Grantham Research Institute on
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the Environment

Centre for
Climate Change
Economics and Policy

Energy and carbon markets in Europe: *Larger or smaller markets?*

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LSE

Agenda

- Energy markets
  - Energy markets and the trilemma: security, affordability, and sustainability.
  - Examples of linking markets.
  - When is ‘more Europe’ better?
- Carbon markets
  - Carbon markets and the European Union Emission Trading System.
  - Large or small carbon markets?
  - Examples of linking markets.
  - When linking is beneficial?
- Summary

Energy Markets

INTRODUCTION

Introduction

- Historically, energy was generated, transmitted and distributed on a regional basis within countries.
- Vertically integrated energy companies, incompatibility across regions.
- Consumer choice limited and no economies of scale.
- Many countries embarked upon nationalisation of regional energy companies, and (subsequently) deregulation to:
  - Separate generation from transmission
  - Separate wholesale and retail electricity markets.
- Allowed larger, national markets to evolve ➔ better for consumers.

Introduction

- The next step is to enlarge electricity markets beyond national borders.

- However this raises some of the same issues:
  - Technological compatibility
  - Regulatory harmonisation.
- Also, the concept of the energy 'trilemma' is important: affordability, sustainability and security of supply.

Energy Markets

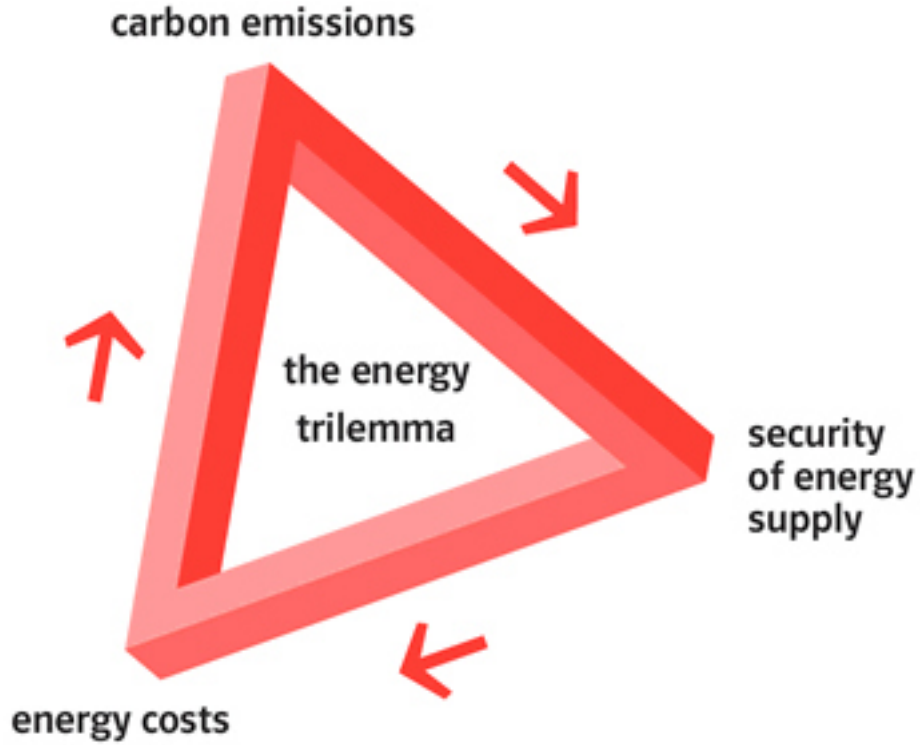
THE TRILEMMA: SECURITY, AFFORDABILITY AND SUSTAINABILITY

Energy markets: the trilemma

- In an ideal world, we want to maximise affordability, security and sustainability, that is:
  - **Cheap** energy
  - From **reliable** sources
  - That is generated in an **environmentally friendly** manner.
- Stated policy goal for many countries. The UK is globally ranked:
  - 22nd in affordability
  - 9th in security
  - 18th in sustainability.
- But 4th overall!

