Renewables – development policies

Filip Černoch
cernoch@mail.muni.cz

CENTER FOR ENERGY STUDIES

What are RES?

- Renewable energy is energy derived from natural processes that are replenished at a higher rate than they are consumed.
- Solar, wind, geothermal, hydropower, bioenergy, ocean power.

Pros and cons

- Infinete by definition – in contrast to fossil fuels.
- No geopolitics included – are evenly spreaded. That contrasts with the conventional (fossil) fuels that are more geographically concentrated.
- Low environmental impact (vary according the technology) – GHG emissions, local pollutants.
- Strategic economic development (rural development, agriculture sector, high-tech manufacturing).
- Energy access through distributed or off-grid sollutions → de-centralized energy system.

Pros and cons

- Low density source – difficult to produce the energy quantity equivalent to that produced by non-renewable sources.
- Technology is expensive.
- Affected by weather (wind and solar non-dispatchable), their reliability is limited.

Global trends

- Supportive governmental policies.
- As a result „RES have been the driver of much of the growth in the global clean energy sector since the year 2000 … As global renewable elektricity generation expands in absolute terms, it is expected to … become the second most important global elektricity source, after coal (by 2016)“ (IEA).
- In 2013 RES accounted for almost 22% of total power generation. Globally, renewable generation was on par with that of natural gas.

