

Global Energy Outlook

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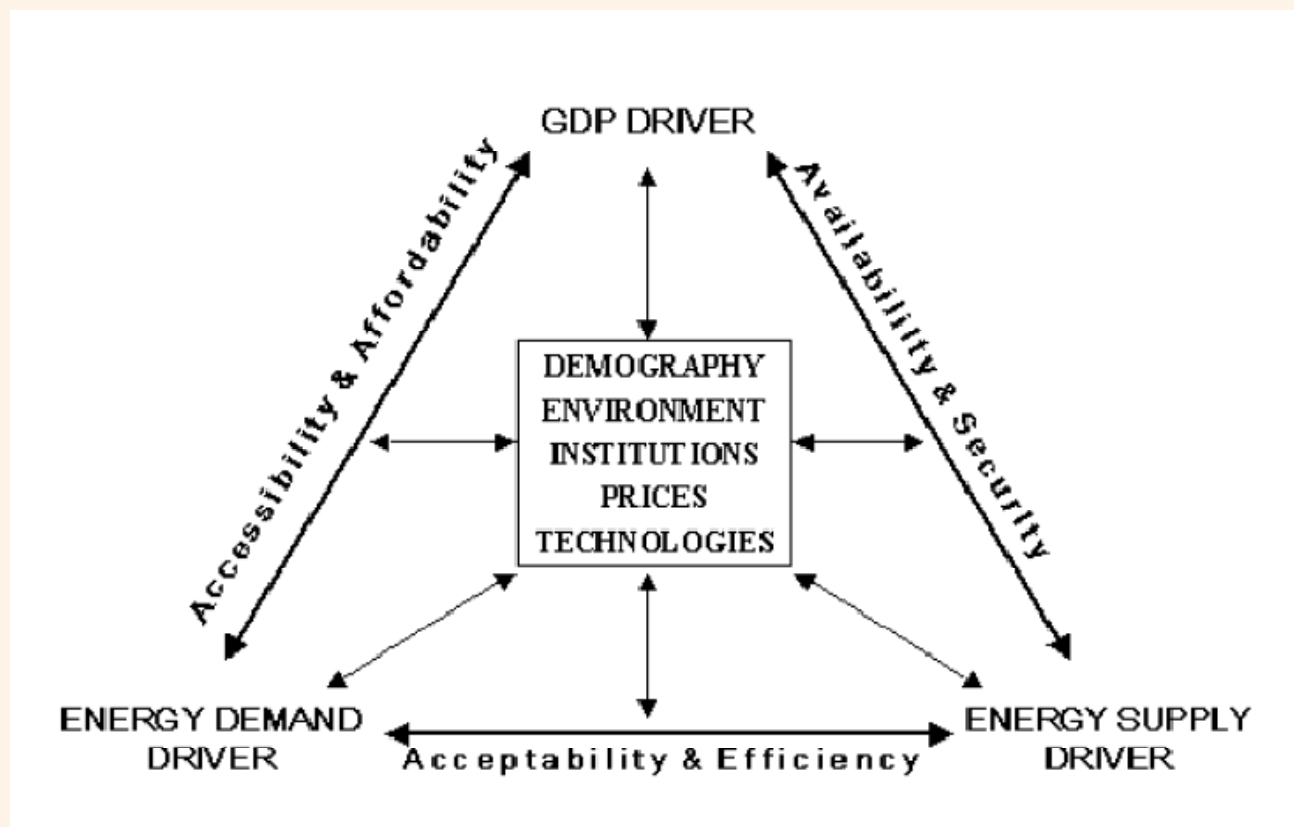
Promoting the sustainable supply and use of energy for the greatest benefit of all



Outline

- **Introduction**
 - Intertwined goals, drivers and issues
 - The World Energy Council
- ***Survey of World Energy Resources Highlights***
- **Roadmap to a Low Carbon Future**
- **Key Findings of *Energy Policy Scenarios to 2050***
- **Conclusions -**

Complex Framework of the Energy Sector



Interconnected goals, drivers and issues

World Energy Council

To promote the sustainable supply and use of energy for the greatest benefit of all

- Established in 1923, multi-energy, non-governmental, non-commercial
- Triennial World Energy Congress
- Work Programme: Studies, Technical Committees, Regional Programmes, Global Energy Information System (GEIS)
- Website: www.worldenergy.org
- Philippine M.C.: Energy Council of the Philippines

