Energy Sector Faces Major Challenges from Climate Change

Without strong mitigation policies, the global average temperature is likely to rise above the internationally agreed 2°C target. As a major source of carbon emissions, the energy sector will be affected by mitigation policies as well as by climate impacts in multiple ways.

Global warming, changing regional weather patterns and extreme weather events will affect demand and impact energy production and transmission. Strong global policy action would also have major implications on investments.

Climate Change | **Changes in Regional Weather Patterns** | **Extreme Weather Events** | **Government Policy** | **Investment**

Impacts and Adaptations

Power Stations

Thermal power plants will be affected by the decreasing efficiency of thermal conversion as a result of rising ambient temperatures. Reduced water for cooling and increasing water temperatures could lead to reduced power operations or temporary shutdowns.

Pipelines

Energy transport infrastructure is at risk, with oil and gas pipelines in coastal areas affected by rising sea levels and those in cold climes by thawing permafrost. May require new land zoning codes and risk-based design and construction standards and structural upgrades to infrastructure.

Power lines

Extreme weather events, especially strong wind, could damage power lines. Standards can be amended to implement appropriate adaptation measures, including re-routing lines away from high-risk areas.

Renewables

Changes in regional weather patterns threaten to impact the hydrologic cycle that underpins hydropower. An increase in cloudiness in some regions would affect solar technologies, while an increase in the number and severity of storms could damage equipment.

Nuclear

Lack of water and extreme weather events may threaten nuclear plants by disrupting the functioning of critical equipment and processes.

Emission Reduction Options

Carbon Capture & Storage

Adoption of carbon capture and storage (CCS) for fossil fuel plants can reduce emissions. CO_2 storage capacity is large and all parts of the technology have been demonstrated. CCS units burning bioenergy (BECCS) can draw CO_2 from the air. But barriers to CCS and BECCS remain, including cost.

Increasing Efficiency

Energy efficiency can be improved by retrofitting existing plants and adopting efficient new ones; improving transmission and distribution and through technology improvements in fossil fuel extraction and conversion.

Switching Fuels

Switching to lower-carbon fuels (eg from coal to gas) can reduce emissions. Moving from world-average efficiency coal plant to state-of-the-art gas can halve emissions if fugitive methane release is controlled, and can act as a 'bridging technology'.

Alternatives

Increasing use of renewables such as solar, wind and biofuels. Increasing use of nuclear power. Hydropower is currently the largest single RE contributor, but solar, wind and bioenergy are expected to experience the biggest incremental growth.

Reducing Demand

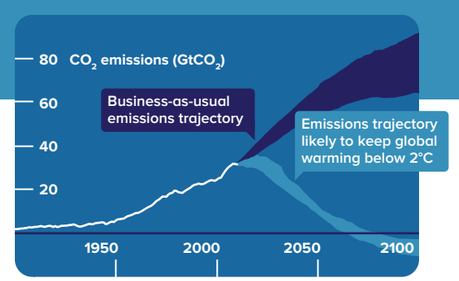
Reducing consumer demand is a key mitigation strategy. The level of demand reduction determines the size of the mitigation challenge facing the energy sector. Potential limitations from 'rebound effect' to be taken into consideration.

Policy Framework

Additional investments, which could be bolstered by fiscal measures and/or subsidies are required in the energy supply sector to keep the global temperature increase below 2°C.

Largest GHG Contributor

The energy sector is the largest source of greenhouse gas (GHG) emissions. Meeting the 2°C target implies swiftly halting the rise in emissions for the full energy system and bringing them to zero before the end of the century, with a likely need for 'negative emissions' technology such as BECCS.



Regulatory Frameworks

Governments may facilitate an increased use of emission reduction options by creating an attractive fiscal and regulatory framework.

Investment in Technology

New technologies can be used for efficiency improvements, power generation, extraction, storage, transmission and distribution.

Carbon Pricing

For government and regulators, a key challenge will be to ensure a price of carbon that incentivises extra investment in low-carbon technologies.