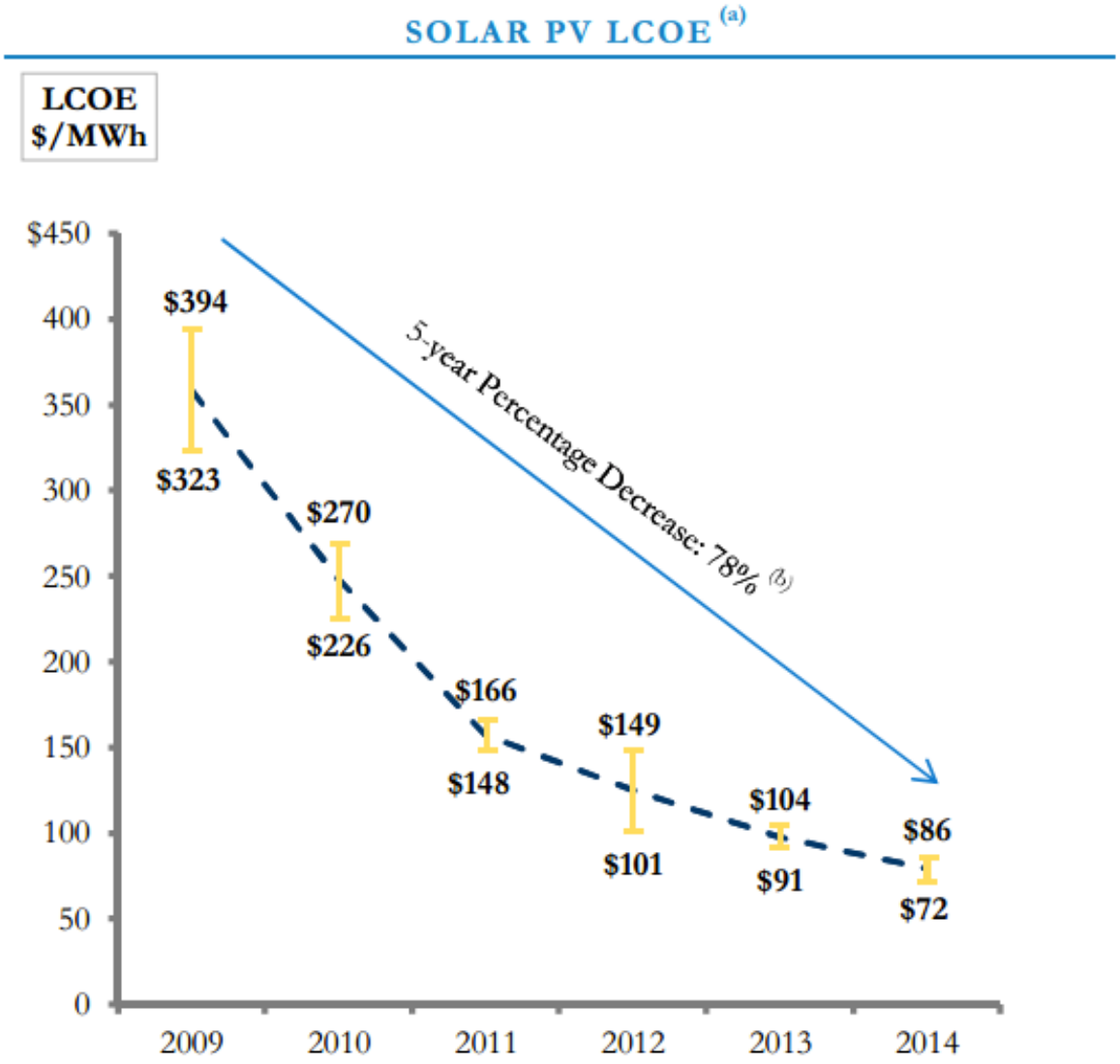
Global trends

- Global renewable elektricity generation projected to grow by almost 45% (+5,4% per year) by 2020.
- 2 global trends driving the development of RES power capacity. 1) development should spread out geographically 2) RES technologies are becoming competitive on a cost basis with alternatives.
- Annual growth in new capacity is expected to stabilise over 2013-2020, reflecting growing risks to deployment in some markets and remaining development barriers.
- Non-OECD countries are expected to account for around 70 % of new RES generation from 2013-2020. (Number of markets have adopted long-term policy framework).