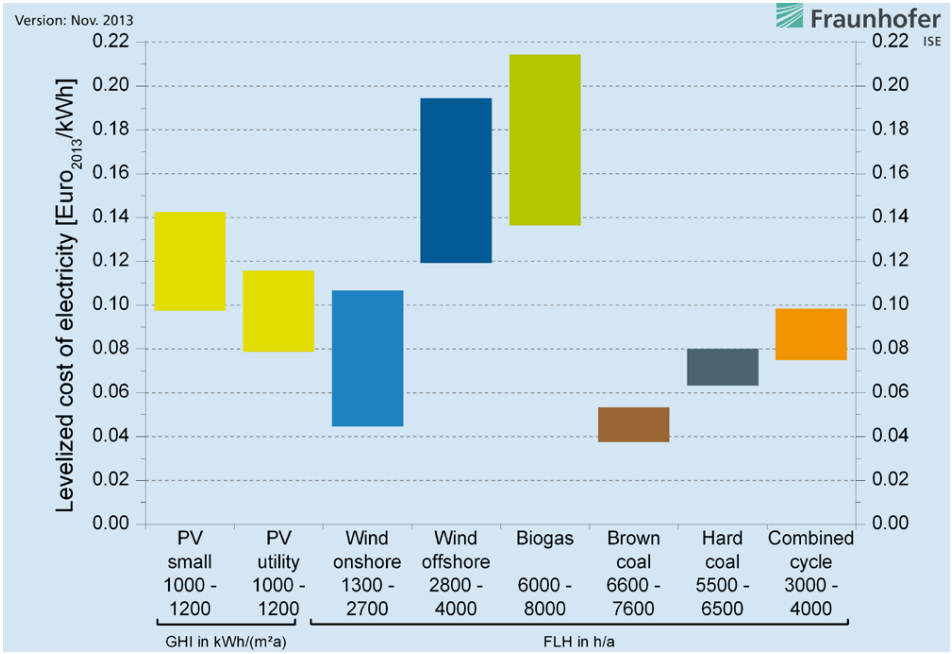
Energy markets: the trilemma

- However the three aspects of the trilemma are interrelated, and it is difficult to pursue all of them at once.



Affordability v. sustainability

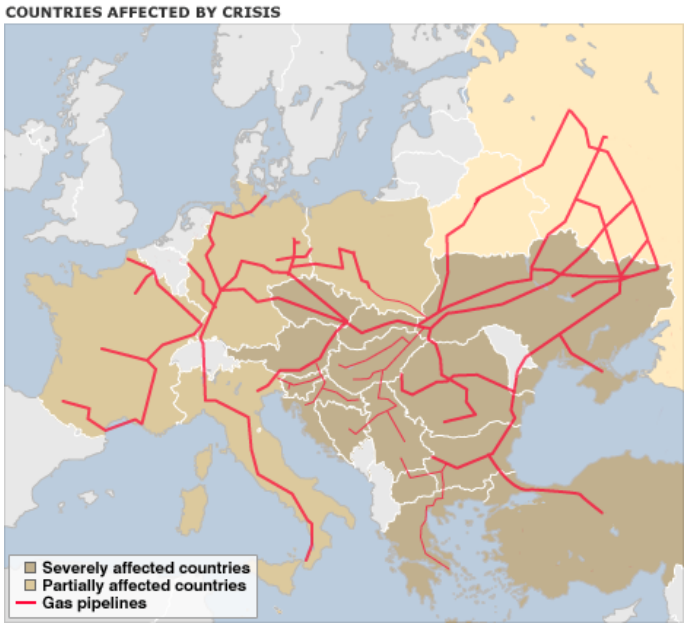
- Cheaper to generate electricity with fossil fuels than with renewables.



