

# Reforming the Renewables Directive and financing the low-carbon future

David Newbery

*University of Cambridge*

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

## Outline

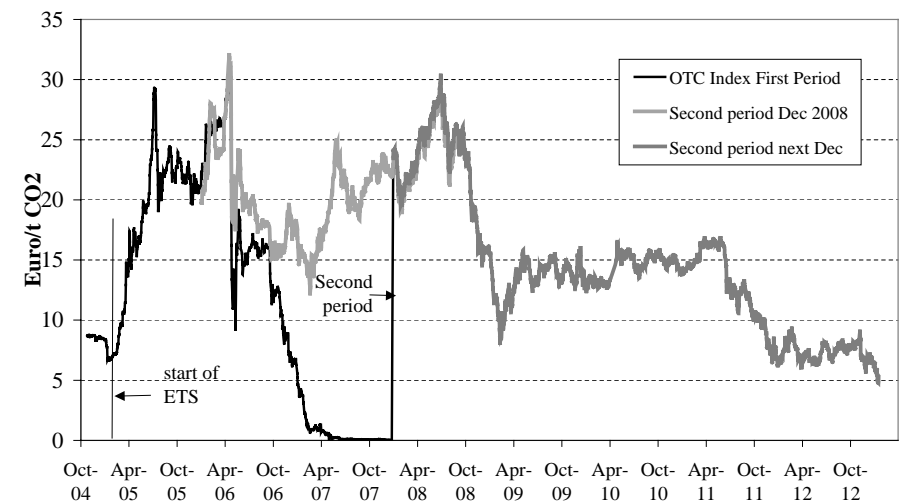
- EU climate change policies poorly designed
  - ETS failing
  - Renewables Directive undermines ETS, subsidies poorly targeted, RES non-tradable
  - SET-plan not adequately funded
- Ideal reform
  - monetise and benchmark RES credits
  - allocate to R&D, demonstration and deployment (RDD&D)
- Fiscal principles: reform how RES is funded

## EU climate change policy - theory

- ETS to price CO<sub>2</sub>
  - to support mature low-C options
  - to enable funding of durable low-carbon investments
- 20-20-20 Renewables Directive:
  - demand pull for not-yet-commercial renewables
  - justified by learning spill-overs and burden sharing
- EU Strategic Energy Technologies (SET) Plan
  - RD&D to support less mature low-C options
  - to compensate R&D collapse after liberalisation

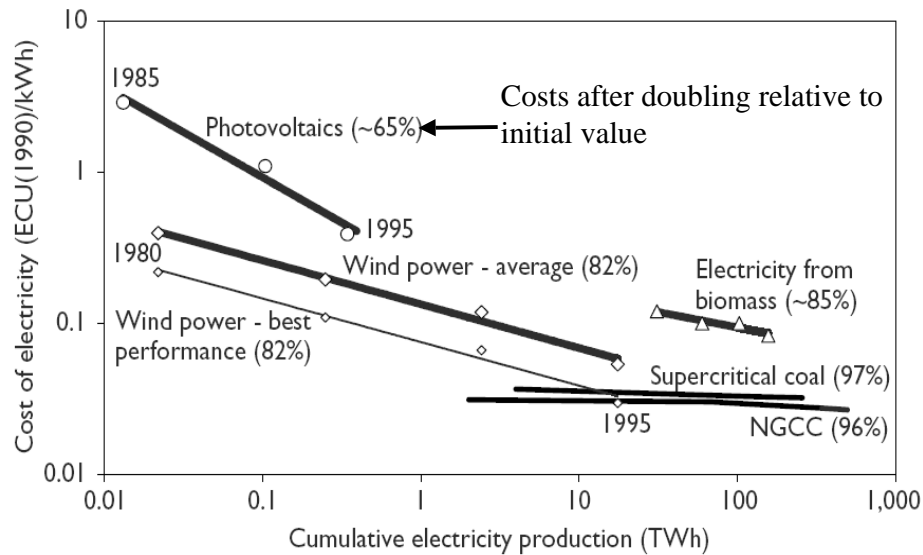
## Carbon prices have crashed

EUA price October 2004-March 2013



Source: (2010) from IEA (2005)

