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*For sustainable energy.*

World Energy Trilemma  
**Time to get real –  
the case for  
sustainable  
energy investment**  
Executive Summary

World Energy Council

Project Partner  
**OLIVER WYMAN**

**2013**  
SUSTAINABILITY  
BALANCE  
ASPIRATION  
CLIMATE CHANGE  
RISK  
ACCESSIBILITY  
AFFORDABILITY  
COMPETITIVENESS  
ENERGY EQUITY  
ECONOMIC GROWTH  
ENERGY SECURITY  
UNCERTAINTY

# Time to get real – the case for sustainable energy investment

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**World Energy Trilemma: Time to get real – the case for sustainable energy investment**

Project Partner

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# Executive summary

*“We can’t make the necessary hard choices if we don’t have the dialogue. We need to make decisions together.”*

By 2030, the United Nations hopes there will be universal access to modern energy services, a doubling of the share of renewable energy sources in the global energy mix, and a doubling of the global rate of improvement in energy efficiency. But after decades of work to advance sustainable energy solutions, an energy gap continues to grow as energy systems around the world struggle under significant strain.

Global demand for primary energy is expected to increase by between 27% and 61% by 2050.<sup>1</sup> Yet 1.2 billion people still do not have access to electricity and 2.8 billion lack access to clean cooking facilities.<sup>2</sup> It will take between US\$19.3 trillion and US\$26.7 trillion cumulative global investments in electricity infrastructure alone between now and 2050 to close this gap and support growing global energy needs.<sup>3</sup>

At the same time, energy policies have been shifting and policy changes have become hard to predict because of radical changes in energy supply, such as that unleashed by the technological revolution in horizontal drilling in unconventional gas. Technological breakthroughs have also accelerated the adoption of renewables.

At the same time, some countries are shifting away from nuclear energy and increasing the demand for fossil fuels. These policy shifts could serve to decrease overall energy security as uncertainty around energy policy slows investment in new energy sources, in updating ageing infrastructure, and in building the new plants and networks necessary to support sustainable energy systems.

As a result, it is not only more difficult, but also more important than ever, for public and private stakeholders to work together to develop a new governance for sustainable energy policies. The external environment public and private sectors operate in has changed over the past 10–20 years. Today, public stakeholders expect more from the private sector. For example, when the United Nations Millennium Development Goals were agreed to in 2000, there was no direct request for business to play an active role in the achievement of set targets. Twenty years later, looking at the UN’s post-2015 development agenda, cash-strapped governmental institutions acknowledge that the private sector has a role to play. Public stakeholders encourage the private sector to think critically about their role in society and to reconsider how they operate in the face of a changing external environment.

Policy decisions reached during this historic moment of flux in energy policymaking could tip the balance. They could make it possible for billions of people to experience sustainable energy systems decades into the future, or they could prevent the goal from being reached.

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<sup>1</sup> World Energy Council (WEC), 2013: World Energy Scenarios: Composing energy futures to 2050; The lower number refers to WEC’s ‘Symphony’ scenario, which focuses on achieving environmental sustainability through internationally coordinated policies and practices, while the higher number reflects WEC’s ‘Jazz’ scenario, which focuses on energy equity with priority given to achieving individual access and affordability of energy through economic growth.

<sup>2</sup> Sustainable Energy for All (SE4All), 2013: Global Tracking Framework

<sup>3</sup> WEC, 2013: World Energy Scenarios: Composing energy futures to 2050

To assist with this challenge, the World Energy Council (WEC), in collaboration with global management consulting firm Oliver Wyman, have prepared the fifth edition of the World Energy Trilemma report. This second of a two-part series of reports examines the drivers and risks preventing the development of sustainable energy systems. It then recommends an Agenda for Change to address these risks and to accelerate a global transition to more diversified, and therefore sustainable, energy systems that will present opportunities for economic growth.<sup>4</sup>

In response to the 2012 World Energy Trilemma report, describing the policies that more than 40 energy industry CEOs and senior executives consider are necessary to advance sustainable energy systems, the 2013 report describes what public sector stakeholders believe they need from the energy industry. It is based on interviews with more than 50 energy and environmental ministers, policymakers, government officials, representatives from multilateral development banks, international non-governmental organisations, and experts from more than 25 countries.

