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CEEPR

MIT Center for Energy and Environmental Policy Research

European Energy and Climate Outlook for 2030

David Newbery

University of Cambridge

EPRG-CEEPR European Energy Policy Conference

Madrid, 2nd July 2014

http://www.eprg.group.cam.ac.uk

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Questions

- Is the *Framework* consistent with cost and security?
- How will it be delivered consistently? Plan vs market?
  - With what impacts on effectiveness, efficiency, equity?
  - What impact on competitiveness?
  - What policies needed to offset adverse impacts and risks?
- Compare efficient with feasible policies

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Cost and security

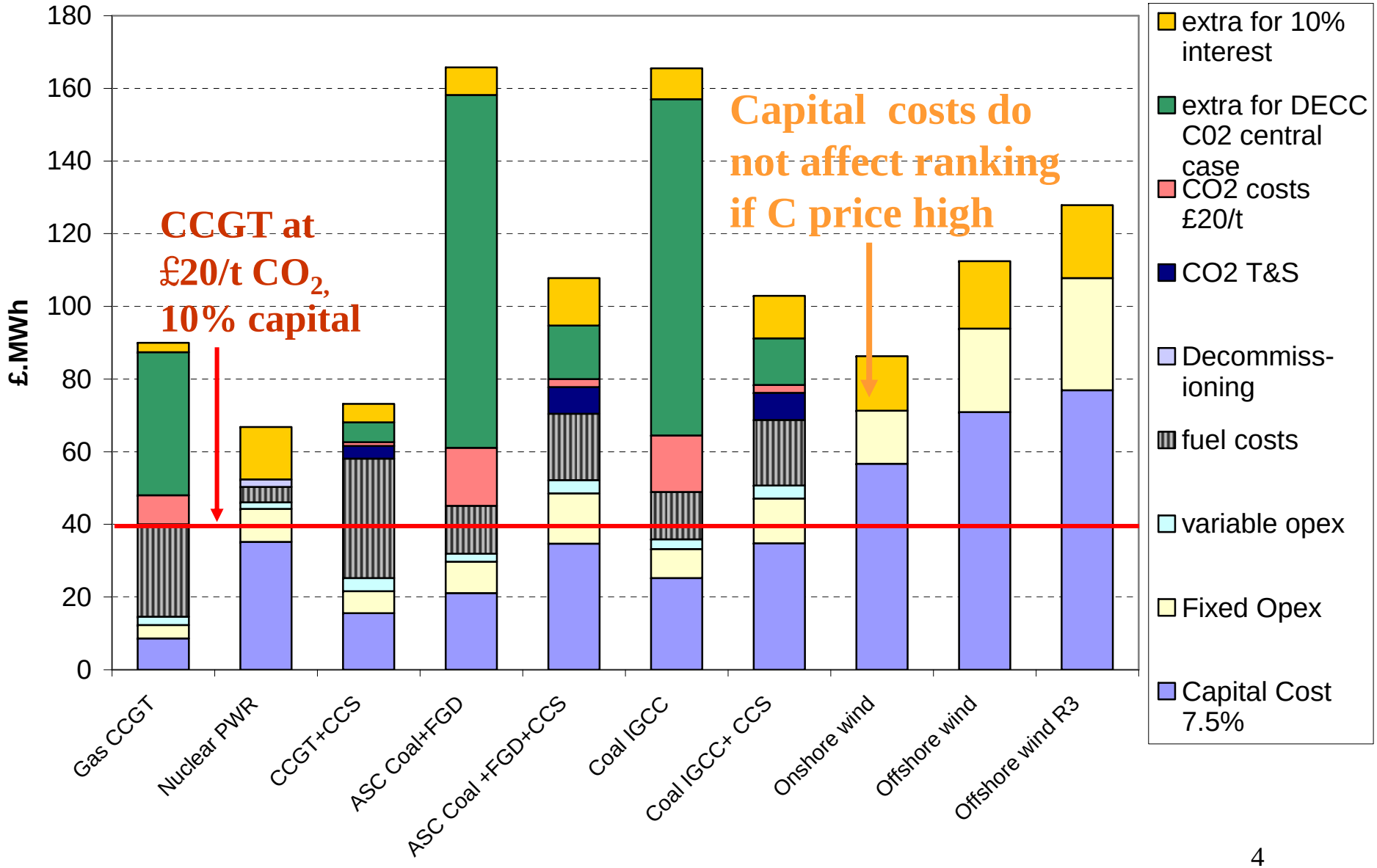
- With a global GHG agreement cost of decarbonising << damage
  - long-term damage => discount at (much) lower discount rates
  - Low-C generation is capital intensive, cost effective at low discount rates
  - Learning-by-doing is lowering PV, wind costs
    - And ought to reduce current nuclear costs with better designs

=> NPV of low-C paths to 2050 no more costly than BAU?

