Power to Change

A business contribution to a low-carbon economy

Summary of key elements and policy messages

World Business Council for
Sustainable Development

The electricity sector and the global climate change challenge

In the coming decades, the world will need double today's generation capacity. We in the power sector, have a strong opportunity to take a lead in combating climate change. But we cannot do this alone. We need to work with governments and other stakeholders to find solutions. We realize some of these changes will take many years, but there is no time to lose and it is only through combined efforts that we will succeed in creating a low-carbon, sustainable energy future.

The power sector bears a front-line responsibility in the urgent global struggle against climate change. It is willing to take resolute action to address a three-fold challenge:

- Sustain economic growth through competitive and available electricity generation
- Reduce CO_2 emissions and mitigate the impact on the environment
- Ensure access to affordable energy for low-income customers to guarantee social cohesion.

Finding solutions

This challenge is huge, but not out of reach. Representing some 10% of the world's global installed generating capacity and serving over 304 million customers every day, we within the WBCSD electricity utilities sector project are eager to face up to our responsibility. We believe in a sustainable electricity future that will be achieved through progressive decarbonization of the electricity mix, more efficient use of electricity by end-users and enhanced substitution of electricity for fossil fuels.

The necessary technologies, on the demand and on the supply sides, have been developed by business, and are already available. Some are commercially mature and can be deployed much more widely today; others – while having promise – are not yet ready for the market and need reinforced and accelerated focus on research and development. In both cases we are prepared to do our part and take action.

Shaping a policies and measures framework at the national and international level

As a business contribution to the international climate change negotiations, the WBCSD electricity utilities project has published *Power to change: A business contribution to a low-carbon electricity future*, and the technology solutions booklet *Powering a low-carbon economy*. Within these documents, we have described the key features of a policies and measures framework for the electricity sector at national and international levels. The power sector is ready and willing to pioneer and deploy new and existing technologies to drive down its carbon emissions. At the same time we look to governments and other stakeholders to create a policy environment that encourages and supports this massive future investment in new infrastructure.

To illustrate our analysis, we refer to the International Energy Agency *Energy Technology Perspectives 2008* ACT Map and BLUE Map scenarios for the power generation sector.[1] The summary table of key elements presented within this document provides an overview of:

- The key enabling technologies and demand-side measures
- The challenges that prevent these technologies from meeting their potential
- The role of electricity utilities in scaling-up technology development and deployment
- The role of governments through national policy development, the building of an effective international policy framework, and various support requirements such as financial support and research and development efforts.

There is no "silver bullet" – neither on the technology nor on the policy side – and we recognize that countries will continue to use their indigenous resources, including fossil fuels, out of concern for energy security. In order to encourage investment in the right technologies at the right time and the right place, policies and mechanisms will need to be tailored to match both national contexts and to capitalize on the maturity of each technology.

[1] The 2008 ACT Map scenario illustrates the necessary actions to bring global emissions in 2050 back to 2005 levels. This would require urgent deployment of key technologies and major commitments by public authorities as well as industry. The BLUE Map scenario is the more aggressive of the two, and illustrates the radical actions, technology breakthroughs and investments necessary to achieve a 50% reduction in CO_2 emissions by. Achieving this would require "urgent implementation of unprecedented and far-reaching new policies in the energy sector."

Electricity sector stabilization wedge

Energy & carbon dioxide savings potential in 2050

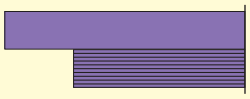
IEA Act Map IEA Blue Map

Innovation & commercialization

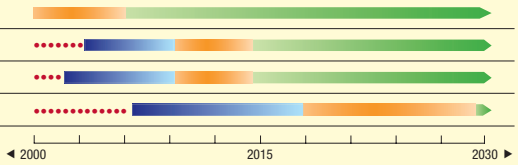
R&D
Demonstration
Deployment
Cost competitive

End-use energy efficiency
(% gigawatt-hour / year savings, relative to baseline)

– 21 %
– 15 %



Heat pumps (including water heater)
Smart meters
Solid state lighting
Electric & plug-in vehicles



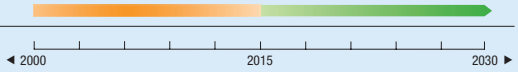
Power generation
(Total CO_2 savings, gigatonnes / year)