The report also reflects the results of the 2013 Energy Sustainability Index prepared by the WEC in partnership with Oliver Wyman. The Index evaluates how well countries balance the three often conflicting goals of energy sustainability – energy security, energy equity, and environmental sustainability – what the WEC defines as the ‘energy trilemma’. Each of the three legs of the

trilemma is vital to the economic and social development of a country. Secure energy is critical to fuelling economic growth, energy must be accessible and affordable at all levels of society, and the impact of energy production and energy use on the environment needs to be minimised to combat climate change and maintain good air and water quality.

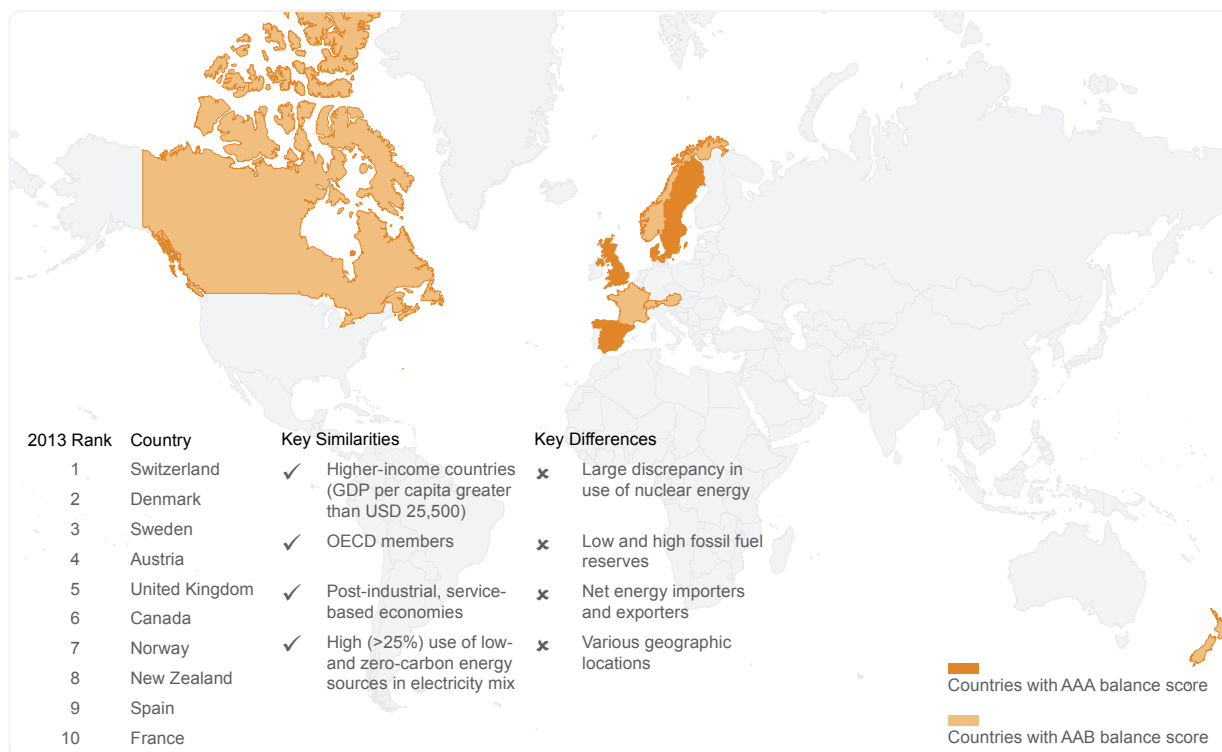
Based on an analysis of 60 data sets used to develop 23 indicators across 129 countries (including 37 non-WEC member countries), the Index provides a comparative ranking and a balance score for how well countries manage the trade-offs among the three core elements of sustainable energy systems – energy security, energy equity, and environmental sustainability. The rank measures overall performance on the Index. For the first time the balance score highlights how well a country manages the trade-offs between each of the dimensions.

#### Box 1: Energy sustainability dimensions

- ▶ **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:** The accessibility and affordability of energy supply across the population.
- ▶ **Environmental sustainability:** The achievement of supply and demand-side energy efficiencies and the development of energy supply from renewable and other low-carbon sources.

