QUELS SOUTIENS AUX ÉNERGIES RENOUVELABLES ÉLECTRIQUES ?

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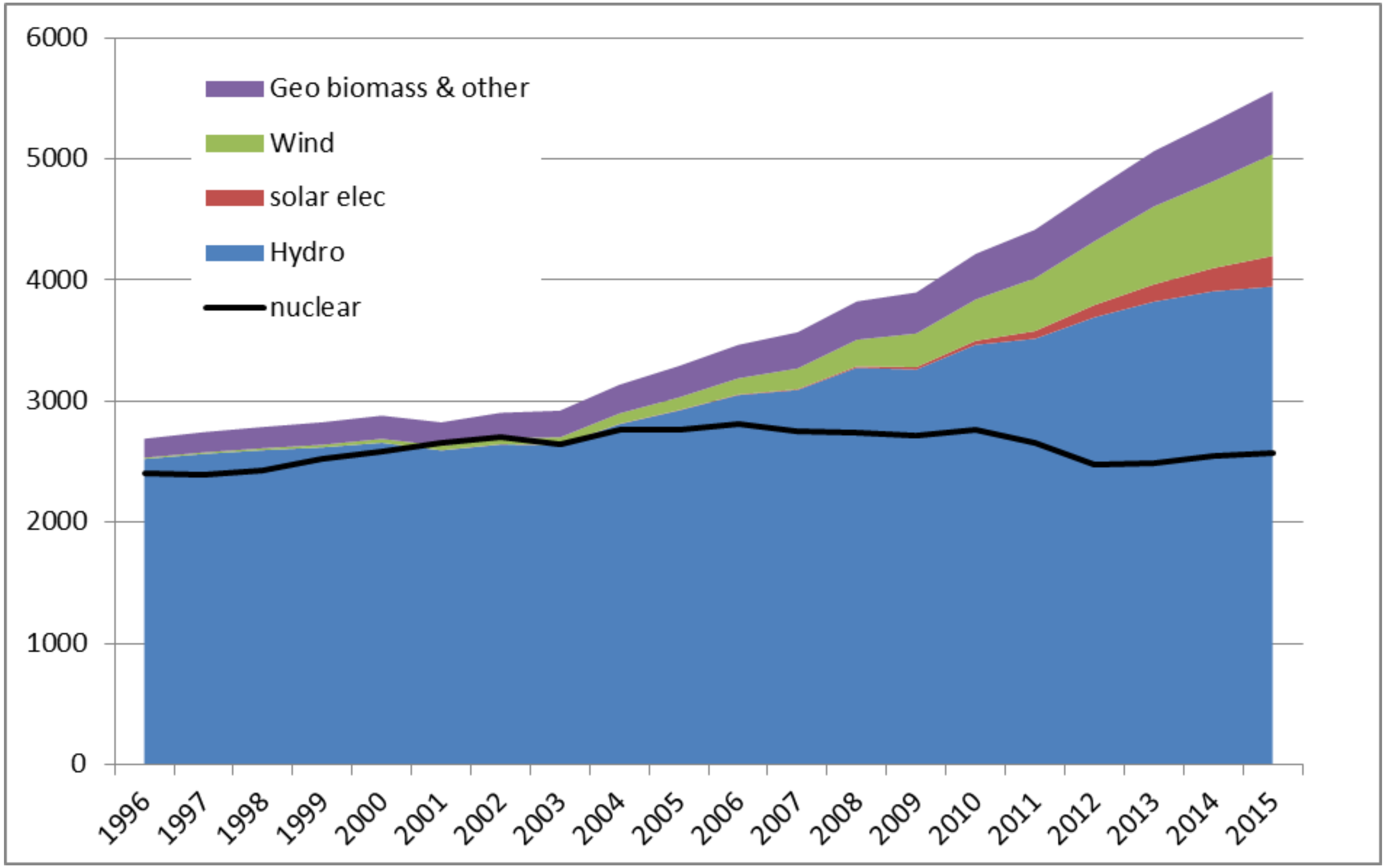
Electricity from renewables & nuclear, World, 1996-2015