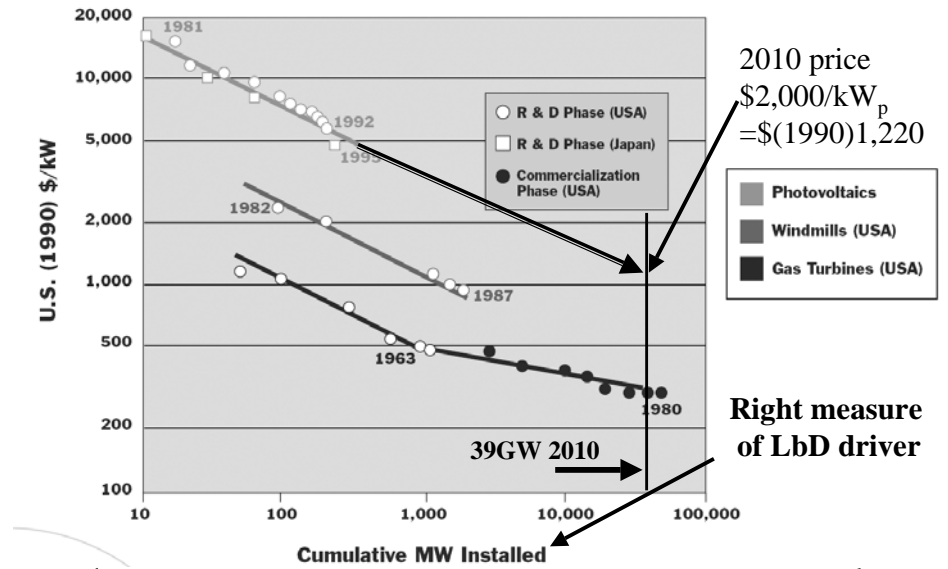
# Learning justifies Renewables Directive



Source: IEA

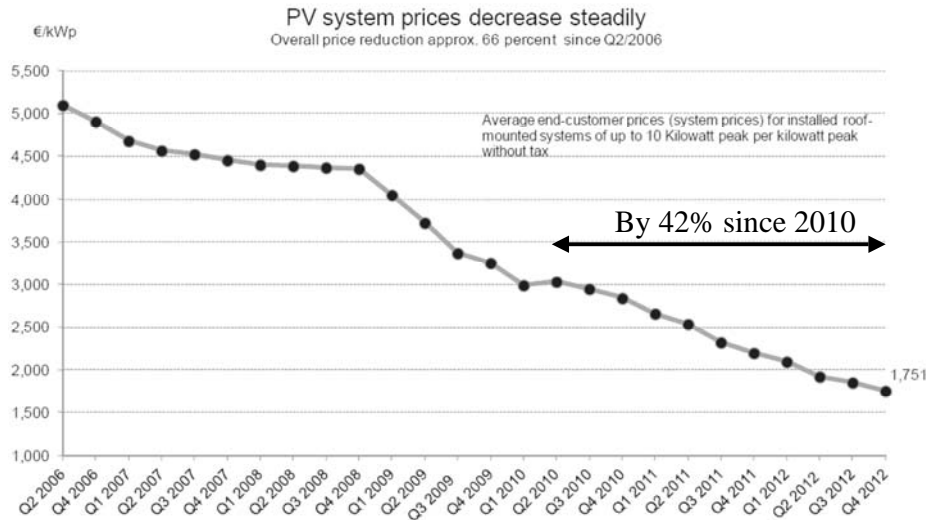
D Newbery

# Learning curves for generation technologies



Source: N. Nakicenovic, A. Grübler, and A. McDonald, eds., *Global Energy Perspectives* (CUP, 1998).