<sup>4</sup> WEC, 2013: World Energy Trilemma: Time to get real – the agenda for change

**Figure 1**  
**Top performing countries in the 2013 Energy Sustainability Index**



### Three dimensions of energy sustainability

The results of the 2013 Energy Sustainability Index show that developed countries with higher shares of energy coming from low- or zero-carbon energy sources supported by well-established energy-efficiency programmes such as Switzerland, Denmark, and Sweden, outperform most countries across all three dimensions of the energy trilemma. Nevertheless, it is clear that all countries still struggle to attain balance. Only five countries rank in the top 25 countries across all three dimensions. Only two are in the top 20. There is no single solution, but countries take full advantage of available indigenous resources and develop a policy framework that supports energy sustainability through the value-chain to the end-user can meet the challenge of the energy trilemma.

None of these rankings are set in stone. Even top performers could fall behind if they fail to draft, support and successfully implement prudent, forward-looking energy policies based on strategies that reflect their local resources and capabilities.

Moreover, there are already signs that developing countries could forge an entirely new path toward sustainable energy systems if they were able to mobilise sufficient investment. As renewable energy sources become more widely available, powerful and cost-effective, fast-growing developing countries may be able to leverage environmentally-sensitive and affordable energy sources to support their industrialisation and improve their populations’ access to energy. For example, by relying heavily on hydropower and other renewable energy sources, Brazil and Uruguay have been able to maintain relatively environmentally-sensitive profiles while significantly growing their economies and improving access to electricity in remote areas.

Based on their current performance on the individual dimensions countries are also awarded a balance score. The purpose of this balance score is to help energy leaders to identify which areas to focus on to develop a more balanced energy profile. A score of ‘AAA’ represents the highest potential score that is reserved for countries which balance the score dimensions of the energy trilemma extremely well and achieve high comparative performance in each dimension. In

2013 only five countries were awarded a balance score of 'AAA': Denmark, Sweden, Switzerland, Spain, and the United Kingdom (UK). The letters B, C, and D indicate areas where energy leaders may want to direct initiatives to achieve better performance and more balanced energy systems.

Absolute rank is not the most important result provided by the Index. All countries have a chance to improve their energy performance, regardless of whether they are ranked first or last. Decision makers in both the public and private sectors are encouraged to look at trends in performance over the years, particularly in each dimension, and to compare their countries against their respective peer groups – regardless of whether those peer groups take a regional, economic, or structure-of-the-energy-sector point of view.

To support this analysis, the 2013 report examines five distinct country energy profiles from the Index analysis to highlight the common challenges countries face. For example, 'Pack Leaders', including Switzerland and Denmark, have reduced their environmental impact and increased their energy security by setting clear targets for both reducing GHG emissions and increasing the percentage of renewables in their electricity fuel mix. 'Fossil-fuelled' countries such as Saudi Arabia or Malaysia struggle to manage the environmental impact of their secure and affordable energy services. 'Highly-industrialised' countries, for example, India and Mexico, wrestle with providing accessible and environmentally-sensitive energy while continuing to experience double-digit economic growth. 'Hydro-powered' nations such as Brazil and Colombia provide energy that is

relatively less accessible and affordable, but environmentally-sensitive. 'Back of the Pack' countries such as Zimbabwe and Nicaragua suffer from the lack of energy investment, but have the opportunity to emerge on a new path to sustainability.

## Public stakeholder recommendations

In 2012, energy industry executives had three main recommendations for how policymakers could expedite the development of sustainable energy systems:

- Define a coherent and predictable energy policy.
- Implement stable regulatory and legal frameworks to support long-term investments.
- Encourage public and private initiatives that enable innovation and foster research, development and demonstration (RD&D).

The interviewees for the 2013 report broadly agreed with these goals. But, in many ways their recommendations underscored the need for increased dialogue between public and private stakeholders. Public stakeholders expressed concerns about how the lack of a global agreement on the target profile of a future energy system is exacerbating policy challenges at the national level. The challenge to craft and implement long-term energy policies is further complicated given the dramatic shifts underway in the energy sector, particularly in terms of emerging technologies and rapidly shifting patterns of energy supply and use.



