



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

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

Executive Summary

World Energy Council

Project Partner
OLIVER WYMAN



Time to get real – the case for sustainable energy policy

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Executive Summary

“We must accept that we have to make hard choices in this generation to bring about real changes for future generations and the planet. Politicians and the industry must get real.”

You can see it in the faces of the 670 million people who recently suffered through blackouts in India, or sense it from the frustrations expressed by three million Americans forced to live without power in the middle of a record heat wave. After decades of work to advance sustainable energy solutions, an energy gap is growing as energy systems around the world buckle under significant strain.

Policymakers and the energy industry urgently need to work together to correct this mismatch by making the hard decisions necessary to realise sustainable energy systems on a much broader scale. If the supply of sustainable energy continues to lag behind rapidly rising demand globally, billions of people could be forced to live without reliable electricity and economic growth could be put in jeopardy. Already, 1.3 billion people live without access to electricity. This number could rise if demand continues to jump by as much as 30% over the next two decades.¹

Goals supported at The United Nations Conference on Sustainable Development (Rio+20) in June 2012 could also remain out of reach. Unless action is taken now, it will be difficult to double the rate of energy-efficiency improvement, ensure universal access to modern energy, or to double the share of renewable energy in the global energy mix by 2030.

To assist policymakers and the energy industry with pressing forward sustainable energy systems, the World Energy Council, in collaboration with global management consulting firm Oliver Wyman,

has prepared the report *World Energy Trilemma: Time to get real – the case for sustainable energy policy*. This first of a two-part series of reports examines the drivers and risks preventing the development of sustainable energy systems. It then recommends actions to address these risks and to accelerate a global transition to a low-carbon future which will present new opportunities for economic growth.

The 2012 report describes what senior energy industry executives believe they need from policymakers to advance sustainable energy systems. It is based on interviews with more than 40 energy industry CEOs and senior executives and the 2012 Energy Sustainability Index built on an analysis of 22 indicators across 93 World Energy Council member countries. The 2013 *World Energy Trilemma* report will focus on what policymakers need from the energy industry.

Three dimensions of energy sustainability

The World Energy Council's definition of energy sustainability is based on three core dimensions – energy security, social equity, and environmental impact mitigation. The development of stable, affordable, and environmentally-sensitive energy systems defies simple solutions. These three goals constitute a 'trilemma', entailing complex interwoven links between public and private actors, governments and regulators, economic and social factors, national resources, environmental concerns, and individual behaviours

¹ International Energy Agency (IEA), 2011: *World Energy Outlook 2011*

Energy sustainability dimensions

- ▶ *Energy security:* For both net energy importers and exporters, this refers to the effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of participating energy companies to meet current and future demand. For countries that are net energy exporters, this also relates to an ability to maintain revenues from external sales markets.
- ▶ *Social equity:* This concerns the accessibility and affordability of energy supply across the population.
- ▶ *Environmental impact mitigation:* This encompasses the achievement of supply and demand-side energy efficiencies and the development of energy supply from renewable and other low-carbon sources.

Energy industry recommendations

CEOs and senior executives from leading energy companies have three main recommendations for how policymakers must expedite the development of sustainable energy systems: 1) Design coherent and predictable energy policies, 2) Support market conditions that attract long-term investments, and 3) Encourage initiatives that foster research and development in all areas of energy technology.

Recommendation 1: Design coherent and predictable energy policies

Policymakers must establish coherent, long-term, accessible, predictable, and transparent policies that rise above narrow interests to respond to energy needs holistically. Contradictory and ad hoc policies developed in isolated 'silos' hinder energy investments. Sound and coherent policies that are oriented toward results rather than around the types of energy or technology used to achieve them can – and should – enable the world to achieve energy sustainability.

A master plan must be developed that connects energy policies on two fronts. First, national energy policies must complement and link together national industrial, financial, environmental, transportation, and agricultural goals and policies. Second, policies concerning energy resources, infrastructure, environmental issues, and regulations must be regionally coordinated. Sharing resources across borders enables countries to increase regional energy security, reduce power costs, and attract investments by creating greater market scale to interest investors, optimise natural resources, and develop common infrastructure.