- Although onshore wind and some PV is now cost-competitive…

Affordability v. security

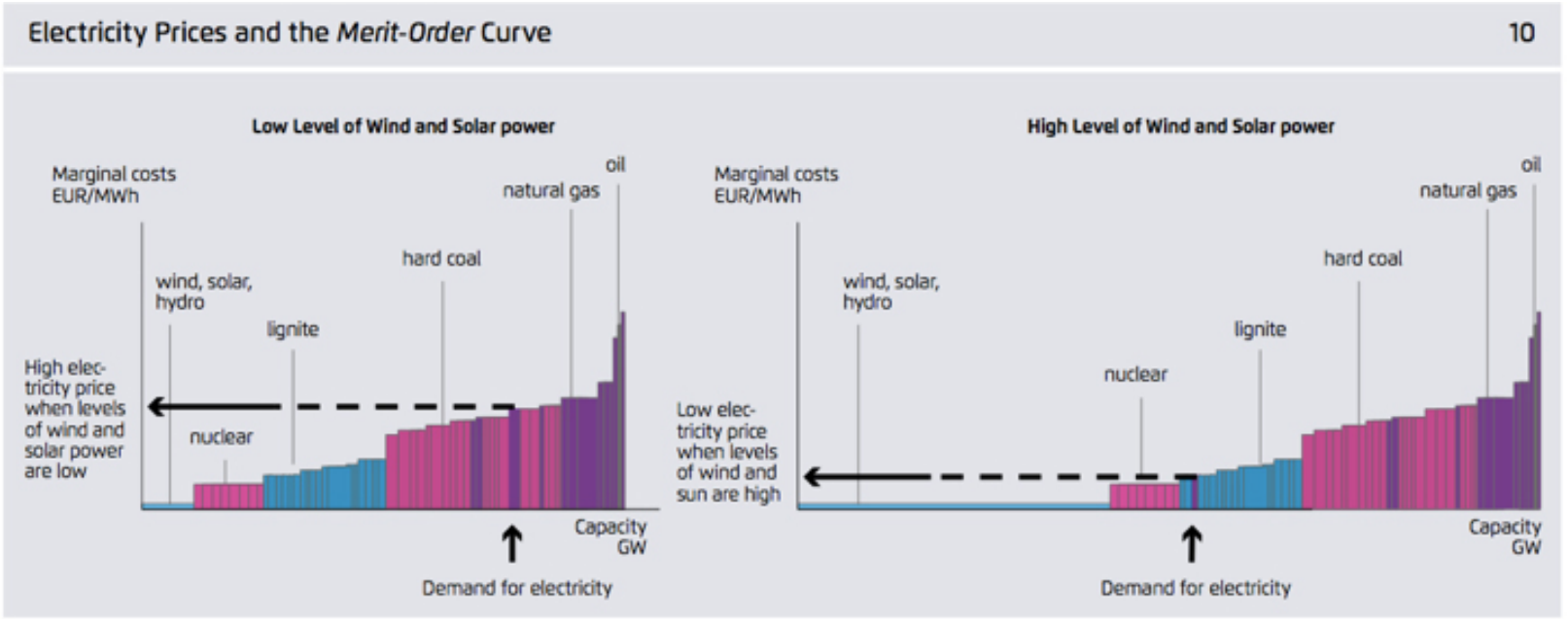
- Gas from Russia is cheap, but crosses several countries and therefore subject to political factors.



- 2009 Russia–Ukraine gas dispute cut off supplies to SE Europe.

Sustainability v. security

- Renewables require fossil fuel baseload, but merit order decreases baseload profitability.



- Solution: capacity payments?

Energy markets: the trilemma

- The trilemma is a useful conceptual tool, operating as a framework for analysing the advantages and disadvantages of a particular energy policy.
- So how will affordability, sustainability and security be affected by larger energy markets?
- Not always obvious…

Security

- Advantages of larger markets:
  - Greater diversity of sources of energy (e.g. coal, gas, wind) and larger ‘pool’ of generators to draw on
  - Therefore easier to manage supply shocks (both internal and external).

Security

- Disadvantages of larger markets:
  - Exposure to larger markets may mean that less efficient, local generators go out of business ➔ but these may be needed for backup supply
  - Energy integration requires political collaboration, but changes in political headwinds can lead to less security in long run
    - Question: energy cooperation between countries decreases or increases long term tendencies to conflict?

Security

- Examples:
  - USSR benefitted from large gas market, but since breakup of USSR, more energy insecurity for former states
  - Expansion of European electricity network to Saharan solar farms (DESERTEC) brings terrorism concerns
  - Japan has fragmented energy system (two different mains frequencies) and regional monopolies ➔ blackouts in Eastern region after Fukushima disaster.

Affordability

- Advantages of larger markets:
  - Larger market can encourage larger generators, which can benefit from economies of scale
  - Larger wholesale and retail market leads to competition on prices
  - Diversity of energy sources means consumers can benefit from lowest cost electricity (base and peak) at any point in time
  - Less need for (expensive) domestic energy storage or baseload to even out demand.

Affordability

- Disadvantages of larger markets:
  - Consumers in exporter countries may experience higher costs as more domestic energy is exported:
    - France, with cheap nuclear
    - Iceland, with cheap hydro
    - Spain, with cheap wind.
  - But, their producers make more money, so it's still an efficient allocation of resources.