# German PV prices continue to fall



Source: BSW-Solar PV Price Index 11/2012

# R&D collapses with liberalization

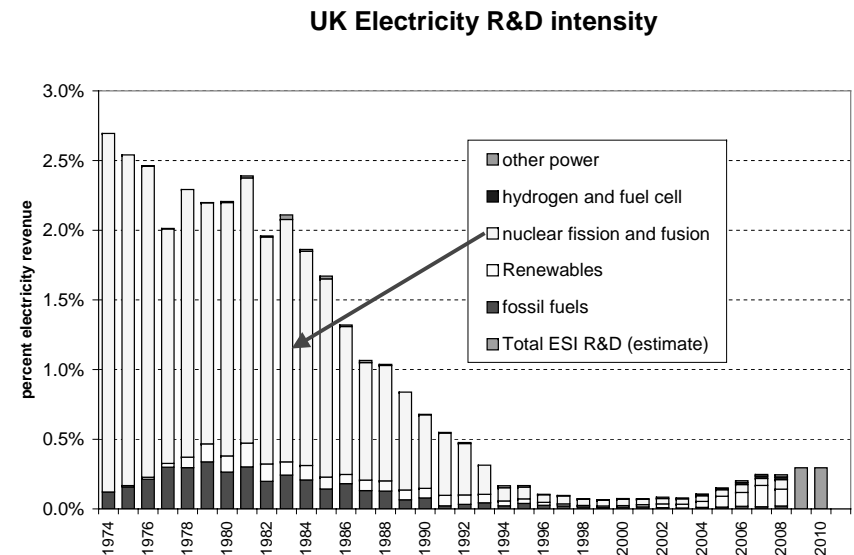
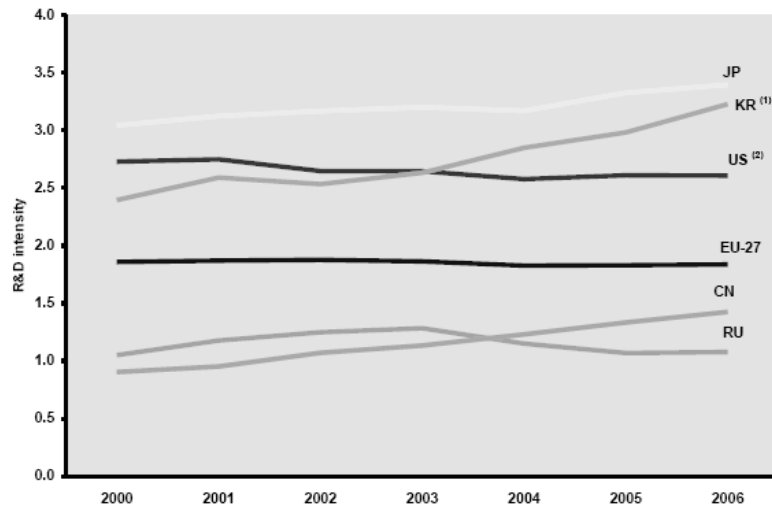


Figure I.1.2 Evolution of R&D intensity, 2000-2006



<http://www2.academieroyale.be/academie/documents/CB2011docpostlimROSSETTI10362.pdf>

Source: DG Research

Data: Eurostat, OECD

Notes: (1) KR : GERD does not include R&D in the social sciences and humanities.

(2) US : GERD does not include most or all capital expenditure.

