The Role of CHP in Delivering Global Energy & Environmental Solutions

New Challenges for CHP and DHC:
The Mission of Combating Global Warming
Chiba, Japan
14 March, 2008

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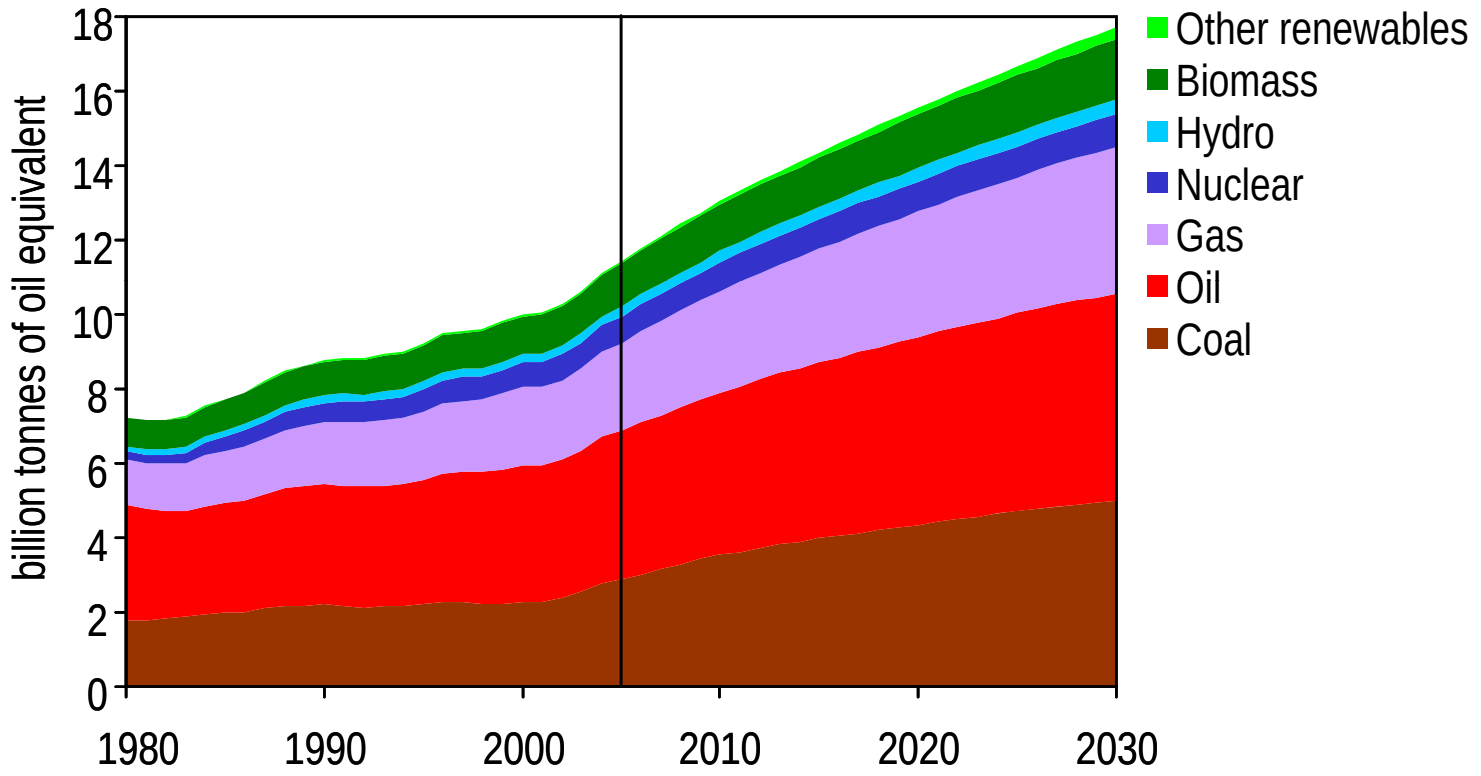
International Energy Agency

Overview

- Energy trends and challenges
- Technology solutions
- The role of CHP
- IEA's work on CHP/DHC

Reference Scenario:

