



Accelerating the intertwined transitions towards decarbonisation and efficient energy markets in the EU

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Two parallel, intertwined transitions

1. Decarbonisation

2. Competitive energy markets

→ *Also to compensate (partly) higher costs due to 1.*

Note: EU Treaty explicitly states that energy policy / energy mix is a national affair.

1. Decarbonisation:

→ Many policy measures, including EU-ETS + EU-RES

→ EU-MS's have different positions on trend

→ EU-MS's apply different policy measures

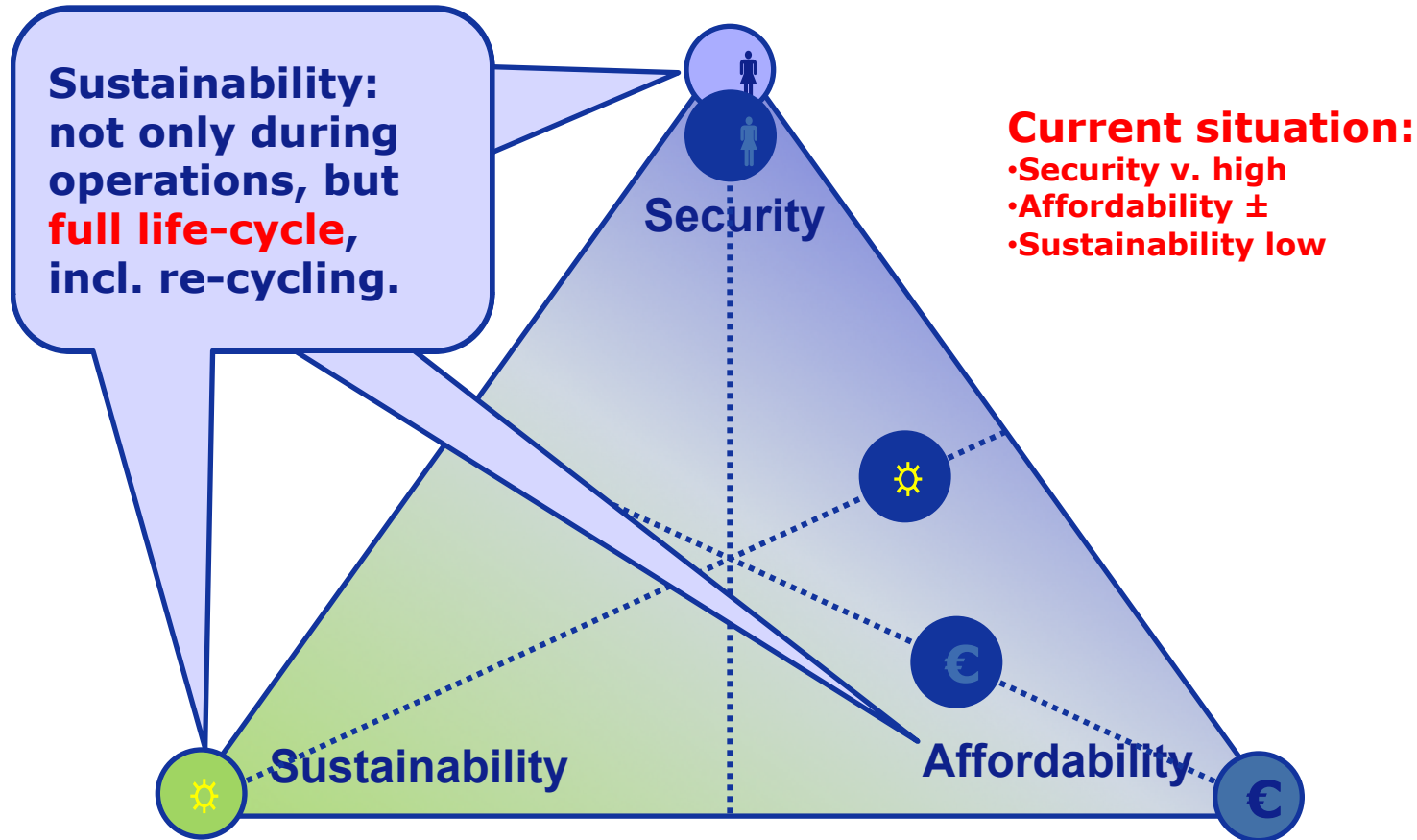
2. Competitive energy markets:

→ Ditto

→ **Main problem: achieving consistency across EU in EU + MS policy measures**

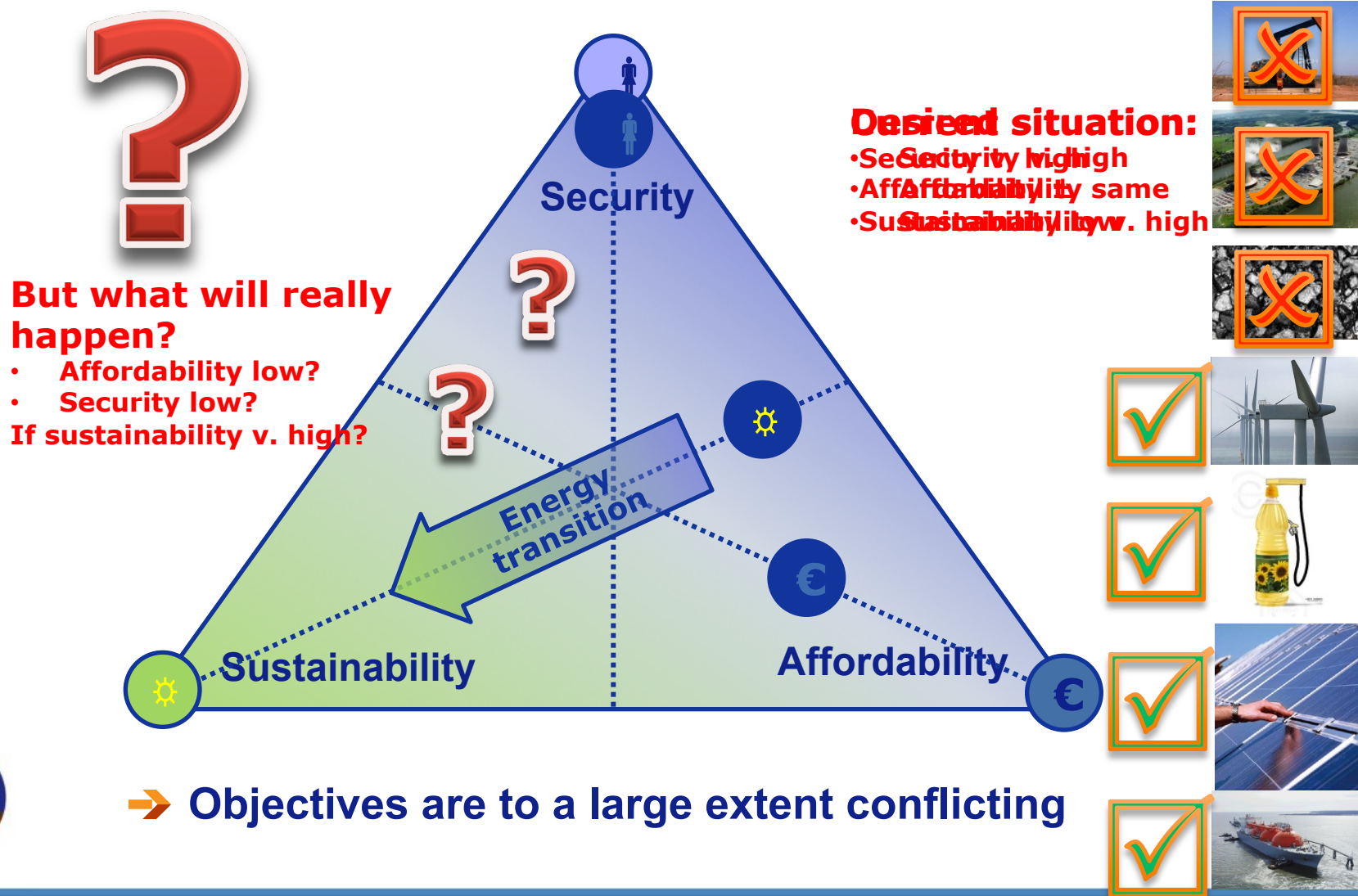


The three objectives of energy policy



➔ Objectives are to a large extent conflicting

The three objectives of energy policy



Subsidies for RES undermine the energy markets and are not sustainable

- “German subsidies impede energy market” (ref. Het Financieele Dagblad, 30-1-2013; NL daily)
- “Subsidies don’t work”



Energy policy problems in the EU

- Distinguishing Objectives, Means and Constraints
- Distinguishing O-M-C's for ST – MT – LT
- Cascading down top-level (EU) O-M-C's to MS's, and to lower-level authorities
- Honouring different starting positions MS's
- Honouring O's & C's of *both* transitions
- Understanding the effect of policy measures on both intertwined transitions
 - Lack of policy support tools that quantify the effect of policy measures (ref. H2020 LCE call)
 - Avoiding inconsistencies Δ MS's and Δ (ST/MT/LT)
 - Challenge: designing a self-reinforcing set of measures



Hierarchical optimisation of energy markets *in transition*



EU's H2020 LCE RDDD programme

- LCE 21 call (modelling and analysing the energy system, its transformation and impacts):
 - *'It is necessary to provide model-based decision support tools for the different actors in the energy system in order to facilitate handling the complex system'.*
 - *Need for 'Analysing and modelling of technology policy measures in the framework of the SET-Plan...' to 'assist policy-makers in identifying effective strategies...'*
- Earlier research (ATEsT project 2011-2013)
 - *'Tools and methodologies focused on analysing the effectiveness of RD&D policies, consumer and/or investor behaviour and institutional factors are direly missing. Nevertheless, current energy system modelling tools barely take these issues into account'.*



EU SET-Plan

- SET = Strategic Energy Technologies
- SET-Plan is the EU's plan to
 - *"Promote the transition towards a sustainable energy system, assessment of the impact on society, environment and economy, including safety and access to clean, reliable and affordable energy".*
- Specific emphasis on
 - Wind, Solar, Marine, **CCS**, Sustainable Nuclear, Industrial Bioenergy, Fuel Cells and Hydrogen (FCH) Joint Technology, 'Smart Cities and Communities'



Zero Emissions Platform (ZEP)

Temporary Working Group Market Economics (2011-2012)



- ➔ Report issued July 2012
 - ➔ Expert economists from ZEP member companies and organisations
 - ➔ All ZEP constituencies represented
- ➔ CCS can deliver, but a weak EUA price threatens demonstration and deployment. Long-term business case is seriously undermined.
- ➔ Deployment demands clear policies at EU/MS level to unlock necessary investment. Report gives clear recommendations.