- Import security enhanced, but RES intermittency problematic

Main problems: transitional costs, poor policy design, competiveness absent global C price

Projected levelised generation costs 2017 NOAK



Source: Mott McDonald 2010 for DECC

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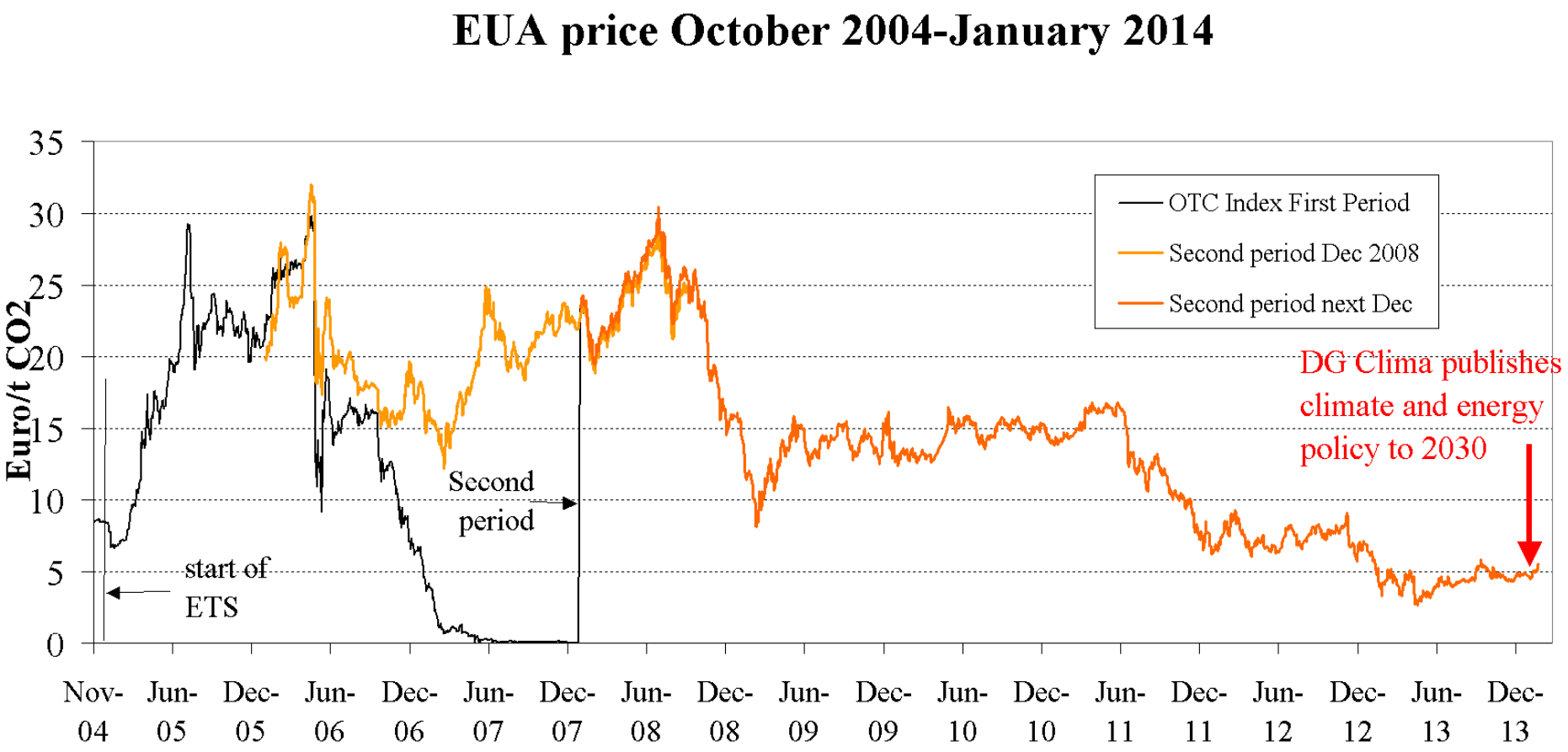
Delivery

- Plan A: adequate, durable and credible carbon price
  - Sufficient for mature low-C generation (nuclear, wind, PV,..)
  - ETS auctions with floor + ceiling price *or* carbon tax
  - Underwritten with long-term contracts (options on C-price?)
  - Transition to global C price - border tax adjustments
- Plan B: emissions performance standards
  - Tonnes CO_2/MWyr, ideally tradable EU-wide
- RDD&D – update Strategic Energy Technology Plan
  - Ensure contestable EU-club funded allocation

