The Role of Carbon Capture and Storage (CCS) in the Global and European Environmental Regime

International Protection of Environment

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Outline

Day 1:

CCS – How and why?

The policy and legal dimensions of CCS

Quiz

Day 2:

The Bellona Foundation & the role of NGO's in the EU

Social dynamics of CCS

Electromobility

Presentations

Definitions: CCS vs. CCUS vs. CCU

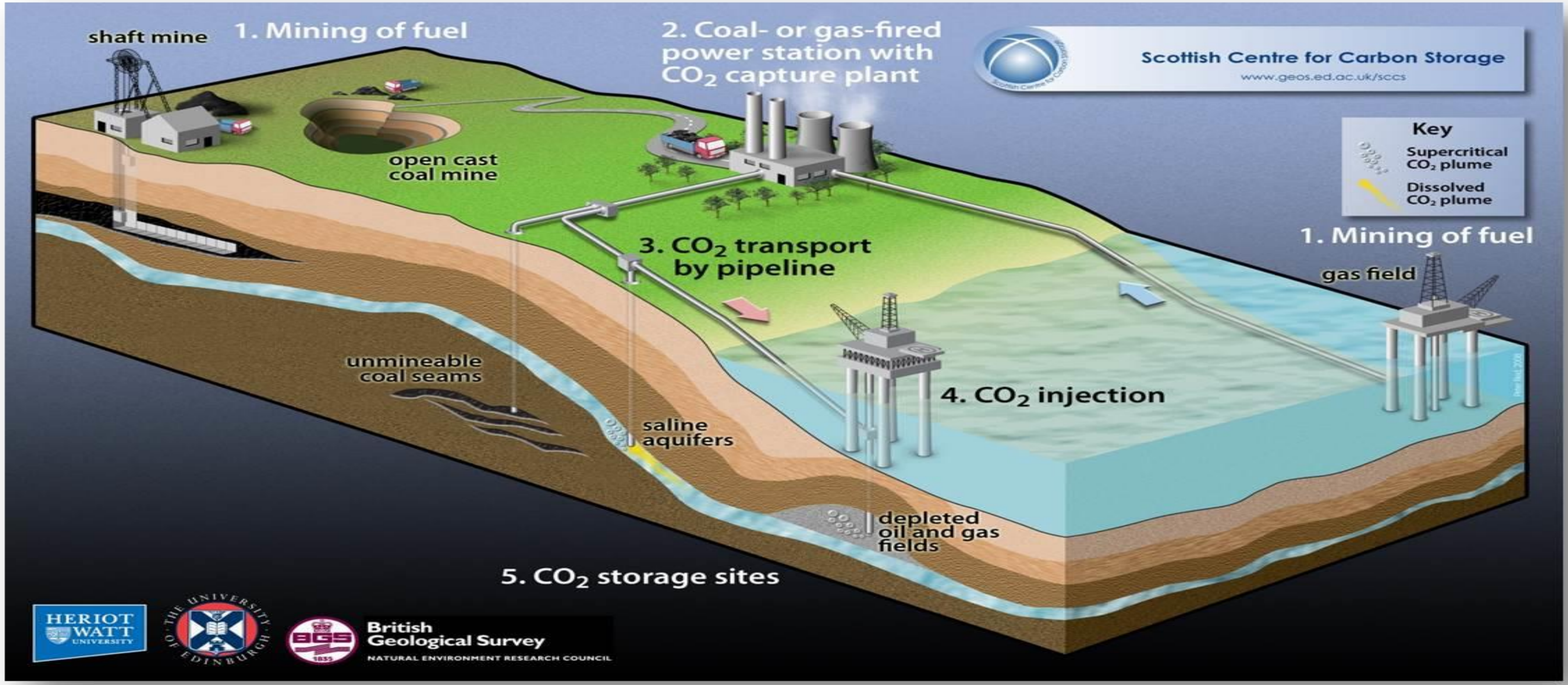
CCS: CO_2 is captured from its source of production and transported to a geologic storage site for long-term isolation from the atmosphere.

CCUS: used when all or part of the CO_2 is used before all is geologically stored for long-term isolation from the atmosphere (i.e. EOR). CCUS: a subset of CCS.