To make sure that these policies are predictable for industry, governments must develop regulations that are consistent, clear, and simple, in spite of the complexities that they address. Equally important, policymakers should separate energy policies from short-term politics to guarantee that they reflect a well-defined, long-term view. A significant hurdle to policy longevity, as perceived by industry, is the

conflict between the long-term nature of energy investments and the comparatively short-term nature of politics.

Consumer education and awareness is also crucial. To encourage energy efficiency, for example, governments must not only establish environmentally responsible construction and manufacturing standards, but can also set a regulatory framework for progressive energy tariffs to make consumers more aware of energy efficiency as a means to reduce overall national energy costs, introduce tax reductions on energy-efficient equipment (on VAT or on import duties), or on energy-efficiency investments (reduction in VAT rate).

Recommendation 2: Support market conditions that attract long-term investments

With consistent and committed regulatory approaches, policymakers must encourage the development of attractive markets to stimulate long-term private investments in energy infrastructure and technologies. Simultaneously, they must support the development of new investment mechanisms that can reduce risks and stimulate greater private sector investment in the energy sectors. Such mechanisms can include green banks, a green bond market, and public-private partnerships. These efforts must be underpinned by a stable and predictable carbon price necessary to drive the transition to a low-carbon energy system.

Huge investments are required to improve access to energy worldwide, develop new energy

technologies, and to build new and replace ageing infrastructure. Cash-strapped governments have limited funds to support a shift to a low-carbon future. Unfortunately, capital from the private sector and from investment funds remains largely on the side lines. Less than 1% of pension investment funds worldwide, for example, are invested in infrastructure projects designed to improve the supply of electricity.²

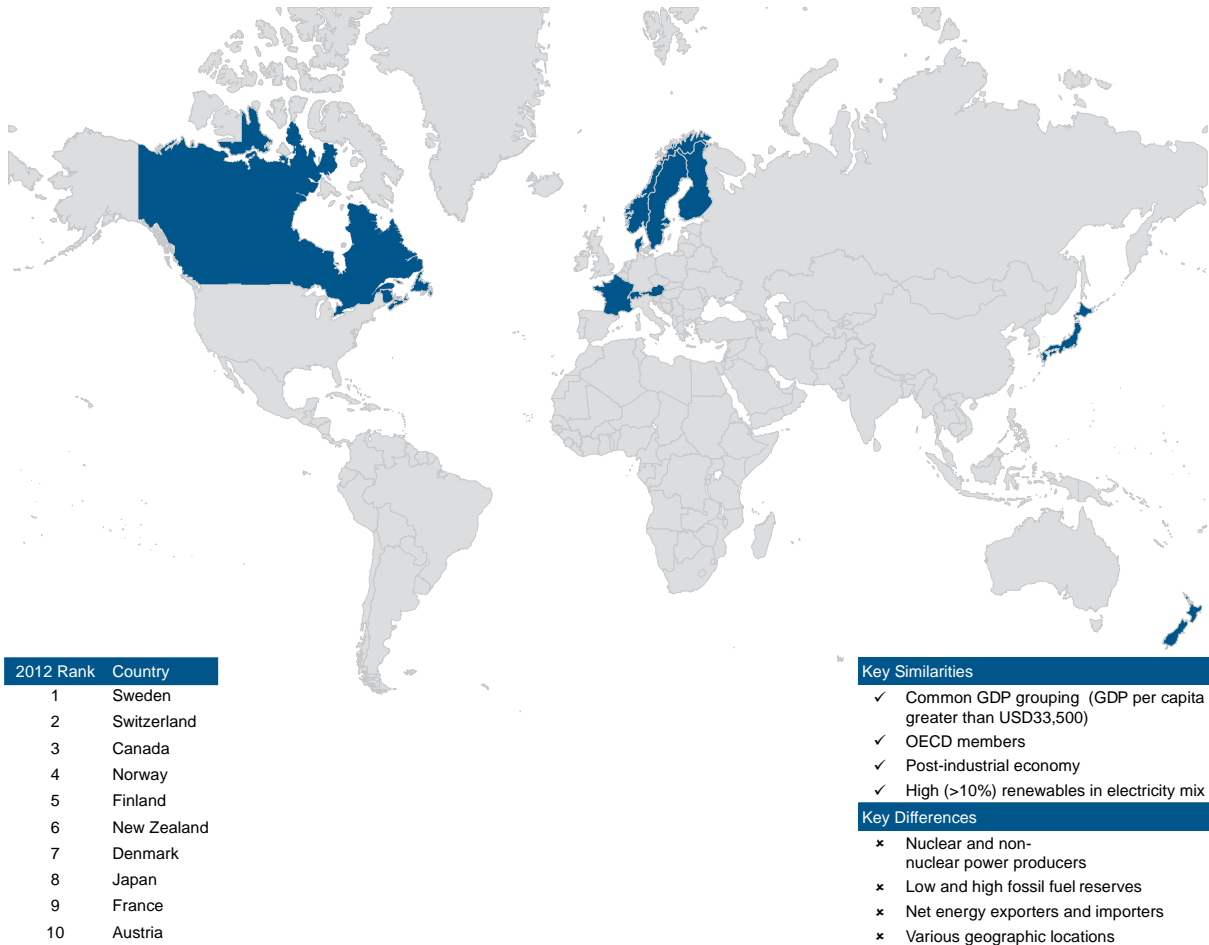
The use of subsidies should be minimised, since they increase political and regulatory uncertainty. This distorts competition and erodes investor confidence. If used, subsidies must be focused on achieving a specific outcome, and have a clear sunset built-in from the start.