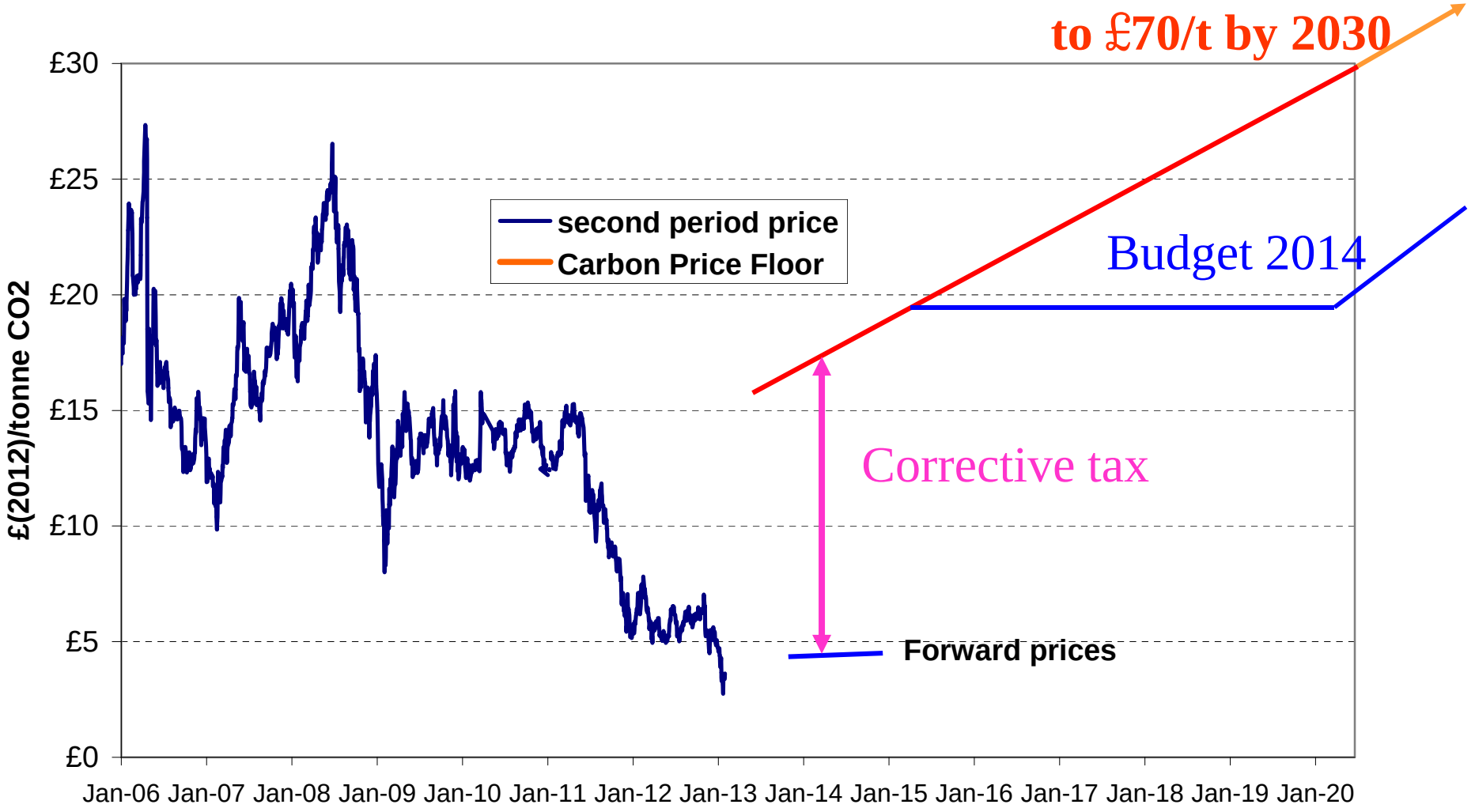
Little recovery after backloading and tightening post 2020



Source: EEX

UK's Carbon Price Floor - in Budget of 3/11

EUA price second period and CPF £(2012)/tonne



Source: EEX and DECC Consultation

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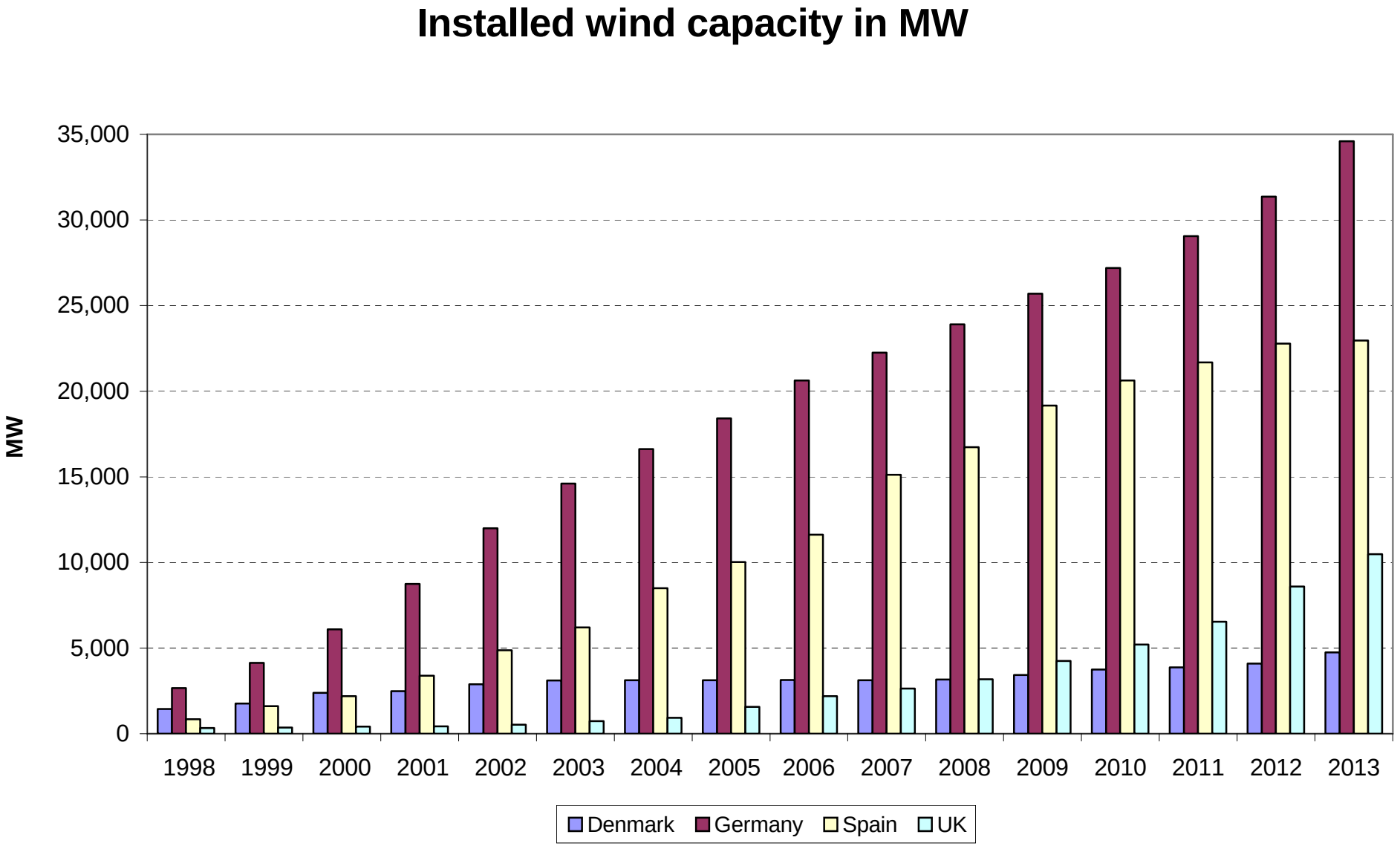
RES and security of supply

