World Energy Issues Monitor 2017
Exposing the New Energy Realities

Einari Kisel | 16th November 2017, Reykjavik
About the Issues Monitor
Understanding the Monitor

Critical Uncertainties: What keeps Energy Leaders awake at night

Action Priorities: What keeps Energy Leaders busy at work

World Energy Issues Monitor 2017 - Global Map - Understanding the Map
The 41 Energy Issues

World Energy Issues Monitor 2017 - Global Map - The 41 Energy Issues

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Issues Monitor 2017

Key Facts

• 8th annual Issues Monitor process
• Responses from over 1,200 energy leaders - CEOs, Ministers and experts across the Council network
• Additional responses from the Future Energy Leaders
• Feedback in 95 countries
• National deep-dives and analyses in over 35 countries (from the six original pilots in 2012) driven by national member committees
Issues Monitor 2017
Responses in 95 countries
Issues Monitor 2017
Including over 35 national deep-dives
Section 1

Key Findings 2017
Issues Monitor 2017 - Key Findings

- **Innovation issues** continue their rise up the agenda
- **Commodity price volatility** remains number one critical uncertainty
- A shift in **economic growth** – slow global growth puts greater uncertainty around primary energy demand
- Shifts in **geopolitical power and regional integration** – due to a renewed focus on US policy, Brexit and uncertainty over EU cohesion
- New physical and virtual risks – **cyber threats** are posing ever greater threats to the energy sector in the OECD, while **extreme weather** keeps leaders awake in the non-OECD
Commodity Prices and Economic Growth top the 2017 agenda
Increasing belief that innovation issues pose today’s greatest opportunity
More ‘traditional’ generation technologies lose out: CCS, Coal and Nuclear
But with a Highly Diverse Regional Importance – Nuclear
But with a Highly Diverse Regional Importance - Coal
The Impact of Digitalisation Splits the Agenda

World Energy Issues Monitor 2017 - Digitalisation

- Digitalisation: global
- Digitalisation: regional
- Digitalisation: national

Less urgent More urgent
Electric Storage is of most importance for leaders in Europe and North America.
Resilience Defined at the Regional Level: Cyber Threats top for the OECD
Section 2

The Regional Agenda
Europe

World Energy Issues Monitor 2017 - Europe

- Low position of coal and nuclear
- High position of digitalisation and renewable energies

Impact

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Latin America and the Caribbean

World Energy Issues Monitor 2017 - Latin America and the Caribbean

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work

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The Middle East and North Africa

World Energy Issues Monitor 2017 - Middle East and North Africa

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work

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North America

World Energy Issues Monitor 2017 - North America

- Critical uncertainties: what keeps energy leaders awake at night
- Action priorities: what keeps energy leaders busy at work

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World Energy Scenarios 2060
## Pre-determined elements of the Grand Transition

<table>
<thead>
<tr>
<th>Pre-determined</th>
<th>Factors that shaped world energy 1970 – 2015</th>
<th>Pre-determined elements 2015 – 2060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population/workforce</td>
<td>Global population grew 2x (1.7% p.a.)</td>
<td>Global population will grow 1.4x (0.7% p.a.)</td>
</tr>
<tr>
<td>New technologies</td>
<td>ICT revolution</td>
<td>Pervasive digitalisation; combinatorial impacts and productivity paradox</td>
</tr>
<tr>
<td>Planetary boundaries</td>
<td>1,900+ Gt CO₂ consumed</td>
<td>1,000 Gt CO₂ consumed to 2100 for the 2°C target</td>
</tr>
<tr>
<td>Shifts in power</td>
<td>Rapid economic rise of developing nations</td>
<td>2030: India is most populous country</td>
</tr>
<tr>
<td></td>
<td>Growing role for global institutions e.g. UNFCCC, IMF, WTO, etc. including G20</td>
<td>2035 – 45: China is the world’s largest economy</td>
</tr>
</tbody>
</table>
Three Scenarios

**Modern Jazz**
Market-driven approach to achieving individual access and affordability of energy through economic growth
- Market mechanisms
- Technology innovation
- Energy access for all

**Unfinished Symphony**
Government-driven approach to achieving sustainability through internationally coordinated politics and practices
- Strong policy
- Long-term planning
- Unified climate action

**Hard Rock**
Fragmented approach driven by desire for energy security in a world with low global cooperation
- Fragmented policies
- Local content
- Best-fit local solutions
1 THE WORLD’S PRIMARY ENERGY DEMAND GROWTH…

…will slow and per capita energy demand will peak before 2030 due to unprecedented efficiencies created by new technologies and more stringent energy policies.