Interviewees acknowledged that, in the absence of a regional or global consensus on climate change, and given the pace of technology development, it will remain difficult for both public and private stakeholders in the energy sector to determine the best course of action. But, they called on the energy industry to adopt and help promote a long-term energy vision and share information and knowledge on implications, realistic targets, and potential alternative approaches to overcome these hurdles and achieve the goals set.

Other recommendations for the energy industry include:

### **Recommendation 1: Be more proactive in improving energy policies**

To make sustainable energy systems a reality, energy executives must be more proactive in sharing their knowledge, insights, and experiences with policymakers and regulators on several fronts. Against the backdrop of a dynamic sector constantly shifting to accommodate significant changes on the energy supply and demand side, governments struggle to design long-term policies that will encourage technological advances toward sustainable energy systems. This will also avoid locking their countries into technologies that could become rapidly obsolete. To develop better market conditions and regulations, policymakers urged the private sector to share more of its technical expertise and to contribute more actively to a long-term vision and associated policies for sustainable energy systems. Greater energy industry involvement can help to bridge the knowledge gap and facilitate effective dialogue by enabling both

policymakers and business to speak the same language.

Public stakeholders recognised the importance of a consensus on long-term energy goals that is based on national values and a 'social licence'. They called on the energy industry to assist in managing public perceptions through increased communication. Reaching such a national consensus requires conversations involving all stakeholders: citizens, the media, activist groups, non-governmental organisations, parliamentarians, policymakers, regulators, and the energy industry.

Governments view the energy industry as a key player in managing the technological and behavioural change needed to realise sustainable energy systems. By providing information about evolving energy options, the cost of energy, the benefits of new technologies, and the need to foster energy efficiency, the private sector can support this transformation. All of these issues could increase public support for a shift towards sustainable energy systems and help enable governments to enact long-term energy policies.

### **Recommendation 2: Advance the alignment of risks**

Huge investments are required to improve access to energy worldwide, develop new energy technologies, and to build new and replace ageing infrastructure. It will take between US\$19.3 trillion and US\$26.7 trillion cumulative global investments in electricity infrastructure alone between now and

2050.<sup>5</sup> Yet cash-strapped governments have limited funds to support the shift to more sustainable energy systems.

As a result, public stakeholders are looking to the energy industry and the financial sector, including non-traditional investors such as pension funds and other long-term investors, to take the lead in these investments. Overall, interviewees call on the private sector to be 'less risk averse' with regard to investments in energy infrastructure and technology.

For this to happen, however, there needs to be better alignment of risk with those best able to bear it. The 'right' risk allocation starts with a coherent energy policy and a clearly defined and well implemented energy regulatory framework to minimise political and regulatory risk. Public stakeholders recognise that the returns on energy investments must be commensurate with levels of risk and also competitive with the returns on other options for investment. However, development banks and policymakers noted that the perception of a country's risk often inhibits energy investments even in countries where the underlying economics of the energy sector are strong.

One way the energy industry can help to break the present deadlock is by engaging with other stakeholders to identify approaches and mechanisms that allocate associated risks to those best suited to manage them. For example, the private sector can improve the confidence of

potential investors by sharing perspectives about the underlying project economics of power projects or highlighting the strength of a nation's power sector and its ability to manage construction, technology, and operational risks.

Public stakeholders are looking at the private sector to play a lead role in the technology development and innovation that will reduce the cost of energy and enable countries to lower their carbon emissions. Policymakers acknowledge the crucial role of the public sector in creating the right environment for RD&D and the possibility of being involved in pre-competitive, early stage technology development and/or large-scale demonstration projects. To avoid shifts driven specifically by politics, public stakeholders called on the energy industry to help coordinate and support broader coalitions to align behind research plans on the basis of evidence about what is likely to work, and work most cost-effectively.

### **Recommendation 3: Assist developing countries with charting a new course**

Today, 17% of the global population is without access to electricity and 41% lacks access to clean cooking facilities, especially in Sub-Saharan Africa, Eastern Asia, Southern Asia, and South-Eastern Asia. Traditionally, fast growing, developing and emerging nations have struggled to maintain an environmentally sensitive footprint as they strive to improve their populations' access to energy and their nations' economic growth. But, recently some countries are starting to chart a new course to sustainability by harnessing the potential of hydro, solar, and wind power.