14.1
18.3

Generation efficiency
(including combined heat and power)

0.8
0.4

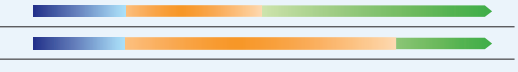
Trigeneration



Solar

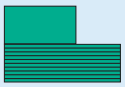
1.3
2.5

Concetrated solar
Photovoltaic

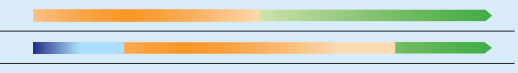


Wind

1.3
2.1



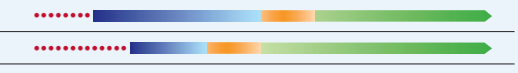
Onshore wind
Offshore wind



Biomass & geothermal

0.3
2.1

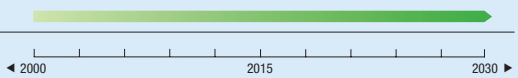
Biomass gasification
Geothermal hot rock



Hydropower

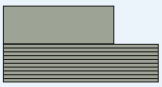
0.3
0.4

Hydropower

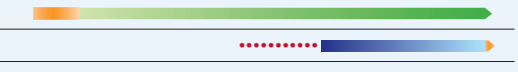


Nuclear power

2
2.8



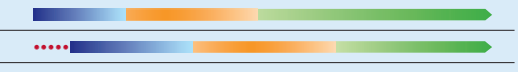
Generation III
Generation IV



Advanced coal
(ultrasupercritical & integrated gasification combined cycle)

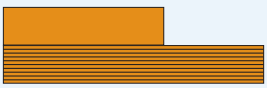
1.4
1.4

Ultra-supercritical (700°C)
Integrated gasification combined cycle
Underground coal gasification

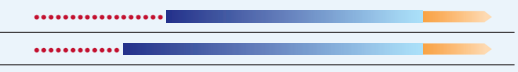


Fossil fuel generation with carbon capture

2.9
4.7

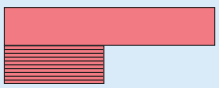


Pre-combustion
Post-combustion
Oxyfuel combustion

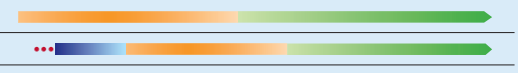


Natural gas

3.8
1.8



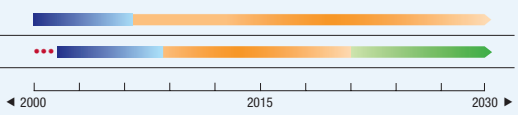
G-series gas turbines
H-series gas turbines



Transmission & Distribution (T&D)

T&D investment and upgrades are necessary for the optimal operation of generation facilities and stable network

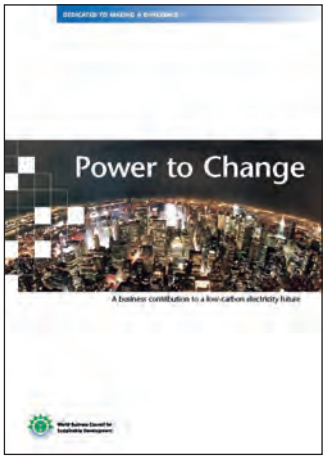
Ultra-HVAC (> 1,000 kV)
Ultra-HVAC (> 800 kV)



