

Improving the efficiency of coal-fired power generation plants

Carlos Fernández Alvarez – Senior Coal Analyst.

Moscow, 20 September 2011

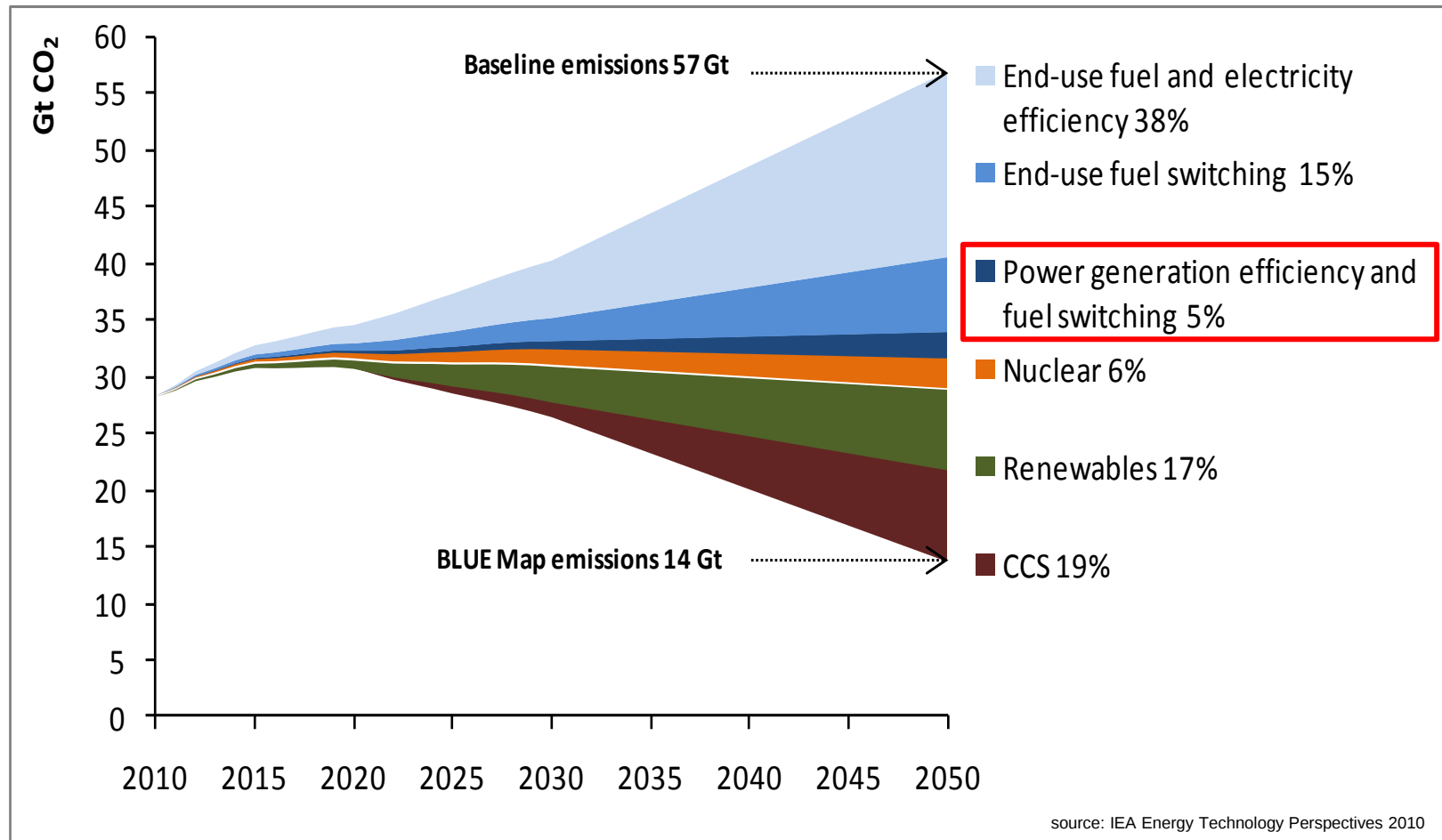


International
Energy Agency

Content will address ...