Source: BP Statistical Review of World Energy June 2016

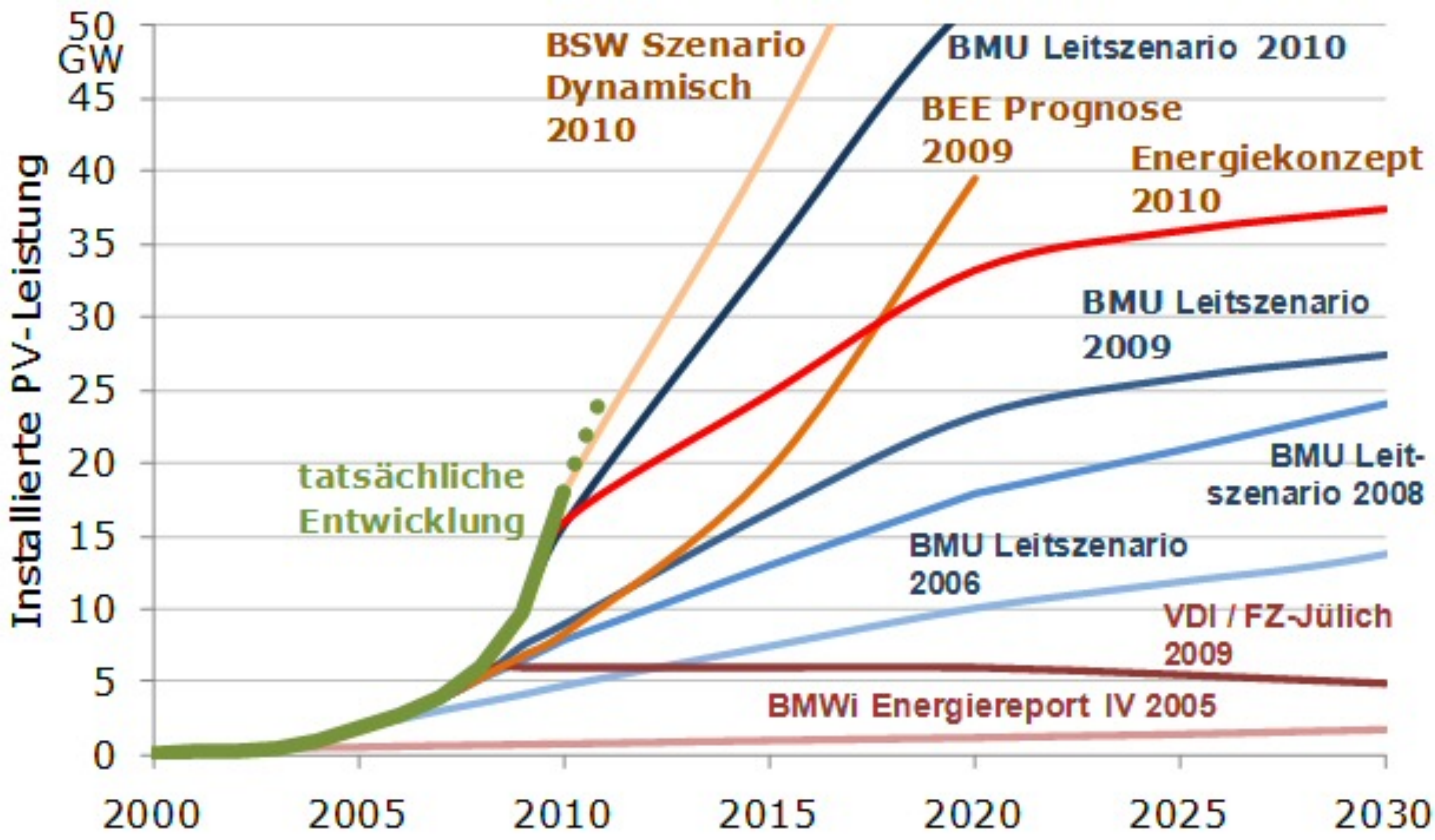
3 main policy instruments for renewables in electricity

