Projected Costs of Generating Electricity: 2010 Edition

Presentation by

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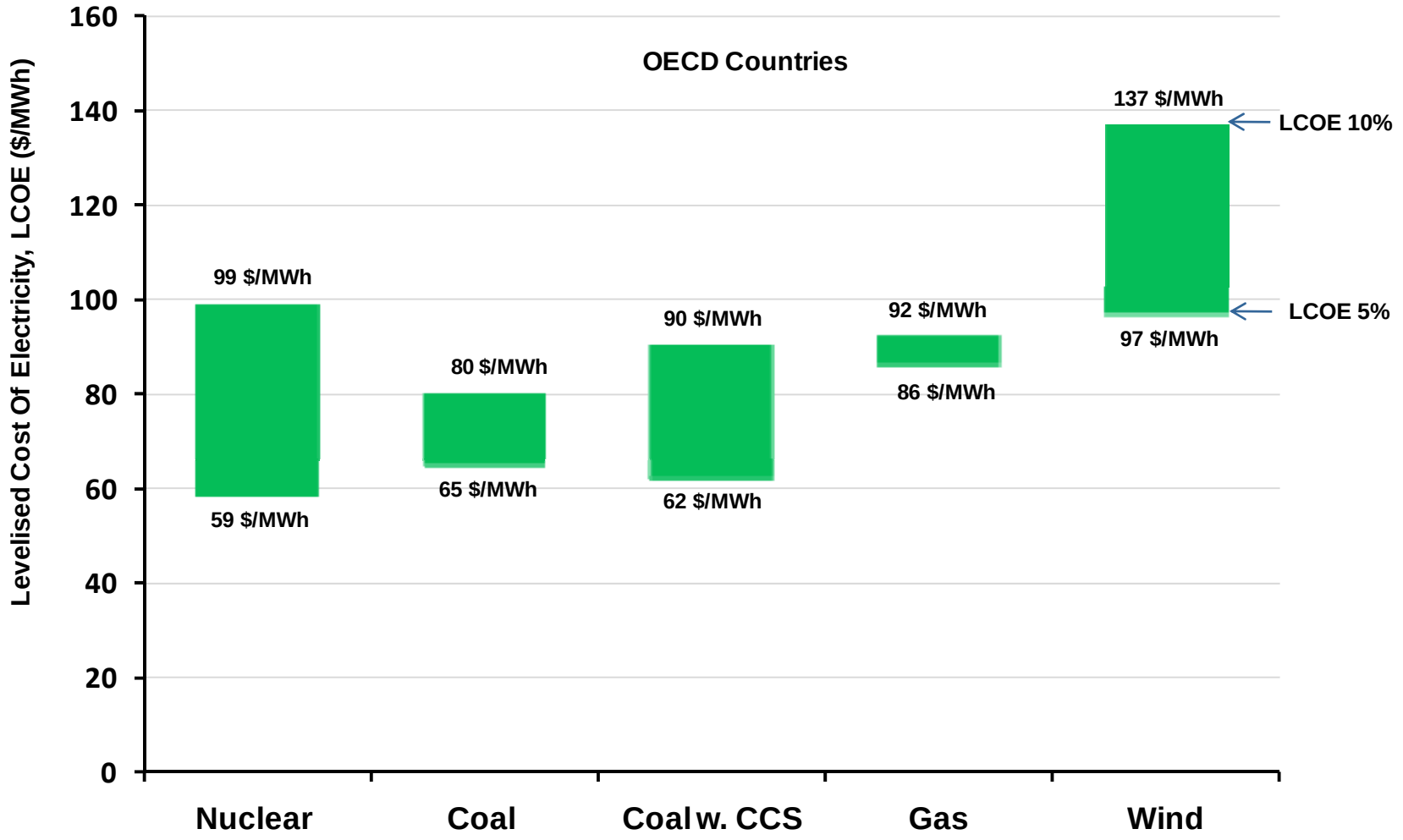
Projected Costs of Generating Electricity: 2010 Edition

