Energy in transition - navigating through uncertainty

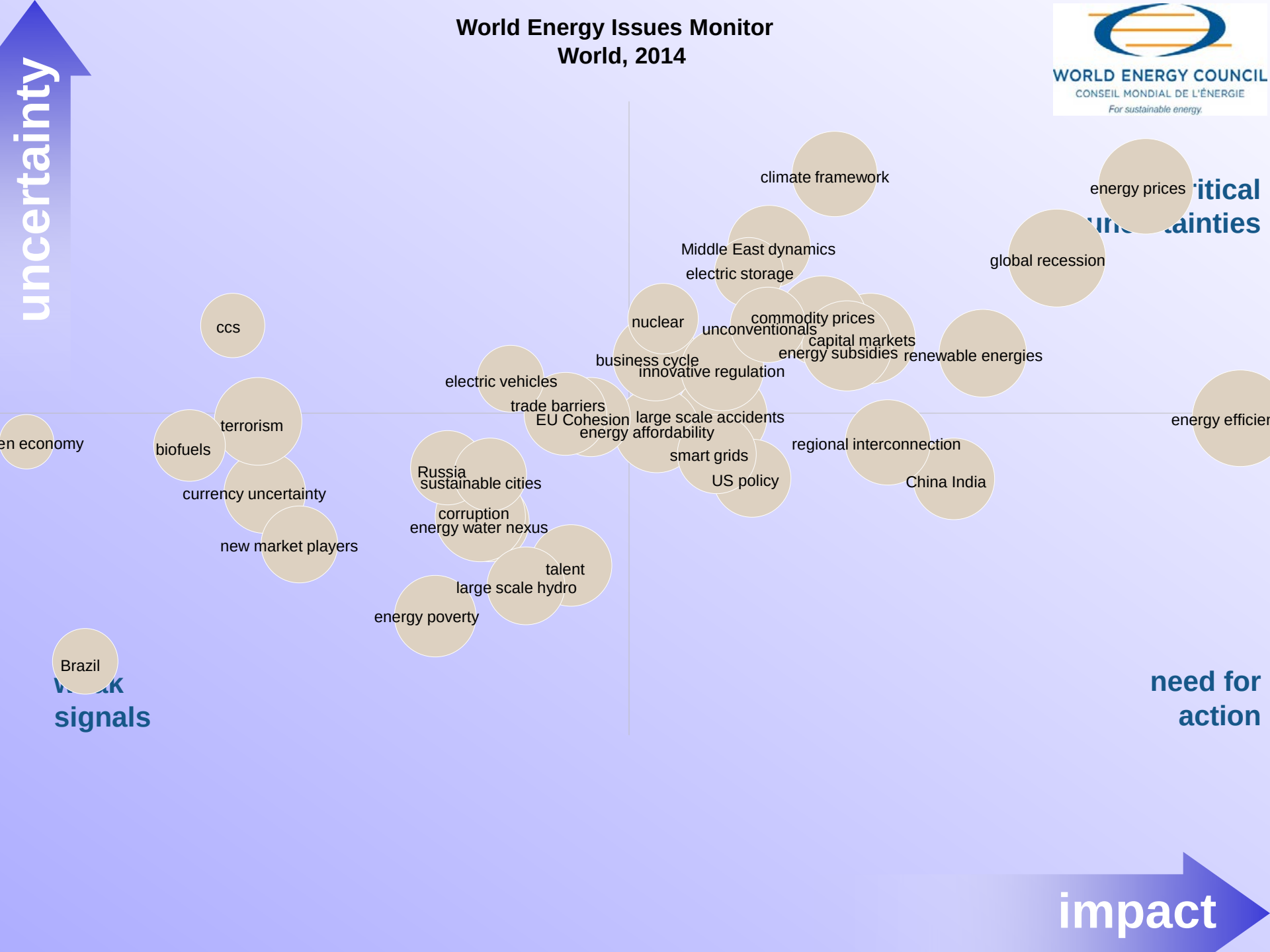
WORLD ENERGY COUNCIL
CONSEIL MONDIAL DE L'ÉNERGIE
For sustainable energy.

Prof. Dr Christoph Frei
Secretary General & CEO
World Energy Council

Vienna, 30 April 2014
WEC Austria

twitter:
@chwfrei

World Energy Issues Monitor
World, 2014



World Energy Issues Monitor
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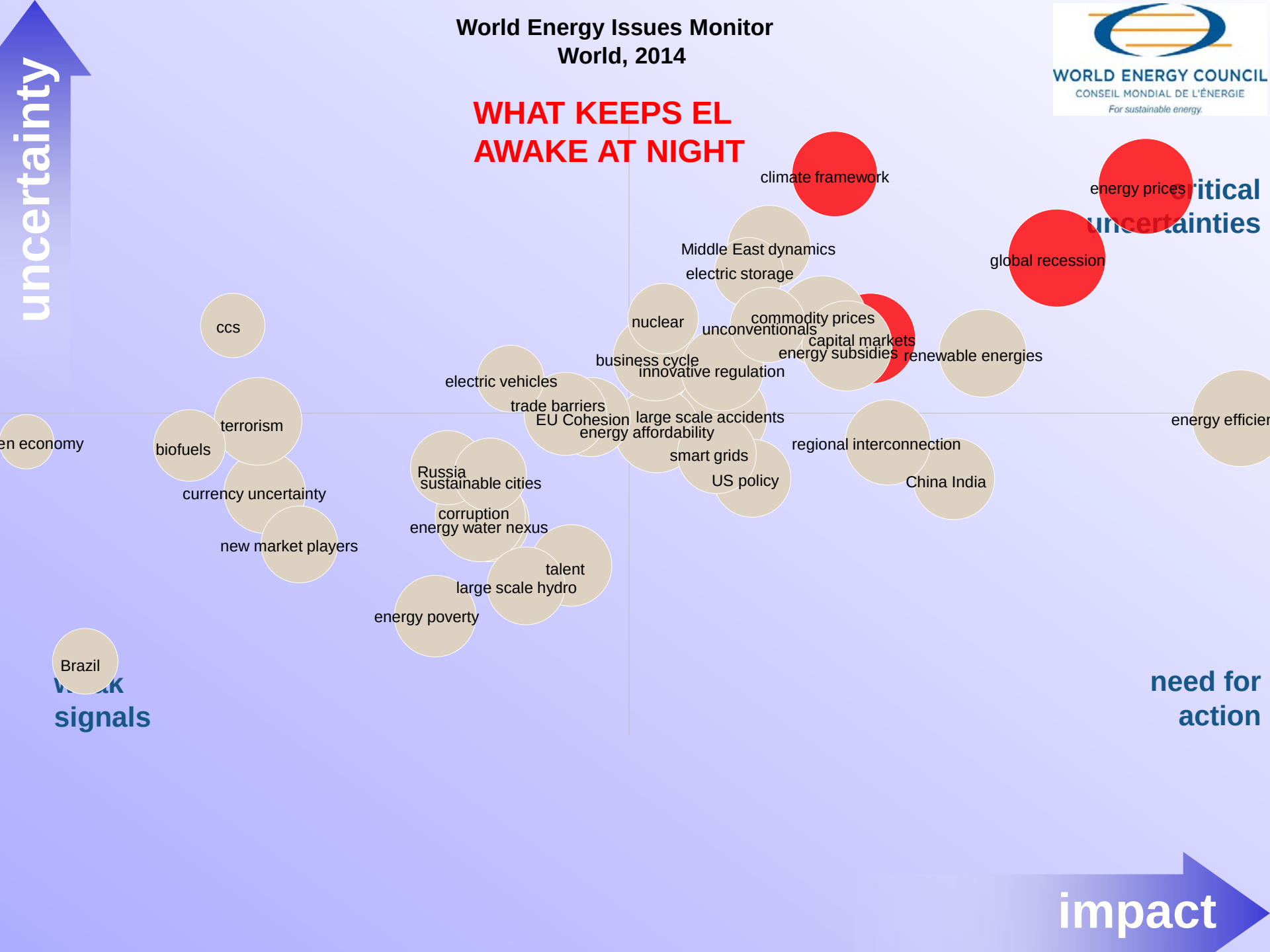