Key Figures 2008

## Policies are poorly designed

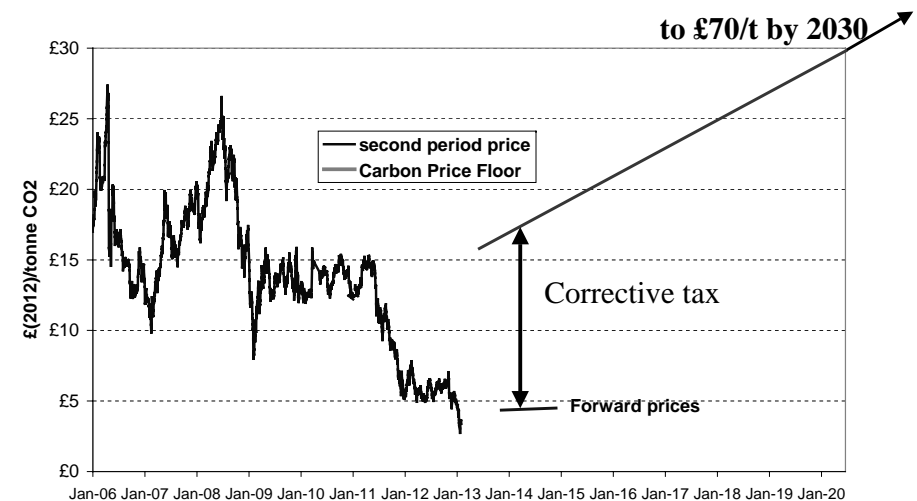
- ETS fixes quantity not price
  - Renewables Directive undermines EUA price
    - Does not reduce CO<sub>2</sub> emissions at all
  - Great Recession further undermines EUA price
  - No bankable future carbon price to guide investment
- Renewables Directive sets country RES targets
  - Different supports by technology and country
  - not well-designed to deliver best learning benefits
- SET plan - driven by industry lobbies?
  - as it lacks funding and allocation criteria

## EMR response to ETS

- The EUA price is too low
  - => create a carbon price floor (but just for electricity)
- The ETS is neither durable nor credible
  - => create long-term contracts for difference for low-C
- But: CPF distorts electricity trade
  - N Ireland exempted to avoid distorting SEM with the RoI
  - => distorts trade over the two interconnectors with GB
- => EU needs to address ETS failures
  - => new 2030 Directive? On C-intensity or renewables?
  - => member states follow GB CPF example?

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

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

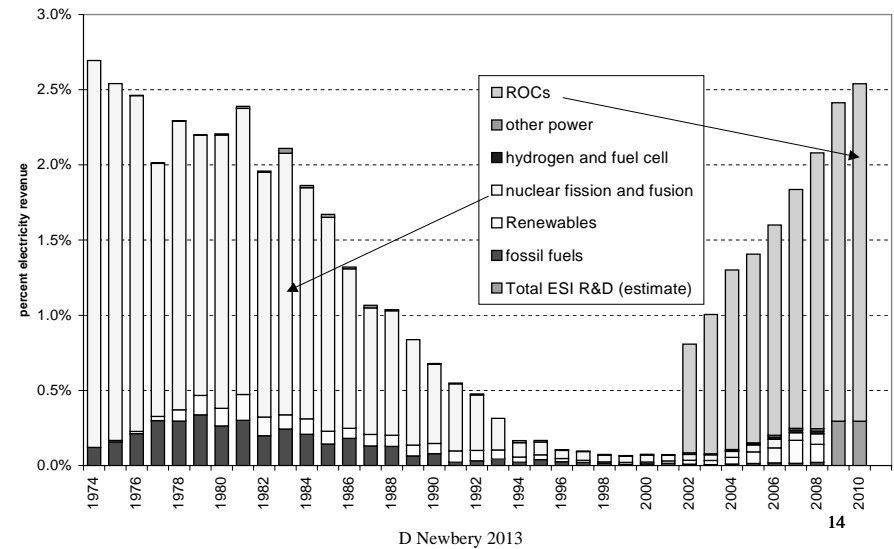


## Supporting RES deployment

- EU Renewables (20-20-20) Directive mandates RES share targets to each member state (MS)
    - devolves cost of meeting to MSs
  - But many diverse RES of varying cost
    - support justified by future learning benefits
    - but current cost borne by MS
- => hard to trade to minimise collective cost  
 => temptation to go for the cheapest not the best  
 => “dash for bio-mass” in old coal stations?

