

## 2 Reducing Emissions A Central Role for Efficiency

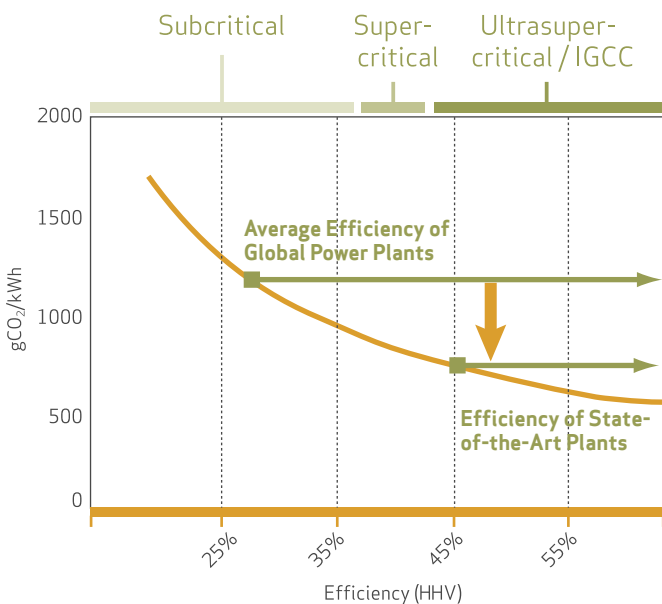
A successful response to climate change requires reducing CO<sub>2</sub> emissions from coal use. While Carbon Capture and Geological Storage (CCS) is a key technology to reduce CO<sub>2</sub> emissions from coal use (see WCI Climate Policy Papers 3 & 4) other technologies - such as improving the efficiency of coal-fired power plants - provide opportunities for significant and cost effective emissions reductions. To reduce emissions from coal-fired power plants the World Coal Institute (WCI) recommends that countries:

### KEY POINTS

- >> Replace the oldest and most inefficient coal-fired plants with larger, more efficient units
- >> Construct the most efficient new coal-fired plants possible
- >> Implement capacity building and knowledge sharing programmes to ensure that the operation and maintenance of plants follows international best practice
- >> Ensure that the Clean Development Mechanism (CDM) and any future market based mechanisms incentivise the deployment of the most efficient coal-fired plant
- >> Identify opportunities to develop methodologies or other innovative enabling mechanisms to encourage coal washing in order to improve power plant efficiency

## Reducing Emissions A Central Role for Efficiency

**Figure 1. Improving the Efficiency of Coal-fired Power Plants Reduces CO<sub>2</sub> Emissions**



Source: IEA "Focus on Clean Coal" (2006)

Note: 1% increase in efficiency = 2-3% decrease in emissions

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  - >> Improving the efficiency of the oldest and most inefficient coal-fired plants would reduce energy related CO<sub>2</sub> emissions by 1.7 GtCO<sub>2</sub>
  - >> Reduces coal use emissions by almost 25%
  - >> Reduces global CO<sub>2</sub> emissions by 6%

Source: IEA "Towards a Sustainable Energy Future" (2008)

**Raising the efficiency of coal-fired power plants generates significant emission reductions, has important co-benefits and must be a priority for both developed and developing countries**

Efficient plants require less coal to produce a given unit of electricity thereby reducing CO<sub>2</sub> emissions, increasing security of energy supply, preserving energy resources and providing economic benefits. The technical potential exists for efficiency improvements to reduce emissions from coal use substantially in both developed and developing countries<sup>1</sup>.

**Increasing the efficiency of coal-fired power plants by 1% reduces CO<sub>2</sub> emissions by between 2 – 3%; highly efficient modern coal plants emit almost 40% less CO<sub>2</sub> than the average coal plant currently installed**

The average global efficiency of coal-fired plants is currently 28%<sup>2</sup> compared to 45% for the most efficient plants (Figure 1). A programme of repowering existing coal-fired plants to improve their efficiency, coupled with the newer and more efficient plant being built, will generate significant CO<sub>2</sub> reductions. Although the deployment of new, highly efficient plants is subject to local constraints, such as ambient environmental conditions and coal quality, deploying the most efficient plant possible is critical to enable these plants to be retrofitted with CCS in the future. Efficient plants are a prerequisite for retrofitting with CCS as capturing, transporting and storing the plant's CO<sub>2</sub> consumes significant quantities of energy. Highly inefficient plants will undermine capacity to deploy CCS technologies.

<sup>1</sup> IEA "Energy Efficiency Indicators for Public Electricity Production from Fossil Fuels" (2008)

<sup>2</sup> All efficiencies measured in Higher Heating Value (HHV)

### The 400MWe, Unit 3 at Nordjylland Power Station – the World’s Most Efficient Coal-fired Power Station (45% HHV)



Photo courtesy of Vattenfall

**Improving the efficiency of the oldest and most inefficient coal-fired plants would reduce CO<sub>2</sub> emissions from coal use by almost 25% representing a 6% reduction in global CO<sub>2</sub> emissions<sup>3</sup>**

These significant emissions reductions can be achieved by the replacement of plants < 300 MW capacity and older than 25 years, with larger and significantly more efficient plants and where technically and economically appropriate the replacement or repowering of larger inefficient plants with high-efficient plants of >40%.

**Countries are encouraged to implement capacity building and knowledge sharing activities to ensure that the operation and maintenance of coal-fired plants follows international best practice**

In many countries power plants operate significantly below their design efficiencies as a result of poor operation and maintenance. The dissemination and implementation of effective operation and maintenance practices are essential to maintain efficiency and ensure that new and repowered plants achieve and maintain the maximum emissions reductions possible.

<sup>3</sup> IEA "Towards a Sustainable Energy Future" (2008), IEA programme of work on climate change, clean energy and sustainable development

## Reducing Emissions A Central Role for Efficiency

### **The Clean Development Mechanism and any future market based mechanisms should fully utilise the emission reduction opportunities provided by high efficiency coal power plants**

The deployment of many clean and innovative coal utilisation technologies is restricted by financial barriers. Methodologies that incentivise the deployment of state-of-the-art highly efficient coal plants or the repowering of inefficient plants can help to address the financial barriers, accelerate the deployment of the most efficient plant and generate significant emissions reductions.

### **Countries should develop methodologies or other innovative enabling mechanisms to encourage coal washing in order to improve power plant efficiency**

In a number of regions washing coals to remove associated mineral material improves their energy content prior to combusting them in a power plant. This can result in improvements to the efficiency of power plants of 2 – 5%<sup>4</sup>. Coal washing is often not undertaken as coal suppliers do not receive a higher price for cleaned coal<sup>5</sup>. Crediting coal washing under market based mechanisms or the development of alternative financing mechanisms will help incentivise such projects.

<sup>4</sup> IEA Clean Coal Centre "Improving the Efficiencies of Coal-Fired Power Plants in Developing Countries" (2003)

<sup>5</sup> USAID Asia "Designing a Cleaner Future for Coal: Solutions for Asia that Address Climate Change" (October 2007)