- Ambitious RES targets crash wholesale prices
  - Fixed Feed-in Tariffs stimulate mass take up
    - Germany, Spain for wind and PV, Italy for PV, UK lags
  - high EU gas prices + cheap coal create impasse
    - gas unprofitable, future CO_2 targets make coal risky
    - Large Combustion Plant Directive 2016 limits coal
    - Integrated Emissions Directive further threat to coal
- Future prices now depend on uncertain policies
  - on carbon price, renewables volumes, other supports
  - on policy choices in neighbouring countries

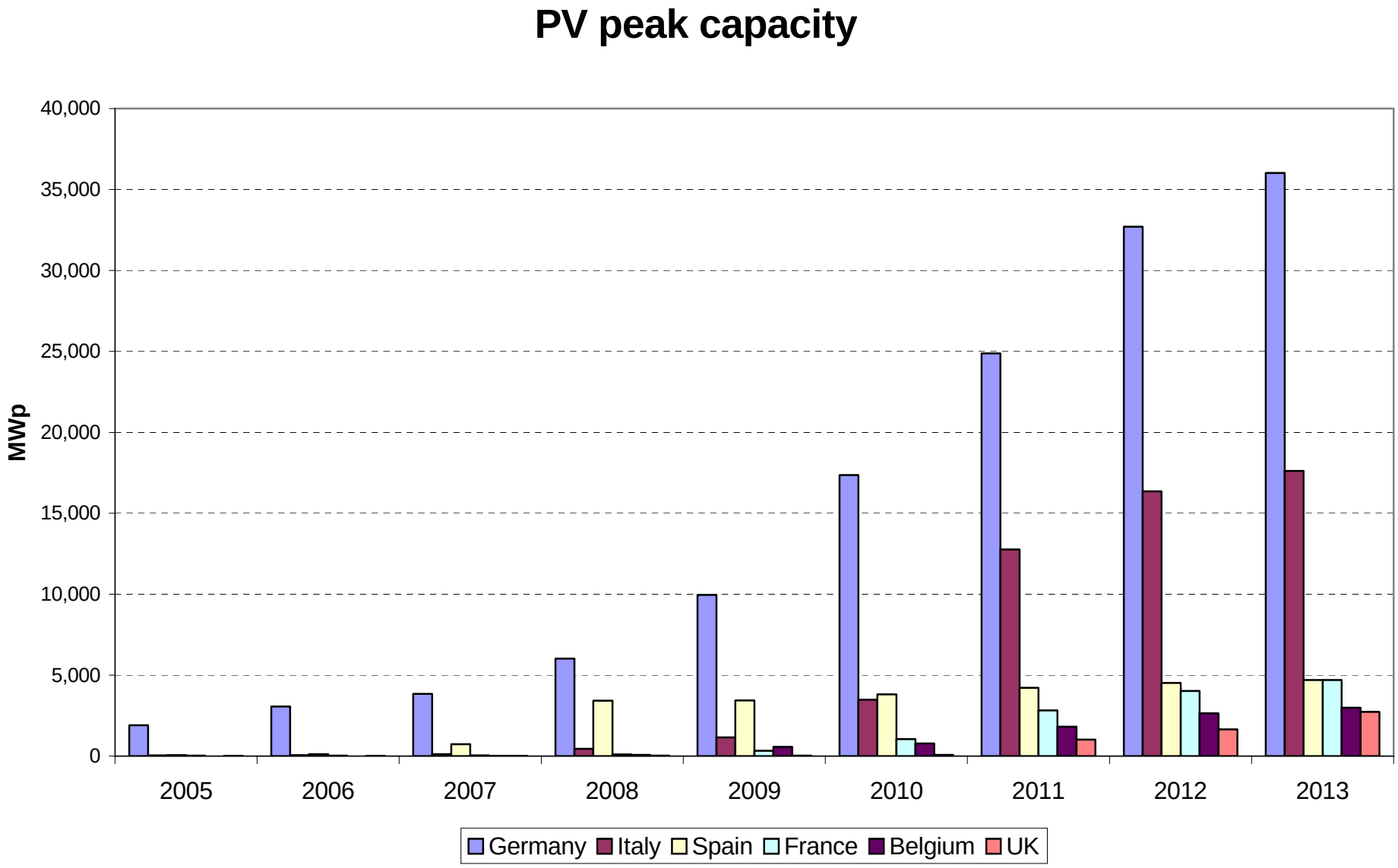
hard to justify investing in reliable power