## Renewables support replaces R&D

UK Electricity R&D intensity

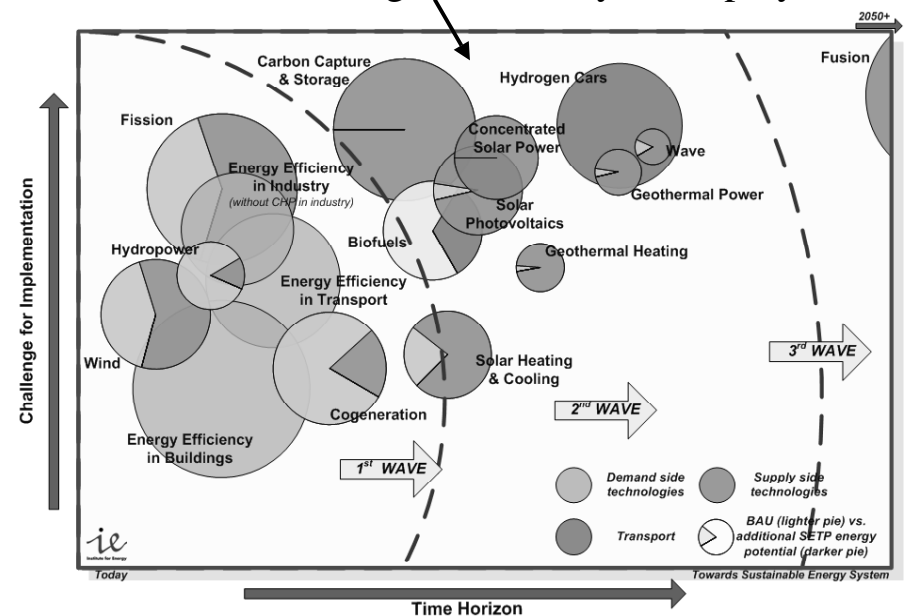


## Innovation

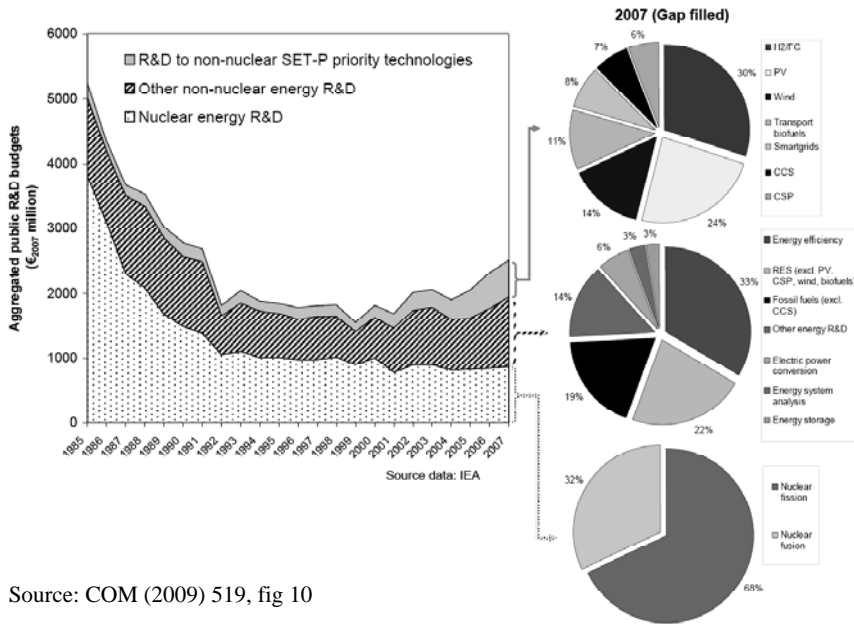
- Liberalizing causes R&D to collapse
  - Renewables Directive has massively increased renewables support
    - Perhaps too much deployment, not enough R&D?
  - SET-Plan is critical but funding doubtful
    - Innovation seen as an EU industrial policy
- => impose duties on imported Chinese PV!

Save the planet or protect (some) jobs?