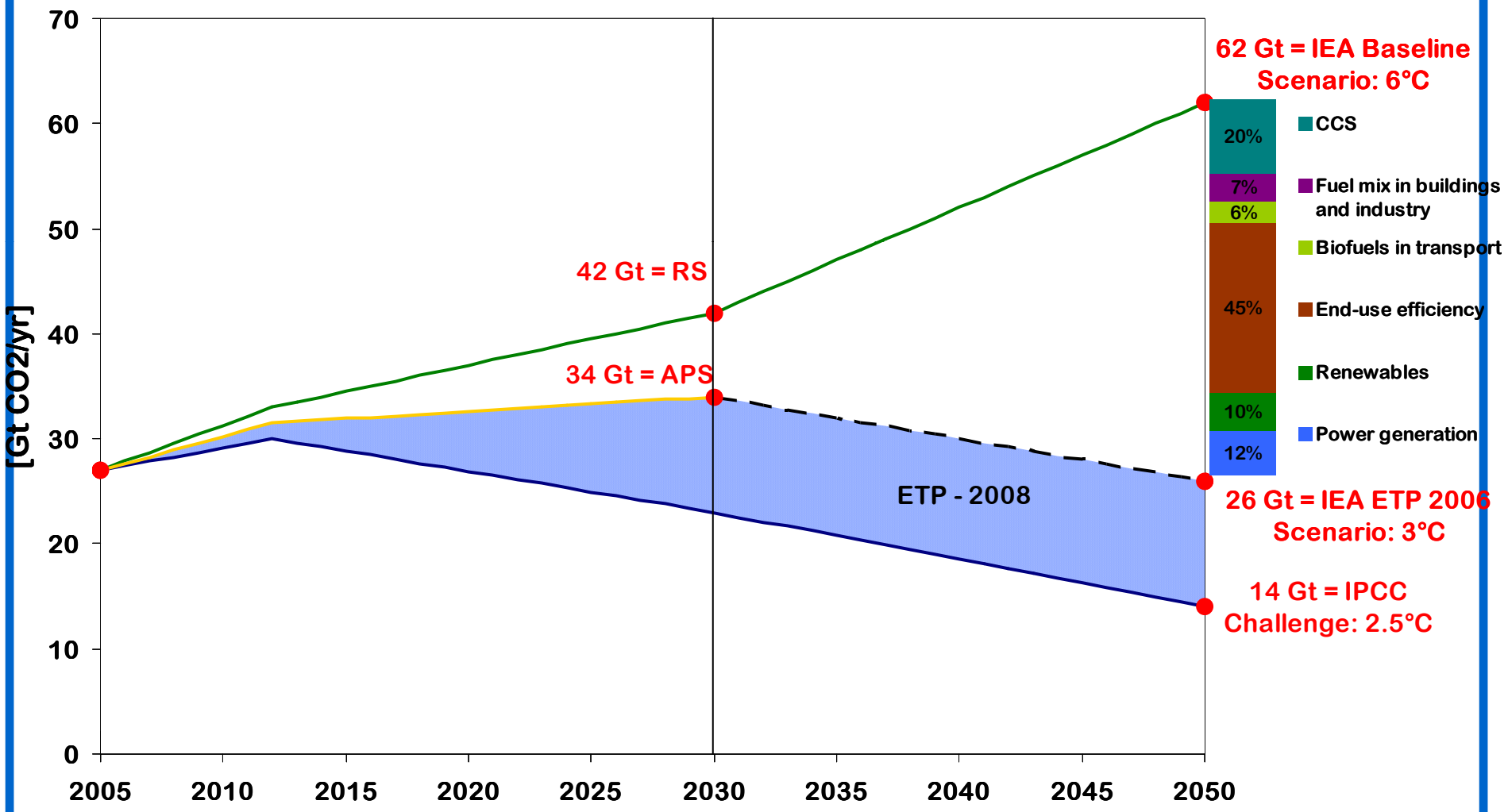
World Primary Energy Demand



Source: IEA/OECD, World Energy Outlook 2007

Global demand grows by more than half over the next quarter of a century, with coal use rising most in absolute terms

The Carbon Challenge to 2050



Technology Must Be the Solution

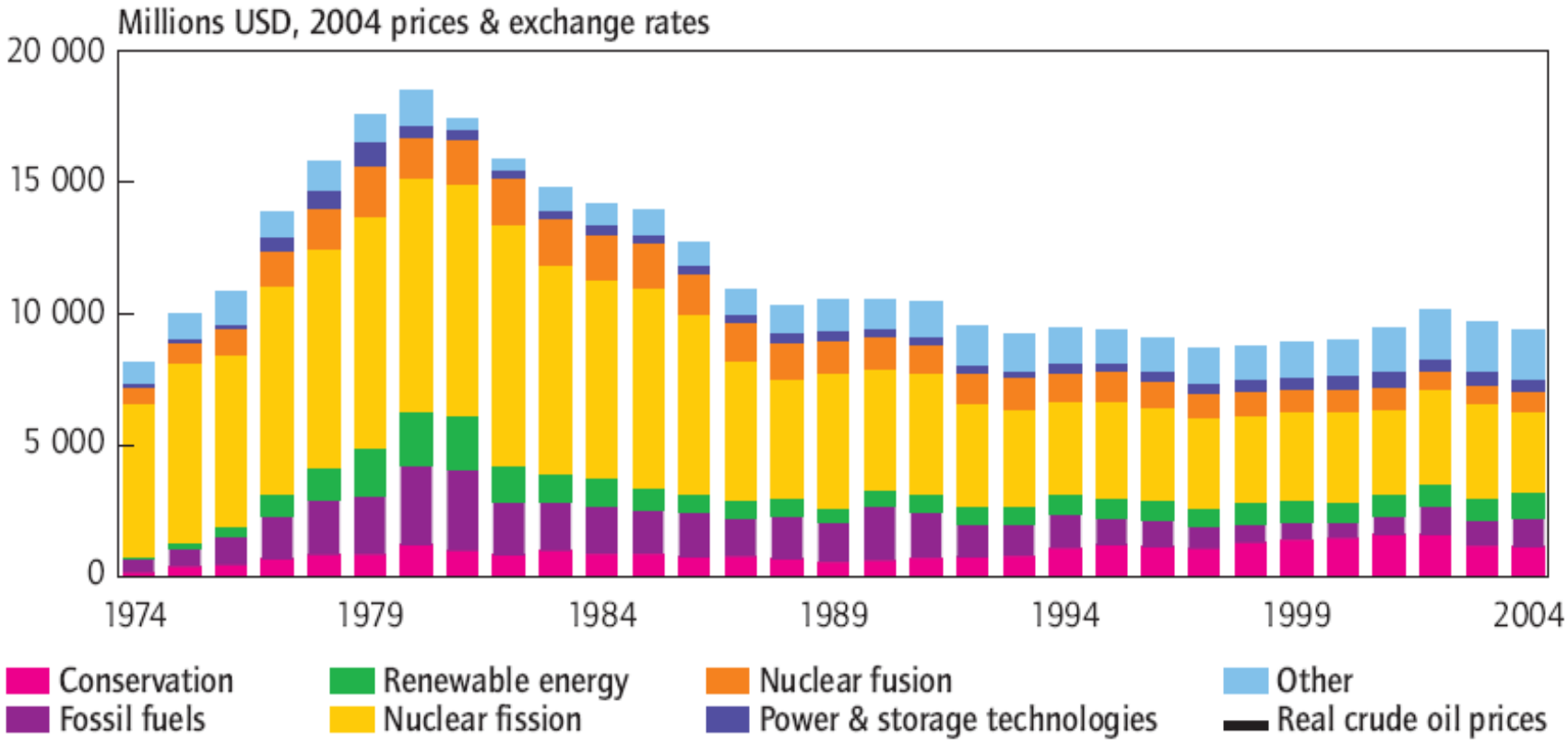
Energy Technology Perspectives 2008

- Builds from 2006 publication
- Theme: "How to get there from here"
  - Short- and medium-term technology policy needs
  - Special attention on technology roadmaps
  - Basis for international technology cooperation
- Scenario analysis
  - Baseline WEO2007 Reference Scenario
  - Global GHG stabilization by 2050 (ACT)
  - Global 50% GHG reduction by 2050 (BLUE)
- Technology chapters:
  - Power sector
  - End-use sectors

ETP 2008: Key Messages

- 50% GHG reduction achievable but is it realistic?
- Global action needed, extremely challenging
- We need a step change in government policies, with closer international collaboration
- Roadmaps can provide a focus for this
- USD 50-60 trillion cost
- Important energy supply security benefits
- Efficiency/power sector first
- Deep cuts also required for transport and industry