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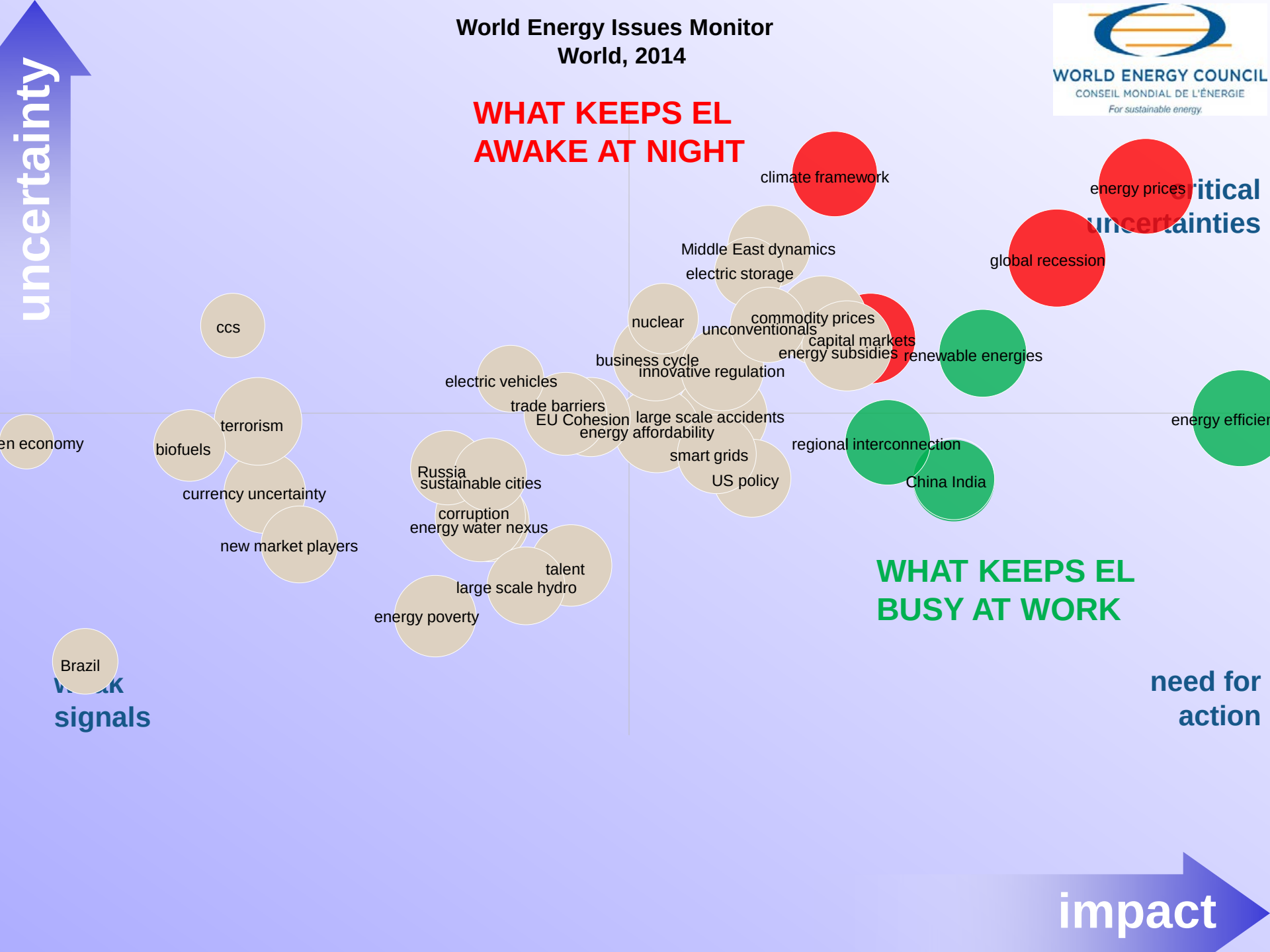
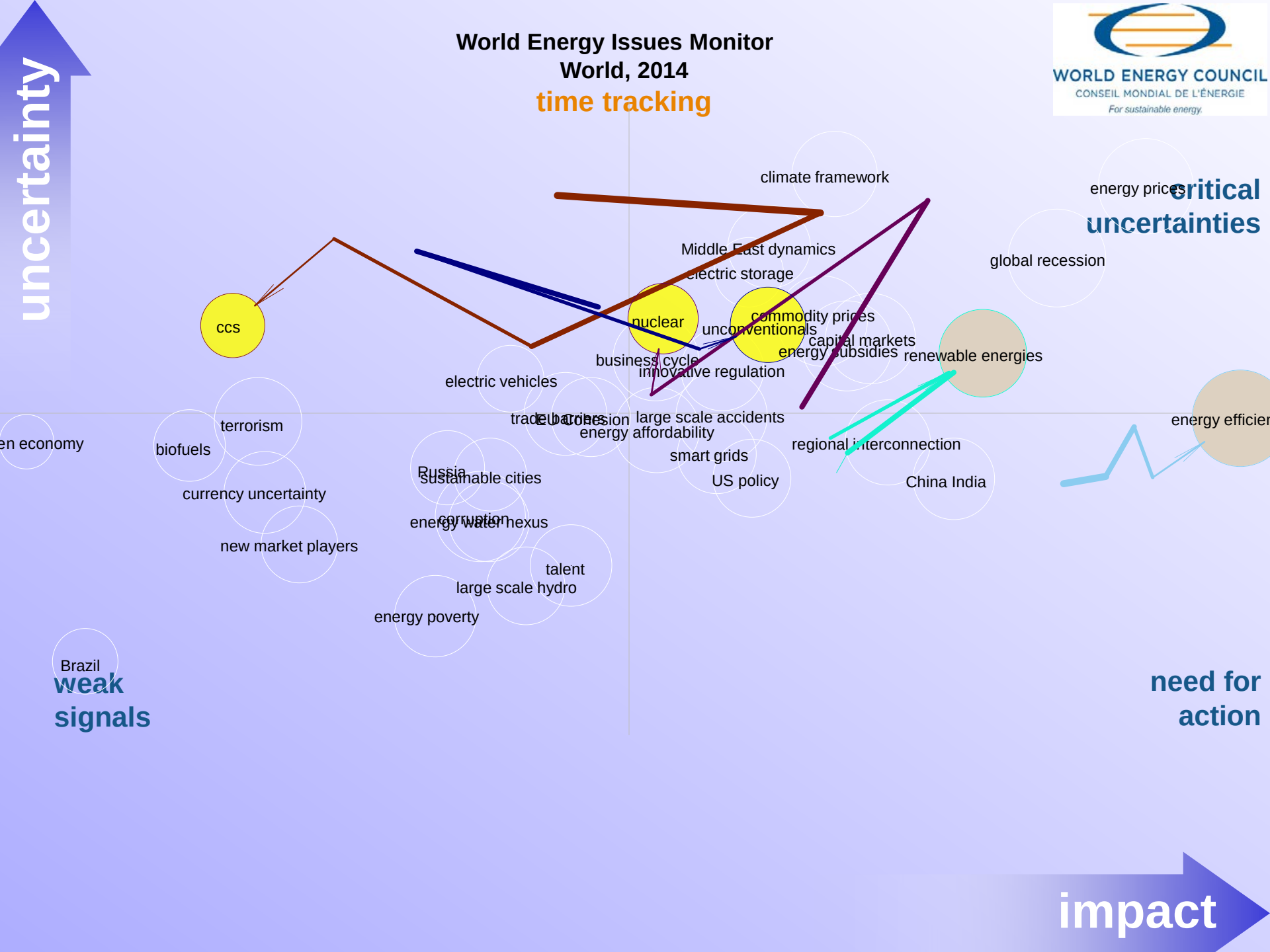


World Energy Issues Monitor
World, 2014
time tracking



World Energy Issues Monitor
World, 2014

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uncertainty

geographical tracking:
energy efficiency

critical uncertainties

climate framework
energy prices
Middle East dynamics
electric storage
global recession
MENA
nuclear
unconventionals
commodity prices
capital markets
energy subsidies
renewable energies
business cycle
innovative regulation
NAm
NonOECD
electric vehicles
Europe
G20
large scale accidents
energy affordability
Africa
regional interco
smart grids
OECD
US policy
Asia
China India
LatAm
ccs
terrorism
biofuels
en economy
currency uncertainty
Russia
sustainable cities
corruption
energy water nexus
new market players
talent
large scale hydro
energy poverty
Brazil