<sup>5</sup> WEC, 2013: World Energy Scenarios: Composing energy futures to 2050



Public stakeholders recognise that, to change the trajectory of industrialisation and growth in energy use, attractive policy and regulatory frameworks encouraging investment in the development of energy infrastructure need to be created. Interviewees pointed out that developing consistent, stable energy policies and regulation, and maintaining a healthy energy infrastructure, requires a degree of experience, knowledge, and acquired skills that may not exist in some least-developed, developing or emerging countries. In their opinion, the private sector needs to play an important role on two fronts. First, the energy industry and also other investors should engage in dialogue with public stakeholders to identify and lower the barriers impeding investment. Second, the energy industry needs to be more proactive in assisting developing countries with adopting proven technologies, in part by working with them to explore ways to reduce the cost of technology transfer.

A particular concern raised by public stakeholders, especially multilateral development banks, is the lack of ‘technically good projects’ that can readily attract investment. Both public and private sector need to work with the respective developing countries to generate more bankable projects.

## Conclusion


United Nations Secretary-General Ban Ki-moon noted that “*energy is the golden thread that weaves together economic growth, social equity, and environmental sustainability*”. The importance and benefits of sustainable energy systems are clear.

But creating a policy framework to achieve those goals remains a challenge for all countries.

To make secure, affordable, and environmentally-sensitive energy systems a reality, public and private stakeholders need to work together to develop a new paradigm for sustainable energy policies. Policymakers urgently need to create the interconnected, lasting, and coherent energy policies. But the energy industry also has an important role to play in assisting policymakers in creating an environment that will mobilise the natural and human resources, finances, and technologies necessary to realise the transformation of current energy systems.

Creating a master plan to achieve diversified, and therefore sustainable, energy systems worldwide may take years to get right, especially given recent dramatic shifts in energy supply and the lack of a global agreement on the target profile of a future energy system. All public and private stakeholders should start down the path now. Too much is at stake for them to hold back. The investment required will take decades to fully transform energy systems and infrastructure. A start needs to be made immediately if sustainable energy systems are to be developed at an affordable cost. It is time to cut through the present uncertainty and to translate the consensus identified into actions on the ground.

**Figure 2**  
**2013 Energy Sustainability Index ranking and balance score**



Index	Country	Balance score	Energy security	Energy equity	Environmental sustainability
1	Switzerland	AAA	19	6	1
2	Denmark	AAA	3	25	10
3	Sweden	AAA	24	14	6
4	Austria	AAB	33	7	7
5	United Kingdom	AAA	11	8	19
6	Canada	AAB	1	2	60
7	Norway	AAB	51	10	8
8	New Zealand	AAB	15	26	37
9	Spain	AAA	22	16	23
10	France	AAB	44	5	9
11	Germany	ABB	31	11	30
12	Netherlands	ABB	42	23	35
13	Finland	ABB	37	21	45
14	Australia	AAD	10	3	97
15	United States	AAC	12	1	86
16	Japan	ABB	48	17	33
17	Belgium	ABB	63	13	34
18	Qatar	AAC	8	9	95
19	Luxembourg	ABD	107	4	29
20	Ireland	ABC	82	30	15
21	Costa Rica	ABB	57	45	2
22	Slovakia	ABB	20	38	48
23	Portugal	ABB	55	53	20
24	Colombia	AAC	5	85	4
25	Slovenia	BBB	60	27	42
26	Argentina	ABB	14	33	38
27	Taiwan, China	ABC	71	22	59
28	Italy	ABC	69	34	24
29	Panama	ABB	53	58	18
30	Croatia	ABC	66	31	21
31	Hungary	BBB	46	42	44
32	Czech Republic	ABC	16	32	90
33	Iceland	ABC	96	15	41
34	Brazil	ABC	27	86	17
35	Ecuador	ABB	25	62	28
36	Tunisia	BBB	28	57	56
37	Malaysia	BBC	34	40	92
38	Bahrain	AAD	23	19	125
39	Greece	ABC	54	18	81
40	Hong Kong, China	ABD	99	24	58
41	Mexico	BBC	29	47	75
42	Lithuania	ABC	93	46	26
43	Latvia	ABD	98	54	14
44	United Arab Emirates	BBD	49	37	102
45	Peru	ABC	21	96	43
46	Uruguay	ACC	92	67	5
47	Singapore	BBD	124	43	51
48	Poland	BBC	38	39	94
49	El Salvador	ABC	68	64	11
50	Barbados	ABD	118	41	25
51	Saudi Arabia	ABD	45	12	124
52	Romania	ACC	9	70	88
53	Mauritius	ABD	109	60	16
54	Russia	ABD	2	61	99
55	Bolivia	ACC	4	84	71
56	Gabon	ABC	35	92	12
57	Chile	BCC	90	56	72
58	Kazakhstan	ABD	6	35	116
59	Angola	ABD	7	104	31
60	Albania	ACC	87	76	3
61	Guatemala	BBC	40	75	36
62	Oman	ACD	78	20	120
63	Cyprus	BCD	104	36	80
64	Korea (Rep.)	BCD	103	49	85
65	Philippines	BBC	39	93	54