R&D Budgets for IEA Countries

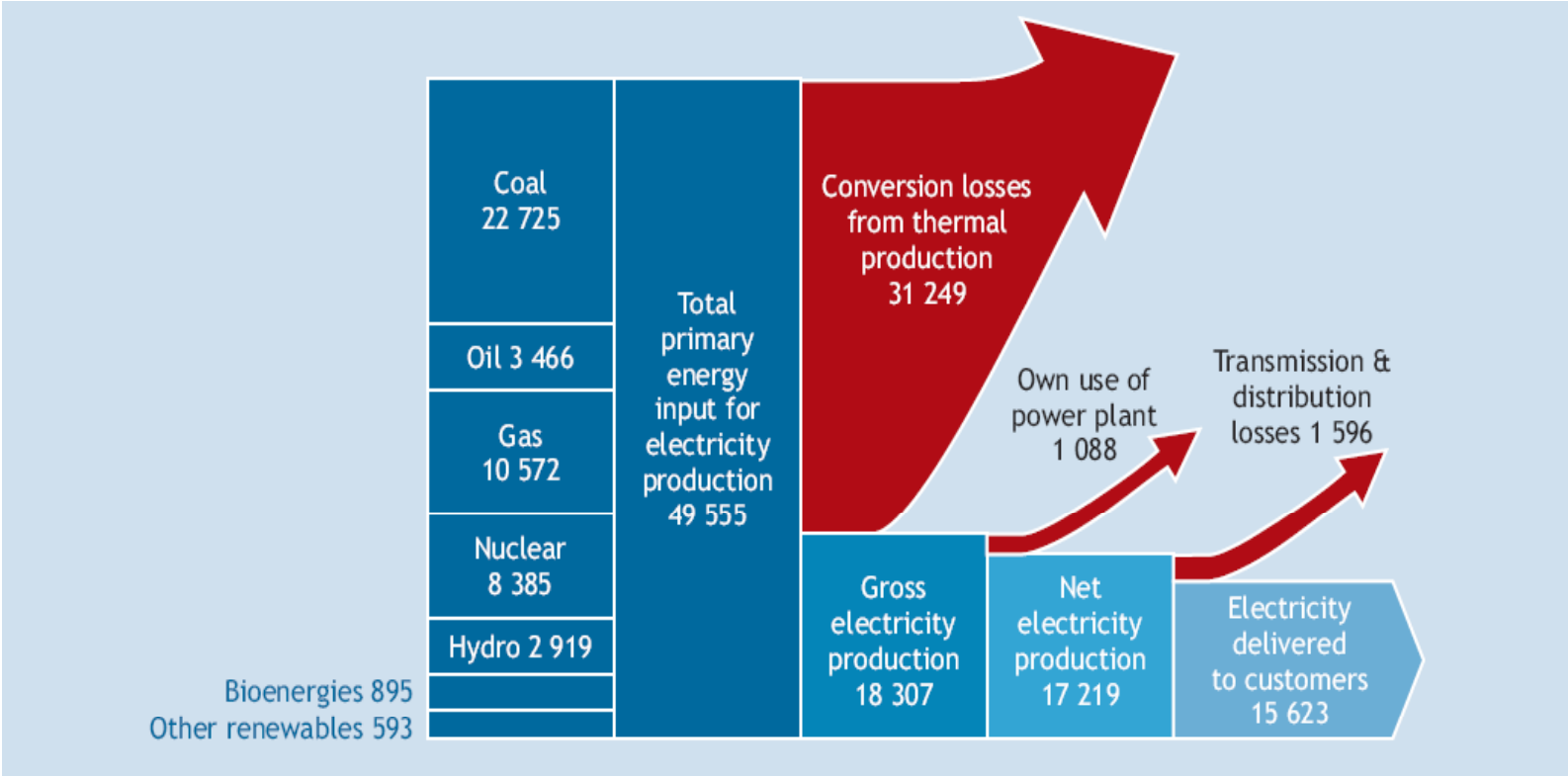


Source: IEA, 2007.

Taking Another Look: The Role of CHP

Wasted Energy Is a Huge Opportunity

Energy Flows in the Global Electricity System

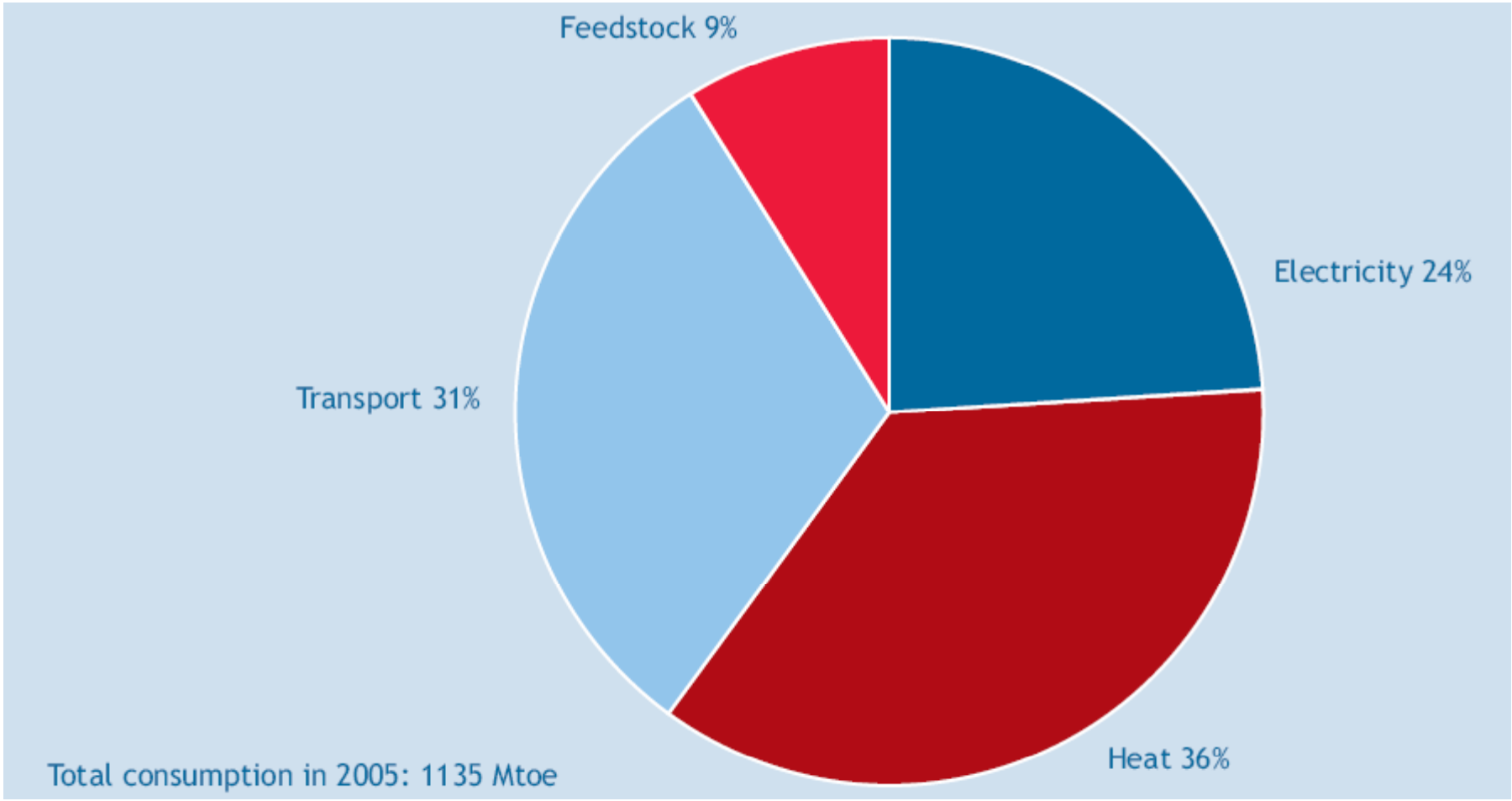


Source: IEA, *CHP: Evaluating the Benefits of Greater Global Investment* (2008).

