

The World Energy Council regularly undertakes analysis of energy futures based on well considered energy scenarios. The most recent results and insightful observations have just been released in a report entitled *World Energy Scenarios 2016: The Grand Transition*. Links to the full report, the Executive Summary, and the Summary Report are provided below[1].

The Scenarios

The project team, led by Ged Davis, Executive Chairman, World Energy Scenarios, have developed three scenarios based on realistic evolutionary pathways for global energy systems. For each scenario, results are presented in the reports for a wide range of parameters which describe possible pathways for energy demand, trends in the supply mix, and implications for climate change matched to each scenario's context and assumptions.

In brief, the three scenarios are named metaphorically to match three styles of music. Quoting from the report:

"The scenario names reflect use of musical genre to give a sense of the mood of each scenario. Thus each of these musical titles evoke a sense of the world described.

For example, for Modern Jazz, we can quote that "Jazz (is) the music of boundless individualism... and the music of the collective."

And for Unfinished Symphony, 'You can't play a symphony alone, it takes an orchestra to play it.

And finally Hard Rock is an expression of strength of spirit in facing hard times."

A brief summary of the key features of each scenario is provided in the Attachment.

Main Messages

The authors distill a few main messages based on the wealth of detailed results for the three scenarios. These messages have been incorporated into the input provided to the 2016 World Energy Congress by the executive of the World Energy Council.

1. Primary energy demand is likely to peak before 2030
2. The demand for electricity will double by 2060
3. The phenomenal increase in deployment of wind and solar generation technologies will continue

[1] Full Report, Executive Summary and Summary Report

4. Demand for coal and oil will peak within the scenario periods, and natural gas will see aggressive growth
5. Global transport is in the midst of a transition featuring less oil, more electrification, and more biofuels
6. Exceptional limits will be required to limit global warming to less than 2^0C
7. To achieve the "energy trilemma" of energy security, energy equity, and environmental sustainability, three essential ingredients are: global cooperation, sustainable economic growth, and innovation.

Also included in this year's report is a comparative summary of the outcomes from each scenario under six topical headings: Efficiency; Mix of Resources; Carbon emissions; Adaptation and Resilience; Energy Trilemma (energy security, energy equity, environmental sustainability); and, Energy, Water and Food.

Using the Reports

There are many scenarios available which describe the evolutionary pathways of global energy systems. This World Energy Council's 2016 scenario study is worth attention for several reasons. The coverage is global, three plausible scenarios cover a range of policy and technology alternatives, the analysis addresses key issues facing global energy leaders today, the analysis has been done to a high technical standard, and the results and observations have been reviewed by international experts.

These reports will be of use to those undertaking own analysis or to those responsible providing informed advice on the future directions of global energy.

Canadian Participants

For each major research project, the World Energy Council creates teams of energy experts drawn from its member countries across the globe. Support and critique of the analysis and the write-up for the 2016 Scenarios project were provided by the Scenarios Study Group consisting of energy professionals from 23 member countries. The Canadian participants were: Yvan Cliché, Dan Hoornweg, Jatin Nathwani, Andrew Pietrewicz, Oskar Sigvaldson, and Graham Campbell.

We hope that the reports from this World Energy Council project will be of interest. The Energy Council of Canada welcomes your feedback on the analysis and observations in the 2016 scenario reports.

Graham Campbell
President
Energy Council of Canada

Key Features of the Three 2016 Scenarios

MODERN JAZZ

The outcome in 2060 is a world with a diverse set of resilient and lower-carbon energy systems. A highly complex and competitive market landscape drives efficiency, innovation, open access to information and rapid deployment of new technologies. Key features are:

- The world is highly productive, with fast economic growth and strong technological development.
- Digitalisation changes not only the way people work, but also the way they live, and has a transforming impact on global governance and political systems
- Politics are characterised by rapidly changing loyalties and coalitions; new political movements come and go in rapid succession and media become decisive opinion leaders
- New lifestyles are adopted, facilitated by pervasive, smart and seamless integration of new technologies, especially by younger generations (digitally connected elites)
- The economic and geopolitical shift to Asia is handled well
- Sustainability is addressed with technology innovation and new business models
- Energy costs are reduced due to developments on the energy supply side and the mid-stream, and there is greater access to energy for all.

UNFINISHED SYMPHONY

By 2060, the world is "ticking on the same clock" and has shifted to a resilient, integrated, global low-carbon energy system. There is global unified action on security, environmental and economic issues, and global institutional and national governments support enabling technologies. Key features are:

- Moderate to fast economic growth, sustainable and more evenly distributed, with high levels of infrastructure investment
- Emergence of new societal goals and behaviours of 'shared economy' models that lead to significantly reduced energy demand
- Significant re-balancing of global wealth through consumer taxes and transfer of technologies from North to South
- Support for a broad-based international governance structure covering security, environmental and energy matters
- An extensive network of fiscal incentives such as green subsidies and carbon pricing, with global standardization across sectors
- Strong technological innovation in large-scale, integrated solutions that drive efficiencies and reduce carbon emissions, although there is more to do to address climate change targets.

HARD ROCK

The outcome in 2060 is a fractured world, with a diverse set of economic, energy and sustainability outcomes. Nationalist interests prevent countries from collaborating effectively on a global level, with limited attention to addressing climate change. Technologies are mandated based on availability of local resources. Key features are:

- Economic growth is slower due to low productivity growth and an aging population with slow growth in labour force
- Poverty and inequity rise, weakening the social fabric
- Ineffective international policies refocus priorities and a strong North-South divide leads to political conflicts and occasional armed conflicts
- Self-centred and nationalistic behaviours prevail, based on widespread fear that people will become losers in an ever-increasing battle for resources and wealth.
- Large-scale domestic energy solutions are driven by security concerns: for example, hydro, nuclear and fossil fuels
- There is underinvestment in energy systems and weakening resilience
- Commodity prices are volatile, with periods of shortage and peak prices followed by underinvestment and recession
- Regional coping strategies start to emerge and differentiate winners from losers, and there are pockets of best-practice solutions to the energy trilemma.