Some Relevant Publications

- Energy for Tomorrow's World –Acting Now! (2000).
- Living in One World: Sustainability from an Energy Perspective (2001)
- Drivers of the Energy Scene (2003)
- End-Use Energy Technologies in the 21st Century (2004)
- Sustainable Global Energy Development: The Case of Coal (2004)
- Survey of Energy Resources, 21st Edition (2007)
- Deciding the Future: Energy Policy Scenarios to 2050 (2007)
- Energy and Climate Change (2007)
- Energy Efficiency Policies around the World (2008)

Survey of Energy Resources

- A triennial compilation of information on energy resources and utilization
- First edition in 1934; 21st Edition in 2007
- Based on input from the WEC Member Committees (94)
- The SER is complementary to the IEA's World Energy Outlook as it covers most of the world's regions
- The 2007 SER is available for free on the WEC website including an executive summary
- It was distributed at the 2007 WEC Congress to all delegates
- Resource commentary, reserves, production & consumption, country notes
- Resources – “known or deduced to be potentially accessible”
- Reserves – “recoverable under specific criteria”

Resources

- Finite Resources:
 - Coal, Crude Oil, Oil sands, Extra-Heavy Oil, Oil shale, Natural Gas, Uranium, Thorium
- Intermediate Resources:
 - Peat, Geothermal
- Perpetual Resources
 - Hydro, Bioenergy, Solar, Wind, Marine (Tides, Waves, OTEC)

Oil

- Proved recoverable reserves are 117 billion barrels higher than 2002
- 61% in Middle East, 11% in Africa, 8% in each of Europe and S. America and 5% in N. America
- Oil will not run out for many years
- Predictions of the production peak highly dependent on resource estimate revisions, further discoveries, technology advances, unconventional sources
- Timing is less important than vision of the long-term decline

Renewable Energy

- Renewables provide about 1/5th of power generation
- Hydro about 87% of renewables; only 1/3rd of potential developed
- Bioenergy – largest share is wood, followed by charcoal and biomass for electricity. Also crop residues, municipal waste etc.
- Biofuels interest at an all-time high; price of oil exceeds biofuels such as ethanol (40% of world production in US and 37% in Brazil)
- Wind has grown rapidly, capacity doubling every 3.5 years
- Solar thermal, PV and Passive Solar have great potential: PV markets growing by 35%/year
- Marine energies yet to be developed fully – wave resource alone estimated to be as much as 10TW