- **7th Edition** in the series of Joint IEA/NEA studies (since 1983)
- Presents **baseload power generation costs** in order to compare:
  - Various types of generating plants within each of the countries represented
  - Between different countries for similar types of plants
- Current context is of **great uncertainty** over future input costs
  - Linked to the current economic and financial crisis
  - Also lack of binding agreement over climate change objectives
    - But investors already internalising future cost of carbon
  - The study assumes, for the first time, a **CO_2 price of 30 USD / tonne**
  - Long-term **fossil fuel prices based on WEO 2009** Reference and 450-ppm Scenarios
- The cost of electricity in the coming years will depend on a number of key parameters, foremost among them the cost of raising financial capital and the price of carbon

Content

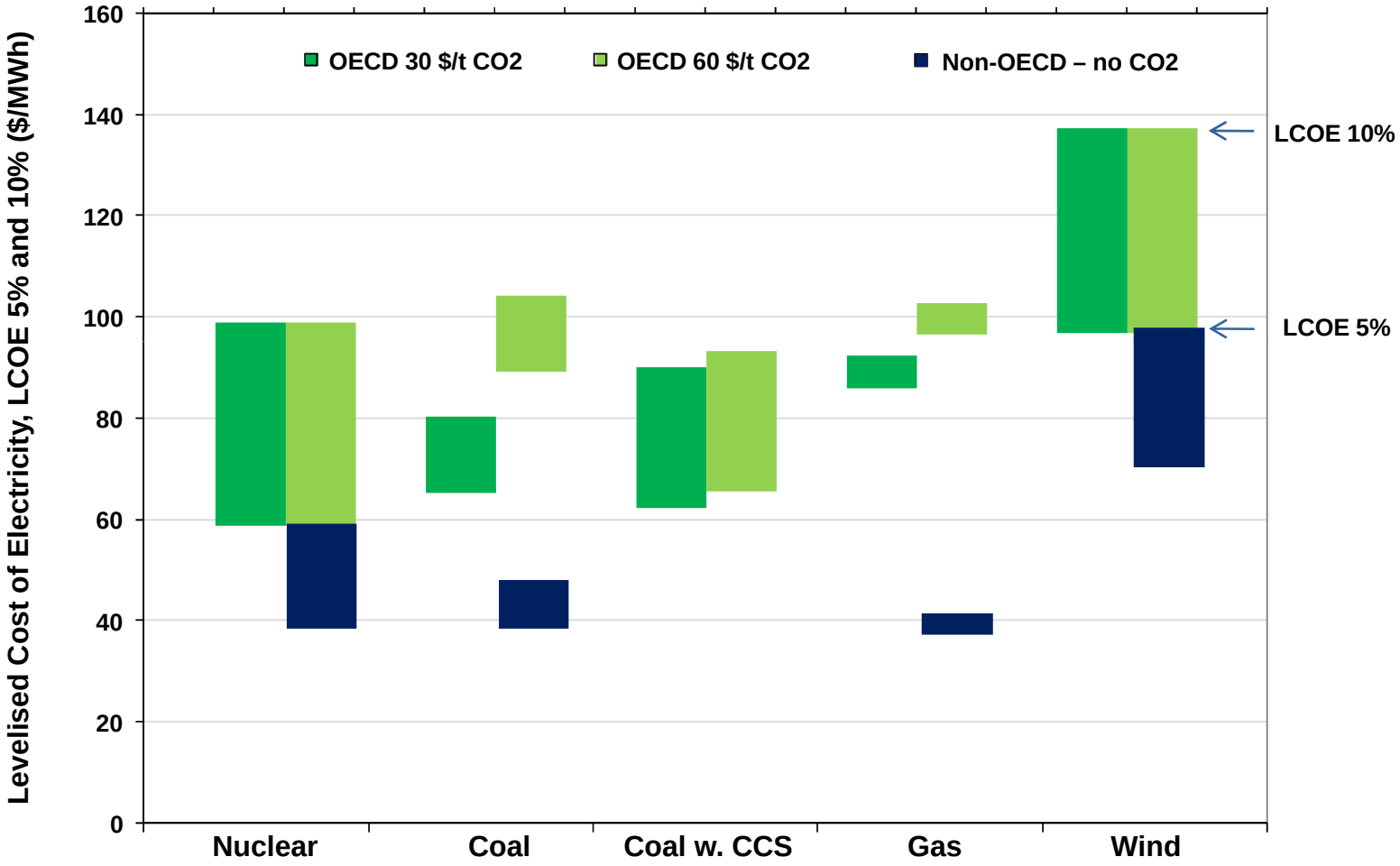
- Data for almost **200 new plants** starting operation around 2015 in **17 OECD** and **4 non-OECD** countries (Brazil, China, Russia, South Africa), including a wide range of technologies:
  - **Nuclear**: 20 light water reactors
  - **Gas**: 25 plants of which 22 CCGTs
  - **Coal**: 34 plants of which 22 SC/USC
  - **Carbon capture**: 14 coal-fired and 2 gas-fired plants with CC(S)
  - **Renewables**: 72 plants, of which 18 **onshore wind** and 8 **offshore wind**, 17 **solar PV** and 3 **solar thermal**, 14 **hydro**, 3 **geothermal**, 3 **biogas**, 3 **biomass**, 1 **tidal** and 2 **wave**
  - **CHP**: 20 plants, of which 13 gas-fired, 3 coal, 3 biomass, 1 biogas and municipal waste
- Extensive range of **sensitivity analyses** to changes in key cost parameters (interest rate, fossil fuel and CO_2 prices, construction costs, lead times, lifetimes, load factors) based on Median Case