Peak wind output *four* times average



Sources: IEA to 2011, EWEA 2011-13

Peak PV output *ten* times average



Source: http://en.wikipedia.org/wiki/Solar_energy_in_the_European_Union

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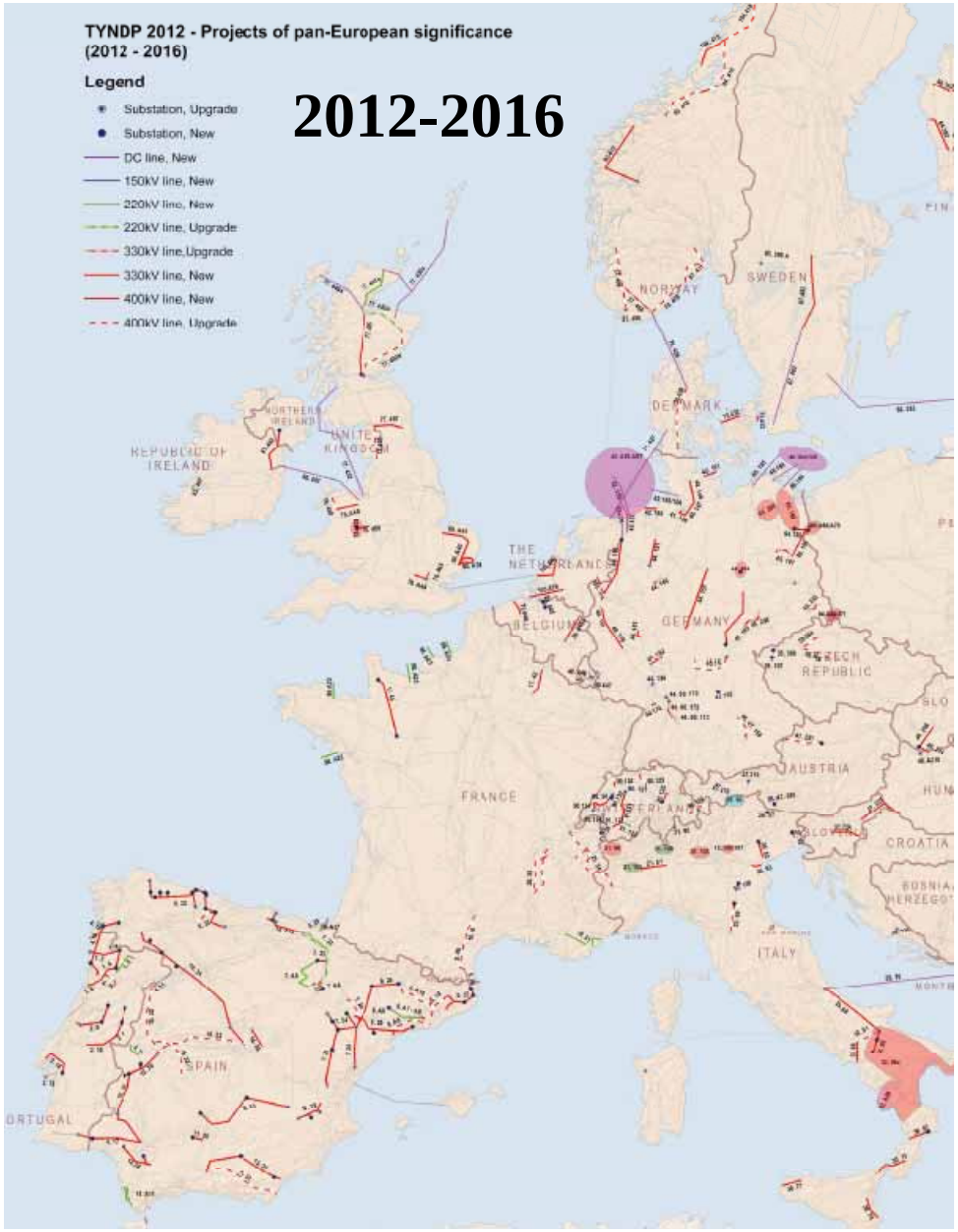
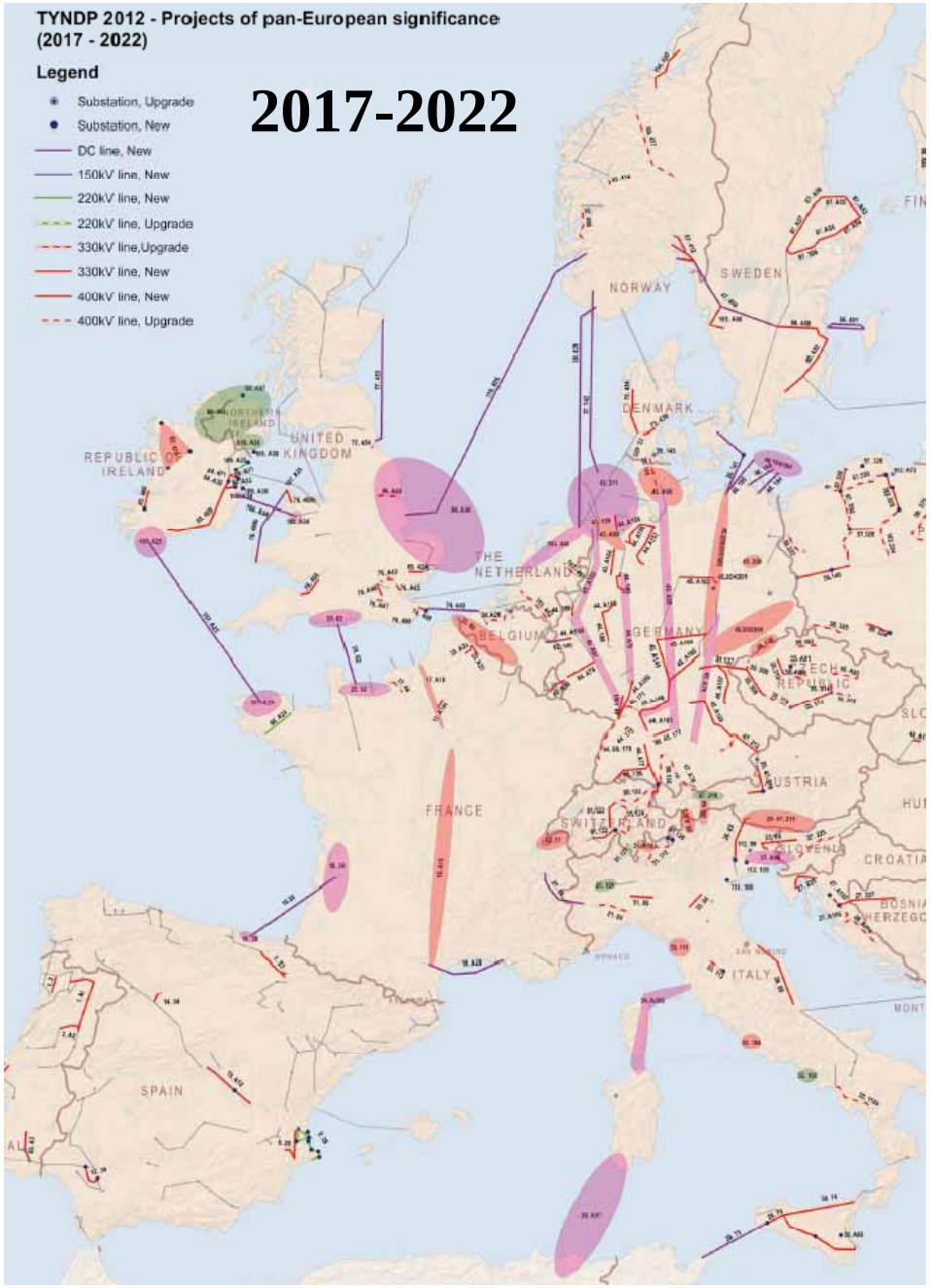
Solutions