Global trends

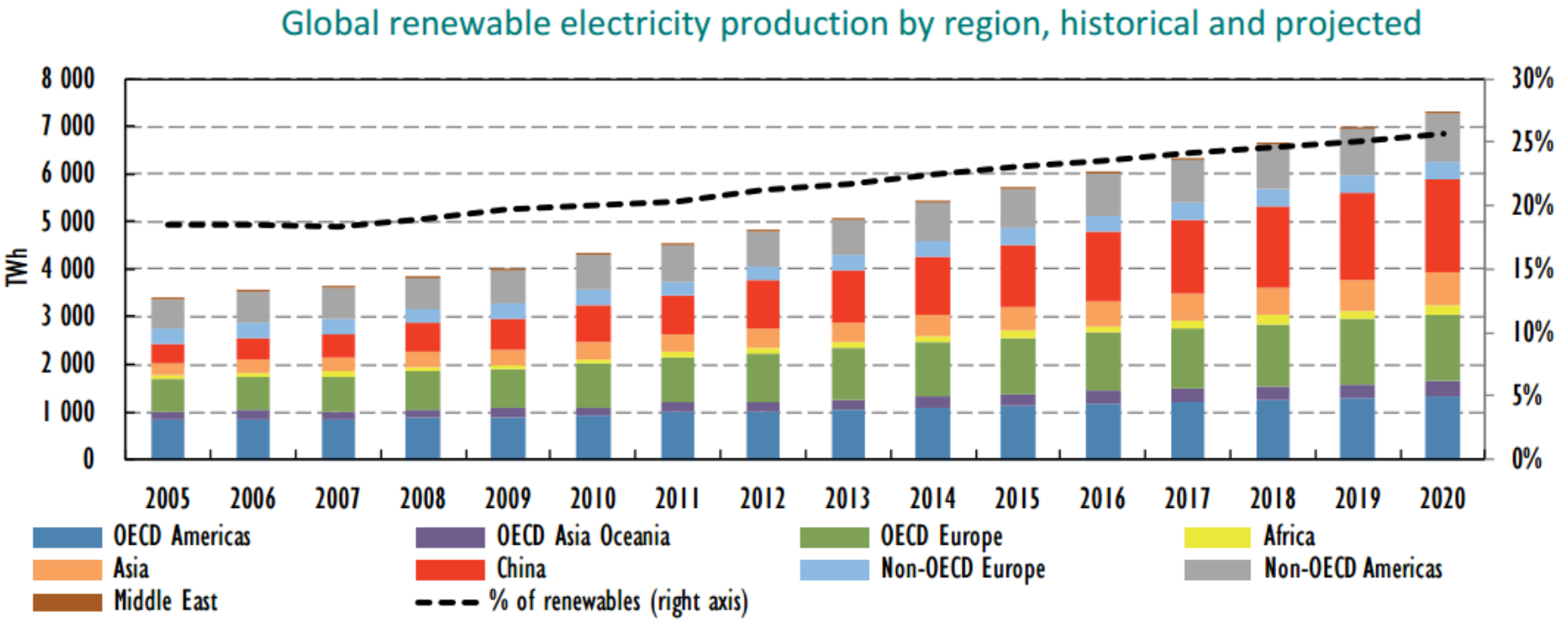
- China remains the anchor of RES capacity deployment, accounting for almost 40 % of the global expansion and over 60 % of non-OECD growth. RES should account for nearly 45 % of incremental power generation over the medium term, ahead of coal.
- In 2013 global new investments in RES capacity estimated over USD 250 billion (plateued, slightly decreasing in last years).
- Reduction in investment costs have helped the LCOE. Closing gap between competitiveness of traditional sources and RES. Competitiveness depends heavily on market conditions and political framework (onshore wind in Brazil, South Africa, PV in Chile).