Main Conclusions: Median Case - Sensitivity to Cost of Financing



No technology has a clear overall advantage globally or even regionally.

Main Conclusions: Median Case - Sensitivity to CO2 cost



To bolster competitiveness of low-carbon technologies such as nuclear, renewables and CCS, we need strong government action to lower the cost of financing and a significant CO_2 price signal to be internalised in power markets.

Each technology has strengths and weaknesses

- **Nuclear** delivers significant amounts of low-carbon electricity at stable costs – but has to manage high amounts of capital at risk, decommissioning and waste management and security issues
- **Coal** is competitive in the absence of a sufficiently high carbon price – but this advantage is quickly reduced as CO_2 cost rises
- **Carbon Capture** may be a competitive low-carbon generation option – but has not yet been demonstrated at commercial scale for power plants
- **Gas** key advantages are its low capital cost, low CO_2 profile and high operational flexibility, which make it a low risk option – but costs highly depend on gas price levels which may make it not profitable as baseload power
- **Hydro** and, for the first time **onshore wind**, are shown to be competitive in cases where local conditions are favourable – but if not dispatchable, renewables cannot be used for baseload

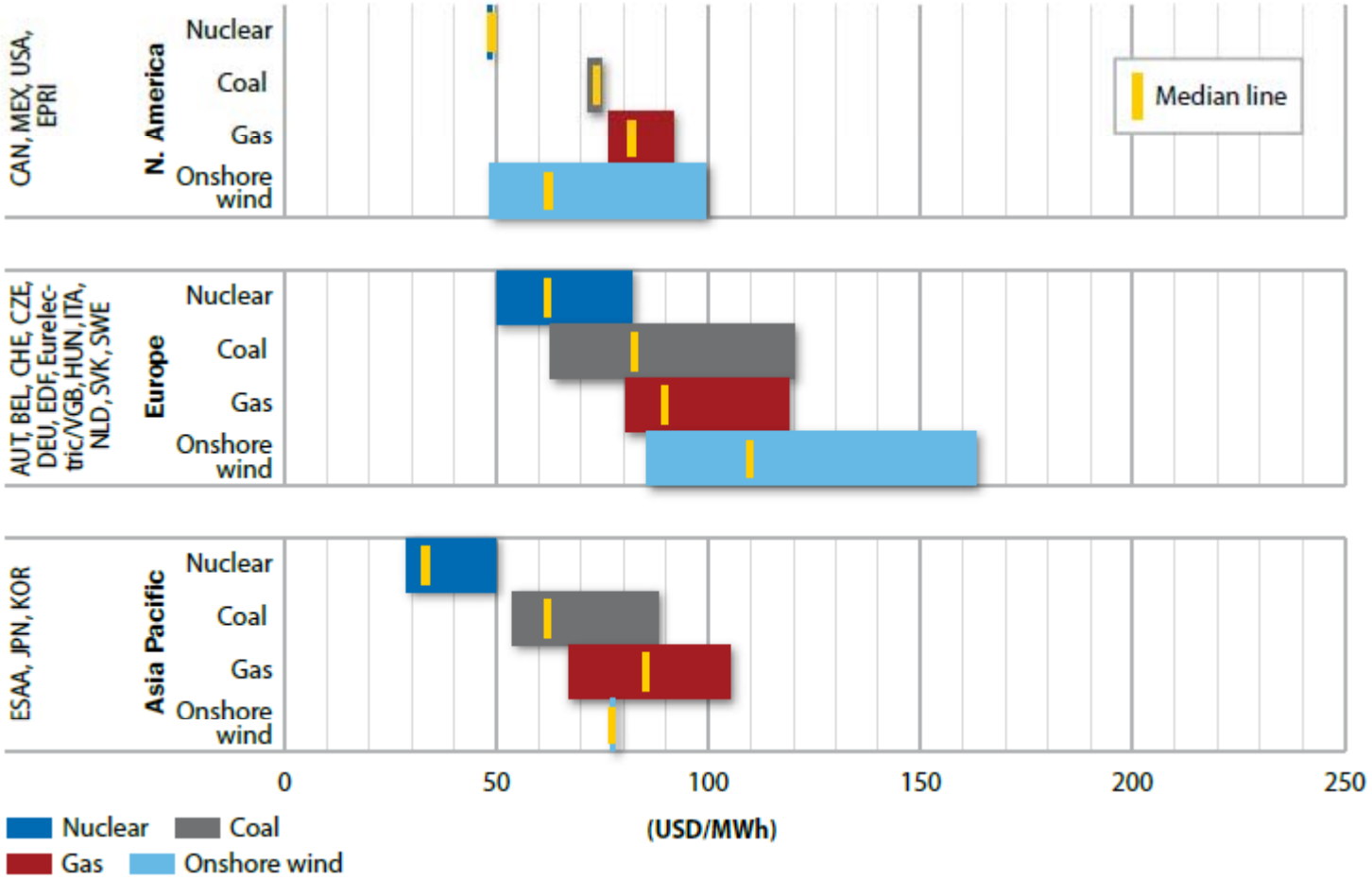
Basic Methodology of EGC Study

- In order to calculate LCOE per MWh all plants costs and revenues discounted or capitalised to the date of commissioning → **2015 (2020 for CCS)**
- Levelised average lifetime costs based on the equalization of discounted revenue and cost flows:

$$\textbf{LCOE} = \Sigma[(I_t + M_t + F_t)*(1+r)^{-t}] / \Sigma[E_t*(1+r)^{-t}]$$