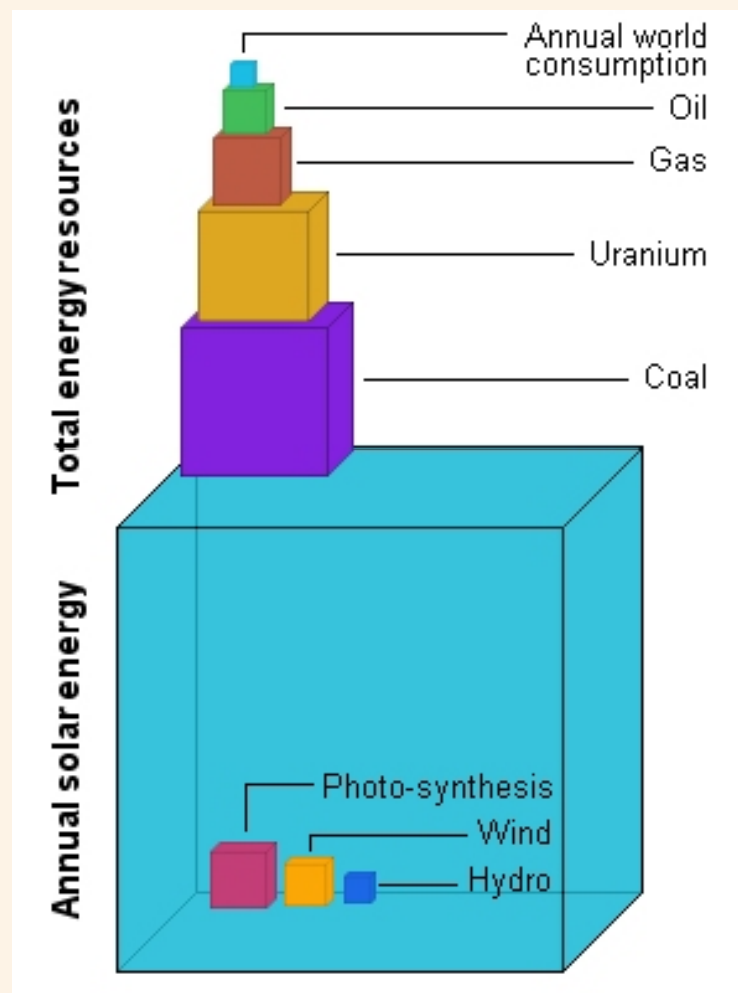
Resources and Production I

	2002	2005	%Changes 2005/2002	Production (2005)
Coal, <i>billion tonnes</i>				
Proved Recoverable Reserves	909	847	-6.8	5.9
Crude Oil & NGL, <i>billion barrels</i>				
Proved Recoverable Reserves	1 099	1215	+10.6	29.6
Shale Oil, <i>billion barrels</i>				
In-Place Resources	3328	2826	-15.1	0.005
Natural Bitumen, <i>billion barrels</i>				
Reserves	247	246	-0.6	0.37
Extra-Heavy Oil, <i>billion barrels</i>				
Reserves	48	60	+23.7	0.23
Natural Gas, <i>trillion cubic metres</i>				
Proved Recoverable Reserves	171	176	+3.5	2.8

Resources and Production II

	2002	2005	%Changes 2005/2002	Production/ Generation (2005)
Uranium, <i>thousand tonnes</i>				
Proved Recoverable Reserves	3 169	3 297	+4.0	41.7
Nuclear				
Installed Generating Capacity, GW _e	359	371	+3.2	2 625 TWh
Geothermal				
Installed Generating Capacity, GW _e	8	9	+9.9	58 TWh
Hydropower				
Technically Exploitable Capability, TWh/year	15 899	16 494	+3.7	
Installed Generating Capacity, GW _e	732	778	+6.4	2 837 TWh
Wind				
Installed Generating Capacity, GW _e	31	59	+89.0	106 TWh

Order of Magnitude of Energy Resources



Sustainable Energy Technology Portfolio

• Efficiency	• Renewables
• Clean Coal	• Carbon Capture & Storage
• Combined Heat & Power	• Distributed Power
• Smart Electronic Control	• Nuclear Power

Current Policy Limitations

- Ineffective and Short-sighted
 - Confusing and Unfocused
 - Impose Equity Issues
 - Inadequate to the Scale of the Issue
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- **MUST HARNESS THE ENLIGHTENED SELF-INTEREST OF EVERY COUNTRY**