Challenges	Role of electric utilities
• A complex web of wide ranging options • Low awareness, low priority and low cost of energy • Business model misaligning the life-cycle costs and benefits	• Collaborate across sectors for energy savings • Promote deployment of electric technologies with lower value chain/life cycle CO_2 emissions • Promote consumer awareness
• Achieving these reductions will require radical actions, technology breakthroughs and large-scale investments, in addition to the "urgent implementation of unprecedented and far-reaching new policies in the energy sector" • Achieving the pace of change necessary given the current capital stock will be an immense challenge	• Engage stakeholders in energy policy dialogue on balancing carbon reductions with other key sustainability and energy security measures • Develop technology roadmaps • Invest in/operate large-scale, low-carbon, capital-intensive, long-lived power plants and transmission and distribution networks (T&D) • Ensure the provision of electricity
• Inadequate operational and maintenance practices and lack of knowledge • Low cost of some fuels • Lack of relevant knowledge for identification and implementation of combined heat and power (CHP) schemes	• Maintain and improve efficiency of operating plants • Invest in higher efficiency options for new plants
• High cost of generated power • Not in my backyard (NIMBY) attitude towards new sites • Variability and predictability of power generation and its impact on the grid	• Collaborate on R&D of new technologies • Test and demonstrate new technologies • Invest in multi-MW systems
• High cost of generated power • Not in my backyard (NIMBY) attitude towards new sites • Variability and predictability of power generation and its impact on the grid	• Integrate large scale variable output wind farms • Provide back up power and stability for the grid under the guaranteed scheme for incremental cost recovery
• High cost relative to conventional energy	• Cooperate on assessments of resource strength and reliability
• In developing countries (which have substantial resource potential), high capital cost for large projects, and limited financing resources • Shared concerns about social and environmental impacts	• Extend the power grid to remote facilities • Implement and share best practices for sustainability
• Safety • Public acceptance and NIMBY syndrome • Uncertainty in licensing and procedures leading to excessive construction cost and delay	• Operate safely and transparently • Invest in capital-intensive new plant projects for the long term
• Need for R&D and technology status improvement • Higher capital cost for advanced coal technologies • Lack of knowledge and technology in some regions	• Invest /operate large scale (> 200 MW) new plants and demonstrations
• High incremental cost for power generation • Undemonstrated use with different plants and fuels; undemonstrated technical storage feasibility, local potential and permanence in all regions • Lack of legal framework including liabilities for long-term CO_2 storage • Public acceptability and uncertainty related to safety	• Cross boarder cooperation on R&D • Demonstrate carbon capture from new or existing power plants at large scale (e.g., 1 million tonnes CO_2 per year) with public financial support
• Rising cost of natural gas • Tight gas supply market • NIMBY attitude towards new liquefied natural gas (LNG) infrastructure	• Invest/operate CCGT where gas is available and affordable
• Lack of incentive for investment • Unclear division of responsibility for the integration of renewables & distributed resources • NIMBY syndrome towards new T&D infrastructure	• Collaborate on R&D for smart grids • Invest in grid expansion and reinforcement

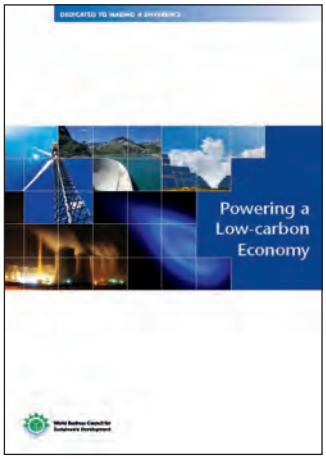
A contribution to discussions on sectoral approches