Policy instruments to promote CCS

Policy tool1	What does it do?	How does it support CCS?	When ?	Adverse effects with ETS?	What can we do about that?
Capital-Opex grants -EPR -Ner300 -MS grants for solar and wind	Public funding towards CCS construction	Support capital deployment and operations, increases willingness to commit funding.	Short term	Reduction in emissions from expansion in renewable power causes EUA price to fall, leading to rise in emissions elsewhere in economy (due to fall in power).	Phase out: if expectations are realized, capital support should decline, greater emphasis on operational support.
EUAs withdrawal -Repurchase EUA from market	Allowance surplus (compared to expectations) removed from the system to restore the ambition level, or scarcity, originally intended.	Reduction in EUA excess supply increases EUA price. EUA price places cost on emissions, which can be avoided by CCS.	Short term, Phase II or III of ETS	May increase uncertainty about ETS system perceived regulatory risk if not part of broader reform.	One-off measure to recalibrate the system, should be presented as first step towards a broader reform of the ETS mechanism.
Feed-in-Tariffs	Fixed price for output to plants where CCS is fitted	Provides relatively high certainty of revenues for the lifetime of the plant.	MT	Reduction in emissions from expansion in renewable power causes EUA price to fall, leading to rise in emissions elsewhere in economy.	This could be accounted for by adjusting the ETS cap. The ETS withdrawal should also help to increase the price. Phase out as technology matures.
Adjust the ETS cap	Reduce the total quantity of CO2 emissions and equivalent EUAs.	Reduction in EUA supply increases EUA price making CCS for fossil power plants economically viable.	LT next phase of ETS.	Strengthens the ETS, i.e., the ambition on the covered sectors to catalyze the transition to a low-emission economy.	Competition effects. Measures are needed to prevent carbon leakage.
Floor price - Reserve auction price - Carbon bank	Allowances are not auctioned below a certain price.	Gives investor more certainty about the EUA price and revenues.	LT, Phase IV of ETS	EUA price may not reflect market fundamentals	There is legitimate reason for putting a floor under the price
Emission performance standard	Limit to emissions per unit of production of new power plants.	In theory, forces CCS if the limit is low enough. In principle, the standard will work discriminatory.	Long term	Reduction in emissions from expansion in renewable power causes EUA price to fall, leading to rise in emissions elsewhere.	This could be accounted for by adjusting the cap and setting a floor price.

ZEP-TWG(ME) recommended strategy

→ **CCS-Specific Issues:**

- Requires large, upfront investments
- At start of learning curve = significant cost-reduction potential
- Significant role in energy mix to deliver EU Energy Roadmap

→ **Correct ETS deficiencies:**

- Main instrument for long-term deployment
- In short/medium term, may not reflect social optimum; does not address specific aspects of CCS; and has much lower EUA price than when cap was set

Strengthen the ETS with complementary measures, adjust accordingly, revise as technology matures + clear phase-out plan



CCS deployment – 2012 - 2020

Conclusions - Short-Term Measures

- **Feed-in tariffs** provide predictable revenues – ZEP recommends sliding premium scheme kept between a floor and a ceiling
- **CCS purchase contracts** would combine economic certainty of feed-in tariffs with greater cost-efficiency/potential for application beyond power
- Immediate **set-aside of a volume of EUAs**: sets precedent for political intervention, so 1st step towards broader ETS reform, including 2030 cap
- Further **capital/operating grants** needed: LT contracts between project sponsors & public authorities based on volume of CO₂ stored
- Uncertainty over role of fossil power generation with or without CCS could be addressed by **forward contracts** for CCS generation capacity
- **Public loan guarantees** with performance or capacity guarantees could be cost-effective way of reducing the capital cost of projects
- **Tax breaks** for EOR, EGR and ECBM with anthropogenic CO₂ could be reasonable and attractive

CCS deployment – 2012 - 2020

Recommended Short-Term Measures

MEASURE	DESCRIPTION	KEY BENEFITS
<i>Short term, 2012-2020</i>		
Feed-in tariffs	A sliding premium scheme whereby a premium indexed on fuel price is guaranteed above the market price	Provides predictable revenues (in demonstration phase needs to be more project-specific, evolving into a pure feed-in tariff as technology matures, i.e. medium-term phase).
CCS purchase contracts	Government sets an amount of anthropogenic CO ₂ to be captured and stored over the next 25 years; competitive bidding process for 20-year CCS contracts to reach the desired volume (excludes project construction time).	Combines contract certainty of feed-in tariffs with competitive and cross-sectoral elements of a CCS certificate scheme.
Set aside a volume of EUAs (as proposed by the Environment Committee of the European Parliament, December 2011)	EUA surplus is not placed into the market in order to restore scarcity as originally intended	One-off measure to help increase EUA price (which places a cost on emissions) which in turn can be avoided through CCS. Will only achieve full impact as a first step towards a broader reform of the ETS, including extending ETS cap to 2030. This measure should be carefully managed to avoid political risk associated with the ETS.
Earmark EUA revenues for CCS capital grants	50% of EUA expenditure of ETS installations is placed in company-specific trust accounts for CCS capex with a 5-10 year "use it or lose it" clause	Simple and predictable for companies and in line with the spirit of the ETS Directive (50% earmarking).
Capacity payments	TSO holds reverse auction for forward CCS-equipped power generation capacity (with set requirements for availability, flexibility etc) – payments are made annually as long as capacity is available (€/MW). The contractual terms for payments should be set for a number of years in advance.	Reduces the risk to return on capex that the trend towards reduced base-load entails for CCS.
Public loan guarantees	Loan guarantees to commercial-scale coal- and gas-fired power plants with CCS	Indirect debt finance measure to help lower the overall cost of CCS projects.
Tax breaks for EOR	Reduction in tax liability for companies operating a CCS asset for EOR projects.	Lowers cost of projects that employ CCS technology.