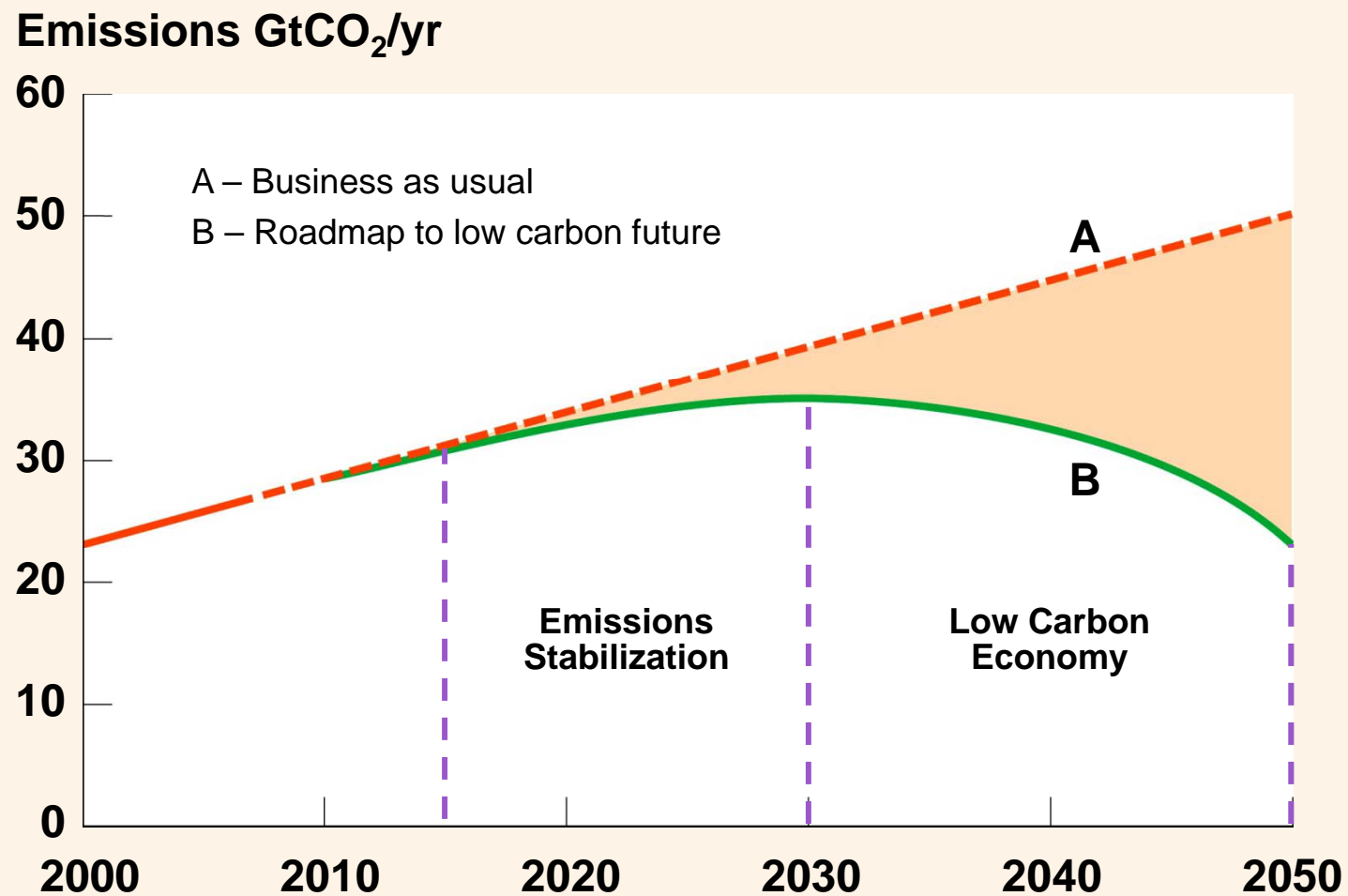
Portfolio of Measures Generally Needed

- Decarbonise electricity
- Develop carbon-free alternatives for transport
- Increase in the scale of funding for technology development
- Major international effort in technology deployment particularly in developing countries

A roadmap to a low carbon future

- **Phase One: 2015** – Credible commitments & slower CO₂ emissions growth
- **Phase Two: 2030** – Emissions stabilization
- **Phase Three: 2050** – Sustainable emissions reduction, a low carbon economy

Global CO₂ Emission Scenarios



Energy Policies Scenarios to 2050

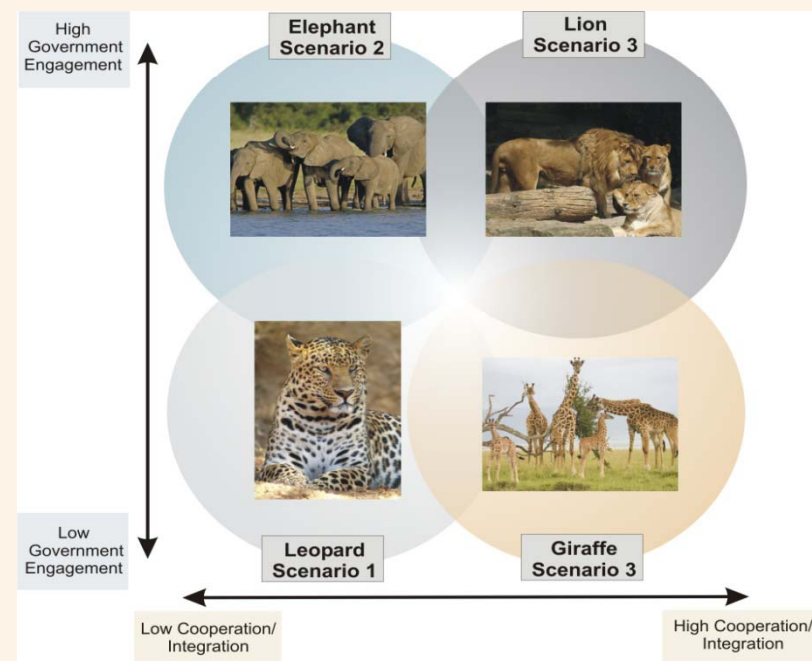
Measures – Study Framework

WEC studied Energy Policy within the framework of:

- **Government Engagement (High – Low)**
- **Cooperation and Integration (High – Low)**

These dimensions have real interest across the spectrum of WEC member counties.