Affordability

- Examples:
  - France reluctant to expose nuclear sector to cheaper wind/solar from Spain

Sustainability

- Advantages of larger markets:
  - Countries are able to access more sustainable energy generation in other countries:
    - Icelandic geothermal power
    - Norwegian hydro power.

Sustainability

- Disadvantages of larger markets:
  - Local sustainable energy may be undercut by cheaper fossil fuels from other countries
  - Countries may have preferences or subsidies for specific technologies (e.g. no nuclear) but forced to accept other sources of energy as part of market rules.

Sustainability

- Examples:
  - Germany opposed to imports of French nuclear power
  - New connection from Iceland to UK carrying cheap hydroelectricity may undercut UK domestic renewables

  - UK/Norway interconnector lessens the problem of UK wind intermittency (excess UK power used to pump water above dams in Norway, which can then be drawn on in times of shortage).

Energy Markets

EXAMPLES OF LINKING MARKETS

Examples of linking markets

- We will now look at:

1. EU Internal Energy Market
2. Regional markets in USA, Central and South America.

EU Internal Energy Market

- Successive energy reforms (most recently Third Energy Package 2009) have sought to create basis for an Internal Energy Market:
  - Ownership unbundling
  - Creation of national regulatory authorities.
- However, slow progress.
- Why? Some debates around trilemma priorities:
  - EU reliance on Russian gas creates energy insecurity, but substituting with coal will have environmental effects
  - Renewable energy incentives have been very costly, affecting affordability (for example, the *energiewende* in Germany).

EU Internal Energy Market

- Also practical/political issues:
  - Incentivising transmission system operators and private investors to build interconnectors
  - Harmonising differing national regulatory systems
  - Compensating third countries for through-transmission of energy
  - Congestion management at interconnectors
  - Creating regional institutions to reduce regulatory overlap:
    - No European regulatory agency with authority to execute plan – 'subsidiarity' limits this kind of supra-national planning.

EU Internal Energy Market

- New model is smaller 'Regional Initiatives' based on intergovernmental agreements:
  - Scandinavian interconnections
  - MIBEL electricity market (Portugal and Spain)
  - SEM electricity market (Northern Ireland and Ireland).

- A full Internal Energy Market may be some way off…

Other examples

1. Regional USA markets (e.g. New England, Midwest).
2. Central American Regional Electricity Market.
3. Andean Community (Colombia and Ecuador).
4. Mercosur (e.g. Brazil and Uruguay, cooperation on large dams).

Energy Markets

WHEN IS "MORE EUROPE" BETTER?

Under which conditions will linkage work?

- Helpful to think in terms of trilemma trade-offs:
  - Expansion generally increases sustainability and affordability
  - But leads to more energy insecurity…

Under which conditions will linkage work?

- EU pushing for larger energy market on the basis of regional political cohesion.
- But always going to be a long term political project/commitment.
- Hence emphasis on regional interconnections, for now.

Energy Markets

SUMMARY

Energy markets: summary

- Energy is a key component of economic activity ➔ there will always be political considerations about expansion:
  - Maintaining security
  - Domestic policy priorities
- Expansion requires physical interconnections and harmonisation of regulations, which can take many years, and be costly.
- Ultimate limit to how far energy markets can be linked – e.g. energy loss through long distance transmission.
- But energy *cooperation* is important, as market interdependence and global resource issues (see International Energy Agency, WTO).