2/3 of the fuel we use to produce power is wasted -- CHP and DHC can more than double this efficiency

Increased Attention on Heat

European Union Energy Demand (2005)



Source: IEA, *CHP: Evaluating the Benefits of Greater Global Investment* (2008).

G8 Communiqués

Gleneagles 2005:

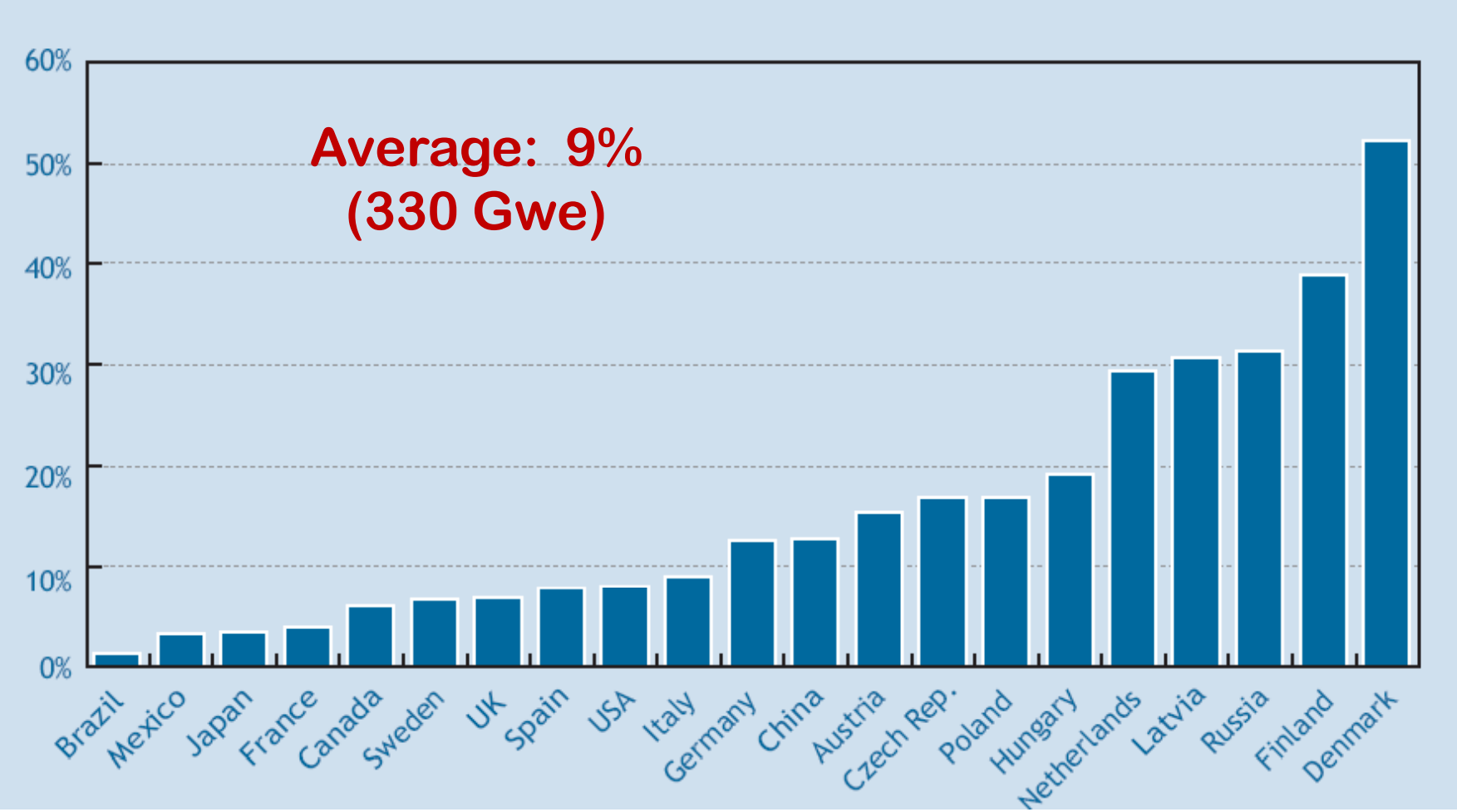
"The IEA will advise on alternative energy scenarios and strategies aimed at a clean, clever and competitive energy future."

Heiligendamm 2007:

Paragraph 67: *"We invite the IEA to create a Sustainable Buildings Network…[to] develop practical instruments for assessing and advising on the use of renewable energies, especially for cooling and heating…"*

Paragraph 70: "*Making power generation more efficient, climate friendly and sustainable is …crucial…we aim to increase average power plant efficiencies in each of our countries…[we will] adopt instruments and measures to significantly increase the share of combined heat and power (CHP) in the generation of electricity."*

CHP as a Share of Total National Power Generation



Source: IEA, *CHP: Evaluating the Benefits of Greater Global Investment* (2008).

CHP/DHC – Technology Needs

- **District heating and cooling networks** need to improve performance and improve integration of RE resources
- **Biomass CHP/DHC, heat/cold storage** – optimise systems and integrate with CHP with other forms of surplus and renewable heat in district heating and cooling systems
- **Solar Thermal** – reduce costs via improved materials, systems
- **Geothermal** – improve efficiencies, reduce costs for lower-temperature resources
- **High-temperature CHP** – increase gas turbine inlet/outlet temperatures; enhance reliability
- **Medium-scale CHP applications** – demonstrate integrated medium-scale turbines at various scales and in a greater number of settings
- **Smaller-scale CHP** – improve the efficiency of microturbines and fuel cells and reduce costs through improved manufacturing techniques and advanced materials