Costs of PV technology



CENTER FOR ENERGY STUDIES

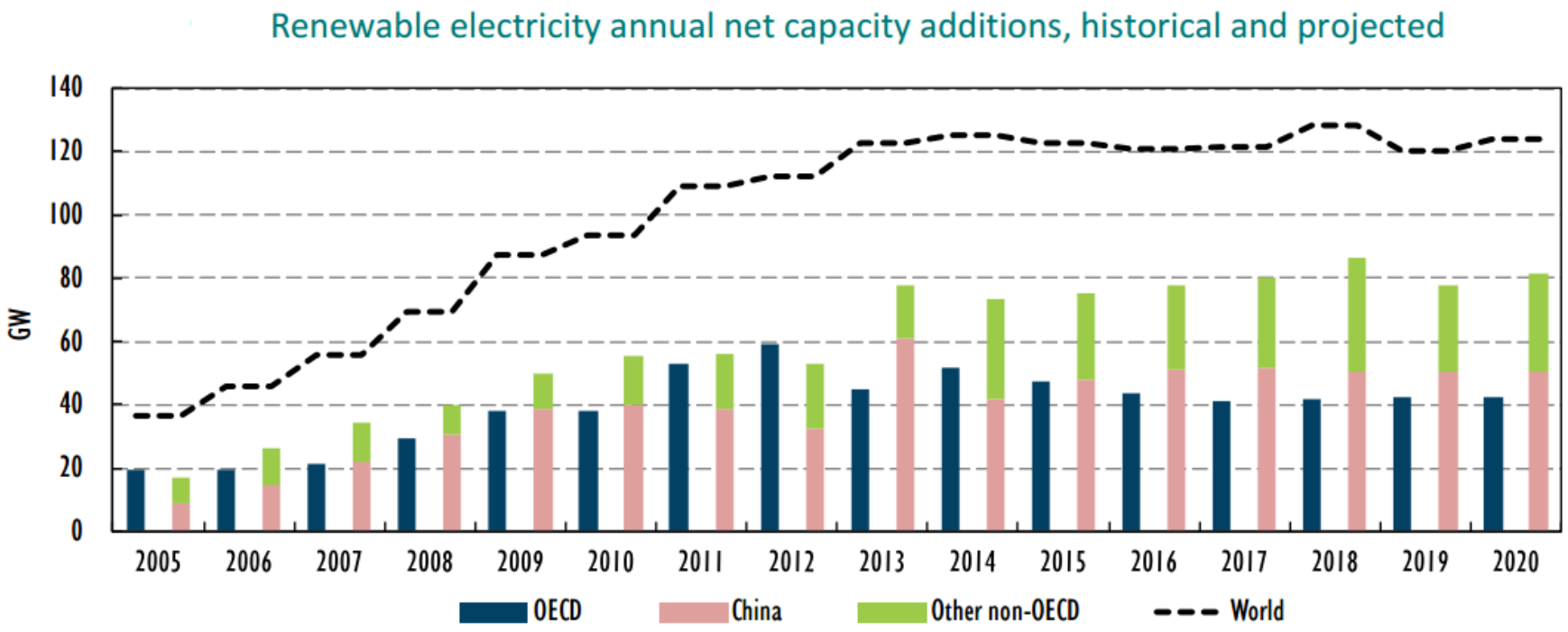
RES electricity production by region



Notes: unless otherwise indicated, all material in figures and tables in this chapter derive from International Energy Agency (IEA) data and analysis. Hydropower includes pumped storage; the onshore and offshore wind split is estimated; total generation is gross power generation.