- Potential for efficiency improvement
- Barriers to achieving improvement
- High Efficiency, Low Emissions Coal Technology Roadmap
- Wrap up

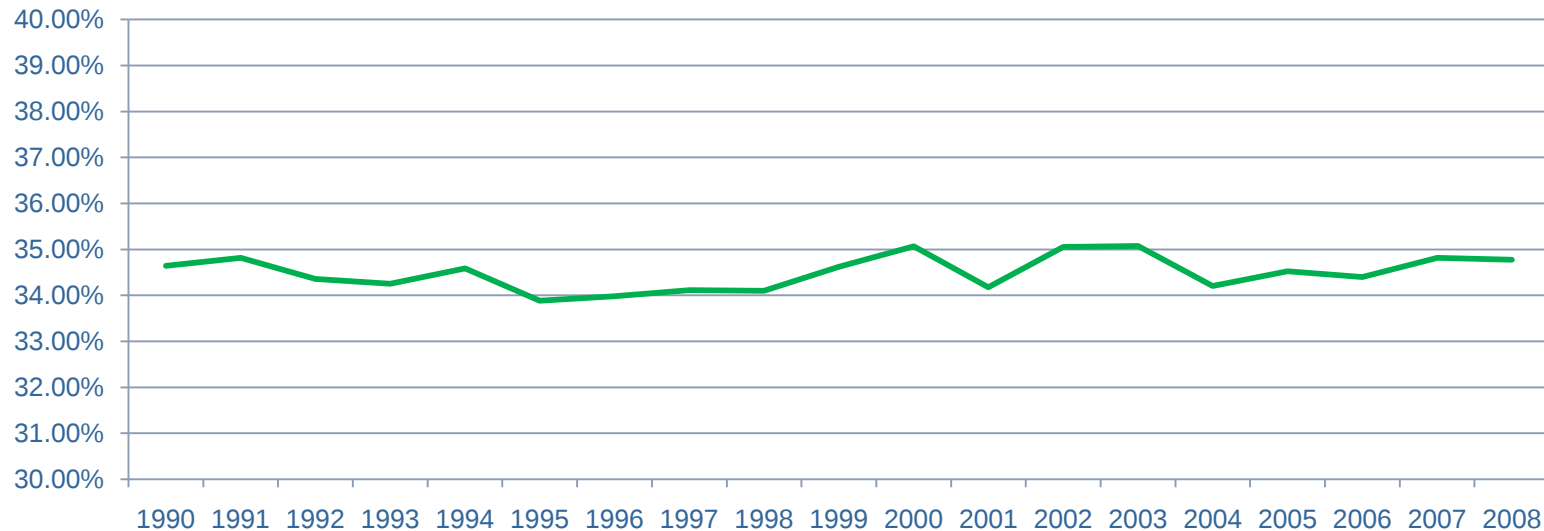
Key technologies for reducing global CO₂ emissions



A wide range of technologies will be necessary to reduce energy-related CO₂ emissions substantially.

Global average efficiencies for coal-fired power plant

Coal-fired plants Efficiency



Source: author's analysis

Values are far from Best Available Technologies:

- Nordjyllandsværket 3 (hard coal, Denmark) reports 47% net on a LHV basis.
- Niederaussem K (lignite, Germany) reports 43% net on a LHV basis

Average plant efficiency does not appear to be improving.

Some reasons to explain it

- Technology is improving, best practices have been disseminated, SC/USC have been built;