weak signals

need for action

impact

World Energy Issues Monitor
World, 2014

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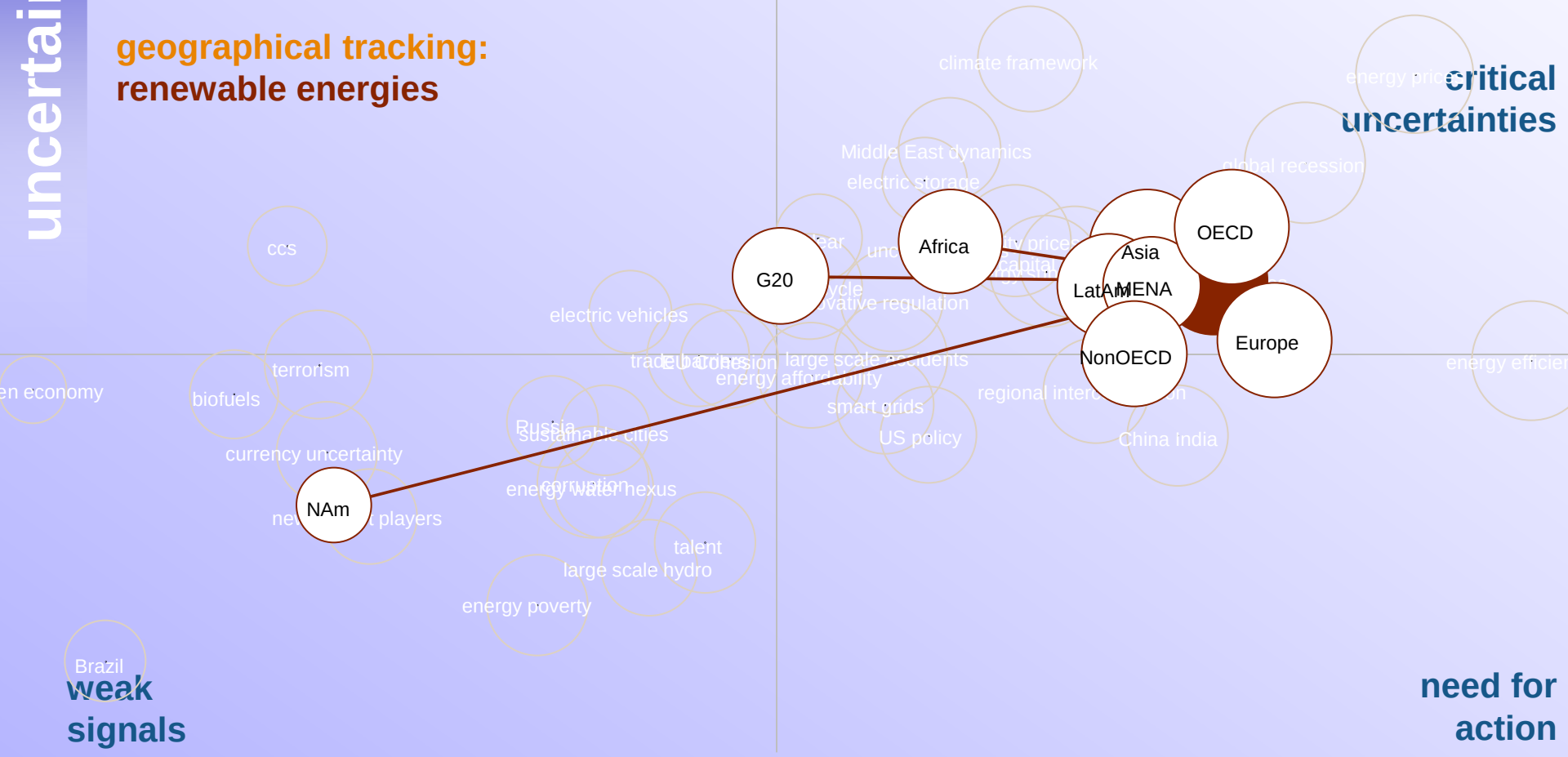
uncertainty

geographical tracking:
renewable energies

critical uncertainties



weak signals

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World Energy Issues Monitor
World, 2014

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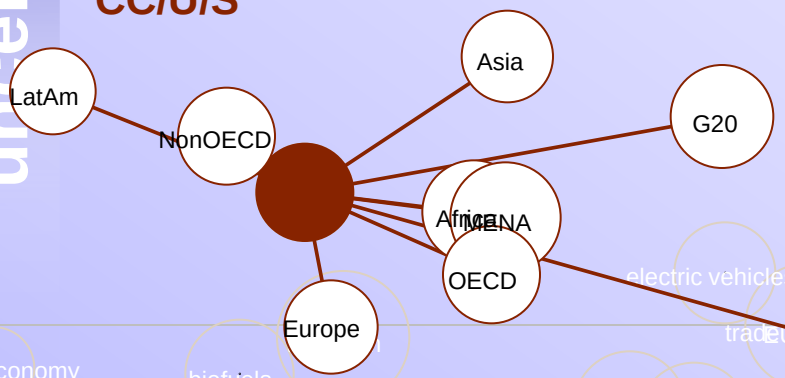
uncertainty

geographical tracking:
CC/U/S



critical uncertainties

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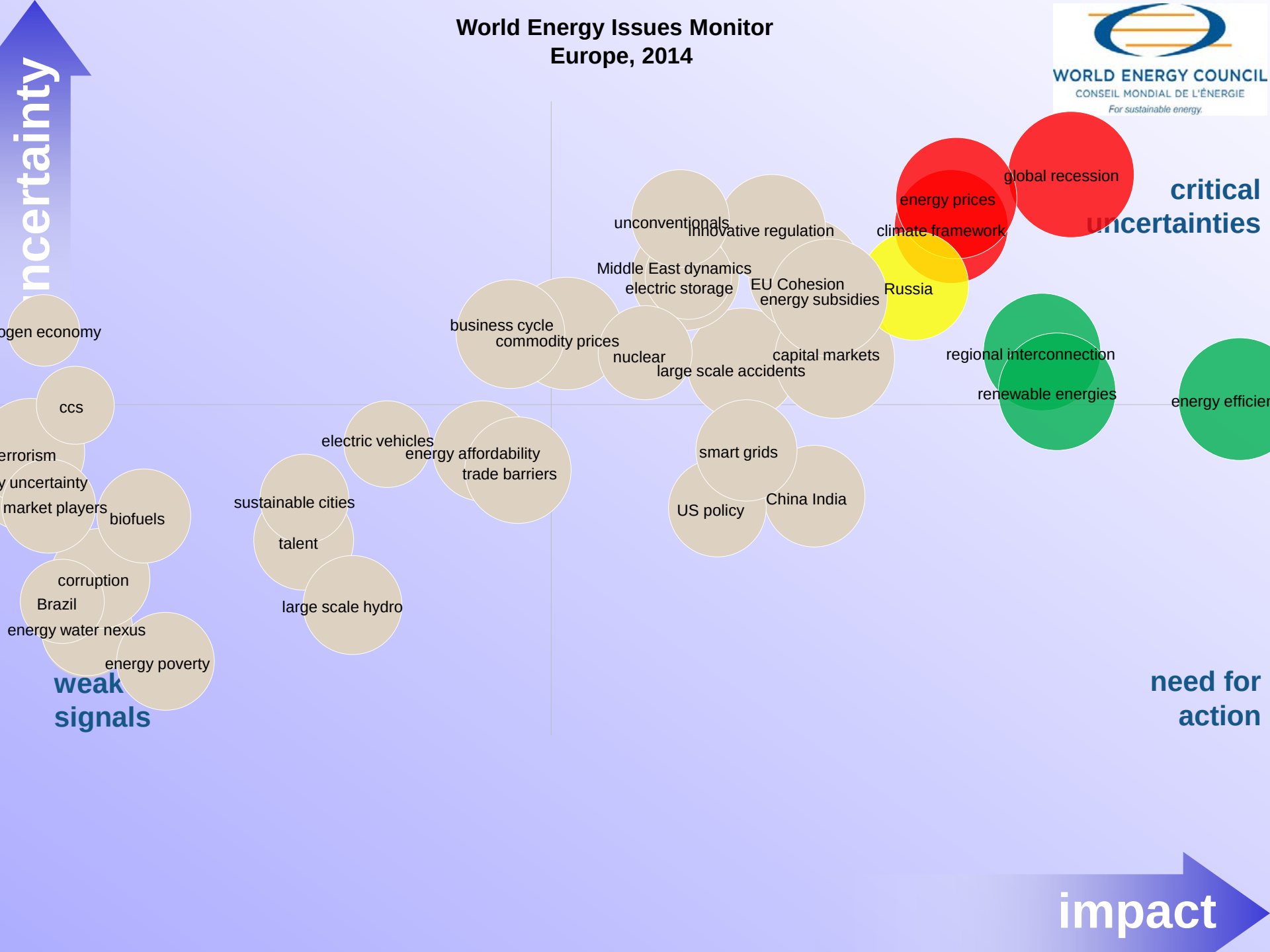
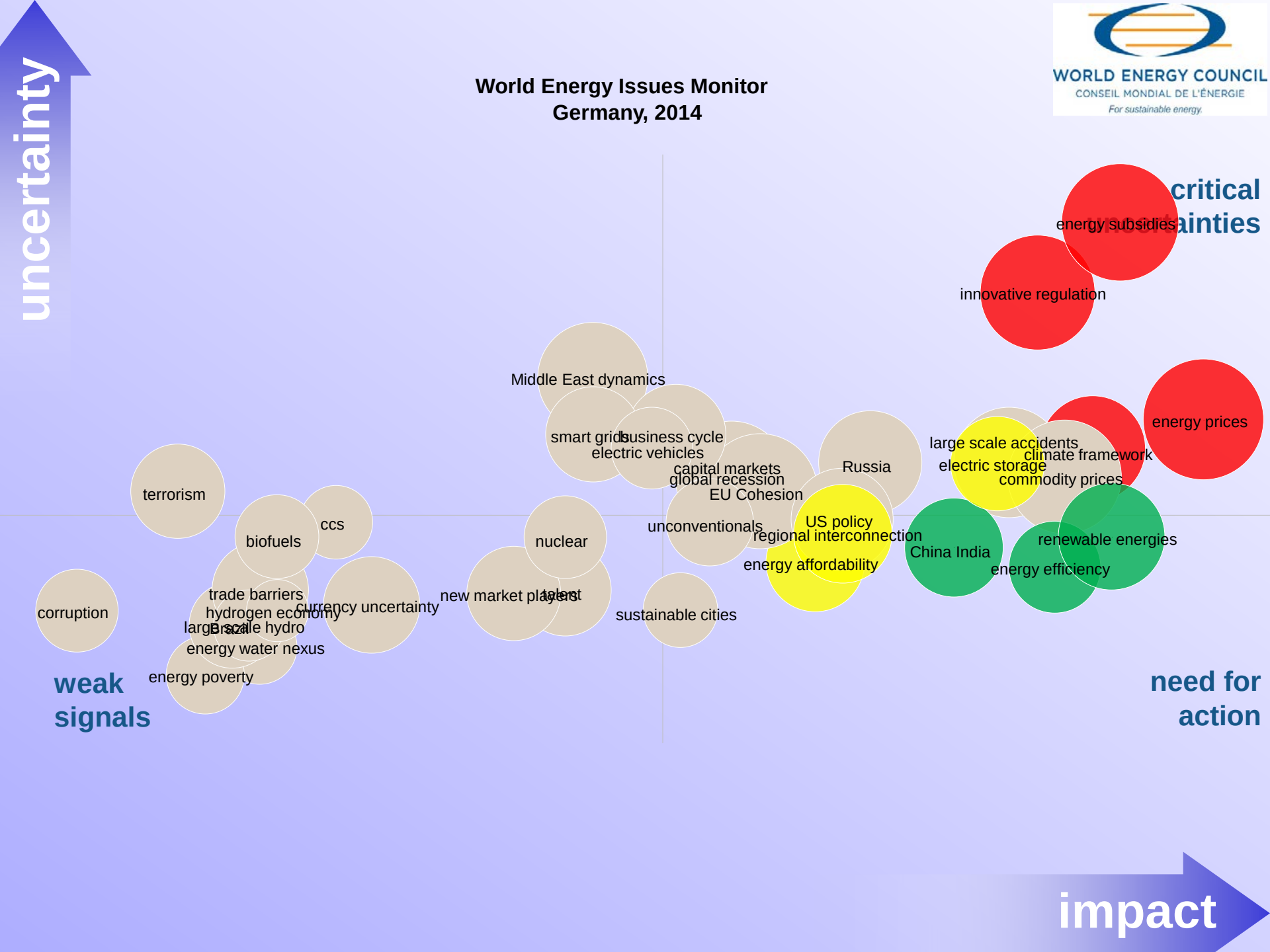
World Energy Issues Monitor
Europe, 2014