- **Feed-In-Tariffs (FIT)**
  - Electricity bought at a guaranteed price for 10-20 years
  - Boosted wind & PV in Denmark, Germany, Spain, France…
  - More & more limited to small-scale PV
- **Feed-In-Premium (FIP)**
  - Per-unit subsidy added to the market price
  - Germany, France moving to FIP (wind)
- **Tradable Renewable Quota (TRQ)**
  - Minimum share of renewables in the power mix; renewable power producers sell "green certificates"
  - Aka "Tradable Green Certificates" (TGC), "Renewable Portfolio Standards" (RPS)
  - Some US states, Korea, Sweden…

Outline

1. FIT vs. FIP vs. TRQ wrt.
   1. Uncertainty
   2. Electricity price variation through time
   3. Imperfect competition
   4. Transaction costs
2. ≠ support levels for ≠ market segments?
3. How to fund the subsidies?
4. Auctions in the EU

1.1. Uncertainty (1)



1.1. Uncertainty (2)

- **Schmalensee 2012**: FIT vs. TRQ
  - No explicit externality → same exp. renewable prod.
  - Uncertain ren. cost
  - Same Expected social cost
  - FIT: lower variance for ren. producers
  - Variance in social cost depends on parameters, likely lower for TRQ
  - Decreasing marginal fossil cost & perfect competition: ?
- **Narita & Requate 2014**: FIT vs. TRQ
  - Externality: CO_2 emissions but internalised by CO_2 tax
  - Uncertain fossil cost: TRQ $\succ$ FIT… but because price cap!
  - Uncertain ren. cost: depends on parameters

1.1. Uncertainty (3)

- **Cornago & Foucart 2014**:
  - TRQ vs. absolute ren. quota vs. fossil quota.
  - Externality: CO_2 emissions
  - fossil quota $\succ$ ren. quota $\succ$ TRQ (share of ren.)
- **Marschinski & Quirion 2014**:
  - FIT vs. FIP vs. TRQ
  - Externality: induced technical progress
  - Uncertainty over fossil cost, ren. cost or elec. demand
  - Numerical application to the US
  - General result: FIT $\succ$ TRQ, FIP $\succ$ TRQ

1.1. Uncertainty (4)

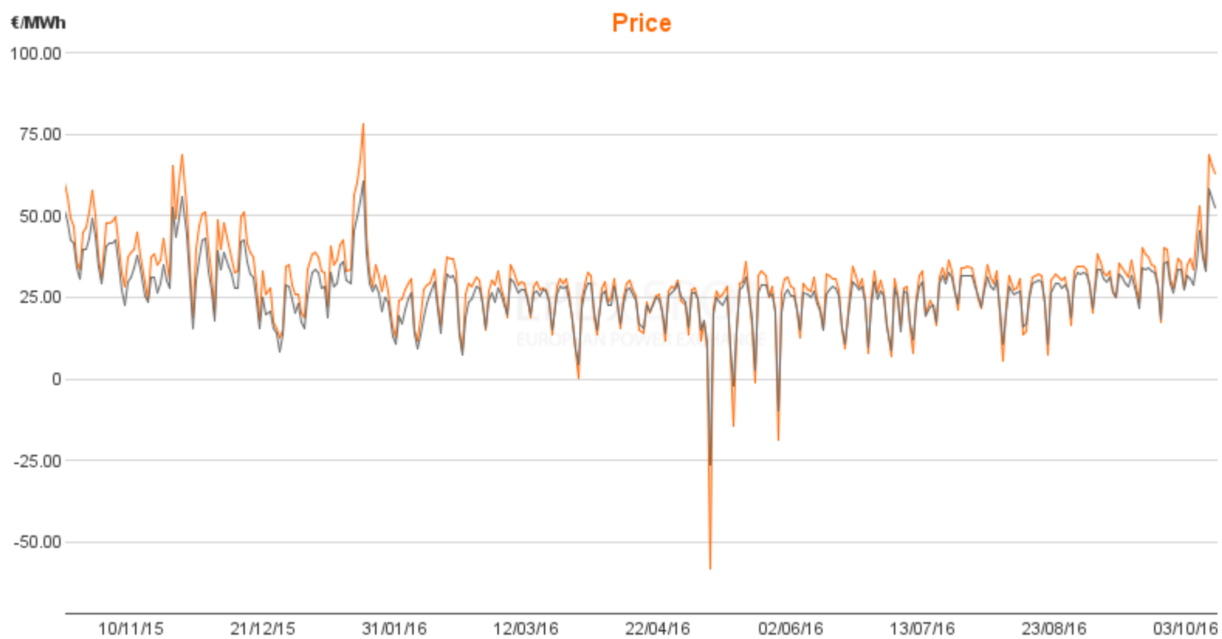
- **Lecuyer & Quirion 2016**:
  - Externality: CO_2 emissions
  - Interaction with EU ETS; ETS emission cap may bind or not
  - Uncertainty over fossil cost, ren. cost or elec. demand
  - Numerical application to the EU
  - General result: FIT $\succ$ FIP $\succ$ TRQ

