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Proceedings:
http://www.inforse.org/europe/seminar_2010_BXL.htm

Global Energy Assessment

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Thomas B Johansson
International Institute for Industrial Environmental Economics,
Lund University, Lund, Sweden, and
Global Energy Assessment, IIASA, Austria
Assessment

Process:

25 Knowledge Modules, ~200 authors, geographically diversified

Stakeholder consultations

External peer review
Supporting the GEA:

**International Organizations**
- UNDESA
- UNDP
- UNEP
- UNIDO
- World Bank
- IIASA

**Corporations**
- Petrobras
- TEPCO
- First Solar

**Industry groups**
- WEC
- WBCSD

**Country Governments/Agencies**
- Austria
- Brazil
- European Union
- Germany
- Italy
- Sweden
- USA

**Foundations**
- UN Foundation
- Climate Works
Challenges requiring actions on Energy

a. Energy services for growing populations and economies
b. access to modern forms of energy (the 2 billion w/o access)
c. affordable energy services (@$100/bbl??)
d. secure supplies, from households to nations
e. local and regional environmental challenges
f. climate change mitigation
g. ancillary risks

=> Major Energy System Changes Needed!
These **challenges** must be addressed **adequately**

**timely**

**simultaneously**
Challenges requiring actions on Energy

a. **Energy services for growing populations and economies**
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e. **local and regional environmental challenges**
f. **climate change mitigation**
g. **ancillary risks**

=> *Multiple challenges – multiple benefits possible*
Electricity

Electricity for All in the Medium Term (may be achievable)

- Use of both grid-extension and decentralized systems + conventional and renewable energy technologies

- Smart use of subsidies and other innovative financing mechanisms (global effort would be required)
Clean Cooking Fuels

- Multiple benefits: development, situation of women and children, health, mitigation:
  - Biogas, LPG, alcohols, kerosene, electricity
  - Stove efficiency
Reasons for Concern – “The Red Embers”

Source: Smith et al. PNAS, 2009
Global emission pathways in compliance with a 2 °C guardrail

Figure 3.2-1
Examples of global emission pathways for the period 2010–2050 with global CO₂ emissions capped at 750 Gt during this period. At this level, there is a 67% probability of achieving compliance with the 2°C guardrail (Chapter 5). The figure shows variants of a global emissions trend with different peak years: 2011 (green), 2015 (blue) and 2020 (red). In order to achieve compliance with these curves, annual reduction rates of 3.7% (green), 5.3% (blue) or 9.0% (red) would be required in the early 2030s (relative to 2005).
Source: WBGU
this translates into a need for a major energy systems transformation

Main elements:
● Energy end-use efficiency
● Renewable energies
● Carbon Capture and Storage (for CC only)

● **Efficiency and Renewables are INSTRUMENTS** for addressing all the challenges at the same time!
“PassivHaus”

Source: Jan Barta, Center for Passive Buildings, www.pasivnidomy.cz
Example of savings by reconstruction

Before reconstruction:

- over 150 kWh/(m²a)

Reconstruction according to the passive house principle:

- 15 kWh/(m²a)

-90%

How far can buildings take us?
Mobility and Communication Through Time

1770s
- Horse
- Hay
- Agriculture
- Sunlight

1870s
- Telegraph
- Electricity
- Steam Locomotive
- Coal
- Coal mine
- Coal fields

1970s
- Internet, Mobile Phone
- Electricity
- ICE Automobile
- Gasoline
- Oil refinery
- Crude oil

2070s
- Convergence
- Energy, Mobility Information
- Hydrogen
- SMR, decarbonization
- Electrolysis

Source: David Sanborn Scott, 2004
Module Cost Reduction Roadmap

2004 Cost/Watt
Q1 09 Cost/Watt
Efficiency
Throughput
Spending
Low Cost Location
Plant Scale
2014 Cost/Watt Target

Q4 2009 cost per watt = $0.84

$2.94/W
$0.93/W
100%
18-25%
4-6%
4-6%
3-4%
2%
56-68%

$0.52 - 0.63/W
Technology Uncertainties: Learning Rates and Market Growth

Source: Grubler & Gritsevskiy, 2002
Annual new grid connections 1995 - 2009

GW

year


wind
nuclear
PV
HVDC Light cable development

1997
Hellefjorden
95 mm² Al
+/- 10 kV, 3 MW

2000
Directlink
630 mm² Al
+/- 80 kV, 60 MW

2001
Murraylink
1400 mm² Al
+/- 150 kV, 220 MW

2004
Estlink
2000 mm² Al
+/- 300 kV, 700 MW

2006 - 2007
1600 mm² Al (Cu)
+/- 300 kV, 700 MW (1100 MW)
Global energy transitions
Can pathways be realised?

- General: integrating with other social, economic and environmental policies
- Balancing markets and governments
- Investment and finance
- International cooperation
- Capacity development and institutional building globally
- Fostering innovation
Key policy tools

- Criteria: delivering change very fast
- Politically possible, low risks for politicians and investors
- Energy end-use efficiency (codes)
- Renewable energies (feed-in-tariff or others with equivalent performance)
- Modernized coal and CCS
- Nuclear (?)
Major findings and conclusions

- Rapidly changing world
- Energy pivotal
- Window of opportunity exists
- Resources and technologies exist
- Electricity (and hydrogen) growing importance
- Transformative changes needed
- Policies and institutions critical
Thank you!

www.GlobalEnergyAssessment.org

Thomas B Johansson
Co-Chair, GEA Executive Committee