World Energy Issues Monitor
Germany, 2014



survey

IMPACT / UNCERTAINTY / URGENCY

<< 30 ISSUES >>

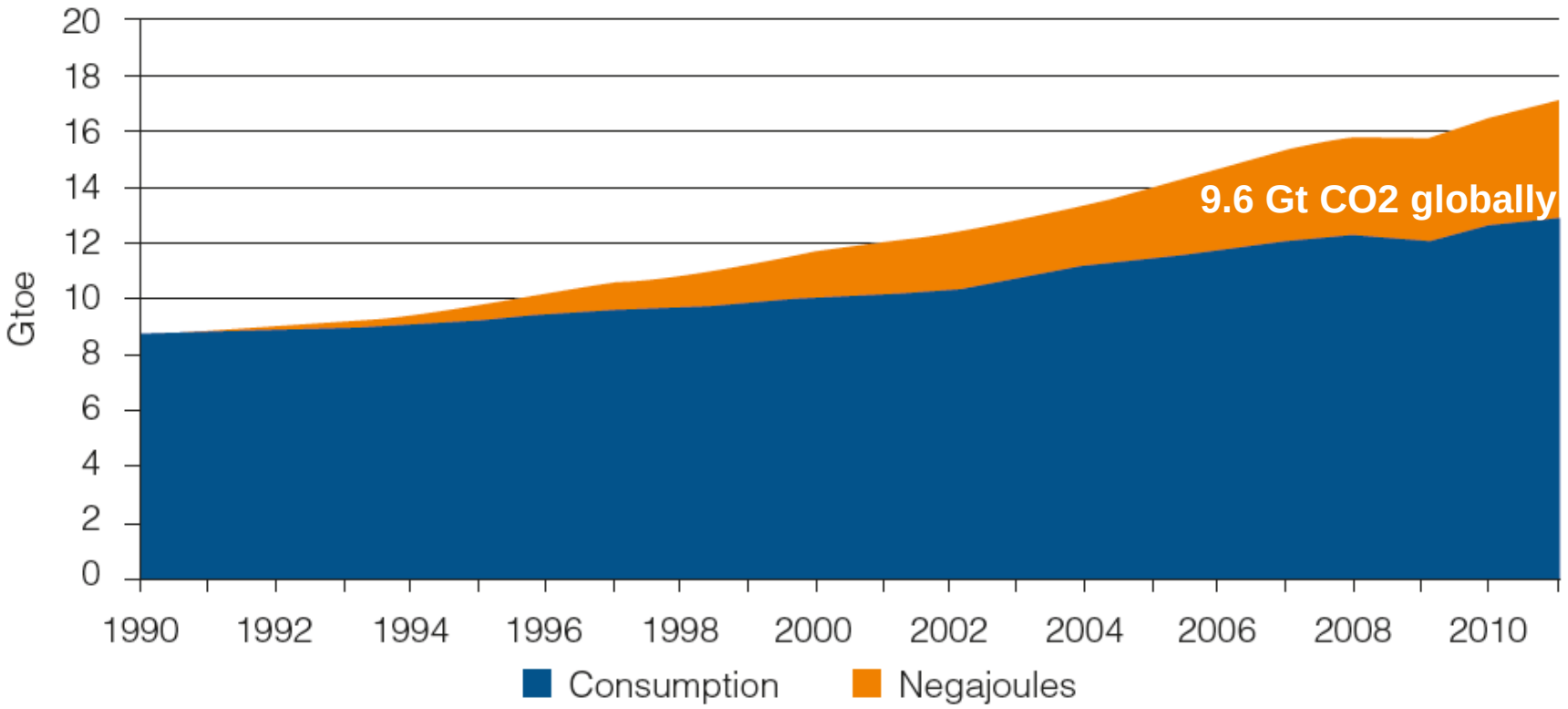
This annual issues survey aims to identify your priorities regarding key issues and their impact on the energy sector. Your feedback will help us in the assessment of WEC's current activities and in the definition of the strategy ahead.	What is the potential **IMPACT** of this issue on the sector? A high score represents high impact (irrespective of whether you consider the impact to be "good" or "bad").			What is your level of **UNCERTAINTY** related to the issue's impact? What you perceive as "critical uncertainties" should score high.			**URGENCY** – When does the sector need to react to the issue? Short term; less than 3 years, long-term; more than 10 years.		
	High	Med	Low	High	Med	Low	<3	3-10	>10
Macroeconomic Risks & Vulnerabilities									
Global climate framework uncertainty	❐	❐	❐	❐	❐	❐	❐	❐	❐
Large scale accidents	❐	❐	❐	❐	❐	❐	❐	❐	❐
Global recession	❐	❐	❐	❐	❐	❐	❐	❐	❐
Capital markets	❐	❐	❐	❐	❐	❐	❐	❐	❐
Commodity prices & volatility	❐	❐	❐	❐	❐	❐	❐	❐	❐
Energy prices & volatility	❐	❐	❐	❐	❐	❐	❐	❐	❐
Currency uncertainty									
Energy-water-food nexus									
Talent scarcity									
Energy poverty									
Energy affordability:									
Corruption									
Energy Geopolitics & Regional Issues									
China/India growth									
Brazil									
Russia energy diplomacy									
EU cohesion									
Middle East / North Africa									
US									
Terrorism									

Global climate framework uncertainty	*Uncertainty* whether the
Large scale accidents	Post Fukus and implica
Global recession	risk related
Capital markets	difficult mat
Commodity prices & volatility	high prices, volatility & inflationary risk
Energy prices & volatility	high volatility & investment uncertainty ("security of demand" concern)
Currency uncertainty	G2 conflict, exchange rate & insolvency risks
Energy-water-food nexus	energy-water(-food) nexus affecting energy supply chain
Talent scarcity	shortage of future engineering skills
Energy poverty	1.3 billion people are still without access to electricity, 87% in rural areas: new entrepreneurial models, creation of financing mechanisms, focused government policies to deliver solutions
Energy affordability	Also referred to "fuel poverty", high or increasing energy prices weighing on the household budgets
Corruption	Slowing down development and development of effective policies.
Energy Geopolitics & Regional Issues	
China/India growth	Shifting demand to east, competition for scarce resources, market uncertainties from uncertain growth.
Brazil	Realising its potential, influence on regional policy, growth and development
Russia energy diplomacy	Power play taking advantage of its importance in the natural gas sector implications for regional / global gas markets.
EU cohesion	Absence of common energy policy
Middle East / North Africa	Political fragility and potential conflict (e.g. around Suez Canal) affecting global security of supply
US	Shale revolution in the US affecting global energy trade, shifting priorities in bilateral relations and international security policies
Terrorism	Physical risks and cyber threats affecting energy markets