Recommendation 3: Encourage initiatives to foster research and development in all areas of energy technology

To drive innovation further in all areas of energy technology, policymakers should implement goal-driven policies rather than prescriptive policies. New renewable energy and fossil fuel technologies can bring the world much closer to attaining sustainable energy systems and potentially spur economic growth. For this to happen, however, policymakers need to leave it to the market to decide which types of technology should survive so that they can remain competitive in the long term.

² Organisation for Economic Co-operation and Development (OECD), 2011: *Pension Funds Investment in infrastructure: A Survey*

Figure 1
Similarities and differences for the top 10 performing countries in 2012 Index



'Technology-neutral' research and innovation policies should be supported with economic incentives and appropriate accountabilities.

Intellectual property rights must also be strongly enforced for the private sector to invest in environmentally responsible and energy-efficient technologies.

Finally, governments must support the research, development, and demonstration of new technologies to boost investor confidence. Policymakers will encourage companies to invest in developing new technologies if they establish a strong research-oriented environment that promotes national and international collaborative research and funds large-scale demonstration projects that support companies' efforts to bring their technologies to market.

Energy Sustainability Index

The 2012 Energy Sustainability Index shows that developed countries such as Sweden, Switzerland, and Canada are closest to achieving sustainable energy systems. This is in large part because a higher share of their energy mix comes from low-carbon energy sources, such as hydro power and from nuclear power. These countries are leaders in terms of energy security largely because of their diversified energy mixes.

The top three performers also have a significant advantage when it comes to mitigating their energy systems' environmental impact because they have long-term programs in place. Sweden, for example, has significantly reduced its greenhouse emissions even though its GDP is rising mainly because it has set long-term sustainable energy and climate policies and goals for 2020.

Nevertheless, developing sustainable energy systems overall remains a challenge. Countries at all stages of development still have trouble balancing the trade-offs involved in providing secure, affordable, and environmentally-sensitive energy. Developing countries, for example, struggle to use cleaner forms of energy as they industrialise.