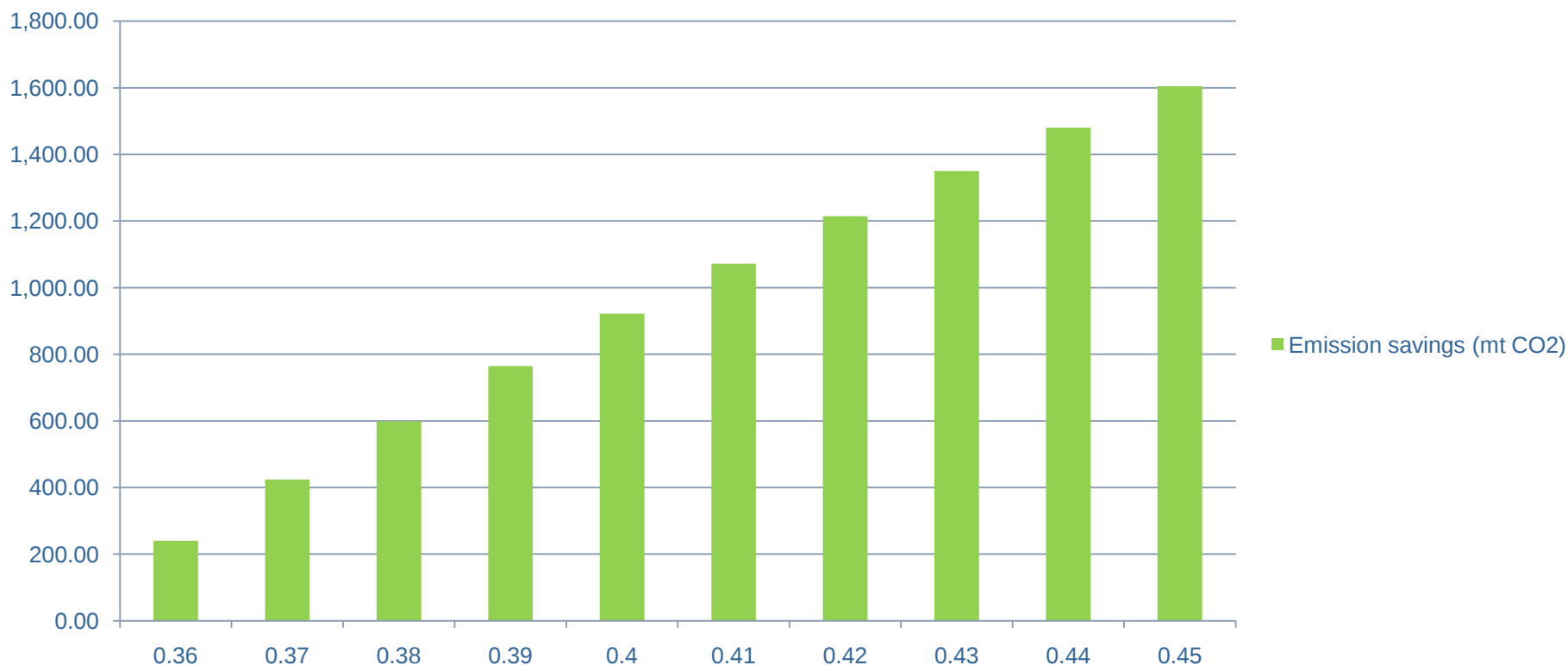
BUT

- Subcritical plants continue to be built ;
- SC/USC is not cost-effective for smaller unit sizes;
- Coal quality is becoming poorer;
- Existing stock is getting older;
- Cleaning systems consume energy.

Generation efficiencies are not contributing sufficiently to the ambition to achieve 450ppm.