The study is qualitative, with some quantitative validation.



Evaluation of the Scenarios

WEC evaluated each of the scenarios on the basis of positive and negative implications for the achievement of the WEC Millennium Goals.

WEC Millennium Goals

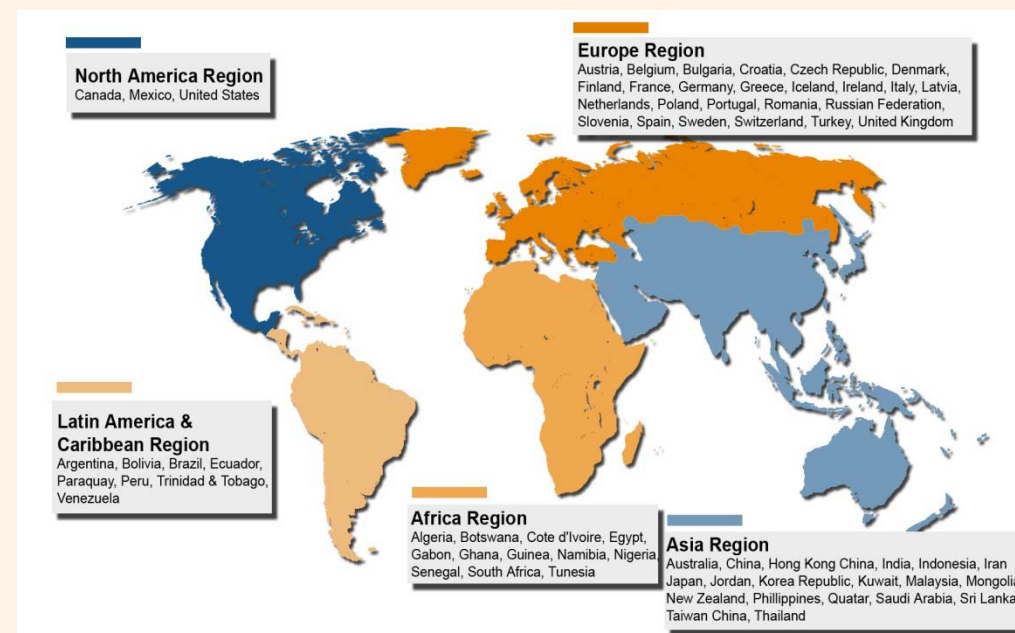
Accessibility: access to affordable modern energy for all people

Availability: reliable and secure energy supply

Acceptability: protect and preserve the local and global environment

Extraordinary and Invaluable Participation

- 5 Regions
- 67 WEC Member Countries
- 398 individuals; all decision makers



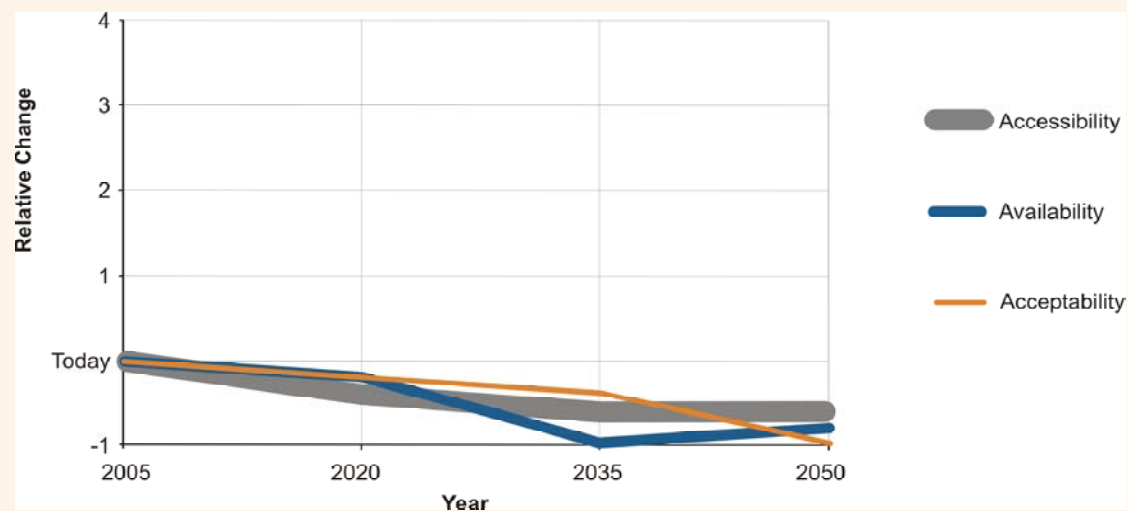
Leopard (Low Government – Low Cooperation)