Index	Country	Balance score	Energy security	Energy equity	Environmental sustainability
66	Kuwait	BCD	73	28	122
67	Israel	BCD	102	29	83
68	Estonia	BCD	65	51	117
69	Sri Lanka	BCC	72	80	40
70	Bulgaria	ACD	26	77	108
71	Malta	BCD	128	48	65
72	Georgia	ACD	106	66	22
73	Indonesia	ACD	17	83	104
74	Paraguay	ACD	84	99	13
75	Turkey	BCC	64	82	70
76	Egypt	BBC	47	59	84
77	Venezuela	BBC	41	55	82
78	China	ADD	18	101	126
79	South Africa	BCD	43	78	128
80	Congo (Dem. Rep.)	BBD	30	121	27
81	Azerbaijan	BCD	32	74	98
82	Cameroon	BBD	62	107	39
83	Montenegro	BCD	115	71	57
84	Nigeria	ACD	13	111	79
85	Armenia	CCC	95	69	73
86	Macedonia	BCD	89	50	106
87	Syria	BBD	52	52	113
88	Algeria	CCC	86	68	74
89	Thailand	CCD	91	88	101
90	Namibia	BCD	123	94	49
91	Iran	BCD	75	44	119
92	Swaziland	BCD	61	98	76
93	Côte d'Ivoire	BCD	36	108	68
94	Malawi	BCD	74	129	32
95	Mongolia	BDD	50	100	129
96	Jordan	BDD	119	63	107
97	Ukraine	BCD	59	73	114
98	Trinidad and Tobago	CCD	79	95	115
99	Botswana	BDD	126	97	62
100	Honduras	BCD	111	90	52
101	Vietnam	CDD	77	102	105
102	Ghana	CCD	85	105	77
103	Mozambique	CCD	67	124	66
104	Chad	BCD	83	123	50
105	Morocco	CCD	110	79	96
106	Serbia	CDD	101	65	118
107	Tajikistan	BCD	81	109	61
108	Kenya	BCD	88	114	63
109	Lebanon	CCD	127	87	89
110	Dominican Republic	BDD	114	106	55
111	Nepal	BDD	125	122	46
112	Ethiopia	BDD	97	119	47
113	Nicaragua	CCD	100	91	87
114	Pakistan	BDD	56	103	100
115	India	CDD	76	110	121
116	Tanzania	BDD	117	125	53
117	Libya	CCD	70	72	123
118	Cambodia	CDD	121	113	67
119	Mauritania	BDD	58	117	112
120	Zambia	BDD	108	120	64
121	Jamaica	CDD	116	81	110
122	Niger	CCD	80	127	91
123	Bangladesh	CDD	113	115	78
124	Madagascar	CDD	105	126	69
125	Moldova	CDD	122	89	109
126	Senegal	CDD	120	118	93
127	Yemen	CDD	94	112	111
128	Benin	DDD	129	116	103
129	Zimbabwe	DDD	112	128	127

# Project participation

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The World Energy Council (WEC) is the principal impartial network of leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all. Formed in 1923, WEC is the UN-accredited global energy body, representing the entire energy spectrum, with more than 3000 member organisations located in over 90 countries and drawn from governments, private and state corporations, academia, NGOs and energy related stakeholders. WEC informs global, regional and national energy strategies by hosting high-level events, publishing authoritative studies, and working through its extensive member network to facilitate the world's energy policy dialogue.

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