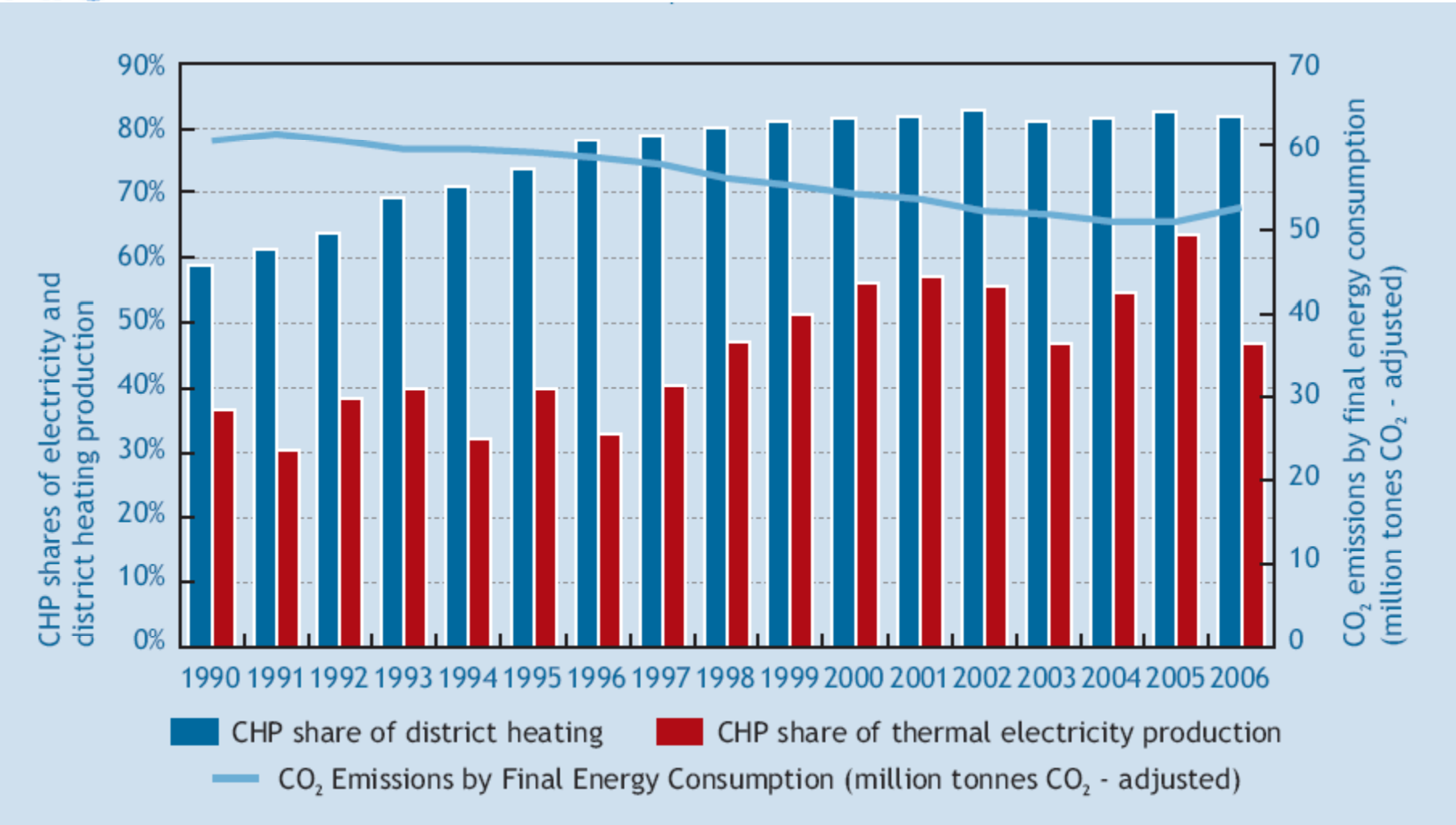
Sources: IEA, Energy Technology Perspectives (2006); IEA, Renewables for Heating and Cooling (2007)

The International CHP/DHC Collaborative

- *Who*: The IEA, working with DHC and CHP leaders worldwide
- *What*: Raise the profile of CHP/DHC among policy makers, industry
- *When*: Launched March 2007 with a 2-year Work Plan
- Activities:
  - **Policy Maker Roundtable**, 10-11 October 2007
  - **Russian District Heating Seminar**, 22 November 2007
  - **2008 IEA publications** with
    - Improved global DHC/CHP data and prospects, by country/sector
    - Benefits globally and on a region/country basis
    - Documentation of successful DHC/CHP policies
  - **Outreach strategy** targeted at
    - policy makers
    - key growth regions (Asia, Middle East, E Europe/Russia)