1.1. Uncertainty (5)

- Risk for ren. producers
  - Lower with FIT: Couture & Gagnon 2010, Fagiani *et al.* 2013, Kitzing 2014, Marschinski & Quirion 2014, Schmalensee 2012…
  - Gavard 2016, wind in Dk:
FIP @ 27 € /MWh ~ FIT support @ 21€/MWh
- Lower risk → investment by smaller players
- But risk for conventional producers higher with FIT (Marschinski & Quirion 2014)

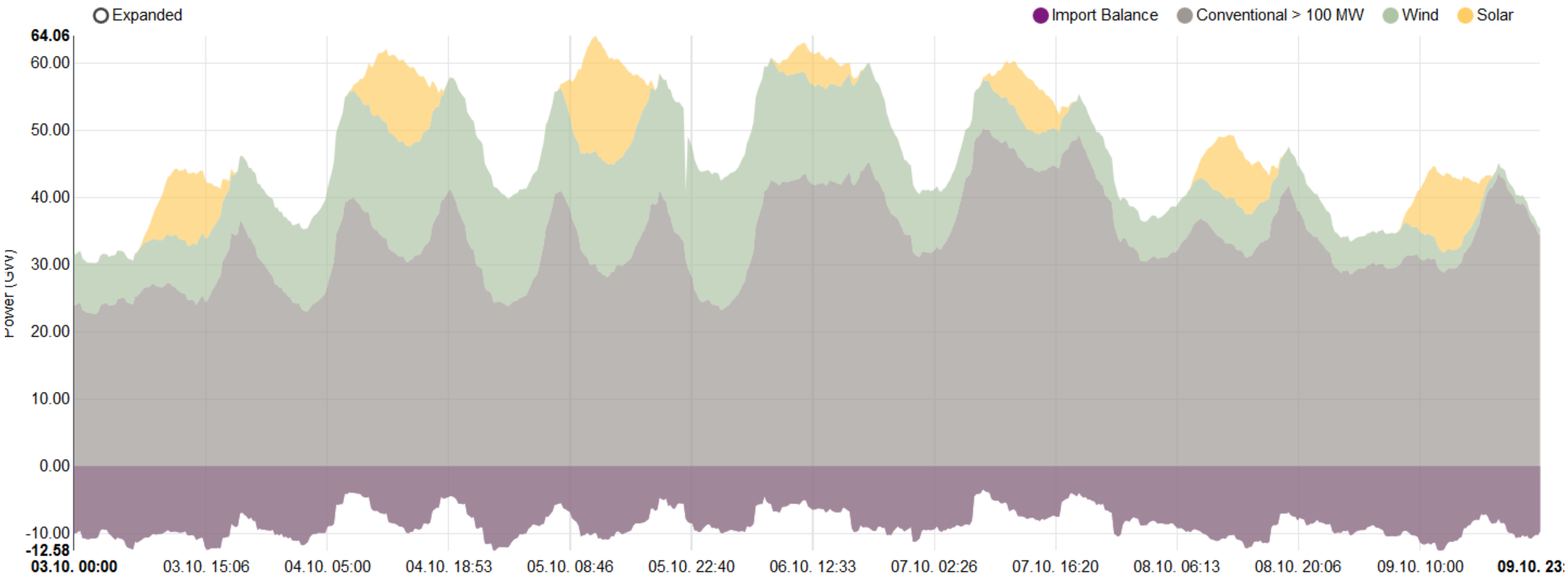
1.2. Electricity price variation (1)

- Negative prices:
  - Few occurrences
  - Social cost only if Abs[price]>fossil externality
  - Can be tackled by any support scheme