Domestic policies & measures to promote development (•) and deployment (•)		*International policies and measures to support cooperation and transfer of low-carbon technology in the electricity sector*
	• Promote understanding and realization of the true cost of energy • Adopt performance standards and labeling (e.g., for buildings and appliances) • Set national targets with financial incentives • Provide funding and support for energy R&D across sectors • Educate the public and provide training to the workforce	• Set up programmatic international flexibility mechanisms for programs of many small energy saving applications, allowing technology (e.g., efficiency lighting) and behavior (e.g., controls) based approaches • Provide an international platform for cooperation on energy-saving technology and policies • Invest in international public-private partnerships for technology transfer • Promote protection of intellectual property rights
• Include all sectors of the economy in emissions management • Establish long-term regulatory clarity, stability and certainty with regard to emissions • Provide guidance on the role of different resources in the future national energy mix • Recognize that the carbon price alone will not bring the necessary new technologies to the market	• Adopt policies and measures consistent with the differences in cost and maturity of low-carbon energy technologies • Create technology roadmaps and set development targets	• Recognize that energy resources and energy uses vary widely from country to country • Recognize that electricity markets vary widely from country to country, including both regulated monopolies and fully contestable markets, and many variations and combinations of these • Recognize that the electricity sector has many participants, both public and private, most of which are serving primarily local needs
• Set guidelines and clear incentives for higher efficiency • Provide public and private funding for R&D on breakthrough technologies	• Develop and promote programs for energy audits and optimization of operation & maintenance	• Provide platforms for transfer of knowledge and best practice • Develop efficiency and operational guidelines for new plants • Introduce programmatic international flexibility mechanisms for improvement of generation efficiency
• Invest in R&D for emerging technologies through public and private funding • Assess resource availability, reliability and costs • Invest in R&D for utility-scale electric energy storage	• Set achievable national targets • Provide for grid access and offtake provisions	• Set up programmatic international flexibility mechanisms for distributed solar • Provide a platform for international R&D exchange on breakthrough technologies
	• Set achievable national targets • Assess resource availability, reliability and costs • Provide for grid access and offtake provisions • Invest in R&D for utility-scale electricity storage	• Phase in domestic content requirements for new projects
• Invest in R&D for emerging technologies through public and private funding • Assess resource availability, reliability and costs • Invest in R&D for utility-scale electric energy storage	• Assess resource availability, reliability and costs • Provide for grid access and offtake provisions	• Provide public and private funding for demonstrations of new technologies in different countries
	• Develop a reliable institutional framework in the energy and water sector • Engage stakeholders on sustainability considerations • Streamline permitting process • Extend the grid to remote facilities • Support climate modeling and forecasting to help optimize development and operation	• Enhance opportunities for sustainable large hydropower within international flexibility mechanisms • Promote uptake of International Hydropower Association Assessment Guidelines
• Provide public funding for international collaborative R&D on Generation IV technologies	• Establish an independent safety authority and promote safety culture and stakeholder consultation • Clarify and streamline licensing and permitting procedures • Make relevant legal decisions with respect to long-term management of waste	• Collaborate on R&D for Generation IV nuclear power technologies • Recognize within the international flexibility mechanisms • Integrate technology transfer in nuclear power development agreements • Foster international cooperation and standards on safety, waste management and non-proliferation
• Provide funding for large scale (>250 MW) demonstrations of new combinations of plant and fuel • Sponsor basic R&D for high temperature resistant materials • Establish a stable investment environment that respects intellectual property rights		• Maintain eligibility of advanced coal within international flexibility mechanisms • Promote protection of intellectual property rights • Provide an international platform for sharing experience with new plant technologies in combination with different types of fuels
• Provide direct financial support for large scale (>1mt CO_2/year) demonstration projects • Map out carbon storage potential and preferred sites	• Establish legal framework to enable CCS • Take up liability for long-term storage of CO_2	• Develop models for regulating carbon storage in different countries • Provide public and private funding for early demonstrations of large-scale (>1mt CO_2 per year) power plants with CCS in different countries • Develop an international platform for national policy development on CCS • Recognize CCS through international flexibility mechanisms
	• Provide a clear regulatory framework for liquefied natural gas (LNG) and identify suitable locations for receiving terminals • Promote long-term predictability and stability in prices and delivery of natural gas • Provide guidance on the best opportunities for combined heat and power (CHP)	
• Provide funding for R&D on high-power electronics and superconductors • Provide funding for R&D on smart grids with variable and distributed resources	• Adopt clear policy with adequate return on investment in regulated T&D infrastructure, and incentives for superior reliability and efficiency • Establish clear roles & responsibilities for integration of renewables & distributed resources, and provision on backup power	



Power to Change: A business contribution to a low-carbon economy

Presents the key features of a policies and measures framework at the national and international levels to support the transition towards a low-carbon electricity future



Powering a Low-carbon Economy

Presents a technology-by-technology analysis of technology potential, technology development and deployment challenges, and policy recommendations at the national and international levels

The WBCSD Electricity Utilities Sector Project members

About the WBCSD

The World Business Council for Sustainable Development (WBCSD) brings together some 200 international companies in a shared commitment to sustainable development through economic growth, ecological balance and social progress. Our members are drawn from more than 30 countries and 20 major industrial sectors.

We also benefit from a global network of about 60 national and regional business councils and partner organizations. Our mission is to provide business leadership as a catalyst for change toward sustainable development, and to support the business license to operate, innovate and grow in a world increasingly shaped by sustainable development issues.

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www.wbcsd.org/web/electricity.htm

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