Carbon Markets

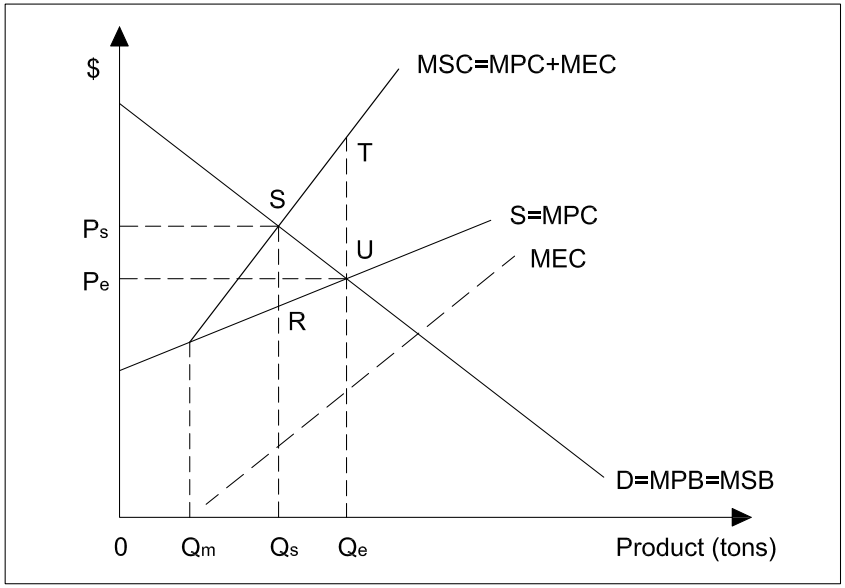
INTRODUCTION

Externalities and market failure

- What is an externality?
  - A benefit to someone who did not choose to receive that benefit.
    - The farmer who grows apples near to a beekeeper ➔ farmer's apple trees pollinated for free
  - A cost to someone who did not choose to incur that cost.
    - The fishermen in a lake downstream from a polluting factory ➔ fish harvest in lake decreased
- A type of market failure…
- The price of the good or service (the beekeeper's honey, the factory's products) does not reflect all of the costs and/or benefits to society associated with its production.

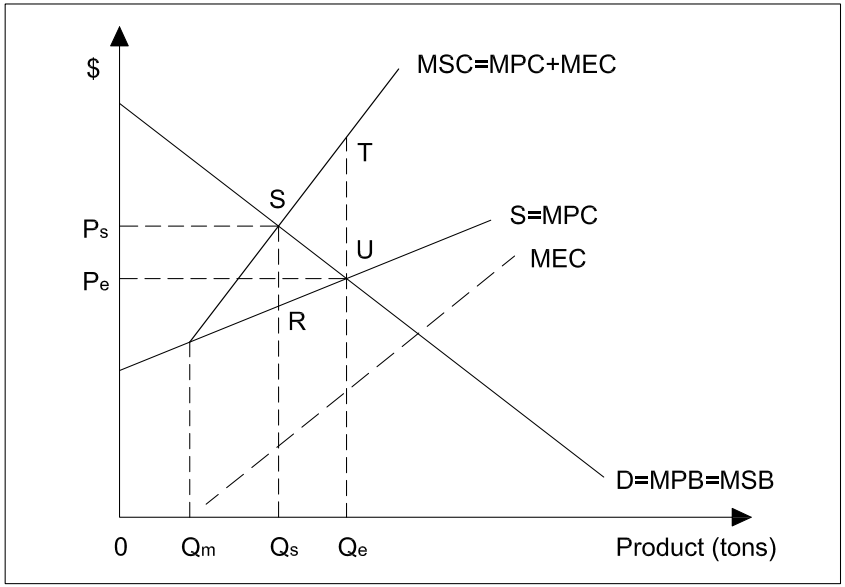
Market failure and private markets

- When there are externalities, markets do not allocate resources in the most efficient way.
- Therefore the overall economy will not achieve maximum welfare.



Market failure and government policy

- Governments can correct ("internalise") externalities through policy action.