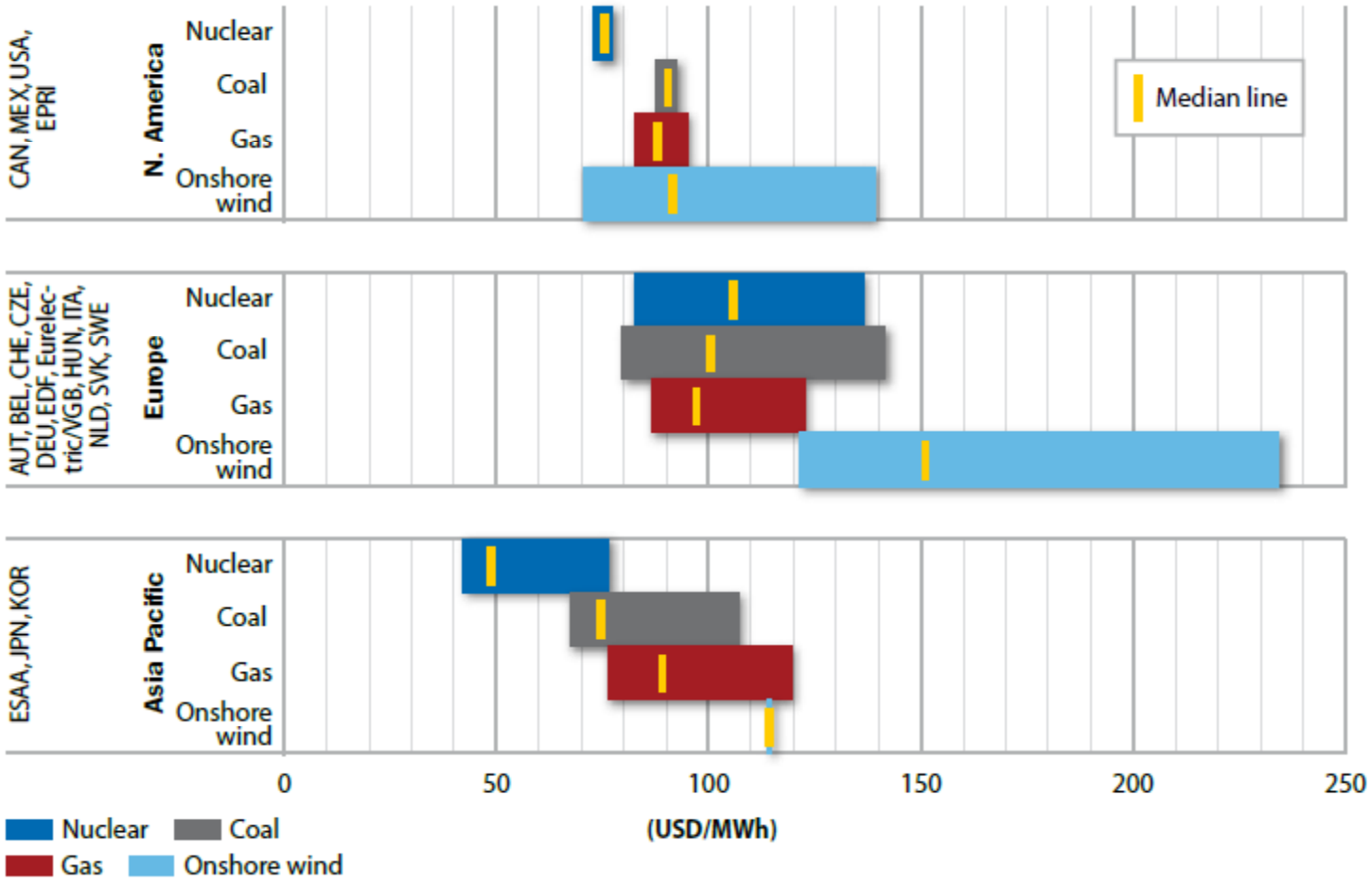
- Cost concept: **Social resource cost** rather than private investor financial cost (WACC): no inclusion of technology-specific risk but two discount rates, 5% and 10%
- Plant-level cost of the production of **base-load** power (85% load-factor) for nuclear, coal, gas and of **renewables** (local load factor); no inclusion of system costs

Regional ranges of LCOE for nuclear, coal, gas and onshore wind plants - 5% interest rate



With financing costs at 5%, nuclear, followed by CC(S) -both capital-intensive, low-carbon technologies- are the most competitive solutions.

Regional ranges of LCOE for nuclear, coal, gas and onshore wind plants – 10 % interest rate



With financing costs at 10%, coal-fired generation, followed by coal with CC(S), and CCGTs are the cheapest sources of electricity.

Key Messages

- Looking at detailed country numbers, the study provides a large variety of results - in the medium term, investing in power markets will be fraught with uncertainty
- We need all options – competition among technologies will be decided according to national preferences and local comparative advantages
- A 30 $/tonne CO_2 price is not enough to give a decisive advantage to low-carbon technologies in all circumstances – Government action is key to enhance their competitiveness
- System costs not included (which may be substantial) nor technology and portfolio considerations or risk assessment in the context of real power markets - complementary qualitative studies ("boundary chapters") on:
  - Financing issues
  - System Costs of Integrating Variable Renewables
  - Prospects for Carbon Capture and Storage
  - The Working of Electricity Markets