Impact of efficiency on CO₂ emissions

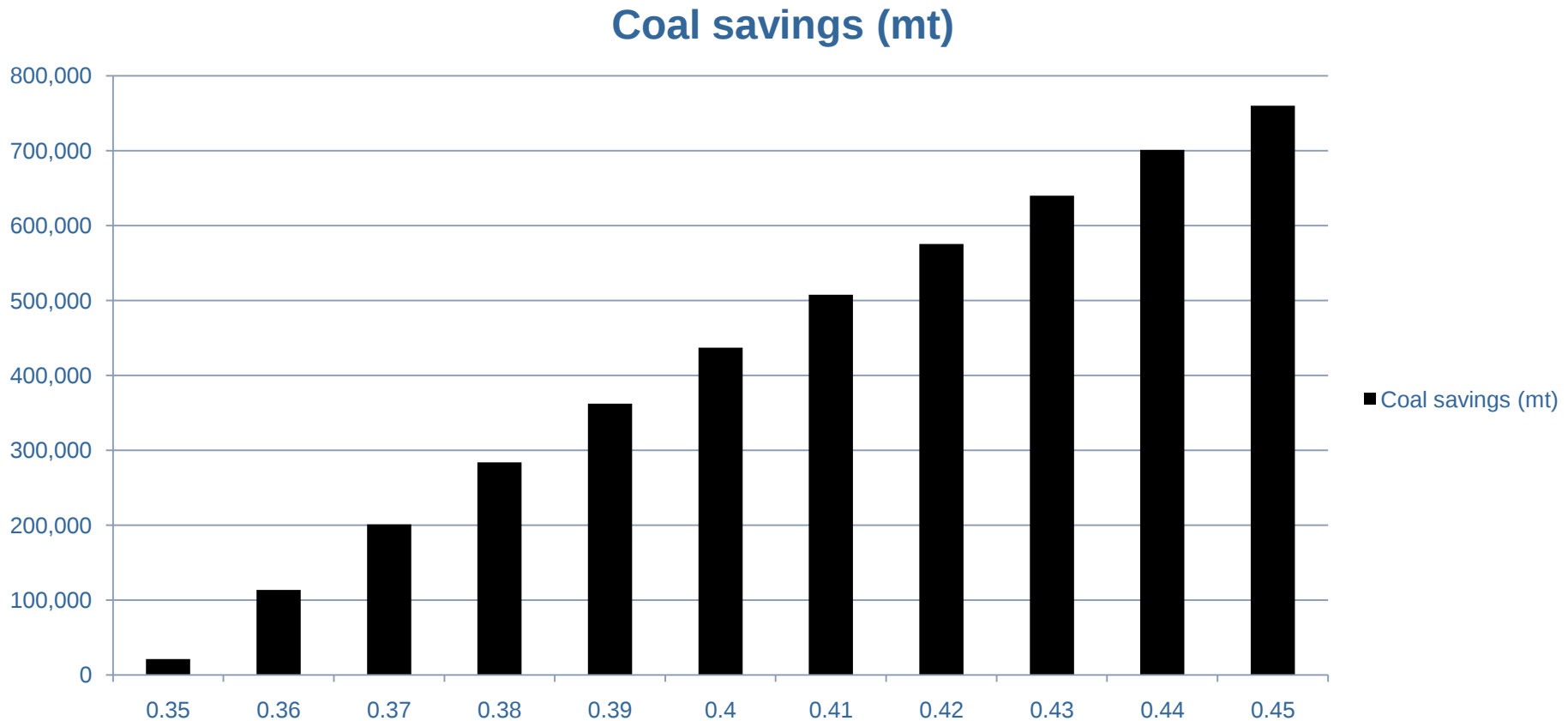
Annual emissions savings (Mt CO₂)



Example for illustration only. Approximations by the author based on emissions of 1 ton CO₂ per MWh for 0.33 efficiency

A 1 percentage-point rise in efficiency can reduce emissions of CO₂ from the average plant by 3%.

... and on coal resources



Example for illustration only. Approximations by the author based on the current fleet .

Efficiency increases lead to substantial savings in fuel costs.

It is not a trivial matter

- Reporting efficiency is difficult, with no globally-agreed procedure or standard:
 - LHV/HHV
 - Gross/net
 - Different plant boundaries or time limits
 - Efficiency is influenced by conditions at each plant:
 - Coal quality
 - Cooling water temperature
 - Operating conditions
 - Maintenance capacity
-

... and high barriers hamper the aim

■ Financial challenges:

- Lack of financial resources may be an issue
- Regulated tariffs may hinder a fair return on investments

■ Coal quality issues:

- Is the coal washed? And at what price?
- Can I recover my investment?
- Is the purchaser ready to burn clean coal? Plant compatibility.