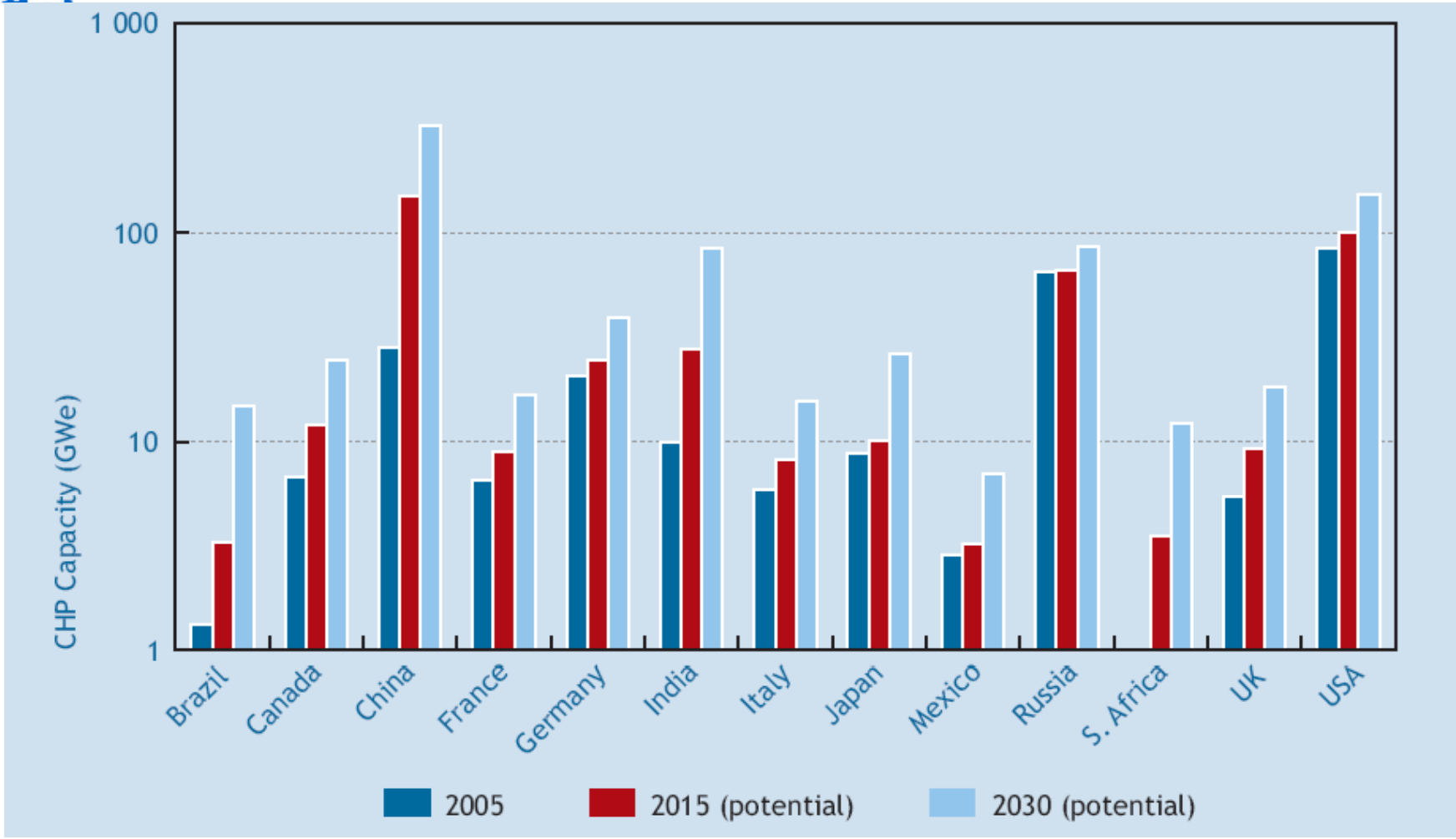
Collaborative Partners

One Model: Denmark



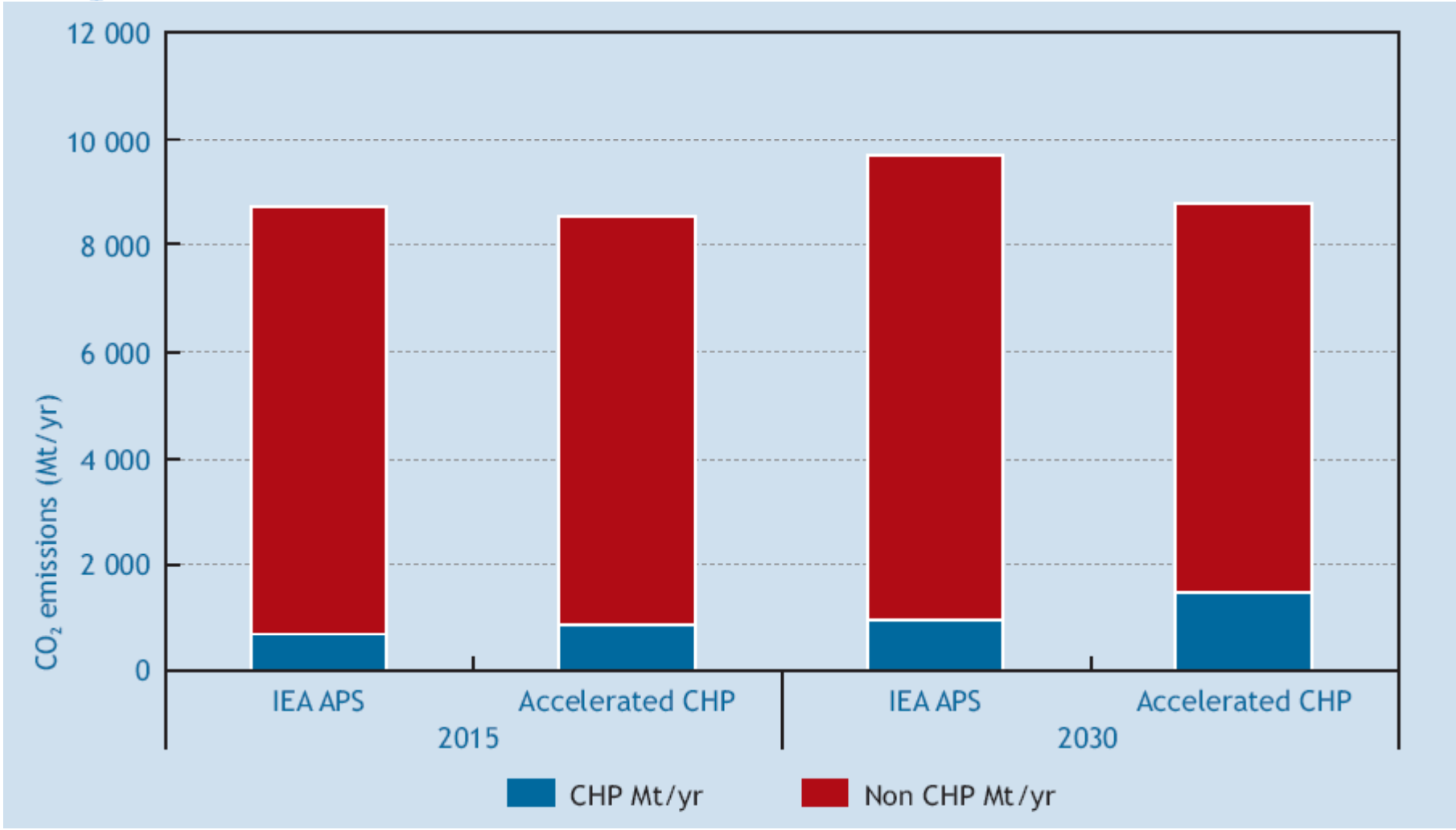
Source: IEA, *CHP: Evaluating the Benefits of Greater Global Investment* (2008).