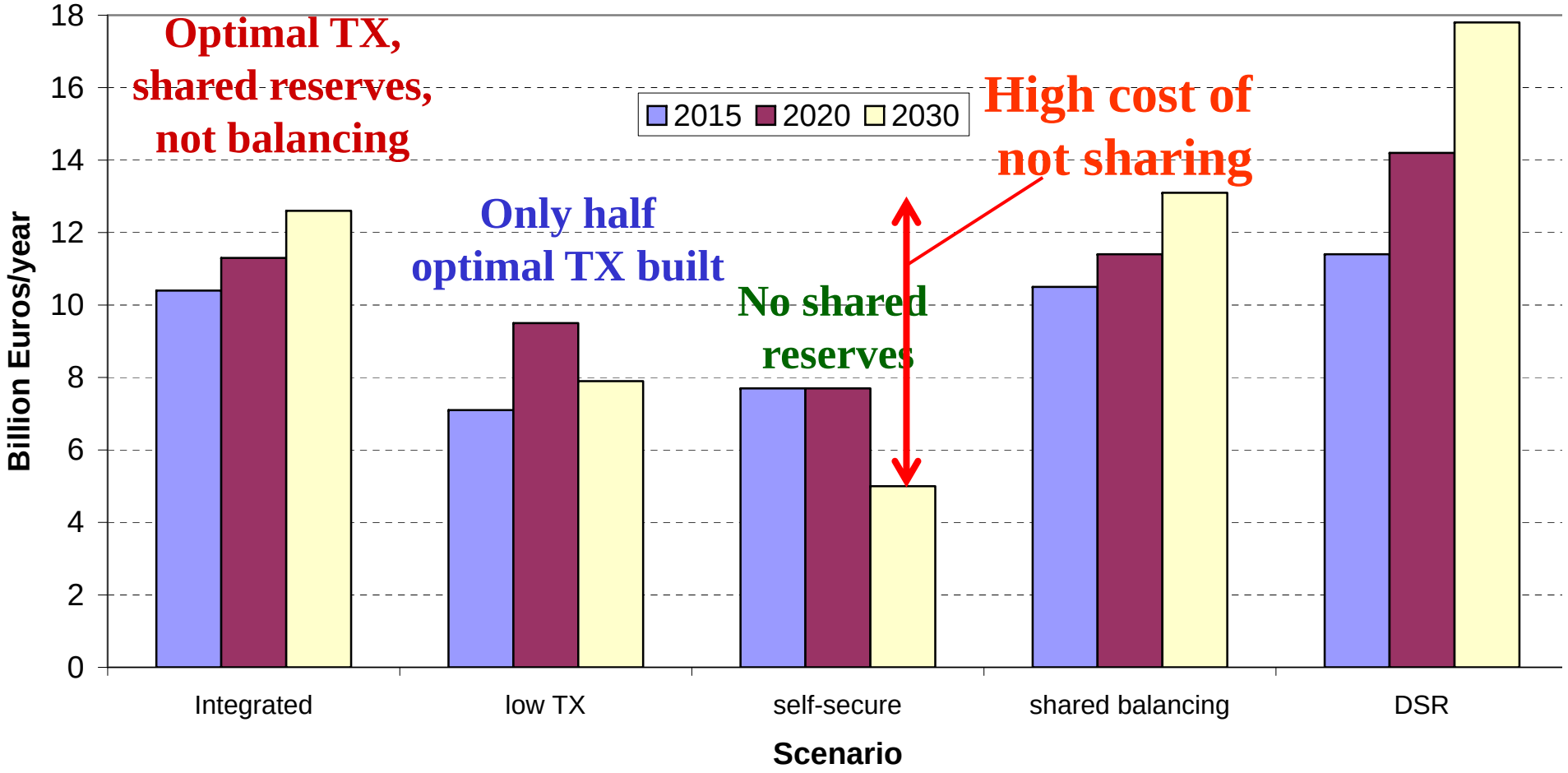
- Capacity markets to address policy/regulatory risks
  - Lowers cost of peaking capacity
- Interconnectors reduce intermittency costs
  - On-shore cheaper than reserves
  - Off-shore more costly – peakers sometimes cheaper
  - Storage seriously expensive
    - But may alleviate costly capacity expansions
    - May be provided by electric vehicles via demand shifting
- Need to retain efficient spot prices
  - Far more volatile, vary from zero to VOLL
  - Will need to be covered by reliability options