CENTER FOR ENERGY STUDIES

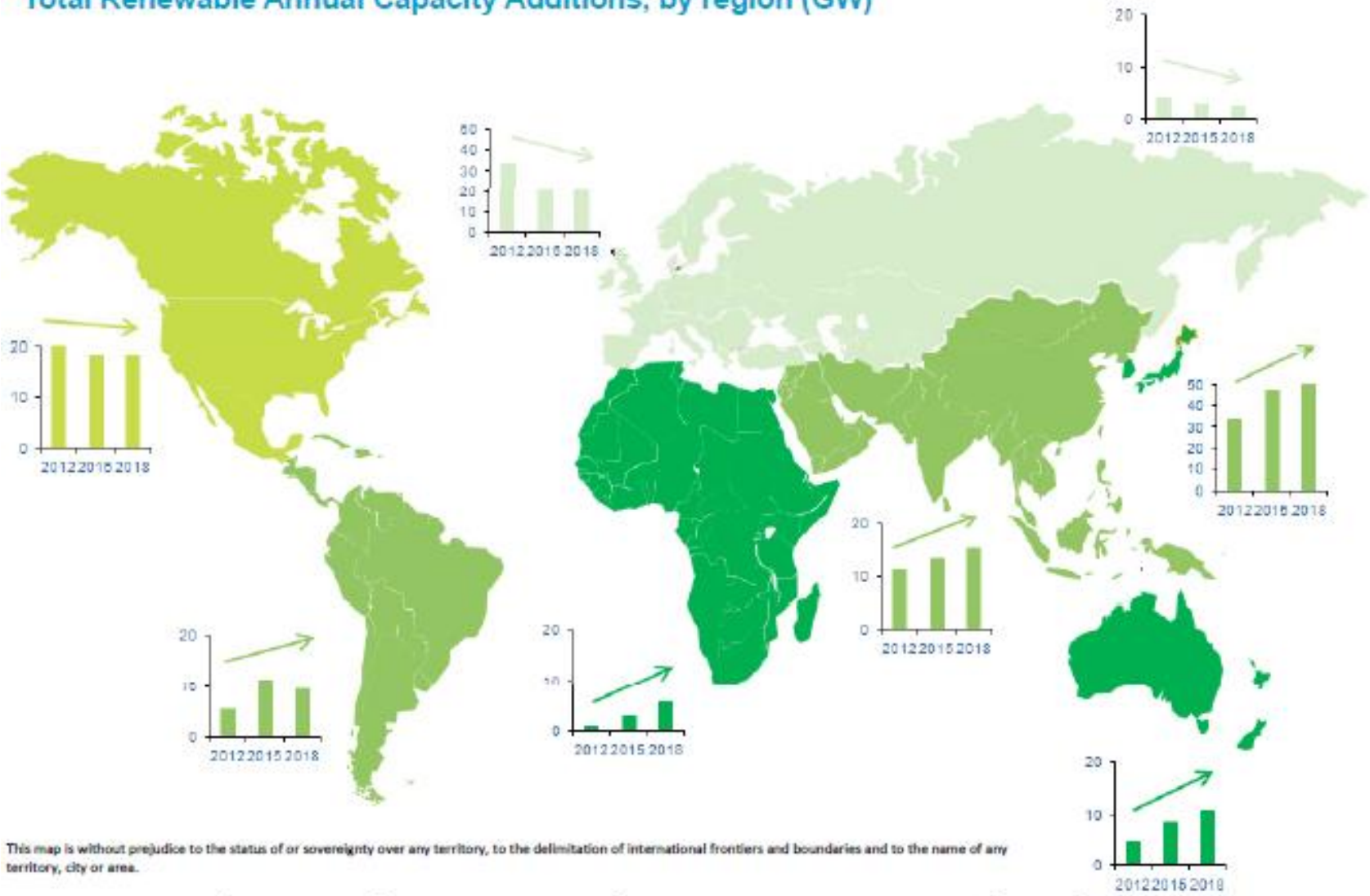
Global trends



CENTER FOR ENERGY STUDIES

Renewable power spreading out everywhere

Total Renewable Annual Capacity Additions, by region (GW)



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

- Emerging markets more than compensate for slowing growth and volatility in markets such as Europe and the US

Barriers to RES – cost and pricing

„RES costs more than other energy resources“.

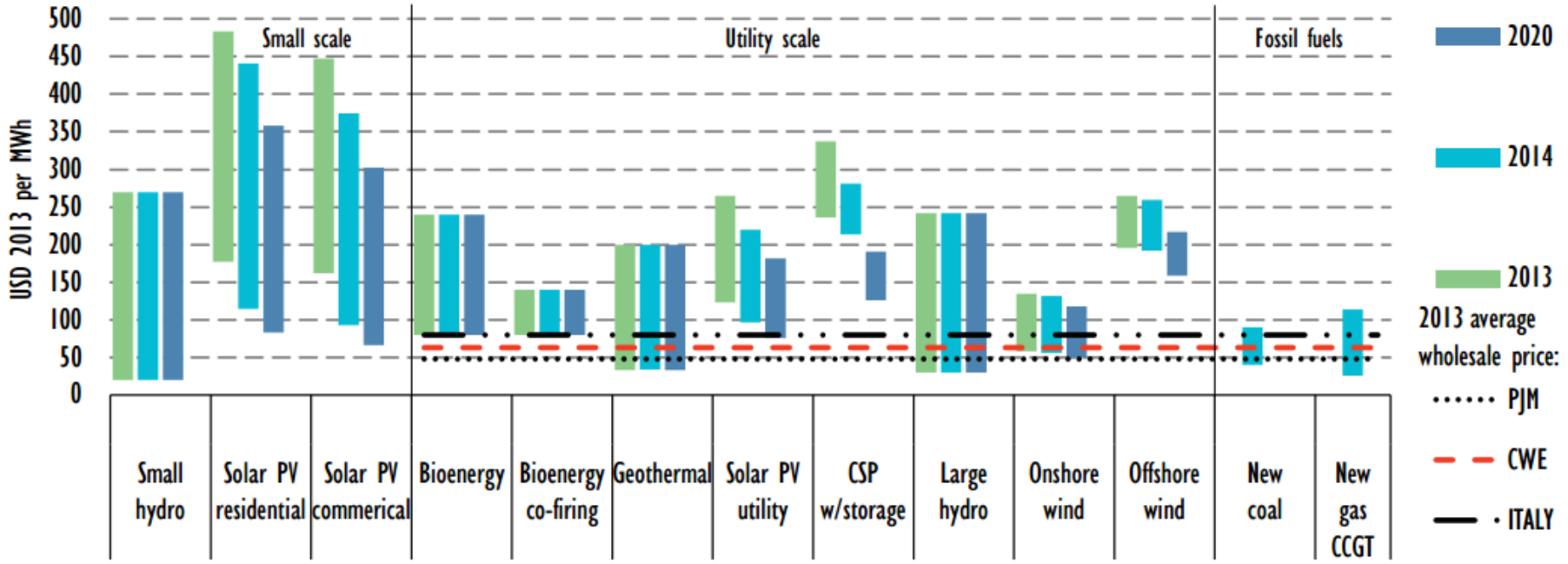
But variety of factors can distort the comparison.