CHP Potentials, 2015 and 2030



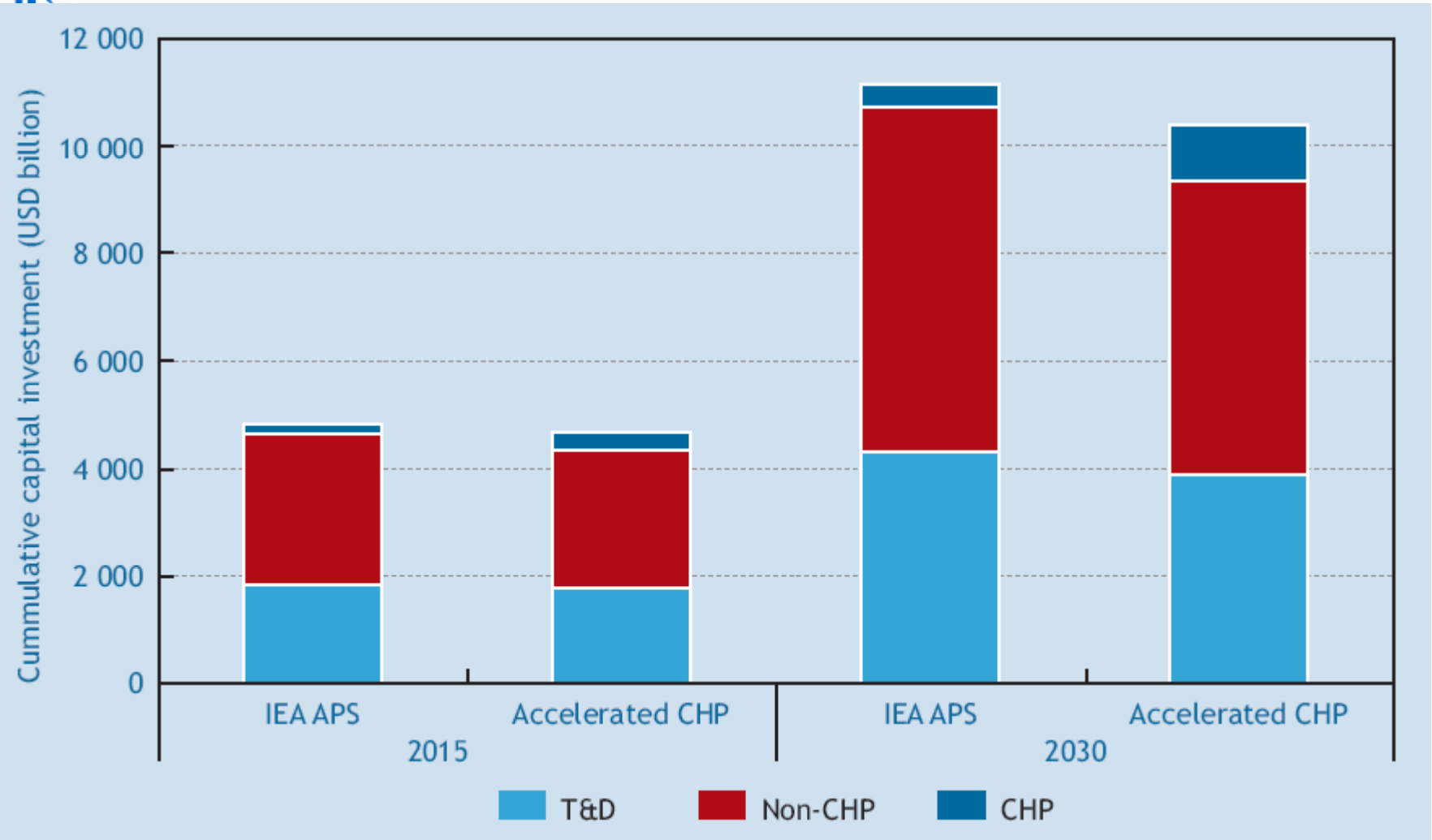
Source: IEA, CHP: Evaluating the Benefits of Greater Global Investment (2008).

CO_2 Emissions Benefits



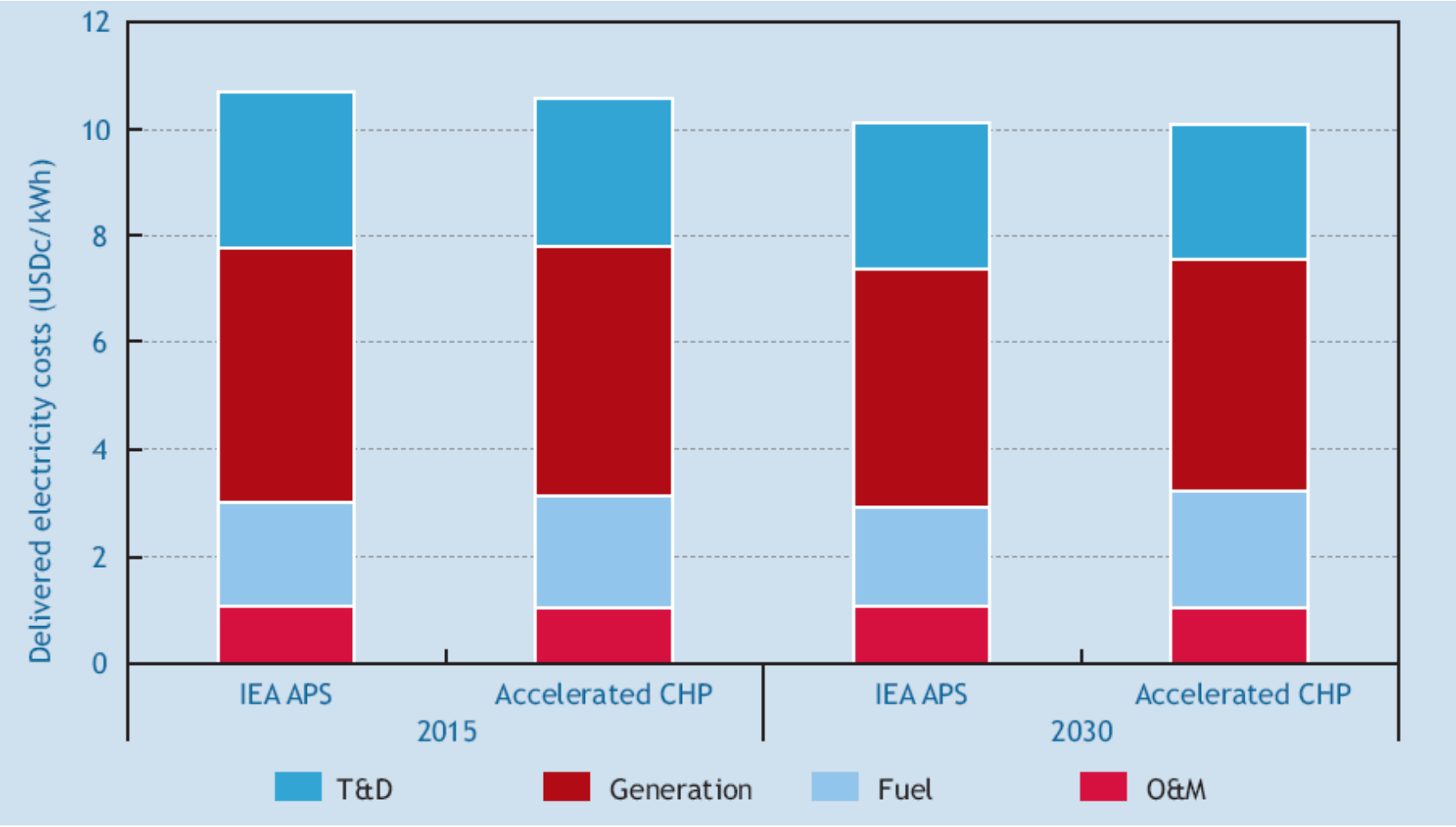
Source: IEA, CHP: Evaluating the Benefits of Greater Global Investment (2008) .