*Final Energy Growth Rate (p.a.)*

![Diagram showing energy growth rate from 2000 to 2060 with different scenarios: History, Modern Jazz, Unfinished Symphony, and Hard Rock.](image)

Source: World Energy Council, Paul Scherrer Institute, Accenture Strategy
DEMAND FOR ELECTRICITY...

...will double to 2060. Meeting this demand with cleaner energy sources will require substantial infrastructure investments and systems integration to deliver benefits to all consumers..

*Electricity Generation (TWh)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Generation (TWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>23,816</td>
</tr>
<tr>
<td>Modern Jazz 2060</td>
<td>48,491</td>
</tr>
<tr>
<td>Unfinished Symphony 2060</td>
<td>44,474</td>
</tr>
<tr>
<td>Hard Rock 2060</td>
<td>44,914</td>
</tr>
</tbody>
</table>

Source: World Energy Council, Paul Scherrer Institute, Accenture Strategy
3 THE PHENOMENAL RISE OF SOLAR AND WIND ENERGY…

…will continue at an unprecedented rate and create both new opportunities and challenges for energy systems.

Electricity Generation by Source

**Solar generation** (’000 TWh)

- Modern Jazz 2060: 5.7
- Unfinished Symphony 2060: 7.9
- Hard Rock 2060: 3.3

**Wind generation** (’000 TWh)

- Modern Jazz 2060: 8.8
- Unfinished Symphony 2060: 9.3
- Hard Rock 2060: 5.6

Source: World Energy Council, Paul Scherrer Institute, Accenture Strategy
DEMAND PEAKS FOR COAL AND OIL…

…have the potential to take the world from “Stranded Assets” to “Stranded Resources”.

Source: World Energy Council, Paul Scherrer Institute, Accenture Strategy
TRANSITIONING GLOBAL TRANSPORT...

...forms one of the hardest obstacles to overcome in an effort to decarbonise future energy systems.

Electric Vehicles of Light-duty Vehicle Fleets

- 26% of 3.0 billion
- 32% of 2.8 billion
- 9% of 2.9 billion

Source: World Energy Council, Paul Scherrer Institute, Accenture Strategy
TRANSITIONING GLOBAL TRANSPORT...

... forms one of the hardest obstacles to overcome in an effort to decarbonise future energy systems.

Transport by Fuel source – EU 31 (in %)

<table>
<thead>
<tr>
<th>Fuel Source</th>
<th>2014 MTOE</th>
<th>2060 Modern Jazz MTOE</th>
<th>2060 Unfinished Symphony MTOE</th>
<th>2060 Hard Rock MTOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>207</td>
<td>324</td>
<td>296</td>
<td>399</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>0%</td>
<td>4%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>Biomass</td>
<td>90%</td>
<td>10%</td>
<td>27%</td>
<td>1%</td>
</tr>
<tr>
<td>Electricity</td>
<td>0%</td>
<td>4%</td>
<td>57%</td>
<td>83%</td>
</tr>
<tr>
<td>Others</td>
<td>0%</td>
<td>21%</td>
<td>5%</td>
<td>1%</td>
</tr>
</tbody>
</table>

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LIMITING GLOBAL WARMING…

…to no more than a 2°C increase will require an exceptional and enduring effort, far beyond already pledged commitments, and with very high carbon prices.

Annual Carbon Emissions (GtCO₂)

Source: World Energy Council, Paul Scherrer Institute, Accenture Strategy
TRILEMMA INDEX IN 2060

Modern Jazz 2060

Unfinished Symphony 2060

Hard Rock 2060

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Key Findings

1. The world per capita energy demand will peak before 2030.
2. Demand for electricity will double to 2060.
3. The phenomenal rise of solar and wind energy will continue at an unprecedented rate.
4. Coal and oil demand peaks have the potential to take the world from “Stranded Assets” to “Stranded Resources.”
5. Transitioning global transport forms one of the hardest obstacles to overcome in an effort to decarbonise future energy systems.
6. Limiting global warming to no more than a 2°C increase will require an exceptional and enduring effort, far beyond already pledged commitments and with very high carbon prices.
7. Global cooperation, sustainable economic growth and technology innovation are needed to balance the Energy Trilemma.
Thank you

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