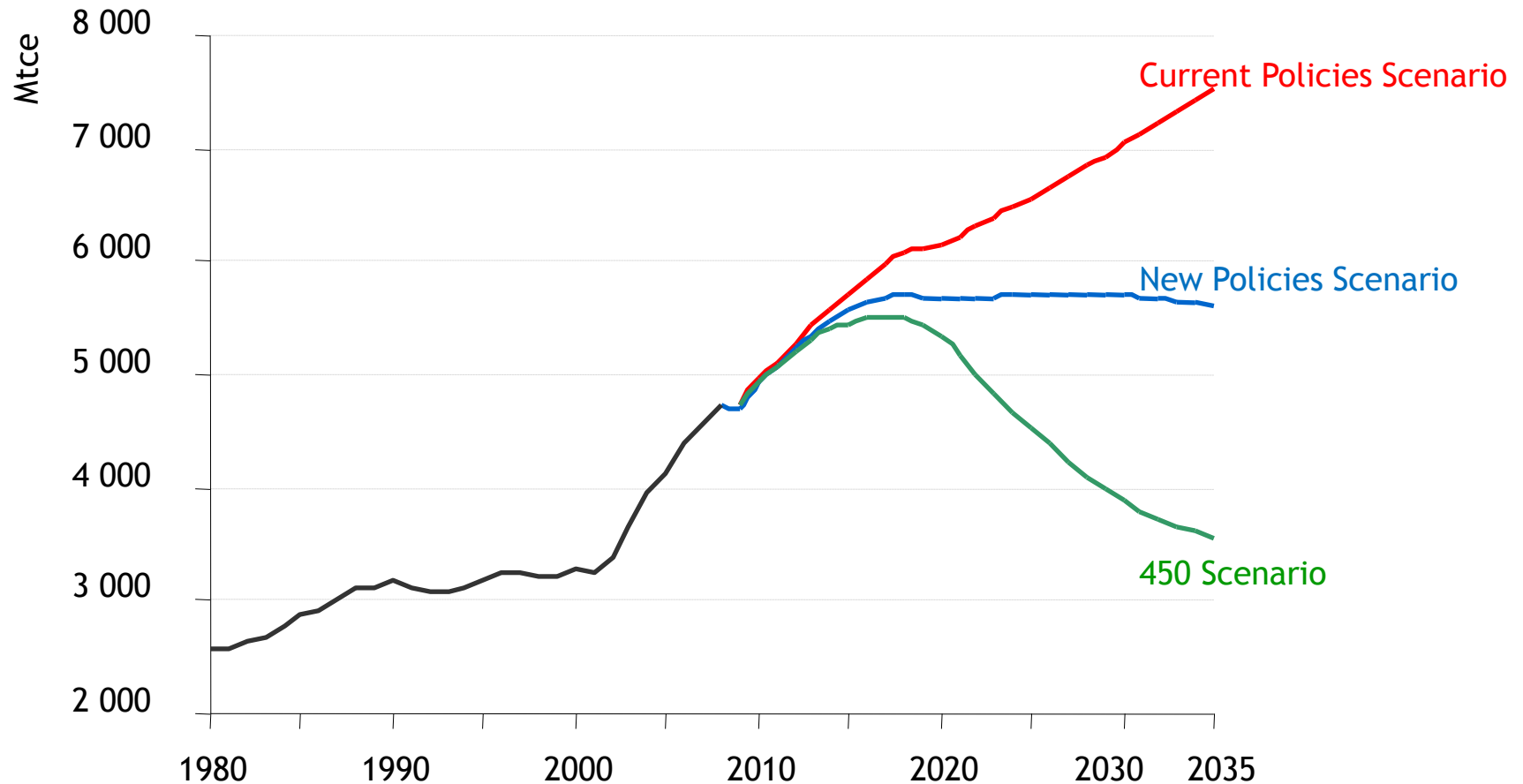
■ Local/regional configuration:

- District heating
- Heat and power plants

■ Free externalities:

- No emission limit/charge

World primary coal demand by scenario



Coal consumption is strongly affected by policies.

HELE Coal Roadmap – content

- To identify milestones for the development of coal technologies for power generation to 2050;
- To cover technical, financial, policy and other matters important to realise more efficient generation of electricity from coal;
- To address regional implications of this development pathway, particularly for major coal-using countries.

HELE Coal Roadmap – provisional timetable

Jun 2011	Workshop on the long-term vision for the deployment of clean coal
May – Sep 2011	Review of coal-fired power generation: technologies, policies, regulation, ...
Jun – Dec 2011	Regional workshops in US, China, India and Eastern Europe
Jan – Feb 2012	Drafting of roadmap
Mar 2012	Workshop to review conclusions
Apr – June 2012	Final drafting, review, editing and design
Jul 2012	Publication of roadmap

Wrap up

- Improving efficiency is essential to our aims for environmental sustainability, energy security and long term economic development;
- There remains much scope for improving technology. Research and development in this field must continue;
- Technologies exist to improve efficiency. Unfortunately, there are also barriers hampering the realisation of the huge potential to deploy them.
- Removing these barriers is important and urgent.

■ Thank you for your attention