1.2. Electricity price variation (2)

- Schmidt *et al.* 2013, Roques *et al.* 2010, Reichelstein & Sahoo 2015: production maximisation ≠ value maximisation
- Implies FIP ≻ (fixed) FIT



1.3. Imperfect competition

- Dressler 2015; Tamás *et al.* 2010
  - FIP vs. FIT, Cournot oligopoly
  - FIP may increase market power
- Verbruggen 2009 (Belgium), Tanaka & Chen 2013
  - TRQ: distortions on green certificates market
  - Interaction between electricity and green certificates markets → more distortions
  - ~ Reclaim in 2000-1 (Kolstad & Wolak 2008)

1.4. Transaction costs

- Langniss 2003, Finon & Perez 2007: FIT $\succ$ TRQ
  - German FIT: 1.3%, Texas TRQ: 2.9%
  - Swedish TRQ: 18% (Mundaca 2013)
- FIP: transaction costs for selling power (Gawel & Purkus 2013: 460 million € in Germany).
- Clear ranking: FIT $\succ$ FIP $\succ$ TRQ

2. ≠ support levels for ≠ market segments?

- Market segment: techno, location, size…
- EU guidelines: “technology neutral”
- Practice: differentiation (exchange rates or separate targets for TRQ)
- Dilemma:
  - Tech neutral → differential rent
  - Differentiation → higher social cost (Requate 2015)
- Empirical studies: higher rent for TRQ
  - Jaraitė & Kažukauskas 2013, Kwon 2015, Verbruggen 2009, Bergek & Jacobsson 2010
- My viewpoint: differentiation unavoidable but should be based on clear principles

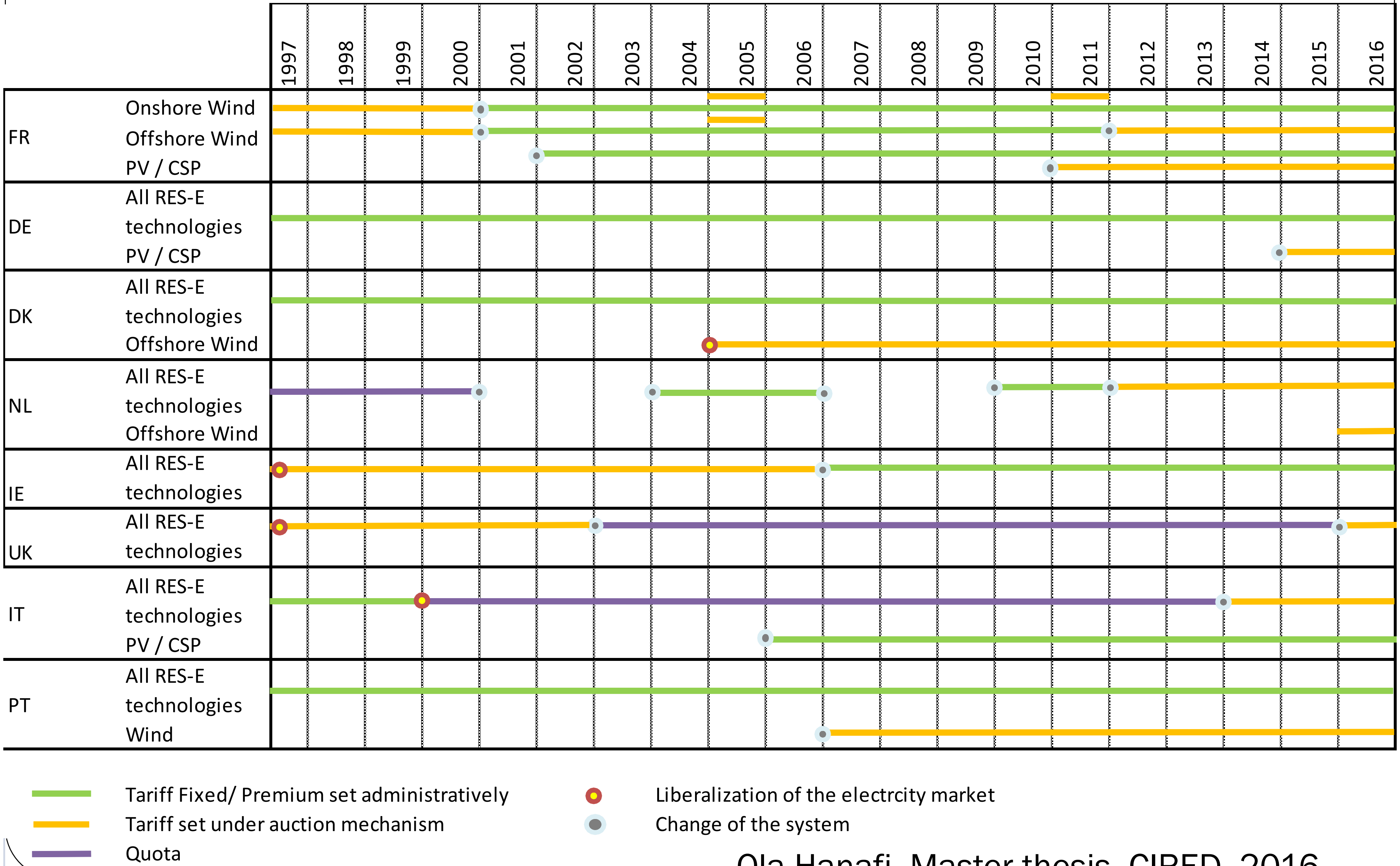
3. How to fund the subsidies?