WITH SOME EXPLANATIONS ON PAGE 2

Energy Efficiency: Moderate progress worldwide

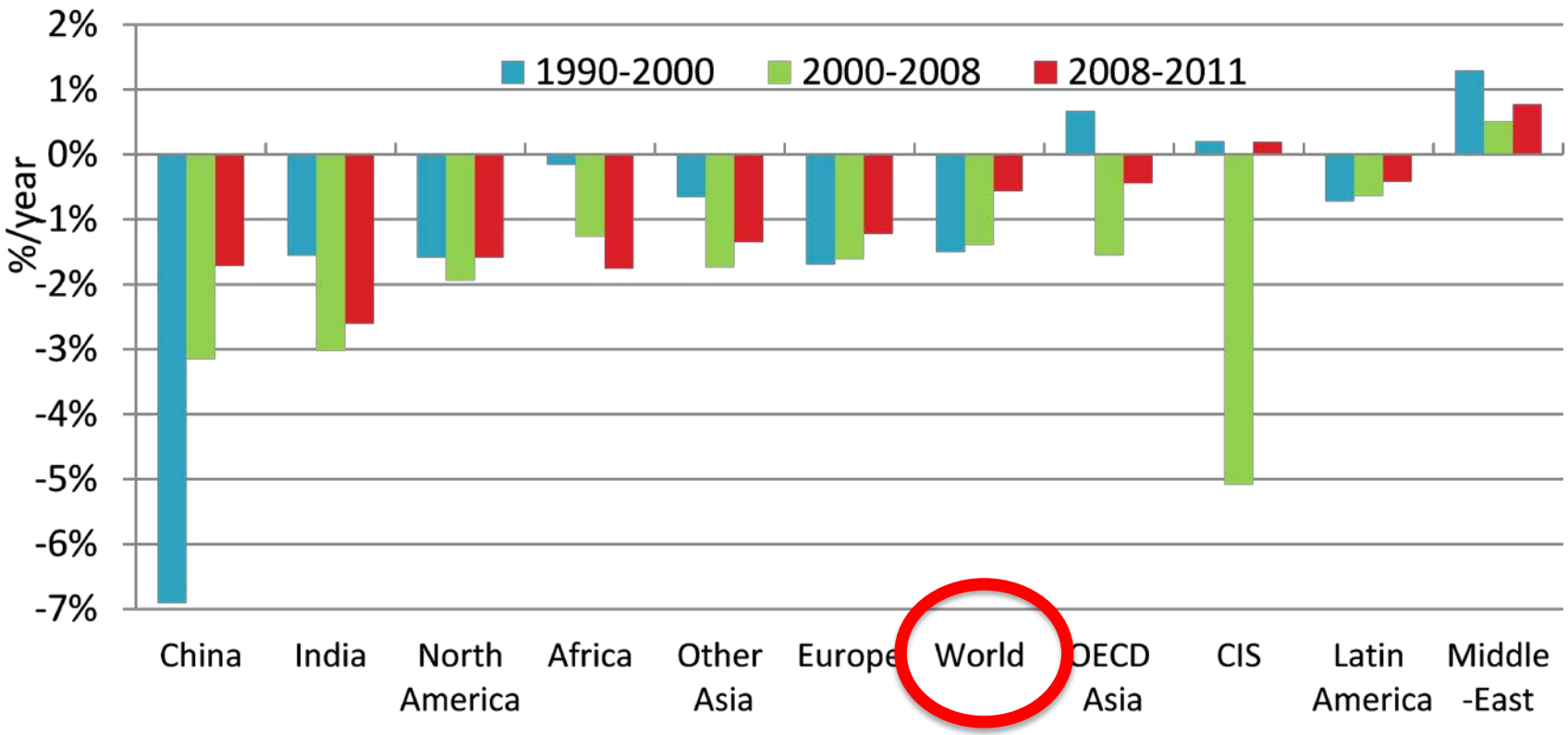
Source: World Energy Perspectives: Energy Efficiency Policies



Improvements in primary energy intensity, 1990 to 2011

Energy Efficiency: slowing down, big regional disparities

Source: World Energy Perspectives: Energy Efficiency Policies



Change in energy intensity by region

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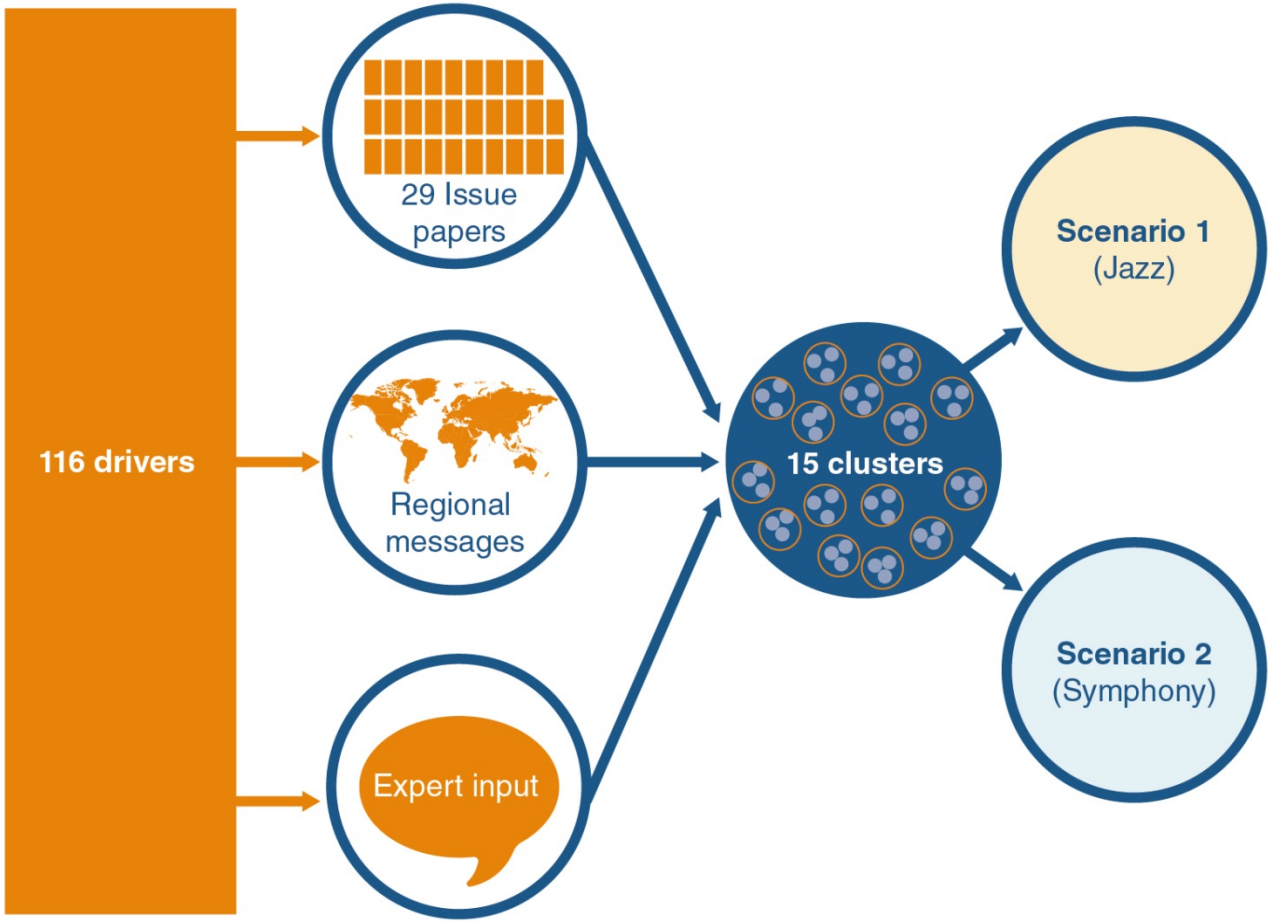
Project Partner:
Paul Scherrer Institute

World Energy Scenarios

Scenario Building Process



WEC Scenarios
Deriving the scenario stories

Two Scenarios stories, exploratory, different and equally probable rather than good and bad