CCS deployment – 2020 - 2030

Conclusions - Medium-Term Measures

- **Feed-in tariffs** should continue as a sliding premium scheme
- **CCS purchase contracts** could be attractive options for MT
- **The ETS cap should be extended from 2020 to 2030 and 2040** in line with EU Low-Carbon Economy Roadmap 2050 (reduction target at 88%-91% for ETS sectors between 2005 and 2050) – a legally binding EU target for reducing the CO₂ intensity of all sectors, including power, is a strong driver for investment by Member States. (Measures may be needed to prevent carbon leakage, including investigation of if and how climate policy obligations could be placed on electricity *distribution* instead of *generation*)
- **Forward contracts for CCS generation capacity** should continue
- **Public loan guarantees** would continue to lower overall cost of projects and should be available; indirect debt-financing measures for commercial-scale coal- and gas-fired power plants with CCS

CCS deployment – 2020 - 2030

Recommended Medium-Term Measures

MEASURE	DESCRIPTION	KEY BENEFITS
<i>Medium term, 2020-2030</i>		
Feed-in tariffs (€80-€100/MWh)	A sliding premium scheme whereby a premium indexed on fuel price is guaranteed above the market price	Provides predictable revenues
CCS purchase contracts	Government sets an amount of anthropogenic CO ₂ to be captured and stored over the next 25 years; competitive bidding process for 20-year CCS contracts to reach the desired volume (excludes project construction time).	Combines contract certainty of feed-in tariffs with competitive and cross-sectoral elements of a CCS certificate scheme.
Extend ETS cap from 2020 to 2030 and 2040 (in line with EU Low-Carbon Economy Roadmap 2050)	A legally binding EU target for reducing CO ₂ intensity of all sectors, including power, is a strong driver for investment by Member States.	Increases EUA price, making CCS for fossil fuel power plants economically viable. (Measures may be needed to prevent carbon leakage.)
Capacity payments	TSO holds reverse auction for forward CCS-equipped power generation capacity (with set requirements for availability, flexibility etc) – payments are made annually as long as capacity is available (€/MW). The contractual terms for payments should be set for a number of years in advance.	Reduces the risk to return on capex that the trend towards reduced base-load entails for CCS.
Public loan guarantees	Loan guarantees to commercial-scale coal- and gas-fired power plants with CCS	Indirect debt finance measure to help lower the overall cost of CCS projects.

CCS deployment – 2030+

Conclusions - Long-Term Measures

- **Long-term ETS cap for 2050 to be set as early as possible** – based on Low-Carbon Economy Roadmap 2050, with a view to making the EUA price an effective part of the long-term business case for CCS; banking should continue to be allowed in order to establish a long-term forward market for EUAs; risk of carbon leakage should be addressed
- Credible and predictable **reserve price auctions** would provide investors with long-term security that the EUA price will not fall below a certain level (some ZEP members consider that this would not have sufficient impact on the business case for CCS and undermine ETS fundamentals)

CCS deployment – 2030+

Recommended Long-Term Measures

MEASURE	DESCRIPTION	KEY BENEFITS
<i>Long term, 2030+</i>		
Adjust EUA supply/ETS cap	Reduces the total quantity of CO ₂ emissions and equivalent EUAs. Set the cap for 2050 in line with EU Low-Carbon Economy Roadmap 2050; banking should be allowed.	Increases EUA price, making CCS for fossil fuel power plants economically viable. (Measures may be needed to prevent carbon leakage.)
EUA reserve price auction	EUAs are not auctioned below a certain price. A carbon central bank could be a way to achieve this.	Gives the investor greater certainty regarding the EUA price and revenues. (Complementary measures to adjust EUA supply are needed to prevent speculation and eliminate adverse interaction between ETS and non-ETS measures.)

Role of governments (1)

- The role of EU and MS-Governments should be restricted to
 - 1) developing a stable investment climate;
 - 2) accelerating the path along the (capture) technology learning curve;
 - 3) developing a practical HSE regulatory framework;
 - 4) where the market fails, partnering in *infrastructure* with private companies ("PPP").

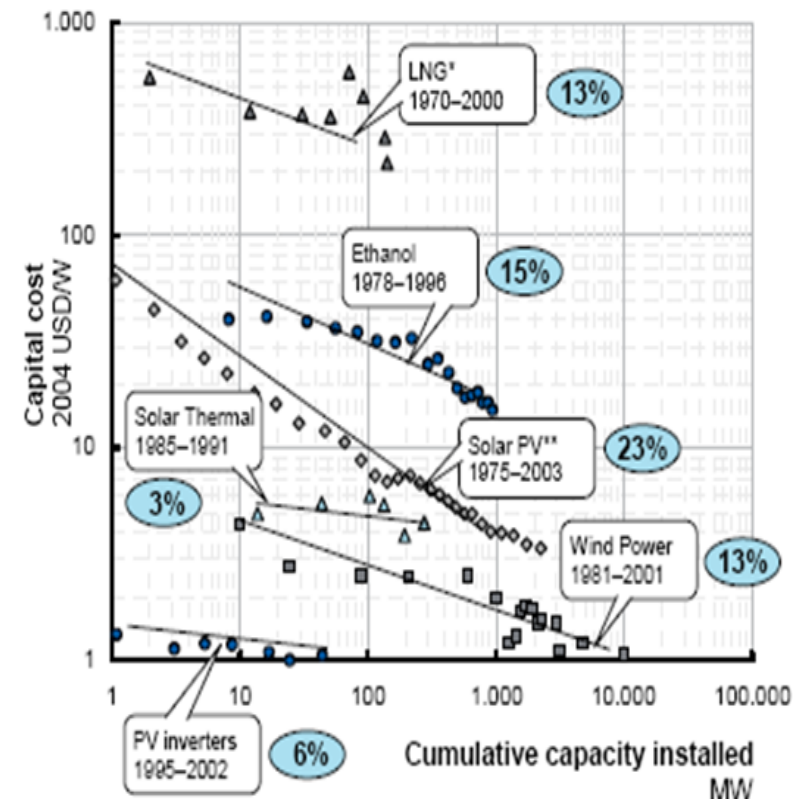
- 'Stable investment climate':
 - 1) Properly working **ETS**
 - 2) EU-MS governments clearly **choose for the market mechanism** to drive, eventually, the investments in abatement technologies;
 - 3) Hence, they clearly **reject market distortion instruments** such as taxation, subsidies, non-level playing field legislation to promote specific technologies, picking winners, etc., except....
(see next slide)
 - 4) EU-member state governments clearly **discourage nimby delaying tactics** by lower authorities and/or lobby groups, provided that the HSE regulatory framework is complied with.