- Most cases in Europe: tax on electricity
  - Clearly more cost-effective than public budget (Goulder 2013)
  - Lower tax rate for electricity-intensive industry (competitiveness concerns)
  - More efficient tools exist (e.g. tax on consumption of energy-intensive goods)

4. Auctions in the EU (1)

- Late 1990s: first auctions in Ireland, France & the UK
- Abandoned: low realisation rate & high transaction costs (Menanteau *et al.* 2003)
- “Back to the future” (del Río et Linares 2014): Auctions in most European & many developing countries

4. Auctions in the EU (2)



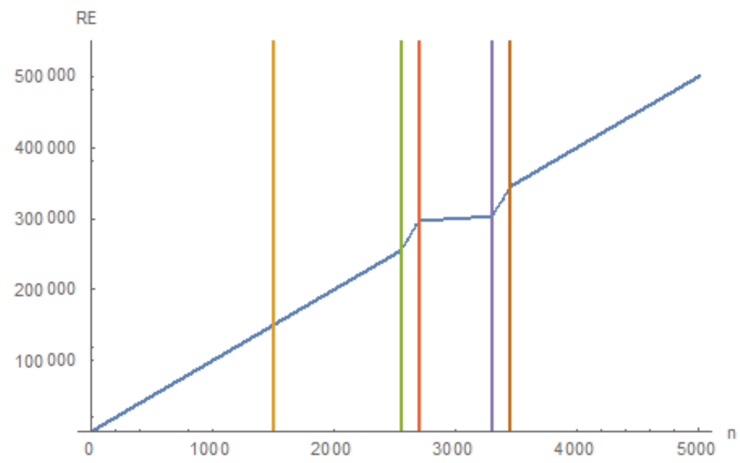
source: European Commission, 2013; IRENA, 2012

Ola Hanafi, Master thesis, CIRED, 2016

4. Auctions in the EU (3)

- EU 2014 guidelines :
  - from 2017, “aid is granted in a competitive bidding process on the basis of clear, **transparent** and **non-discriminatory** criteria”
  - “aid is granted as a **premium** in addition to the market price”
  - aim: “**cost-effective** delivery through market-based mechanisms”
- **Non-discriminatory**? French auctions for offshore wind & PV include clear protectionist rules
- **Transparent**? Little information on prices & realisation rate; ½ of criteria qualitative.
- **Cost-effective**? For offshore, “competitive dialogue” to avoid duplication of feasibility studies. High transaction costs.
- **Cost-effective**?
  For offshore, potentially distorting risk mitigation features.
- **Cost-effective**?
  Premium rather than tariff

Remuneration rule as a function of wind speed measured in FLH



Conclusion

- Tradable renewable quota dominated by tariff or premium for many reasons
- Move from premium to tariff questionable
- Details may matter more (funding, differentiation…)
- Move towards auctions questionable for onshore wind & PV in Europe