- Public subsidies – in 2011 renewables received roughly €30 billion in subsidies, nuclear power €35 billion and fossil fuels took €26 billion. (EEA 2013)
- High initial capital costs – lower fuel and operating cost make RES cost competitive on a life-cycle basis, but higher initial capital costs results in less installed capacity per initial euro invested. RES generally require higher amounts of financing for the same capacity. Capital markets may demand a premium in lending rates for financing RES because more capital is being risked up front than in conventional projects.

Barriers – cost and pricing

- Transaction costs – RES instalations typically smaller than conventional energy projects. That makes transaction costs (eg. resource assessment, sitting, permitting, planning…) higher.
- Environmental externalities.
- Unfavourable power pricing rules – RES may not receive full credit for the value of their power. On one hand, they are close to the consumer, on the other hand those sources are intermitent.
- Difficulty of fuel price risk assessment – risk associated with fluctuations in future fossil fuel prices may not be quantitatively considered in decisions about new power generation capacity because these risks are inherently difficult to access.

Levelised costs of electricity (USD per megawatt hour [MWh]), beginning year



Notes: CSP = concentrated solar power; CCGT = combined cycle gas turbine. Wholesale power prices are expressed as the annual average of daily traded, day-ahead base-load power prices. CWE (Central Western Europe) refers to annual average of power prices in France, Germany, Austria and Switzerland. United States (US) PJM refers to the regional transmission organisation covering parts of 13 states in the mid-Atlantic and Midwest portion of the United States. LCOEs reflect typical system costs for selected technologies. Costs are indicative and ranges reflect the system cost, resource and financing differences among countries. Geothermal LCOE range includes only conventional and binary plants.

Source: IEA analysis with 2013 wholesale electricity price data from Bloomberg LP (2014), accessed 01 June 2014; and EIA (Energy Information Administration) (2014), Wholesale Electricity and Natural Gas Market Data accessed 20 May 2014, Washington D.C.

CENTER FOR ENERGY STUDIES

Legal and regulatory barriers

- Lack of legal framework for independent power producers – in many countries power utilities still control a monopoly on production and distribution → absence of a legal framework for independent producers investing in RES facilites and selling their electricity.
- Restriction on siting and construction – based on height, aesthetics, noise, safety. Permiting authorities may not be familiar with the technologies.
- Transmission access – utilities may not allow favorable transmission access to RES or may charge high prices for transmission access.

Legal and regulatory barriers

- Utility interconnection requirements – individual home or commercial systems connected to utility grids can face inconsistent or unclear utility interconnection requirements. Lack of uniform requriements add to transaction costs.
- Liability insurance requirement – problem for small power generators that may face excessive requirements for liability insurance.

Market performance barriers

- Lack of access to credit – small investors may lack access to credit to invest in RES (esp. when state support policy is unstable).
- Percieved technology performance uncertainty and risk – even proven and cost effective technologies may be percieved as risky if there is little experience with them in region. Wrong perception (or missing experience) may increase required rates of return, resultin in less capital availability. „Lack of utility acceptance.“

Market performance barriers

- Lack of technical or commercial skills and information – markets function best when everyone has low-cost access to information and skills. But in specific markets, skilled personnel who can install, operate and maintain RES technologies may not exist in sufficient numbers.

Barriers to renewable energy

= Policy remains vital to the competitiveness of RES. Policy uncertainty remains a key challenge to the RES deployment.

= Non-economic barriers, integration challenges, grid connection risks … can all increase financing costs and prevent investments.