Role of governments (2)

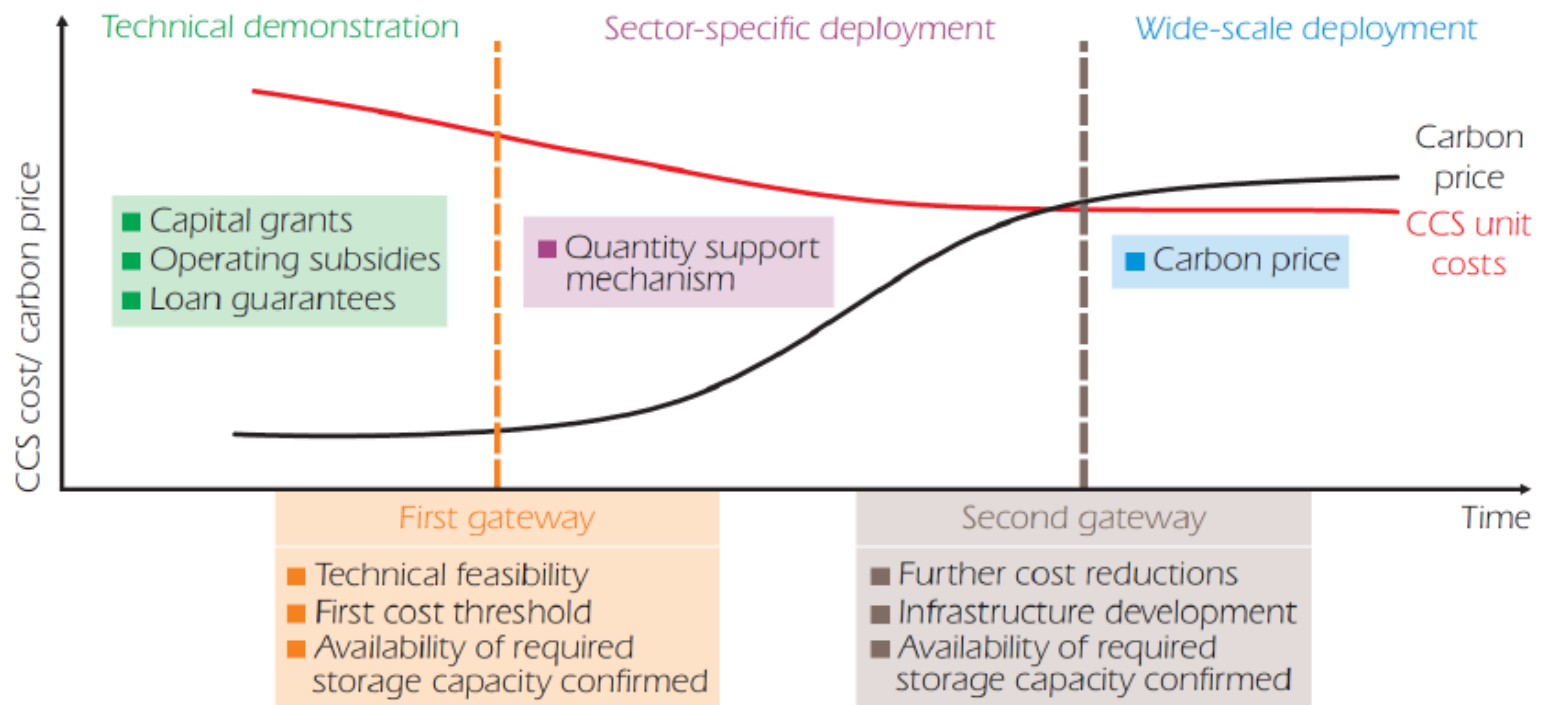
- ➔ The role of EU and MS-Governments in 'Accelerating the path along the TLC' is contrary to the idea that markets should pick the winners.
- ➔ However, they may intervene in 'picking the winners' provided that the following conditions are fulfilled:

1. Government intervention **demonstrably accelerates** the path along the technology learning curve towards commercial application.
 - *Improved TLCs are to be developed.*
2. The technology has **sufficient** potential **abatement volume**.
3. **Commercial investments** in this potential are being **unlocked timely**.



CCS: stimulate path to commerciality

➔ ZEP's path towards CCS large-scale deployment



EU-ETS

**Quote by Hans ten Berge, NL-president
of Eurelectric (2013):**

'We, the electricity producers, but also the steel, aluminium and cement industry, have stockpiled enough CO₂ emission rights until 2025 to fire gas and coal as much as we want. We can just lean back and relax'.



The EU-ETS challenge

- › CO₂ reduction: -20% in 2020, ~-80% in 2050 (ref. 1990);
- › EU-ETS is EU's key instrument to achieve this target.
- › EU-ETS consists of different phases:
 - › Phase I: 2005-2007 ⇒ Learning Phase
 - › Phase II: 2008-2012 ⇒ Improvements, no cap reduction
 - › Phase III: 2013-2020 ⇒ Cap reduction (-1.74% / yr)



The EU-ETS paradigm

- › **Markets are more efficient than governments to achieve some objective at minimum societal cost**
- › **Governments set the objectives, rules of the game and legal constraints, while market parties play the game**
- › **Governments act as market designer and referee/regulator**



Should governments play the game? Or just set the rules and regulate?