ENTSO-E Ten-Year Development Plan 2012





Benefits of market integration for EU 27+2 relative to base case



Base case: each country matches average production to consumption arbitrages over coupled IC's, no shared balancing or reserves

Source: DG ENER (2013)

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What electricity models?

- Decarbonising: high capital cost, low variable cost
  - Need to de-risk, lower cost of capital

⇒ hard in liberalised market without credible C-price

⇒ contracts, capacity payments, price caps – where is market?

- Renewables are intermittent, paid high price per MWh
  - RES support distorts prices, location, trade => Reform!
- Options
  - Adapt US Standard Market Design
  - Single Buyer model based in ISO
  - State: owns nuclear; procures & auctions RES sites

Aims: cheap capital, socialize risks, efficiency

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Several possible solutions

- Real public sector interest rates now near zero
  - Govt finance attractive when backed by productive assets
  - Aggregate risks low, markets amplify company risks

  => finance low-C generation from state development banks
- ***But*** need contestability to deliver efficiency

  => tender auctions for PPA contracts?
    - Or regulated revenues if flexibility needed? (but generating is simple!)

  => single buyer (ISO) for efficient dispatch? Or Pool?
  - Or complex audited bids & central dispatch (SMD) e.g. SEM

Design market to fit technology

Commodity markets not good models

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EU Standard Market Design?

- Central dispatch in voluntary pool
  - SO manages balancing, dispatch, wind forecasting
  - LMP + capacity payment =LoLP*(VoLL-LMP)
  - Hedged with reliability option (RO)

  => reference prices for CfDs, FTRs, balancing, trading
- Auction/tender LT contracts for low-C generation
  - Financed from state investment bank
    - Credible counterparty to LT contracts, low interest rate
  - CfDs when controllable, FiTs when not, ***or*** Capacity availability payment plus energy payment
    - Counterparty receives LMP, pays contract price
- Free entry of fossil G, bids for LT ROs
  - To address policy/market failures

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Conclusions

- Optimistic case: OECD + BRIC deliver C price, Member States make credible with LT contracts
  - least bad alternative - a carbon intensity target?

  => Avoids apparent tax-like instrument, hides cost, politically expedient
- Renewables delivered by C price and nuclear hostility
  - Interconnection reduces intermittency cost
  - Flexible plant running few hours need capacity payment
  - and efficient pricing, hedged with Reliability Options
- Main challenge is lowering cost of capital
  - State finance & contract counterparty cheapest

  ⇒ need for new utility model?