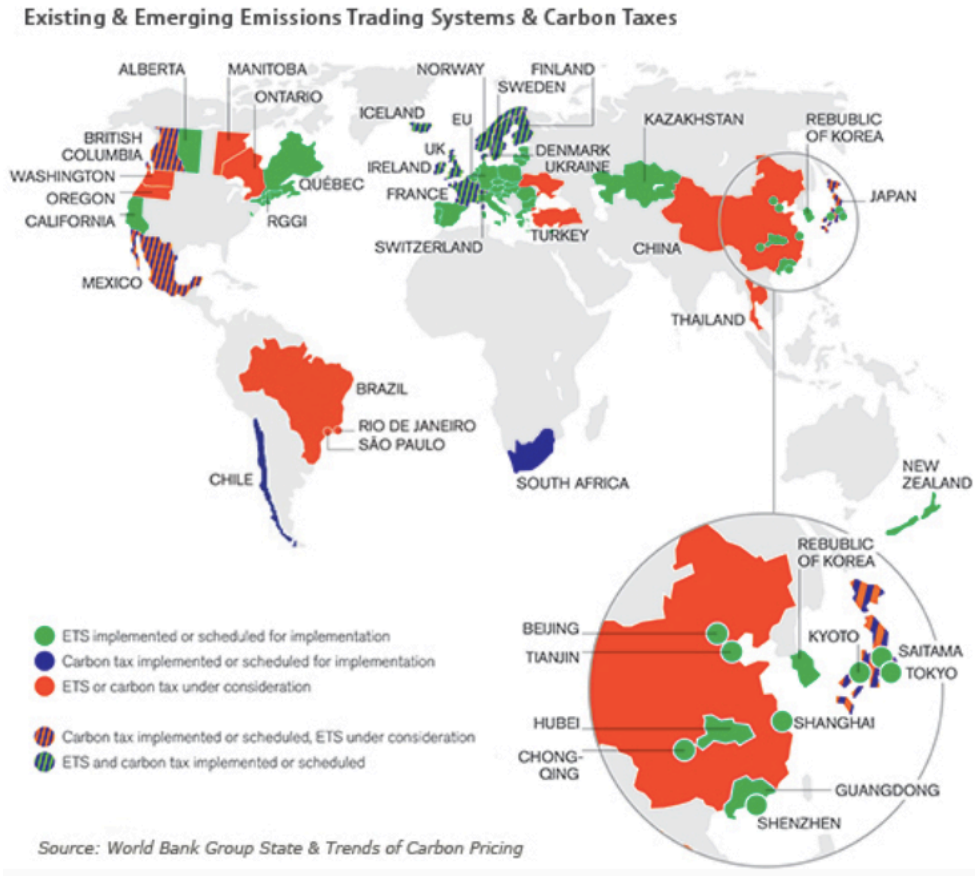
Regulation through quotas

- Quotas are a type of government policy to address market failure.
- The government creates an artificial market for transferable permits.
- In the case of pollution, these permits are a 'licence to pollute'.
  - An emission permit is a permission to emit a unit (pound, ton, etc.) of a specific air pollutant.
- Requires the following:
  - It is possible to obtain/define a legally sanctioned right to pollute.
  - The total number of permits and the initial distribution among the various polluters is assigned by government agencies (e.g. EC centralized allocation).
  - Polluters emitting in excess of their allowances are subject to a monetary penalty.

International agreements

- In February 1992 the representatives of the United Nations discussed and established the United Nations Framework Convention on Climate Change (UNFCCC).
- The Conference of the Parties in 1997 in Kyoto resulted in a legally binding agreement to limit greenhouse gas emissions (GHG) emissions.
- Several national and regional GHG trading systems were designed to help countries with national emissions limitation commitments under the Kyoto Protocol obligations.
- After the EU Emission Trading System (EU ETS), several ETSs are emerging world-wide, e.g. in California, Canada, New Zealand, China, South Korea, among others.