## Less mature technologies not ready for deployment

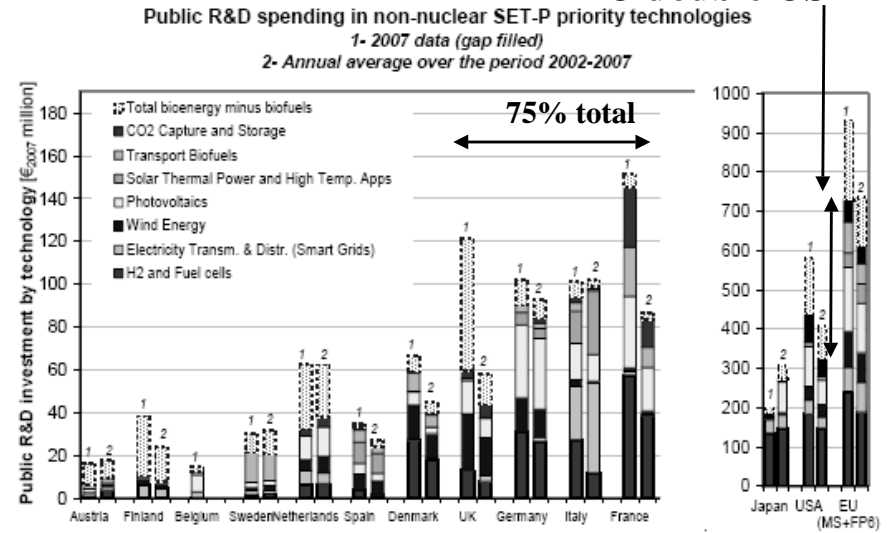


# Aggregate EU public R&D funding



Source: COM (2009) 519, fig 10

# R&D concentrated in few MS EU double US



Source: COM (2009) 519

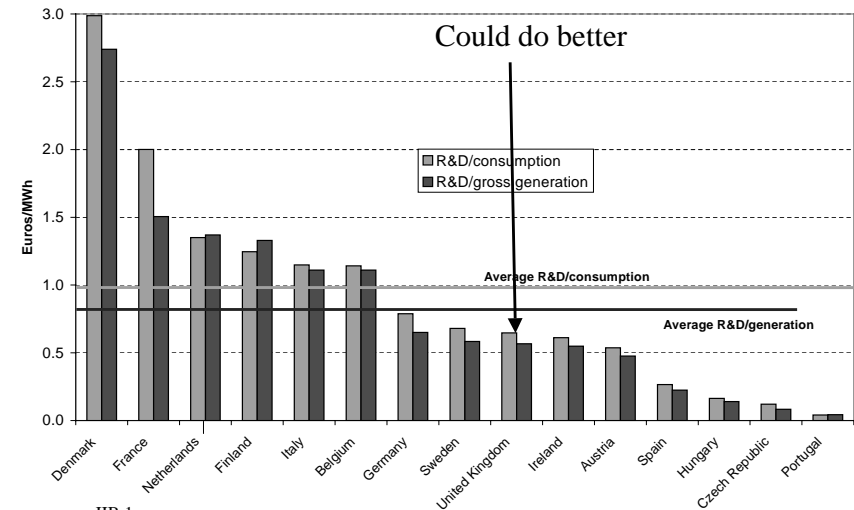


## Criteria for support

- SET-plan criteria
  - EU added value/additionality
  - Willingness of actors to join forces
  - Future market size/penetration
  - CO<sub>2</sub> reduction, SoS, competitiveness
- US evidence from federal R&D funding:
  - Success from supporting multiple alternatives*
  - Make R&D contestable*
  - Avoid institutional lock-in - rotating externals*