Sound policy making determines to what extent a country will be able to develop a sustainable energy system. The energy industry and policymakers should assist in helping nations to forge an alternative path of energy development. As Figure 1 shows, the top ten performers all have high GDPs per capita. They are OECD member countries with predictable and strong political, societal, and economic frameworks. However, there are also key differences between them, underscoring that there is not one single solution. France is a significant user of nuclear power. Canada is a net energy exporter. By contrast, Japan is a net importer.

Conclusion

Energy systems around the world remain at vastly different stages of development. But all countries share a common problem: They are far away from achieving sustainable energy systems.

To make affordable, secure, and environmentally-sensitive energy systems a reality, policymakers urgently need to develop interconnected, lasting, and coherent energy policies. Policymakers and energy industry executives must develop a common understanding of what energy

sustainability is, its importance for economic growth, and the steps necessary to achieve it. Only then can they work together to build on clearly defined sustainability goals that will encourage all forms of energy in every nation's energy mix by taking a technology-neutral approach.

With clearly defined, coherent, and predictable energy policies, the energy industry will be able to mobilise the natural and human resources, finances, and technologies necessary to realise sustainable energy systems. Without them, billions of people will continue to live without secure, affordable, and environmentally-sensitive energy. Global prosperity could also be threatened. There is no time to waste.

Figure 2
2012 Energy Sustainability Index rankings

2012 Rank	Country	Importer / Exporter	GDP Group	2011 Rank	2010 Rank
1	Sweden	I	A	4	7
2	Switzerland	I	A	3	1
3	Canada	E	A	1	2
4	Norway	E	A	5	3
5	Finland	I	A	2	4
6	New Zealand	I	B	6	5
7	Denmark	E	A	8	8
8	Japan	I	A	11	11
9	France	I	A	7	6
10	Austria	I	A	9	10
11	Germany	I	A	10	18
12	United States	I	A	12	9
13	Belgium	I	A	18	12
14	Netherlands	I	A	16	13
15	United Kingdom	I	A	28	21
16	Spain	I	B	15	26
17	Slovakia	I	B	20	17
18	Luxembourg	I	A	13	16
19	Hungary	I	B	21	25
20	Australia	E	A	24	20
21	Italy	I	B	31	33
22	Slovenia	I	B	25	14
23	Iceland	I	A	14	15
24	Croatia	I	B	17	40
25	Portugal	I	B	29	19
26	Russia	E	B	27	29
27	Korea (Republic)	I	A	37	34
28	Argentina	E	B	19	24
29	Czech Republic	I	B	26	22
30	Ireland	I	A	39	28
31	Lithuania	I	B	22	27
32	Taiwan, China	I	A	33	35
33	Colombia	E	C	32	37
34	Hong Kong, China	I	A	35	32
35	Estonia	I	B	38	23
36	Uruguay	I	C	34	30
37	Latvia	I	B	23	31
38	Bulgaria	I	C	40	51
39	Ukraine	I	C	36	45
40	Albania	I	C	41	58
41	Qatar	E	A	48	38
42	Greece	I	B	52	44
43	Kazakhstan	E	C	30	49
44	United Arab Emirates	E	A	49	50
45	Bolivia	E	D	-	-
46	Saudi Arabia	E	B	47	42
47	Poland	I	B	53	47
48	Iran (Islamic Republic)	E	C	63	39
49	Cyprus	I	B	51	48
50	Mexico	E	C	46	53
51	Trinidad & Tobago	E	B	62	55
52	Paraguay	E	D	56	59
53	Brazil	I	C	45	56
54	Kuwait	E	A	60	54
55	Egypt (Arab Republic)	E	C	50	36
56	Romania	I	C	42	41
57	South Africa	E	C	55	46
58	Peru	I	C	59	63
59	Gabon	E	B	73	-
60	Tunisia	I	C	66	52
61	Israel	I	B	61	73
62	Macedonia (Republic)	I	C	58	43
63	Thailand	I	C	67	72
64	Turkey	I	C	75	61
65	Cameroon	E	D	65	66
66	Serbia	I	C	44	82
67	Kenya	I	D	69	65
68	Jordan	I	C	70	60
69	Congo (Dem. Republic)	E	D	77	83
70	Côte d'Ivoire	E	D	74	81
71	China	I	C	71	78
72	Zimbabwe	I	D	-	-
73	Sri Lanka	I	D	68	70
74	Nepal	I	D	78	74
75	Philippines	I	D	57	64
76	Syria (Arab Republic)	E	D	64	69
77	Lebanon	I	B	72	67
78	Algeria	E	C	84	79
79	Namibia	I	C	81	68
80	Swaziland	I	D	43	57
81	Ghana	I	D	80	76
82	Tanzania	I	D	79	80
83	Indonesia	E	D	76	71
84	Nigeria	E	D	83	77
85	Mongolia	E	D	85	88
86	Chad	E	D	-	-
87	Morocco	I	D	82	85
88	Libya	E	C	86	75
89	Ethiopia	I	D	92	91
90	Niger	I	D	90	90
91	Botswana	I	B	87	86
92	Pakistan	I	D	88	87
93	India	I	D	89	84
94	Senegal	I	D	91	89