- EU-Commission and MS-Governments are impatient and want to be seen as dynamic.
- They introduce many measures to speed-up the decarbonisation transition but seem to miss how this only delays the transition to efficient markets.
- They rarely have an exit strategy for these short-term measures that distort the market, which ultimately can only function if there is a \pm '*level playing field*'.
- EU & MS-governments fail to see they are undermining their own flagship ETS program. And it is the ETS that sets the EU-emissions level. Not the other measures!



The waterbed effect of the ETS

CO₂ emissions

F	I	E	SF	P	Ire	Bul	Gr	Hu	Ro	UK	DK	S	D	NL	A	Lux	B	Lit	Est	PL	CK	Slo	SK	HR	Mal	Cy
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- › Total EU emissions are determined by the ETS cap, not by the deployment of SETs by the individual EU member states.
- › Constraints, goals and means are being confused.
- › If ETS-EUA price is systematically being undermined by '*non-ETS parallel measures*', then a large flagship programme, with high societal transaction costs, has been implemented to no avail.

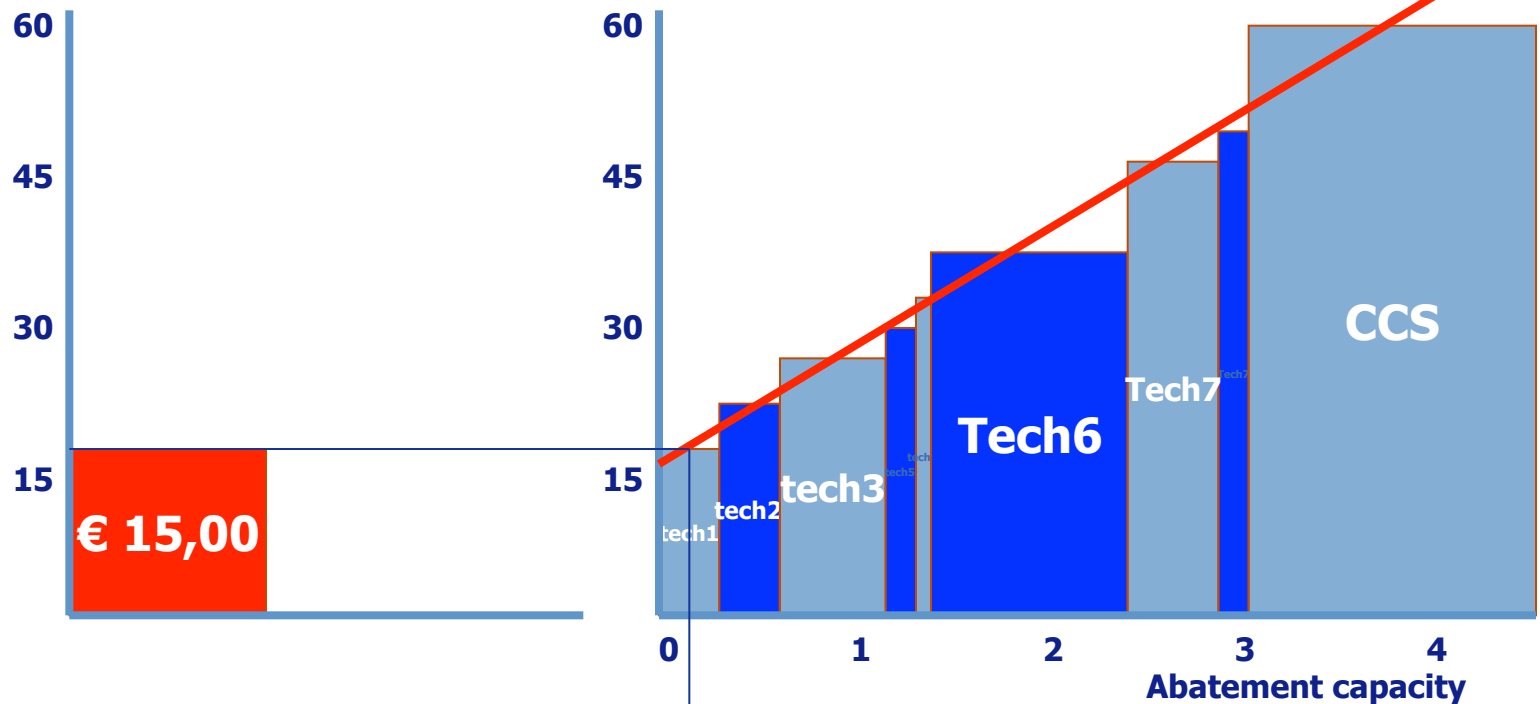
Fundamental EUA price

(merit order of SET determines EUA price)