- Domestic economic development is the primary driver, underpinned by domestic energy security.
- Government engagement is constrained and there are few levies or subsidies.
- International treaties, where they exist, are ineffective.



Leopard (Low Government – Low Cooperation)

- There is very little progress on any of the measures under this scenario.
- For the developing regions, this scenario leads to social and climatic degradation.



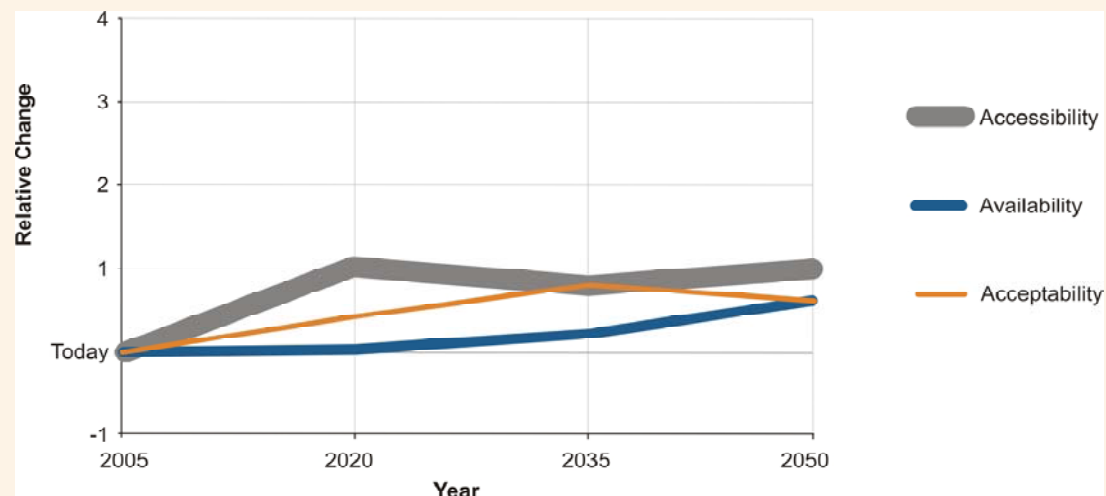
Elephant (High Government – Low Cooperation)

- Strong, hierarchical leadership from governments.
- The first priority is domestic energy security to support structured economic activity and growth.
- Focus on development, and protection, of indigenous resources.
- Limited use of international bilateral agreements.



Elephant (High Government – Low Cooperation)

- Government engagement ensures steady improvement in all the measures.
- Low cooperation inhibits progress in developing regions due to technology and resource constraints.



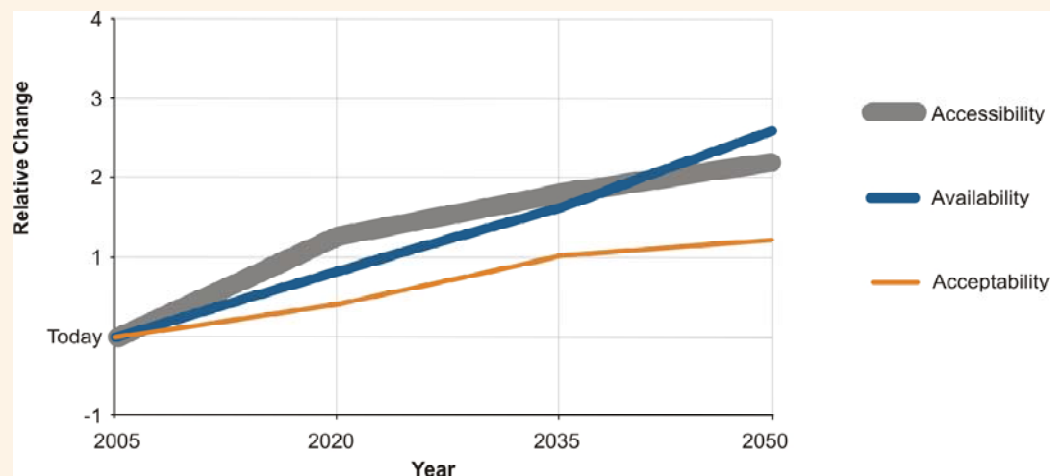
Giraffe (Low Government – High Cooperation)