= in some areas RES are competitive without financial suppport.

Support policies

- Public funds for RES development.
- Infrastructure policies to build and maintain market infrastructure.
- Construction and design policies.
- Site prospecting, review and permitting.
- Equipment standards and certification.
- Government procurement.
- Custromer education.
- Indirect support policies.
- …

CENTER FOR ENERGY STUDIES

Tackling economic barriers

- RES projects are capital-intensive with low operating costs.
- The logical support for them would be cost reduction policies, not operating subsidies. This was the norm in the early days and some countries still give personal income, corporate, property tax and VAT exemptions for RES.
- Consumer levies also hit the poorer harder.

Cost-reduction policies

Designed to provide incentives for voluntary investments in RES by reducing the cost of these investments.

- Reduction of capital costs up front via subsidies and rebates. (In the EU a long history - in 1991 Germany´s 1000 solar roofs program to subsidise individual household purchases of PV of up to 60% of capital system costs).
- Reduction of capital costs after purchase via tax reliefs (esp. U.S., but also Japan, Europe, India…).
- Offseting costs through the payments based on power production via production tax credits (grants).
- Providing concessionary loans and other financial assistance.

Operating subsidies

- Funding through consumer levies has the advantage of a) not putting a further burden on government budgets, and b) being less visible, except in countries where the RES surcharge is clearly marked on consumers' energy bills.
- More efficient in terms of faster dissemination of RES technology.

Operating subsidies

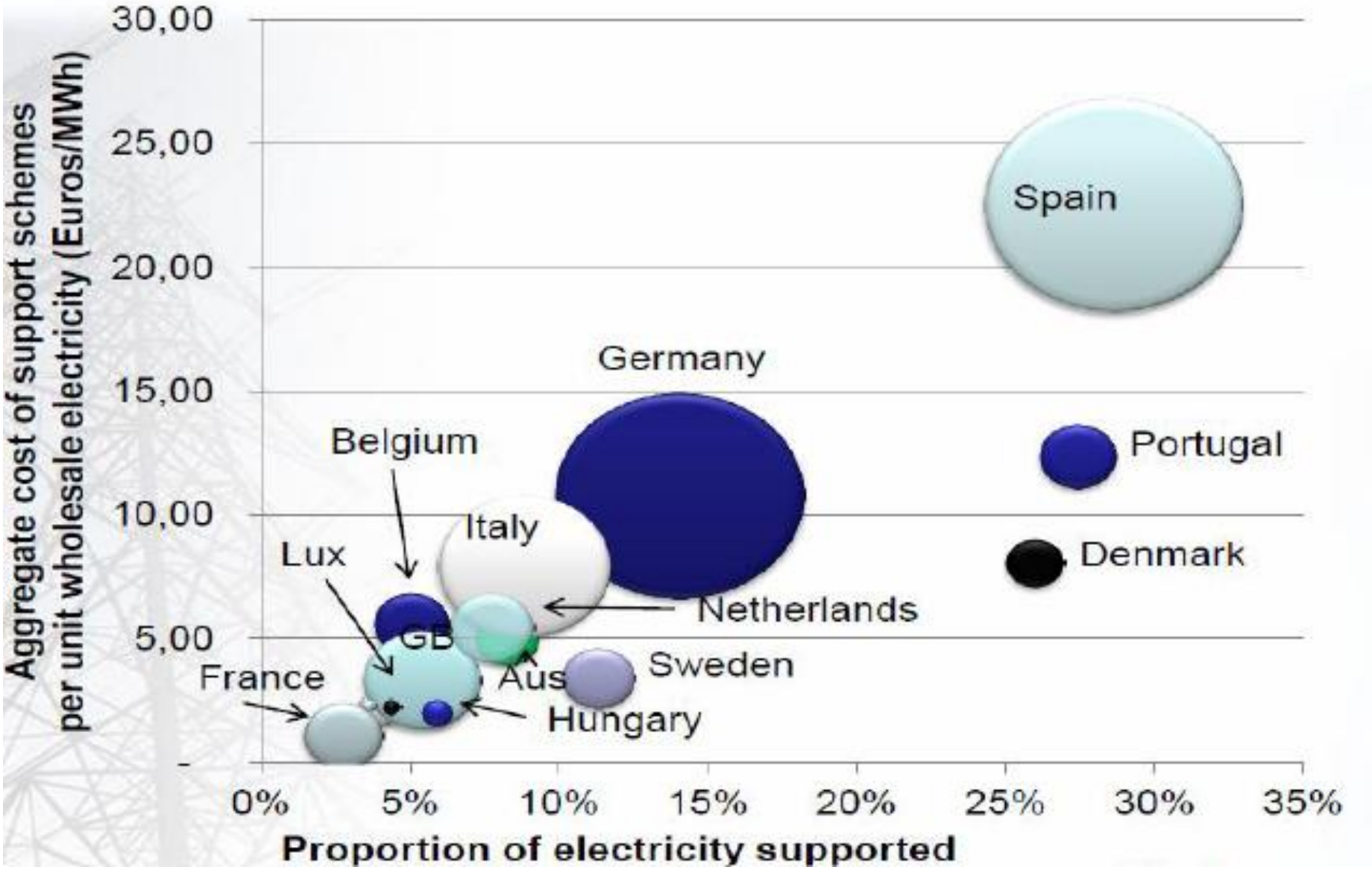
- Price-setting policies reduce cost- and pricing-related barriers by establishing favorable pricing regimes for RES relative to other sources of power generation. The quantity is unspecified, but prices are known in advance.
- Quantity-forcing policies do the opposite. They mandate a certain percentage (or absolute quantity of generation) at unspecified prices.