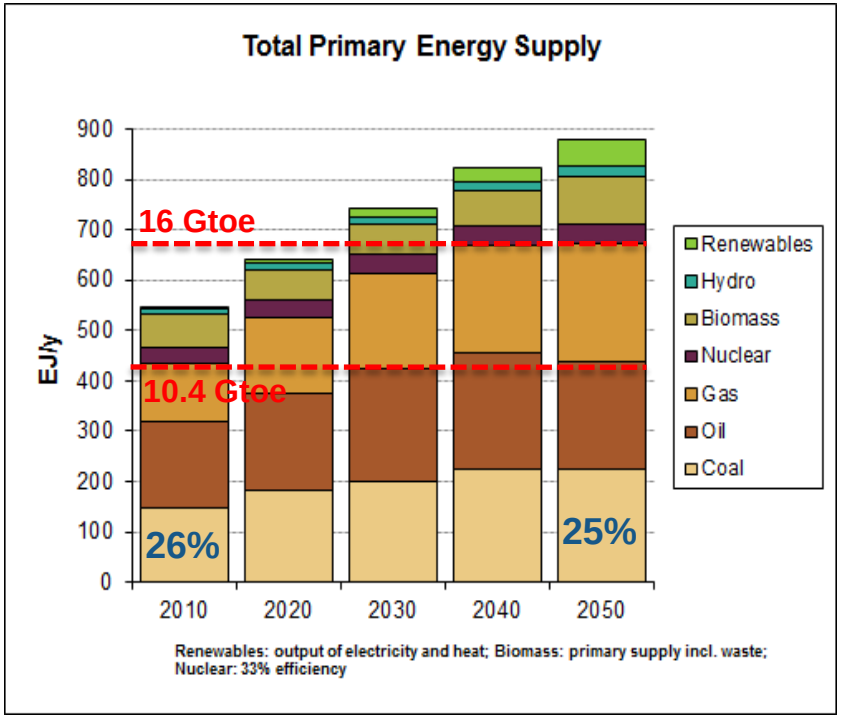
Jazz:
Market & trade based, consumer driven, decentralized decision making, focussed on access and affordability. achieving growth through low cost energy. Governments facilitate GHG actions.

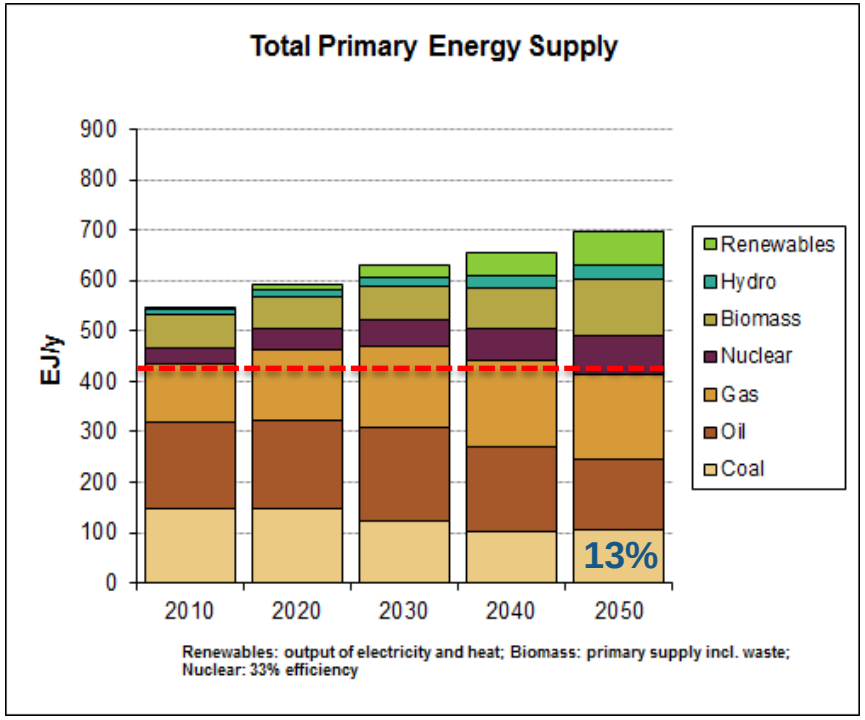
Symphony:
Government led, "orchestrated", voter driven, focussed on environmental goals and energy security, national and regional measures to increase share of renewables in energy mix. Binding international agreement on GHG emissions.

Storyline and quantification assumptions

	Jazz	Symphony
GDP growth	**Higher** (3.54% pa CAGR, PPP)	**Lower** (3.06% pa CAGR, PPP)
Population	**Lower** (2050 = 8.7 billion)	**Higher** (2050 = 9.3 billion)
Efficiency/ Intensity	**Increasing** (-2.29% pa (primary, PPP))	**Increasing more strongly** (-2.44% pa (primary, PPP))
Climate policy	**Limited** Prices (2050): 23-45 USD/tCO_2	**Stronger** Prices (2050): 75-80 USD/tCO_2
Resources	Better access to **unconventionals**	More expensive **unconventionals**
Technology support	Limited; energy choice based on free markets	support for **nuclear**, **large hydro**, **CCS** and **renewables**
Technology innovation	Further development of CCGT decentralized power (SPV)	Focused R&D programs (esp. CC(U)S, solar PV)

Global total primary energy supply



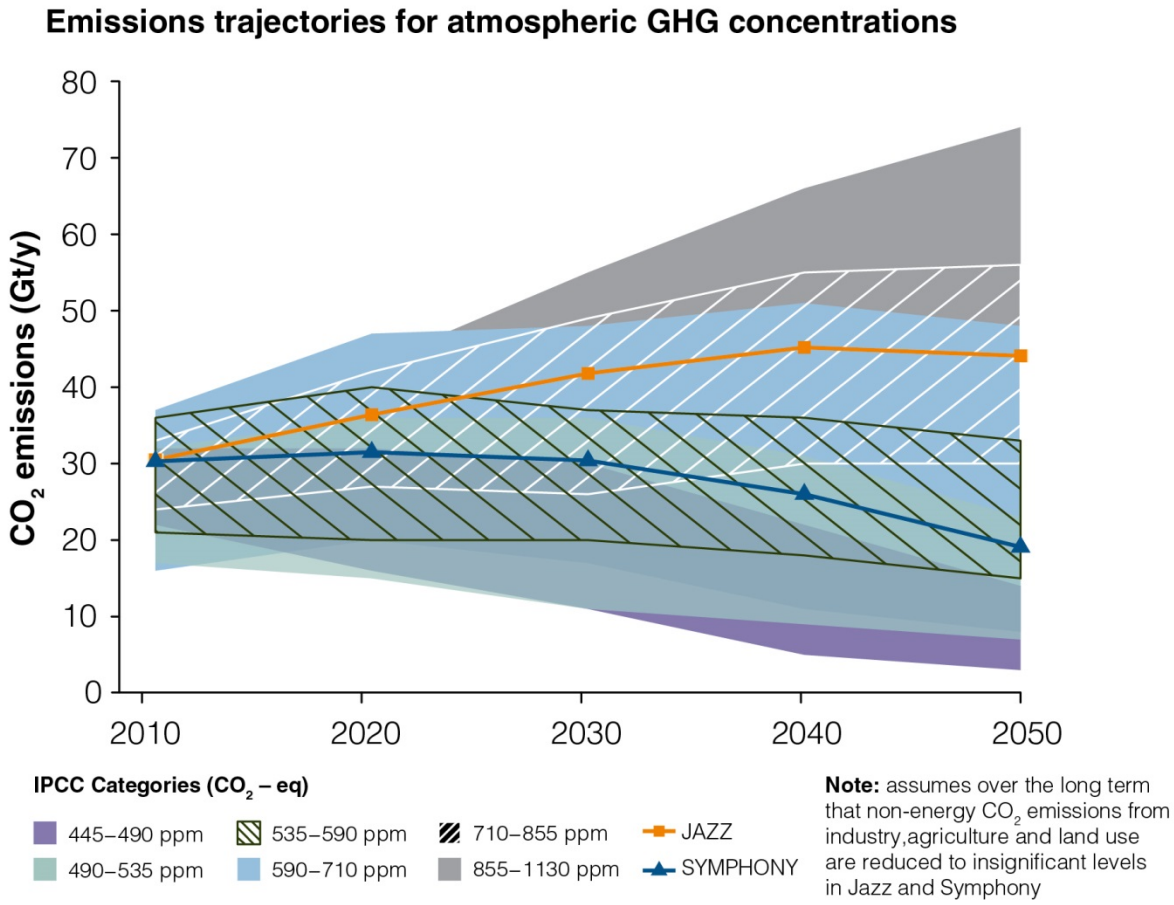


Jazz — **fossil fuels: +55%/- 5%** { **oil: +/- 15%**; **natural gas: +100%/+50%**; **coal: +/- 40%** } — **Symphony**

Upstream liberalized;
technology development,
supply surge/more producers
Coal remains dominant in some regions