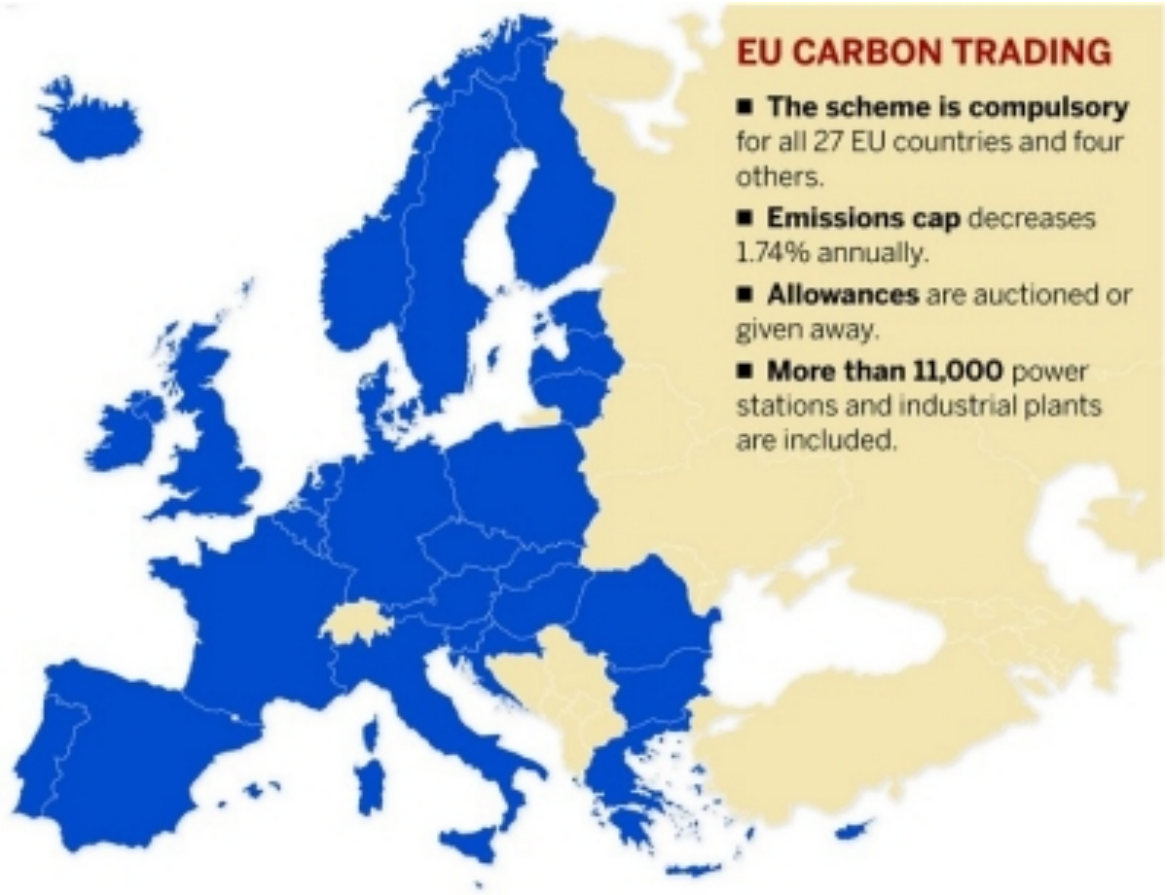
International agreements



The EU Emissions Trading System

- The EU ETS is a regional initiative established to help the EU meet its climate change commitments under the Kyoto Protocol.
  - Expected to reduce total emissions by 21% in 2020 compared to 2005 levels.
  - Covers 11,500 installations in 31 European countries.
- Each regulated installation must choose from one of the three following alternatives:
  - Reduce production to reduce pollution.
  - Purchase permits to cover pollution.
  - Adopt new technologies to reduce pollution per unit of production.

The EU Emissions Trading System



Carbon Markets

LARGE OR SMALL MARKETS?

Larger carbon markets

- "Within the constraint imposed by a given emissions control target, costs are minimised when flexibility is maximised across space and across time."
  - I.e. larger markets are generally better.
- But let's look at some economic, political and practical considerations…

Economic considerations

- Advantages of larger markets:
  - Overall efficiency gains, as marginal abatement costs are minimised across larger compliance pool.
  - Greater liquidity decreases transaction costs.
  - Greater liquidity decreases permit price movement and uncertainty.

Economic considerations

- Disadvantages of larger markets:
  - Real world efficiency gains may be overrated…
  - Some economies may face greater price volatility.
  - Larger markets are more exposed to systemic shocks.

Political considerations

- Advantages of larger markets:
  - Commitment to international cooperation.

  - Mutual pressure to continue the system.
  - Alleviates competitiveness concerns between economies.

Political considerations

- Disadvantages of larger markets:
  - Loss of control over domestic priorities, such as:
    - Environmental policy portfolio
    - Carbon prices
    - Level of environmental ambition.

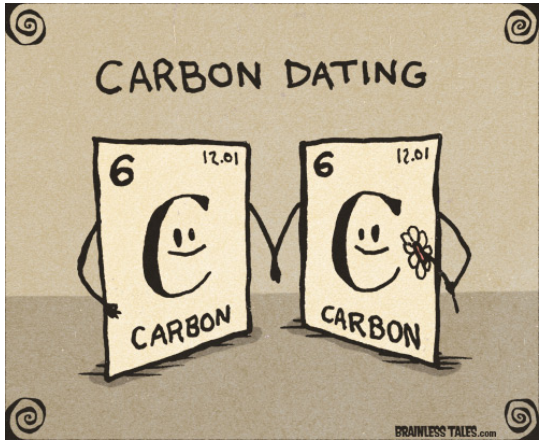
  - The co-benefits of a less polluted environment may be shifted abroad.