## Who should finance RDD&D?

### R&D intensity 2008



## A better EU low-C RDD&D policy?

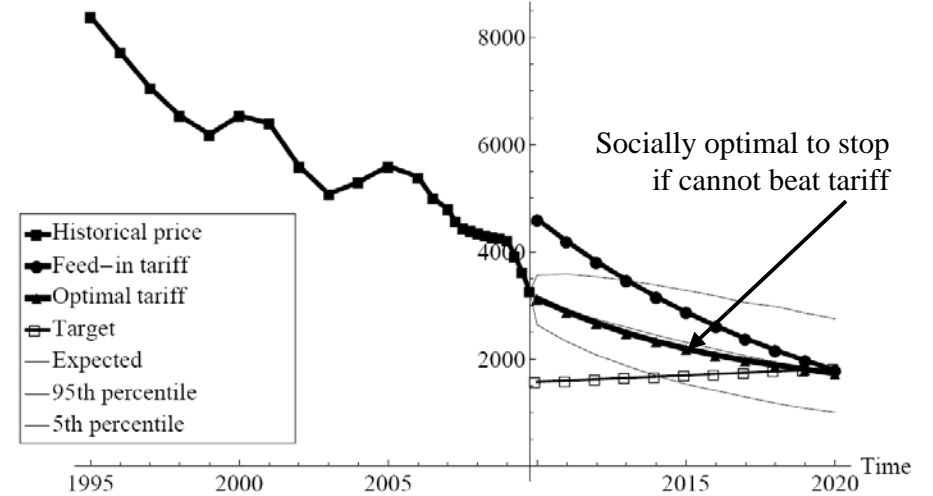
- Targets are an effective method of devolving support
- Why not set the target in cash terms as a share of GDP?
  - Possibly reflecting the cost of the RES targets
- Member states meet their targets by:
  - commissioning R&D and demos by competitive tender
  - supporting RES-E, credited with benchmarked value
    - anywhere in the world (preferably where comparative advantage)
- Financed by efficient public finance tools:

*tax/charge final consumers not producers*

## RJ Lange's Optimal stopping rule

German v optimal tariff

Price in € per kWp



Source: R J Lange PhD 2012

## Allocating support needed

1. Decide which technologies are promising
  - for R&D, demonstration and deployment
  - => develop a social cost-benefit method to value innovation
2. Determine initial total EU budget allocation
  - e.g. as in a better form of the SET-Plan road map
3. Determine how/when to stop/reallocate budget
  - e.g. if the revealed rate of cost reduction too slow
4. Allocate budget to Member States (MSs)
5. MS decide what to support and how, report results
6. Expenditure valued at benchmarked rates



Sonneneinstrahlung 2007

kWh/m2

focussolar.de

See

## SET road map

- 2007 SET R&D non-nuclear ~ €2.4bn (Nuclear €0.94)
  - 70:30 private:public; 80:20 MS:EC
- SET-plan to 2020 total €70 bn or double current rate
  - Grid: €2bn; fuel cells + H<sub>2</sub>: €5bn; Wind: €6bn;
  - nuclear fission €7bn; bio-energy € 9bn;
  - smart cities €11 bn; CCS €13 bn; Solar: €16bn;

***Concern that the allocation is based on lobbies  
not careful evaluation of potential***

## Benchmarking RES-E

- Example: solar PV, for each MW<sub>p</sub> installed, credit =  
Least EU installed cost *less* NPV of electricity generated in  
best EU location valued at cost of CCGT output displaced
- Where budget for technology is limited, MSs tender for  
right to undertake: winner is least credited unit cost
- Where learning independent of location (e.g. depends  
on volume installed) can choose non-EU locations
  - e.g. Africa

## Other options

- High CO<sub>2</sub> price needed to support low-C technologies
  - => windfalls to existing low-C (especially nuclear)
  - => raises final energy costs, concerns over fuel poverty
  - => reduces competitiveness of energy-intensive industry
- Reforming ETS requires unanimity - hard
  - => hence attraction of targets (20-20-20 by 2020)
  - => danger of a new 2030 RES target
- Better to set C-intensity of sectors like electricity?

***Politics is the art of the possible***

## Conclusion

- EU climate change policy is in disarray
  - ETS collapsed, R&D under-funded, RES inefficient choices  
(type, location, no trade)
- changing ETS will be challenging
  - => redefine end goals and choose best instruments
  - => develop methods of valuing contributions
- competition drives innovation and cost reduction,  
efficiency requires trade & cash is a useful metric

***measure success by benchmarked delivery***

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CCS	Carbon capture and storage
CPF	carbon price floor
EMR	(UK) Electricity Market Reform
ETS	Emissions Trading System
EUA	EU Allowance for 1 tonne CO <sub>2</sub>
MS	Member States
PV	Photo voltaic
RDD&D	Research, development, demonstration and deployment
RES	Renewable Energy/Electricity Supply
RoI	Republic of Ireland
SEM	Single Electricity Market for Ireland
SET	Strategic Energy Technologies
TEM	Target Electricity Market