  ⇒ but need to retain contestability (of investment and RD&D)

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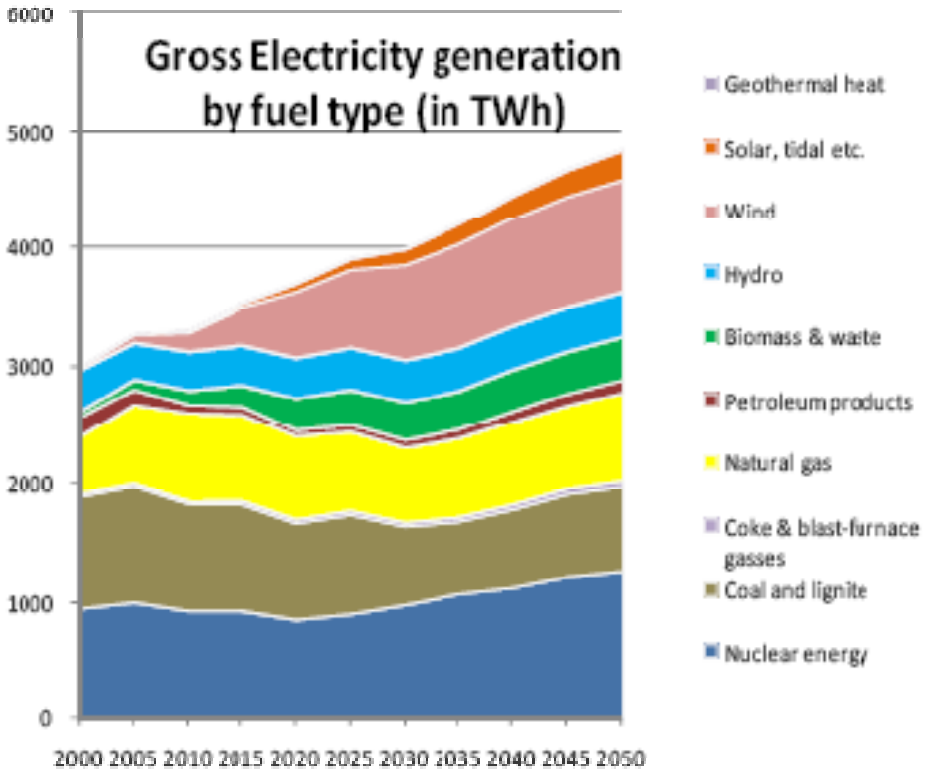
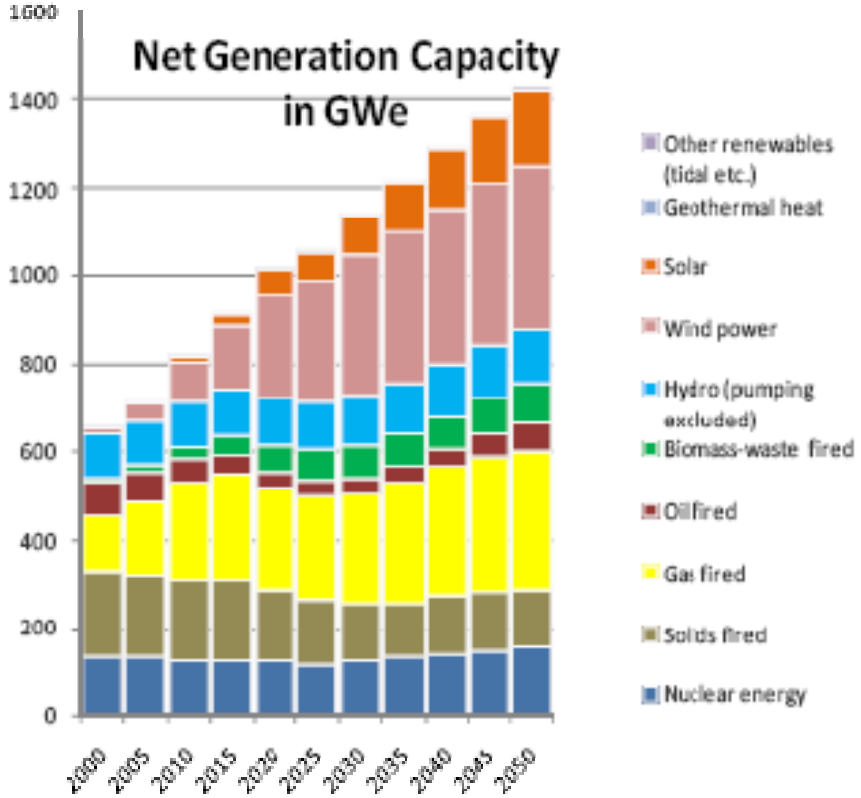
Future of marginal pricing

- Important to avoid perverse subsidy schemes
  - e.g. support for RE leading to negative prices
  - better to pay for capacity availability
- Biomass has high controllable variable costs
  - storage hydro and interconnection helps pricing
- Capacity payments => fixed charges passed through to end consumers (at system stress?)
- Volatile spot prices needed for storage, DSM, ...

Still a lot of coal and gas on system





Source: SEC(2011) 1565/2