Price setting policies

- Feed-in tariffs. provide a fixed rate of subsidy for fixed period. Designed to cover all producer's costs and profit, they essentially replace the market. Very successful in triggering large deployment of RES, but at a high cost. Basic rule is government sets the price, market (investor response) sets the quantity, but many recent amendments to control cost.
- Grid priority - the grid must take RES electricity first.
- Feed-in premiums act as a partial FiT providing a top-up to electricity market price. Increasing popularity.

Quantity forcing policies

- Quota obligations with tradeable certificates. Government sets the quantity, the market the price. These exist in 6 EU states (2013), have been less successful, but are cheaper.
- Two sources of revenues. 1) The power is sold on the normal power market. 2) RES generators sell a certificate that represents a certain amount of renewable electricity they generated on the separated market. Demand for these certificates is ensured by a quota obligations.



CENTER FOR ENERGY STUDIES

Indirect promotion policies – emission reduction policies

- Policies to limit GHG increase the price of carbon (cap and trade policies), resulting in higher competitiveness of RES.
- Regulation – favours RES (and nuclear) in energy mixes at the expense of fossil fuels.
- Taxation – higher price of fossil energy.

Indirect promotion policies – power sector restructuring policies

Complex changes of traditional mission and mandates of electric utilities.

- Self-generation by end users and distributed generation technologies. Shift to end users being also independent power producers. RES is well suited to self-generation.
- Competitive retail power markets and green power sales – consumers are free to select their power suppliers from those operating in a given market, they can choose for the green energy. (In Netherland after restructuring in 2001 1 million green power customers signed up within the first year – there was also a large tax on fossil fuels).

- Privatization (and/or commercialization) of utilities. Utilities are becoming private for-profit entities that must act like commercial corporation. (or losing state subsidies in terms of state-run companies). It could affects the RES deployment in many ways, pozitive or negative, depending on the situation.
- Unbundling of generation, transmission and distribution. Unbundling can provide greater consumer incentives to self-generate using RES (to avoid transmission and distribution charges).

Sources

- IEA (2011): Renewable Energy. Policy Consideration for Deploying Renewables
- IEA (2011): Deploying Renewables: Best and Future Policy Practice

CENTER FOR ENERGY STUDIES