Figure 3
2012 Country rankings for energy performance dimensions

2012 Rank	Energy security (2011 rank)	Social equity (2011 rank)	Environmental impact mitigation (2011 rank)
1	Canada (1)	United States (1)	Paraguay (8)
2	Sweden (9)	Canada (2)	Sweden (1)
3	Denmark (5)	Australia (3)	Iceland (2)
4	Zimbabwe (-)	Switzerland (4)	France (3)
5	Colombia (6)	Luxembourg (5)	Norway (4)
6	Slovakia (28)	United Kingdom (8)	Finland (6)
7	Japan (16)	Austria (7)	Albania (15)
8	Russia (2)	France (10)	New Zealand (7)
9	Norway (21)	Japan (6)	Lithuania (5)
10	Hungary (20)	Norway (11)	Switzerland (14)
11	Germany (13)	Germany (12)	Austria (18)
12	Switzerland (15)	Belgium (9)	Canada (12)
13	Finland (7)	New Zealand (13)	Latvia (9)
14	Croatia (11)	Finland (14)	Slovakia (17)
15	Czech Republic (38)	Qatar (15)	Belgium (24)
16	New Zealand (33)	Sweden (33)	Russia (11)
17	Spain (27)	Argentina (20)	Slovenia (20)
18	Ukraine (8)	Saudi Arabia (18)	Luxembourg (13)
19	Italy (49)	Spain (17)	Hungary (22)
20	Kenya (23)	Netherlands (22)	Netherlands (31)
21	Gabon (10)	Iceland (19)	Brazil (16)
22	Bolivia (-)	Taiwan, China (21)	Uruguay (19)
23	Portugal (39)	Greece (16)	Ukraine (23)
24	Nigeria (18)	Ireland (24)	Japan (37)
25	Australia (42)	Korea (Republic) (25)	Denmark (28)
26	Congo (Dem. Republic) (30)	Italy (23)	Croatia (26)
27	United States (32)	Kuwait (31)	Taiwan, China (47)
28	Slovenia (41)	Denmark (26)	Bulgaria (43)
29	France (29)	Cyprus (28)	Nepal (25)
30	Côte d'Ivoire (3)	Hong Kong, China (29)	Argentina (27)
31	Belgium (61)	Iran (Islamic Republic) (30)	United States (39)
32	Cameroon (17)	Czech Republic (27)	Korea (Republic) (35)
33	Egypt (Arab Republic) (14)	Croatia (32)	Italy (48)
34	Netherlands (53)	Mexico (34)	Colombia (33)
35	Argentina (12)	Slovakia (35)	United Kingdom (53)
36	Romania (46)	Hungary (39)	Trinidad & Tobago (34)
37	United Kingdom (58)	Portugal (36)	Ethiopia (66)
38	Kazakhstan (34)	Poland (38)	Portugal (40)
39	Austria (37)	United Arab Emirates (40)	Ghana (38)
40	Bulgaria (25)	Kazakhstan (37)	Spain (46)
41	Turkey (68)	Slovenia (41)	Germany (44)
42	Estonia (69)	Romania (43)	Ireland (41)
43	Greece (63)	Israel (42)	Tanzania (49)
44	Albania (26)	Uruguay (44)	Kazakhstan (21)
45	Mexico (51)	Lithuania (45)	Bolivia (-)
46	Peru (48)	Estonia (46)	United Arab Emirates (55)
47	Iran (Islamic Republic) (71)	Russia (48)	Congo (Dem. Republic) (51)