Capital Cost Savings



Source: IEA, CHP: Evaluating the Benefits of Greater Global Investment (2008) .

Consumer Rate Impacts



Source: IEA, CHP: Evaluating the Benefits of Greater Global Investment (2008) .

Case Studies

Apar industrial cogeneration project, India

- Gas turbine CHP unit with absorption chiller
- 64% overall efficiency
- 4,000 tons/year CO2 savings
- 515,000 USD annual savings
- 3-year payback

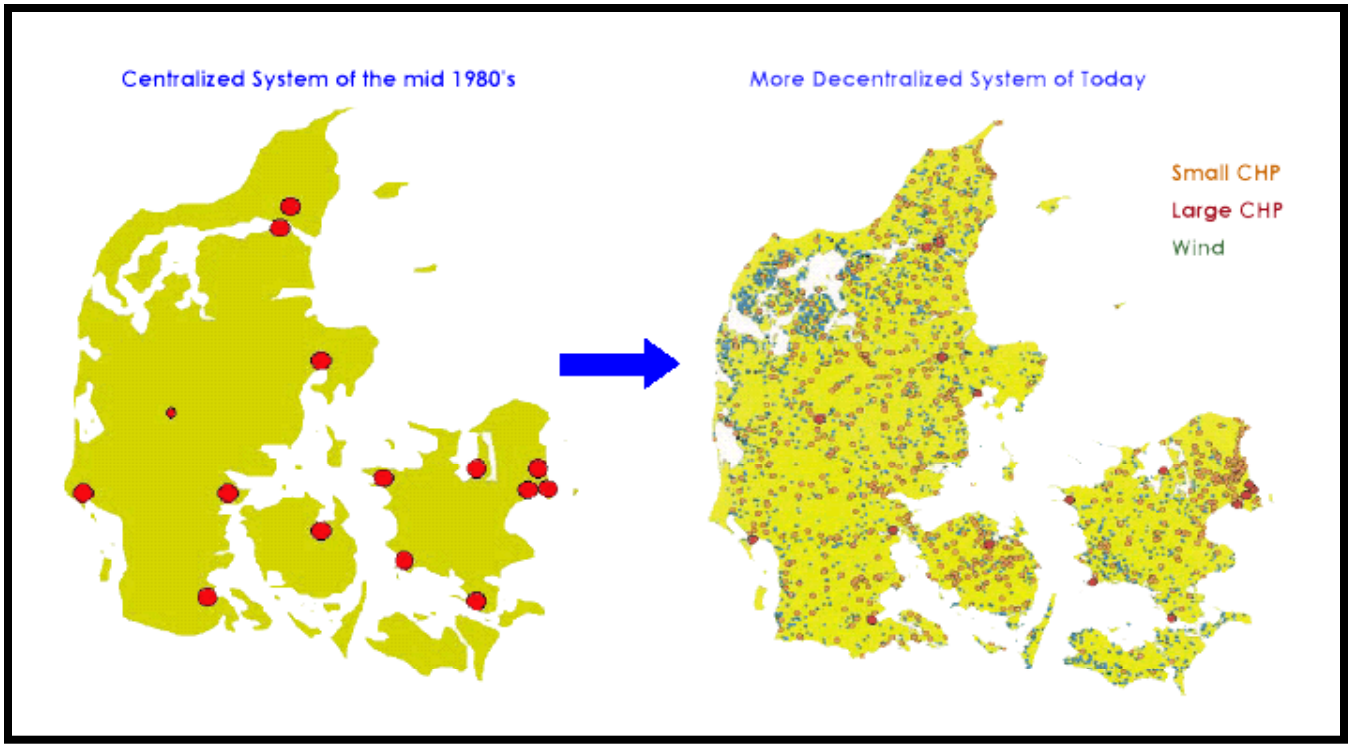
Shanghai Pudong International Airport, China

- Gas turbine CHP unit with absorption chiller
- 74% overall efficiency
- Less than 6-year payback

Source: IEA, CHP: Evaluating the Benefits of Greater Global Investment (2008) .

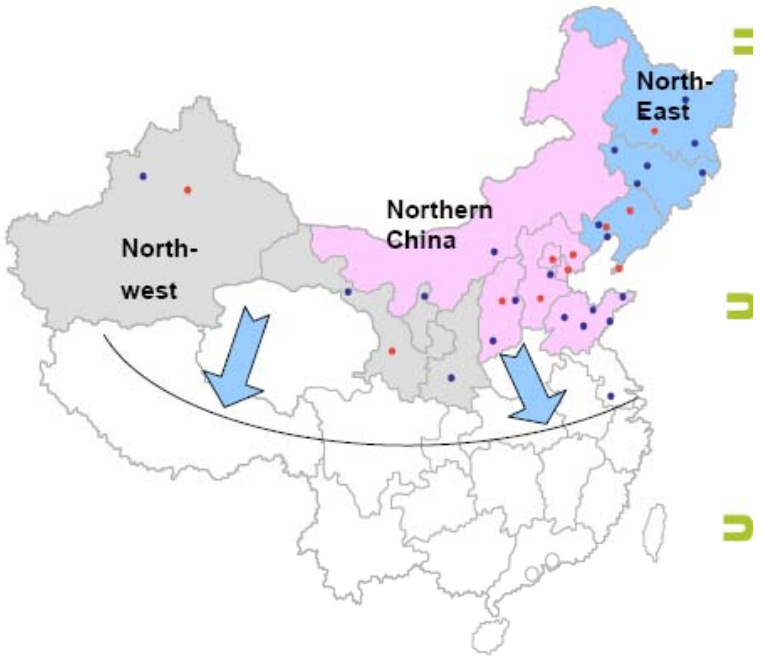
CHP and District Heating & Cooling

- Synergies
  - CHP needs DHC to create a sustainable heat demand
  - DHC needs CHP to achieve maximum CO_2 savings



CHP and DHC

- **Transfer of technology and expertise**
  - **Replicating the Danish experience in China**



  - **Key countries/regions:**
    - **China**
    - **Russia**
    - **E Europe**
    - **Korea**
    - **USA**
    - **EU**

Next Steps

- March 2008 publication
  - Improved global data and prospects globally and for G8 +5 countries
  - Analysis of associated CO_2, energy savings benefits
- October 2008: Best practice policies, approaches
  - CHP/DHC in cities - technologies, financing
  - Industrial CHP: focus on China, India, EU, US
  - DH and CHP in Russia, E Europe
  - Transitioning to biomass/renewable CHP/DHC
  - 20+ case studies posted on website
- Spring 2008: Country CHP profiles
- Outreach

For More Information

http://www.iea.org/G8/CHP/chp.asp

Thank you!

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