Abatement

EUA Price

€/t abatement



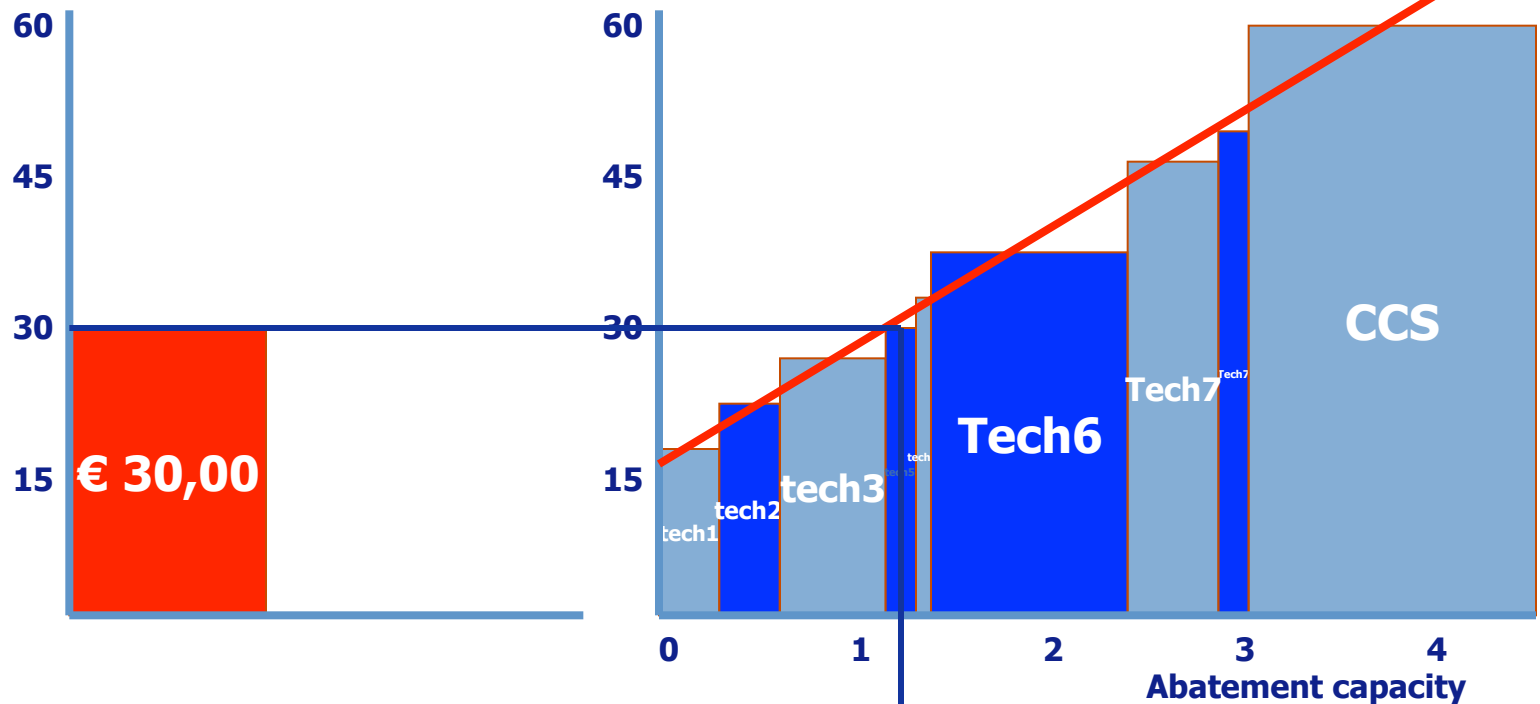
Fundamental EUA price

(merit order of SET determines EUA price)