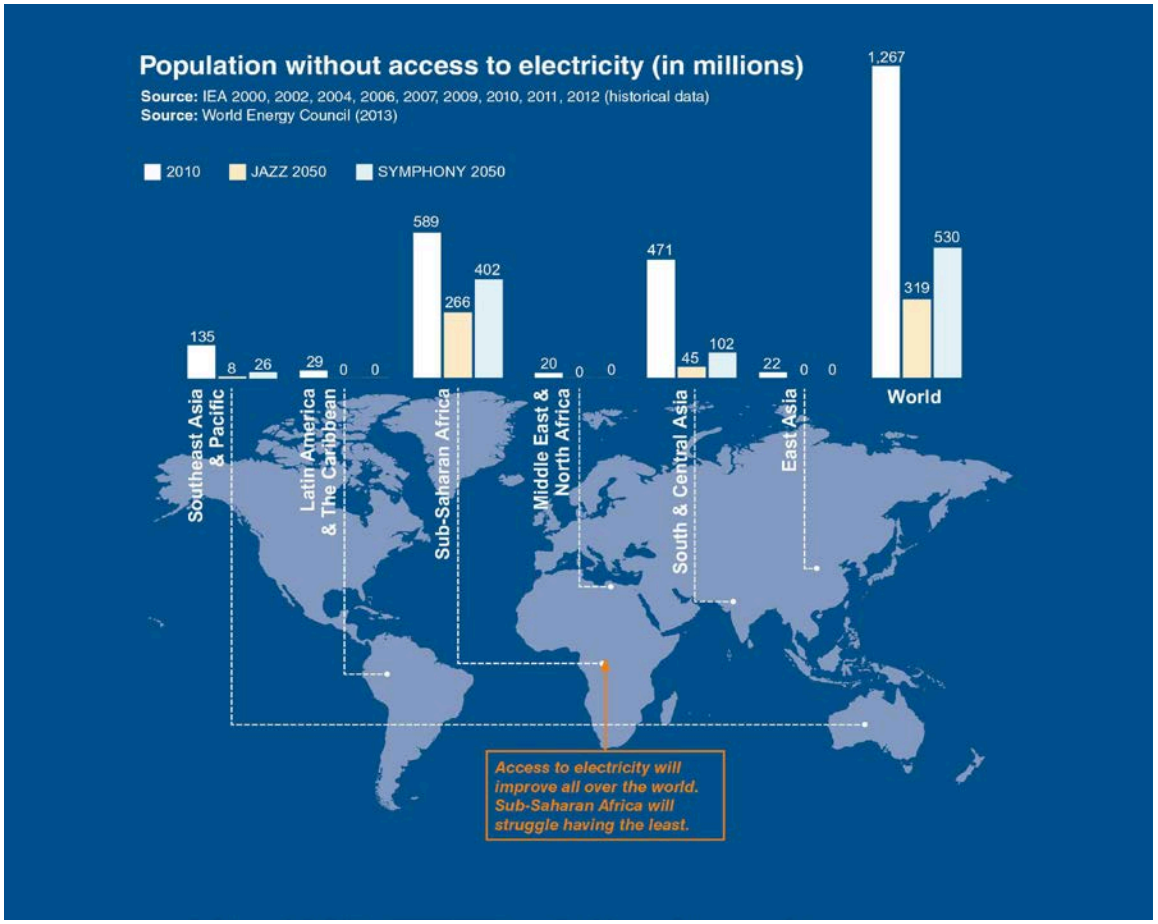
Tighter supply (lower E&P)
Higher infrastructure costs
Energy security drives reduced fossil use

Resulting CO_2 emissions



The global economy will be challenged to meet the 450 ppm target without enormous economic costs

Access to electricity in 2050



JAZZ:

- 310 million without access in 2050

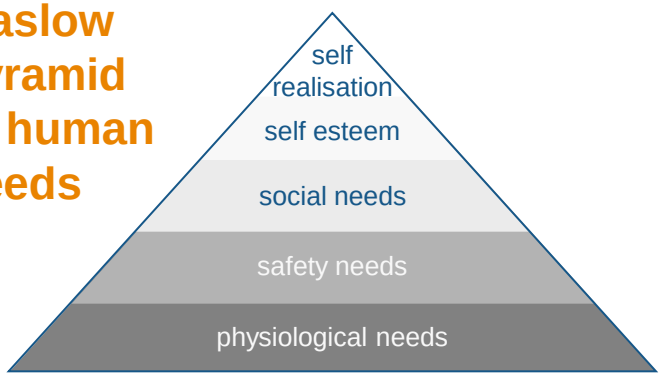
SYMPHONY:

- 530 million without access in 2050

if Maslow were in energy politics…

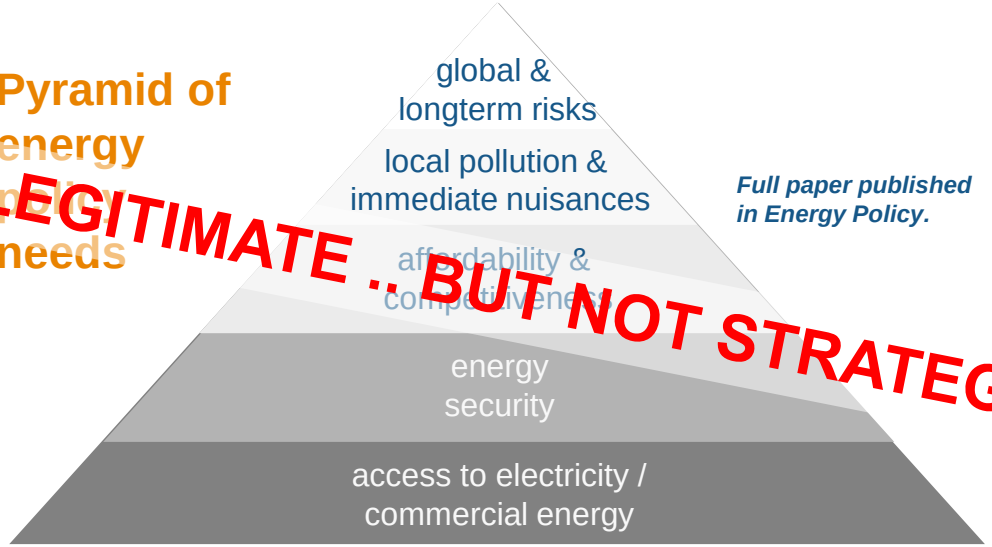

Abraham Maslow

Maslow pyramid of human needs



"A person who is lacking food, safety, love and esteem would most probably hunger for food more strongly than for anything else," stated the American psychologist Abraham Maslow in 1943 while formulating a theory to explain the motivational structure of a healthy person.

Pyramid of energy needs



LEGITIMATE .. BUT NOT STRATEGIC

Full paper published in Energy Policy.

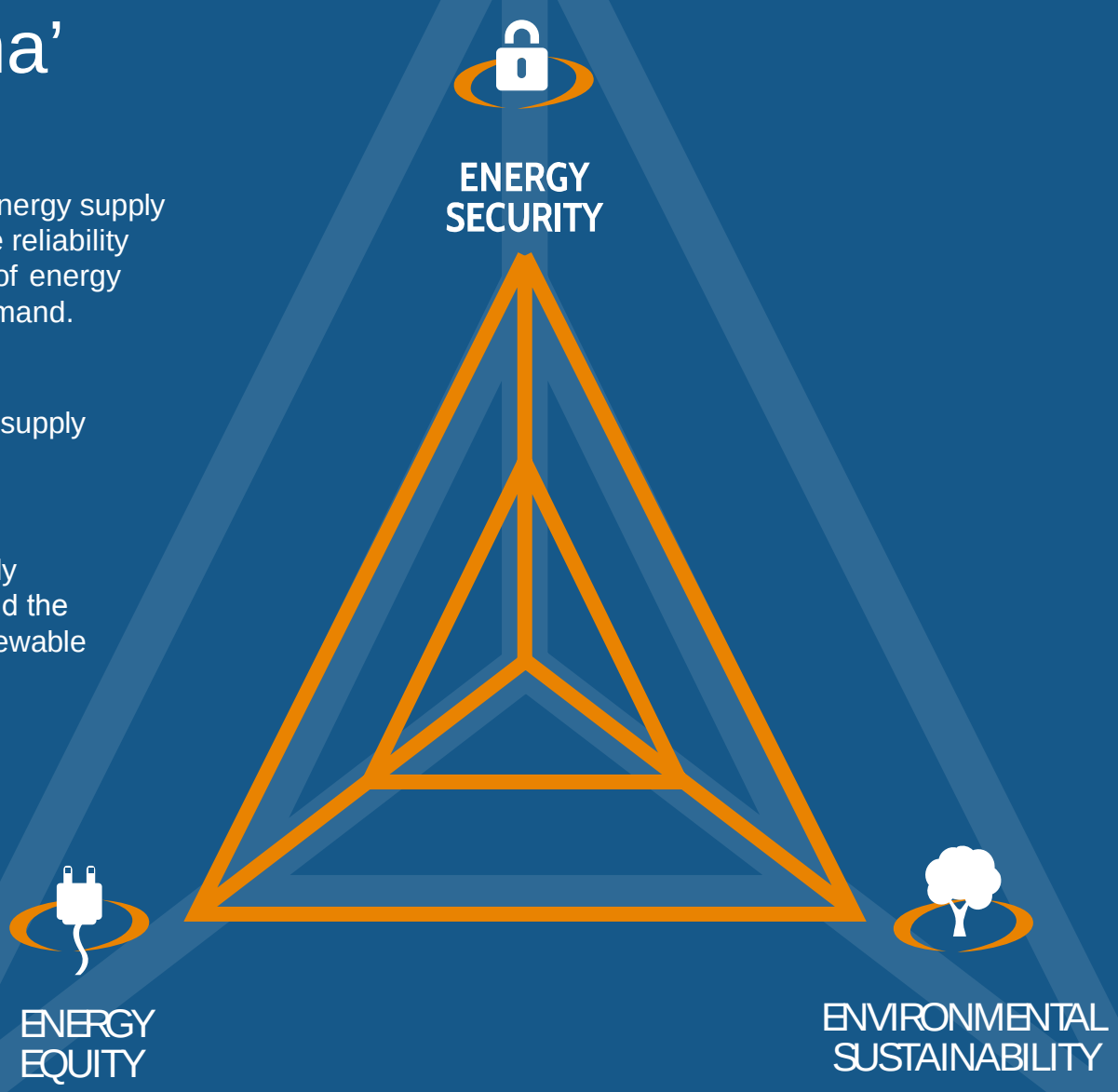
Got all eggs in one basket?

