HELE COAL TECHNOLOGY ROADMAP

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Content of presentation

- Summary of ETP2012
- Technology Roadmaps
- HELE Coal Technology Roadmap
  - Coal-fired power generation today
  - Vision for HELE coal-fired power plant
  - Technologies for raising efficiency
ETP 2012 – Choice of 3 Futures

2DS
a vision of a sustainable energy system of reduced Greenhouse Gas (GHG) and CO₂ emissions
The 2°C Scenario

4DS
reflecting pledges by countries to cut emissions and boost energy efficiency
The 4°C Scenario

6DS
where the world is now heading with potentially devastating results
The 6°C Scenario

The 6°C Scenario

The 4°C Scenario

The 2°C Scenario

sustainable

reflecting

pledges by
countries to cut
emissions and boost
energy efficiency

where the world is now heading with potentially devastating results

The 4°C Scenario

The 2°C Scenario

The 6°C Scenario
A sustainable energy system is a smarter, more unified and integrated energy system.
Clean energy: slow lane to fast track

Progress is too slow in almost all technology areas

Significant action is required to get back on track
Clean energy investment pays off

Every additional dollar invested in clean energy can generate 3 dollars in return.
Renewables will generate more than half the world’s electricity in 2050 in the 2DS
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IEA Roadmap Definition

“A technology roadmap is a dynamic set of technical, policy, legal, financial, market & organisational requirements identified by all stakeholders involved in its development. The effort shall lead to improved and enhanced sharing and collaboration of all related technology-specific RDD&D information among participants.

The goal is to accelerate the overall RDD&D process in order to deliver an earlier uptake of the specific energy technology into the marketplace”.

Energy technology roadmaps
Technology roadmaps provide answers

• Where is technology today?
• What is the deployment pathway needed to achieve 2050 goals?
• What are the priority near-term actions?
Technology roadmaps status

2009
- HELE Coal (for power)

2010
- Chemical catalysis
- Energy efficient building envelopes

2011

2012

2012 / 2013
- HELE Coal (for power)
- Chemical catalysis
- Energy efficient building envelopes
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Fossil fuels dominate energy demand

Efficiency improvement reduces specific fuel consumption and also reduces specific pollutant emissions.
Despite an increasing contribution across two decades, the share of non-fossil generation has failed to keep pace with the growth in generation from fossil fuels, particularly coal.
Coal is abundant and widely available

Sufficient coal reserves exist for an 150 years of generation at current consumption rates. For some brown coals, reducing the moisture content is important for efficient use.
What are HELE technologies?

*Efficiency improvement*
Reduce non-GHG emissions

HELE

Reduce CO₂ emissions

CCS

Efficiency improvement reduces specific fuel consumption and also reduces specific pollutant emissions.
The size of the challenge is clear

Near-term projections are not consistent with a low-carbon scenario
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Improve efficiency, then deploy CCS

- Decrease generation from subcritical
- Increase generation from high-efficiency technology (SC or better)
- Install CCS* on plants over supercritical

* CCS (Post-combustion, Oxyfuel, Pre-combustion CO₂ capture)

Global coal-fired electricity generation (TWh)

- Subcritical
- Supercritical
- USC
- HELE Plants with CCS*
- IGCC

* CCS fitted to SC (or better) units.
Technology improvement coupled with targeted policy and regulation are essential to realise the 2DS target in 2050.
Efficiency improvement achieved by reducing generation from inefficient units and increasing generation from HELE units.
Best practice technology to be adopted

Potential for capacity growth in coal-fired power generation is seen mostly in non-OECD countries such as China and India.
HELE technologies reduce the CO$_2$/kWh for capture

Increasing plant efficiency is important to reduce the cost of CO$_2$ abatement.
Impact of efficiency improvement on CO\textsubscript{2} abatement

Raising efficiency significantly reduces the CO\textsubscript{2}/kWh emitted
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Advanced technology is essential

Ultra-supercritical plants are currently operating in various countries, particularly in China.
The challenge of advanced USC

Nickel-based super-alloys will enable plant components to withstand temperatures of 700°C and beyond.

- Nickel-based super-alloys
- Ferrite/Austenitic alloys
With the latest 1500°C-class gas turbines, efficiencies of 50% (LHV, net) may be achievable, with cost-competitiveness will depend on sufficient numbers of plants being deployed.
The steam cycle is optimised for maximum efficiency.
Recommended actions for the near term

- By 2020, CO₂ emissions from coal-fired power generation must already have peaked to be consistent with the 2DS.
- Greater efficiencies must be achieved in the power generation sector.
  - Deploying supercritical and ultra-supercritical technologies, both available now, will be important.
  - Even higher efficiencies will be achieved as A-USC and more advanced IGCC become available.
- Power generation from low-grade coals, such as lignite, can be much more efficient.
- CCS must be developed and demonstrated rapidly if it is to be deployed at a scale sufficient to achieve the 2DS.
Explore the data behind ETP

www.iea.org/etp