- Primary focus is economic growth, freeing up global markets to promote international trade.
- Heavy reliance on market mechanisms with limited regulation.
- Few levies and subsidies and few restrictions on global movement of goods and services.



Giraffe (Low Government – High Cooperation)

- Availability improves dramatically as an essential enabler of economic growth.
- Accessibility and Acceptability are second order priorities in the absence of government engagement.
- Developing countries also progress due to high cooperation.



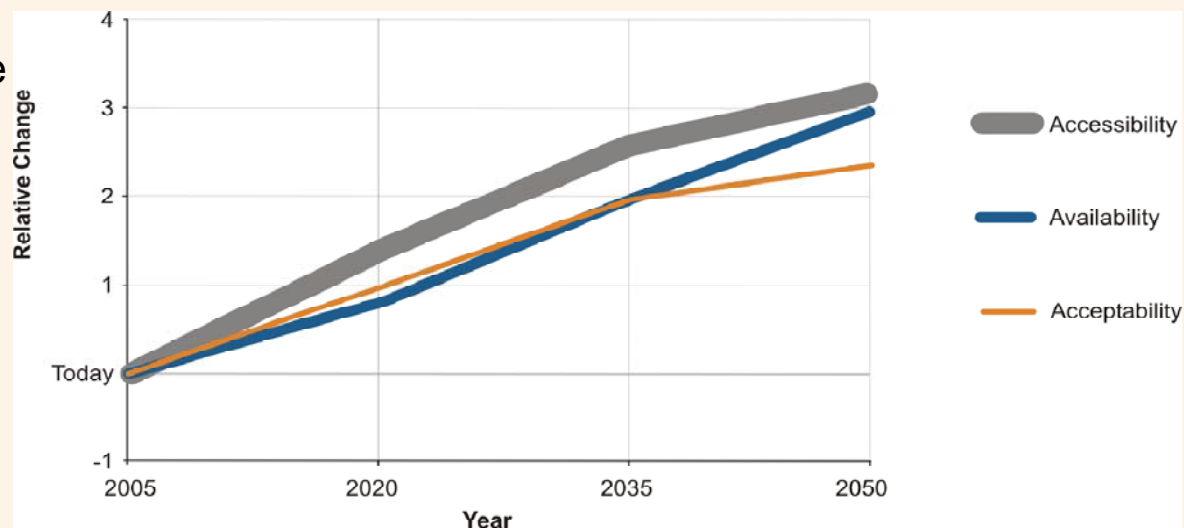
Lion (High Government – High Cooperation)

- National policies provide protection of property and commercial rights promoting international alliances.
- Governments and businesses actively share their experience and expertise.
- Public Private Partnerships ensure a focus on delivery of policy intent.



Lion (High Government – High Cooperation)

- Accessibility and Acceptability are global concerns.
- All 3 A's make strong progress through powerful international agreements and programmes.
- This is the best scenario for developing regions.



Key messages

- **To meet the energy needs of all the people in the world, global energy supplies will have to double before 2050.**
- **The world has sufficient energy resources, knowledge, skills and capital to meet the supply needs; the challenge is to get them from where they are plentiful to where they are needed most.**
- **We can address the world's accessibility needs in harmony with the effective management of acceptability, thereby mitigating against both social and environmental degradation.**
- **Higher energy prices (or the specter of the same) will drive efficiency and attract capital investment in developed countries but robust international cooperation and integration is necessary to avoid unintended negative consequences and exacerbating energy poverty in developing countries.**
- **Private sector engagement is essential – influencing national policy, driving business policy, and ensuring focus on sustained delivery of the policy intent.**

Turning Challenges to Opportunities

- Policy framework is important in deciding our energy future
- Cooperation between public and private sector at the local and international levels is a key factor
- Tap and share the wealth of knowledge, experience and expertise of institutions focused on sustainable energy

THANK YOU