Balancing the ‘Energy Trilemma’

Energy Security
The effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of energy providers to meet current and future demand.

Energy Equity
Accessibility and affordability of energy supply across the population.

Environmental Sustainability
Encompasses the achievement of supply and demand side energy efficiencies and the development of energy supply from renewable and other low-carbon sources.



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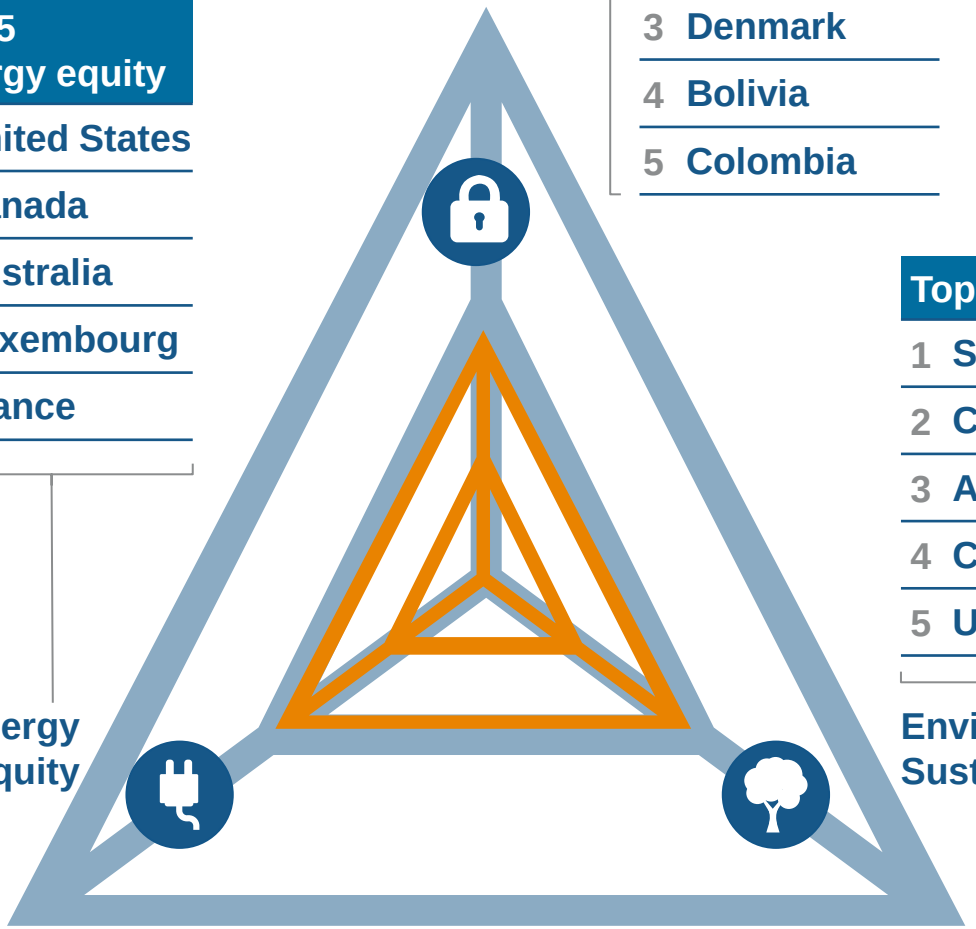
5 Top Energy sustainability index

1	Switzerland
2	Denmark
3	Sweden
4	Austria
5	United Kingdom
6	Canada
7	Norway
8	New Zealand
9	Spain
10	France



Top 5 Energy security

1	Canada
2	Russia
3	Denmark
4	Bolivia
5	Colombia

Energy security

Top 5 Energy equity

1	United States
2	Canada
3	Australia
4	Luxembourg
5	France

Energy equity

Top 5

1	Switzerland
2	Costa Rica
3	Albania
4	Colombia
5	Uruguay

Environmental Sustainability

BALANCE SCORE

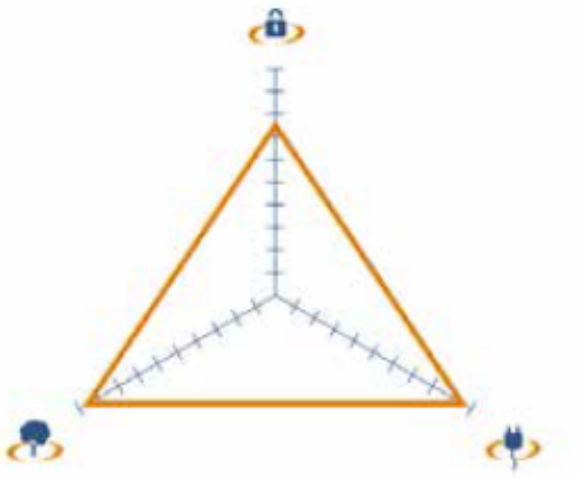
AAB

AUSTRIA

INDEX RANK

4

ENERGY SUSTAINABILITY BALANCE



ENERGY SUSTAINABILITY INDEX RANKINGS AND BALANCE SCORE

	2011	2012	2013	Trend	Score
Energy performance	5	3	5	↓	
Energy security	31	30	33	↓	B
Energy equity	11	7	7	→	A
Environmental sustainability	7	7	7	→	A
Contextual performance	11	12	12	→	
Political strength	11	9	12	↓	
Societal strength	13	16	16	→	
Economic strength	26	28	27	↑	
Overall rank and balance score	**5**	**4**	**4**	→	**AAB**

22nd World Energy Congress, 2013, Daegu

"The world's premier energy gathering"

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Summing it all up

22nd World Energy Congress, 2013, Daegu

"The world's premier energy gathering"

- **7 Myths**
  - **M1: Global energy demand will flatten out. Reality: Energy demand will double by 2050**
  - **M2: Peak Oil. Reality: No shortage for fossil fuels in sight.**
  - **M3: Demand growth will be fully met by new clean energy sources. Reality: The contribution of fossil fuels to the global energy demand is still growing in absolute terms.**
  - **M4: We can reduce global GHG emission by 50% by 2050. Reality: Even in the best case we will see a near doubling of GHG emissions compared to 1990 levels.**
  - **M5: Current business models and markets are delivering. Reality: Current designs are unable to cope with the increasing renewable shares, decentralised systems, or growing information architecture.**
  - **M6: Current programmes will deliver universal energy access by 2030. Reality: On current paths, 320..530 million people will still be without electricity in 2050.**
  - **M7: On a global scale capital is cheap and abundant. Reality: Capital is extremely sensitive to perceived political and regulatory risks. Lack of agreement between investors and governments on nature, price, and value of risks related to energy infrastructure makes capital flow elsewhere.**

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“The world’s premier energy gathering”

- **6 Fixes for the Future**
  - **F1: We are looking in the wrong place: The focus must shift from the supply mix to demand efficiency.**
  - **F2: In order to attract the needed investment national policy and regulatory frameworks have to be balanced: the "Energy Trilemma" provides a solid policy framework.**
  - **F3: We need significant investments and focus in RD&D: Electricity storage and CC(U)S are potential game changers for energy systems.**
  - **F4: The energy map is changing: Institutions need to change to reflect these changes or risk becoming obsolete.**
  - **F5: Universal access to energy is a key development enabler: Policy / institutional frameworks & funds need to de-risk entrepreneurial approaches.**
  - **F6: New risks (energy-water nexus, extreme weather events, social activism, or cyber attacks) expose our energy infrastructure to potential disasters: We need to urgently re-think, redefine, and adapt the resilience for energy infrastructure.**