48	Chad (-)	Trinidad & Tobago (49)	Niger (81)
49	Sri Lanka (40)	Egypt (Arab Republic) (47)	Hong Kong, China (60)
50	Poland (57)	Latvia (50)	Estonia (29)
51	Tunisia (60)	Tunisia (51)	Iran (Islamic Republic) (50)
52	Philippines (31)	South Africa (52)	Gabon (79)
53	Lithuania (36)	Turkey (53)	South Africa (57)
54	Syria (Arab Republic) (19)	Macedonia (Republic) (58)	Cameroon (62)
55	Libya (70)	Jordan (54)	Swaziland (42)
56	Macedonia (Republic) (43)	Colombia (59)	Côte d'Ivoire (77)
57	Ireland (88)	Serbia (57)	Namibia (73)
58	Thailand (67)	Ukraine (56)	Chad (-)
59	China (45)	Bulgaria (60)	Saudi Arabia (56)
60	Indonesia (47)	Algeria (55)	Peru (45)
61	Korea (Republic) (83)	Albania (67)	Czech Republic (32)
62	Paraguay (54)	Thailand (63)	Serbia (30)
63	Uruguay (50)	Lebanon (62)	Cyprus (59)
64	Latvia (22)	Bolivia (-)	Qatar (75)
65	Lebanon (44)	Brazil (65)	Poland (63)
66	Israel (52)	Morocco (66)	Egypt (Arab Republic) (74)
67	Serbia (35)	Peru (68)	Jordan (67)
68	Tanzania (56)	Syria (Arab Republic) (71)	Macedonia (Republic) (58)
69	Trinidad & Tobago (86)	China (72)	Kenya (54)
70	Swaziland (4)	Paraguay (69)	Algeria (84)
71	Iceland (55)	Sri Lanka (74)	Zimbabwe (-)
72	Luxembourg (81)	Indonesia (61)	Syria (Arab Republic) (70)
73	Pakistan (64)	Libya (64)	Australia (72)
74	Mongolia (72)	Botswana (73)	Kuwait (68)
75	Algeria (65)	Swaziland (70)	Mongolia (78)
76	Hong Kong, China (66)	Namibia (75)	Greece (83)
77	Brazil (62)	Philippines (76)	Pakistan (71)
78	South Africa (59)	Gabon (77)	Philippines (52)
79	United Arab Emirates (80)	Mongolia (78)	Thailand (65)
80	Morocco (77)	Pakistan (79)	Romania (36)
81	Qatar (91)	Ghana (80)	Nigeria (88)
82	Nepal (76)	India (84)	Sri Lanka (61)
83	Taiwan, China (73)	Cameroon (81)	Mexico (64)
84	Kuwait (92)	Nigeria (82)	Turkey (69)
85	Saudi Arabia (85)	Côte d'Ivoire (85)	Lebanon (82)
86	Senegal (78)	Kenya (86)	Senegal (85)
87	India (84)	Niger (88)	Morocco (76)
88	Ghana (79)	Chad (-)	Libya (92)
89	Botswana (87)	Senegal (87)	Tunisia (80)
90	Namibia (75)	Ethiopia (92)	Indonesia (90)
91	Cyprus (90)	Congo (Dem. Republic) (89)	China (87)
92	Niger (74)	Nepal (90)	Israel (89)
93	Jordan (82)	Tanzania (91)	India (86)
94	Ethiopia (89)	Zimbabwe (-)	Botswana (91)

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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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