Practical considerations

- Need for regulatory changes to ensure regimes are compatible:
  - Monitoring, reporting and verification (MRV) of emissions.
  - Enforcement and penalty mechanisms.
  - Registry system.
  - Cost containment mechanisms.
- Leads to less domestic regulatory flexibility.

Practical considerations

- You need to choose the right partner!



- May be easier to link systems which are designed from the start to be linkable.
  - See later in the case of China…

Carbon Markets

EXAMPLES OF LINKING MARKETS

Indirect linking

- Indirect linking:
  - Two systems **do not** accept permits from each other, but **do** accept permits from a common third party.
  - For example, the EU ETS and California ETS allow firms to use credits from the Clean Development Mechanism (CDM) under the Kyoto Protocol.
- Enlarges portfolio of mitigation instruments, which enhances cost-effectiveness.
- But usually quality / quantity constraints on use of external credits.
  - Maintains ETS 'national sovereignty'.

Direct linking

- Direct linking:
  - Two systems accept permits from each other for purposes of compliance with their local caps.
- Can be bilateral (two-way):
  - EU ETS and Australia (a failure).
  - California and Quebec (a success – although not technically a link).
- Or unilateral (one-way):
  - Only one of two systems allows credits from the other for compliance.
  - EU ETS and Norway (although bilateral since 2009).

Bottom-up linkage

- The benefits of a global carbon market are economic and political in nature.
  - Minimises the overall cost of meeting the collective cap and sharing efforts.
- New climate change agreement to be signed in Paris in late 2015.
- But it may prove difficult to implement a 'top-down' market.
- Current thinking is around 'bottom-up' linkage of existing markets.
- As an example, 7 Chinese regional markets are expected to link up to form a national market in 2016.

Bottom-up linkage

Bottom-up linkage

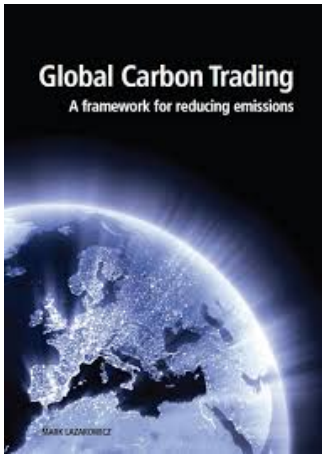
- The World Bank has identified a ‘super-region’ of countries that currently regulate carbon emissions using ETSs:
  - 31 nations, four individual nations and 13 sub-national jurisdictions.
- Currently researching linkage using a common currency / ‘International Carbon Reserve’.

Carbon Markets

CONDITIONS FOR LINKAGE

Conditions for linkage

- Economic considerations come first.
- Need to persuade industry and the public that there will be concrete benefits in linking.



- If it makes economic sense to link, what else matters?

Conditions for linkage

- Importance of technical criteria:

Criteria	Alignment
Relative stringency of targets	✔
Stringency of enforcement	✗
Eligibility of offset credits	✔
Cost-containment targets	✔
Method of allocation	✔
Common definition of emissions	✗

- How many criteria are aligned?

Conditions for linkage

- In general:
  - Particular difficulties where definition of emissions (intensity-based versus absolute) is different.
  - Also difficulties where banking options and the time periods differ.

- But:
  - Can link schemes with different sector coverage (and there may be benefits from doing so).
  - Can link schemes between economies at differing stages of development.

Carbon Markets

SUMMARY

Carbon markets: summary

- Linking of ETSs in different countries allows for voluntary exchanges of permits across systems.
- Linking depends on each country's willingness to accept permits from other ETSs, requires harmonisation/agreement on:
  - Use of offsets, caps, monitoring, reporting and verification standards.
- But purely regulatory harmonization ➔ does not require new physical infrastructure.
- Also, carbon permit is a purely notional 'currency' ➔ single countries can suspend national policies or international agreements without material consequences.

Energy and Carbon Markets

SUMMARY

Conclusions: more Europe?

- The European energy market is not a success story… So far.
  - But new focus on energy security (October 2014) gives boost to integration.
- The EU ETS covers 11,000 installations in 31 countries ➔ already a success story.
  - But needs reform to make it more flexible to reflect economic conditions.
  - Proposals for a 'Market Stability Reserve' currently in Parliament.

Thank you!