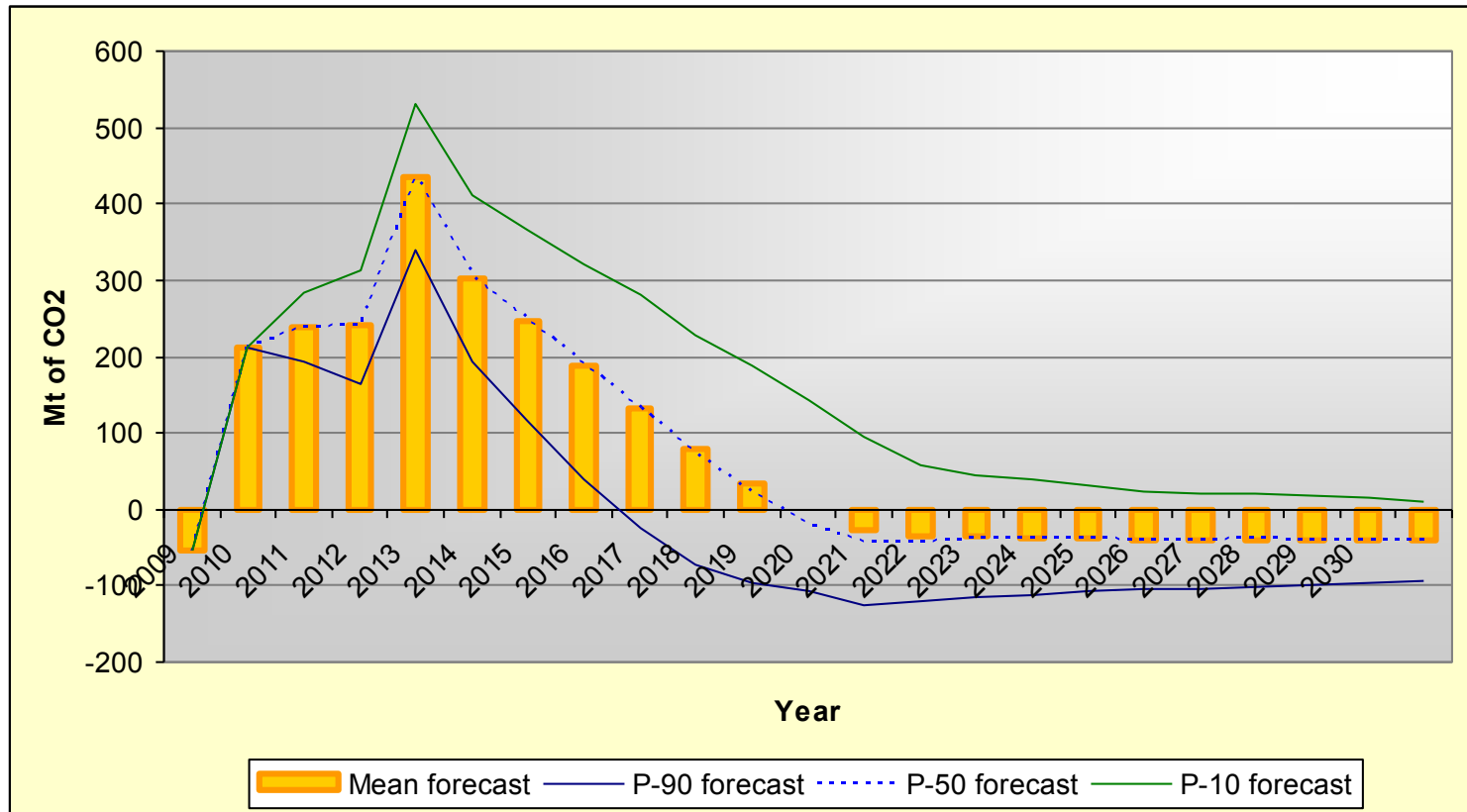
Abatement

EUA Price

€/t abatement



EUA scarcity modelling (BAU)

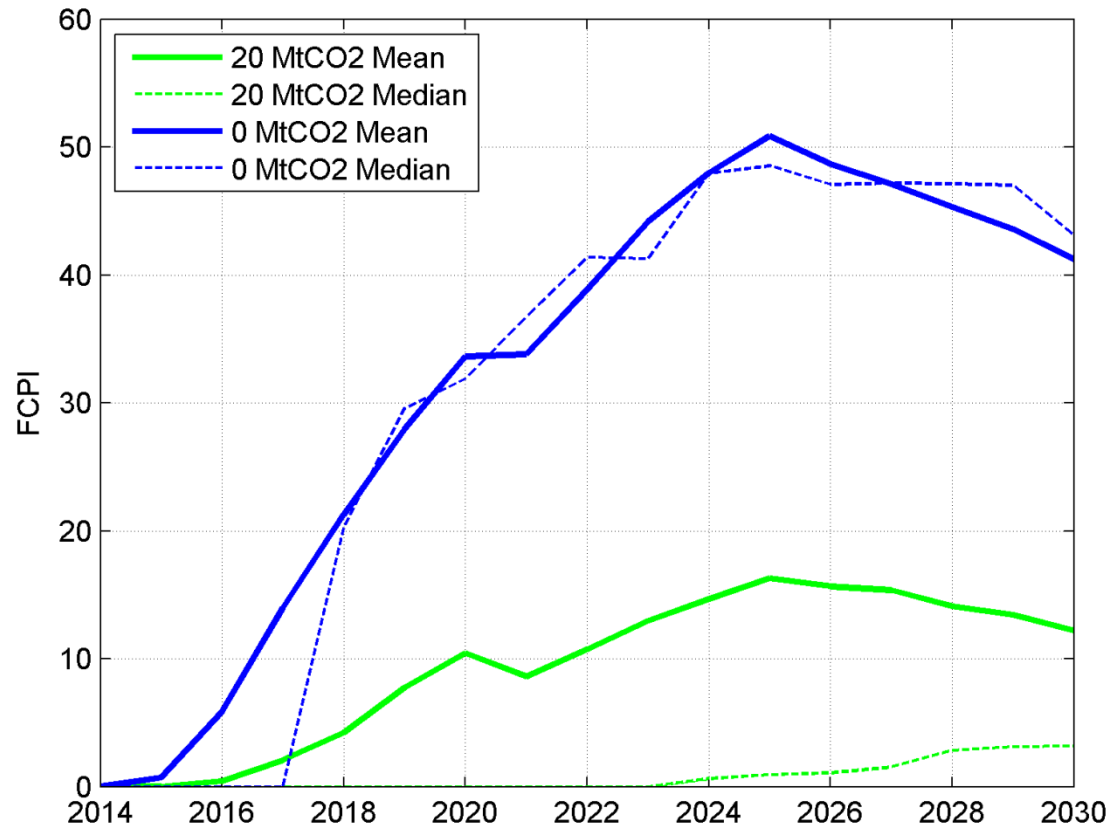


Scarcity of allowances between 2008 and 2030
(positive values = surplus)

Slide
30

Simulation with parallel instruments

non-linear effect on EUA price!



Blue lines: no parallel measures: ETS only

Green lines: only 20 MtCO₂/yr worth of parallel instruments are deployed.

Result of this low amount of parallel instruments: near-zero CO₂ price.

And: emission target can only be met by massive subsidies or mandated abatement.



Possible solution?

Option 1 – market system

- Phase-out all non-ETS measures to allow CO₂ price to take off. Remove market distortions asap.
- Combine this with more stringent ETS cap reduction and/or with EUA set-aside measure
- Only stimulate those pre-competitive technologies, which
 - Have high abatement market potential, *and*
 - Have a learning curve that is steep enough, *and*
 - Have a current unit price that is not too high
 - Will not take too long to have a sizeable market impact
- Develop long-term level playing field, incl. WTO tariffs.

OR Option 2: a taxation system

- Bury ETS and replace by CO₂ tax system;

OR Option 3 : a mandate system

- Introduce a mandate system consistently (sewage model)



Hybrid schemes don't work / create inefficiencies

→ Present situation:

- MS's have different positions on the intertwined trends toward decarbonisation and competitive markets
- All MS's participate in the EU-ETS
- MS's have their individual non-ETS RES promotion schemes
- Consistency between MS's starts by consistency within a MS
- Even the EU has its own hybrid scheme (ETS + priority for RES on grid)



Discussion

- **Consistency** in energy policy to realise both targeted transitions (decarbonisation + competitive markets) is direly missing.
- Therefore, a *business perspective* for CCS is missing. If this is the primary hurdle for CCS deployment, shouldn't CO2GeoNet focus more on *policy* R&D, rather than on *technical* R&D?