CCU: CO_2 is used to produce oil (EOR), or gas (EGR), or other goods (i.e. fuels, chemical products).

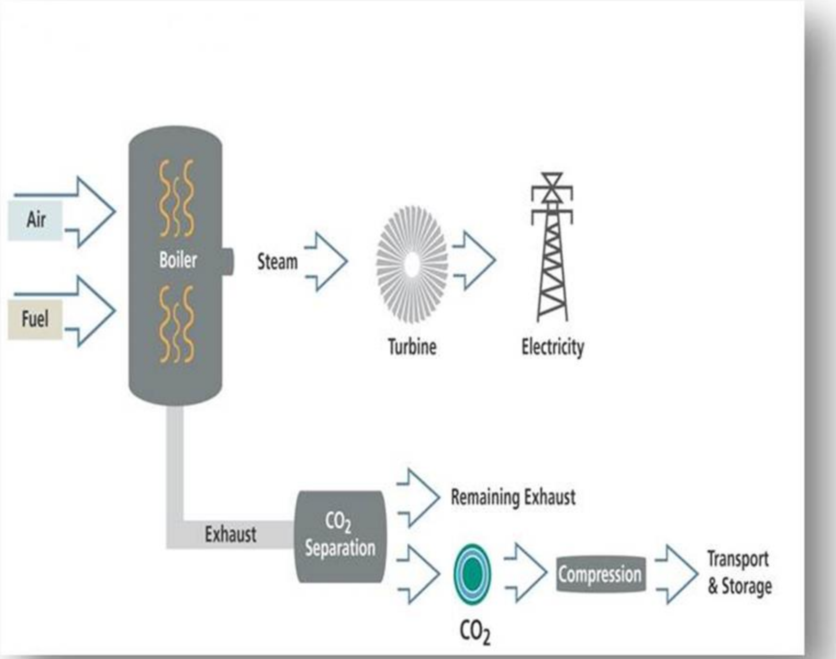
Relative to CCS, CCUS and CCU have limited contributions to the climate mitigation challenge.

CCS – HOW AND WHY?



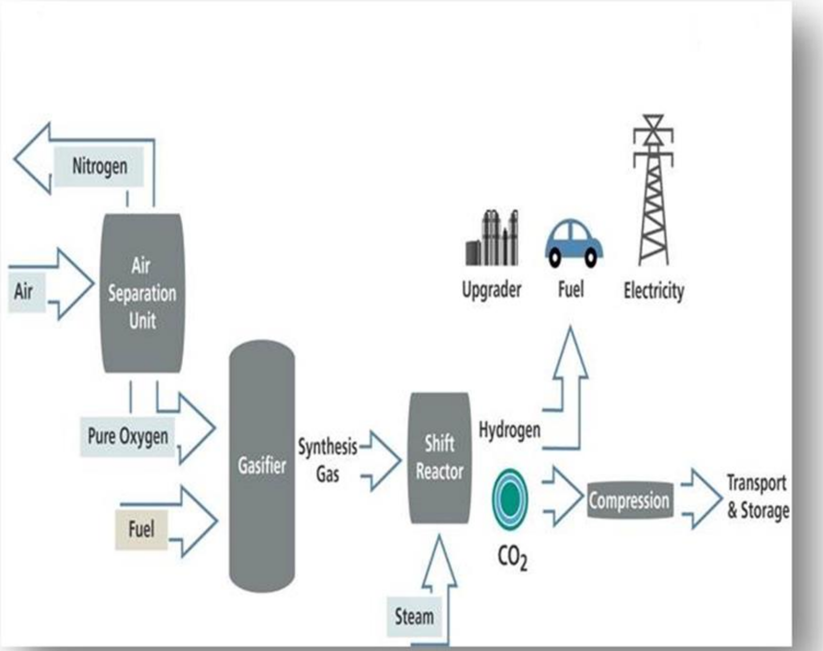
How is CO_2 captured? Post-combustion

- CO_2 is separated after combustion of the fuel takes place.
- Most common way is using a liquid solvent.
- Once CO_2 is absorbed by the solvent, the stream is then heated after which a high purity CO_2 stream is obtained.
- Process widely used already in the food and beverage industry.



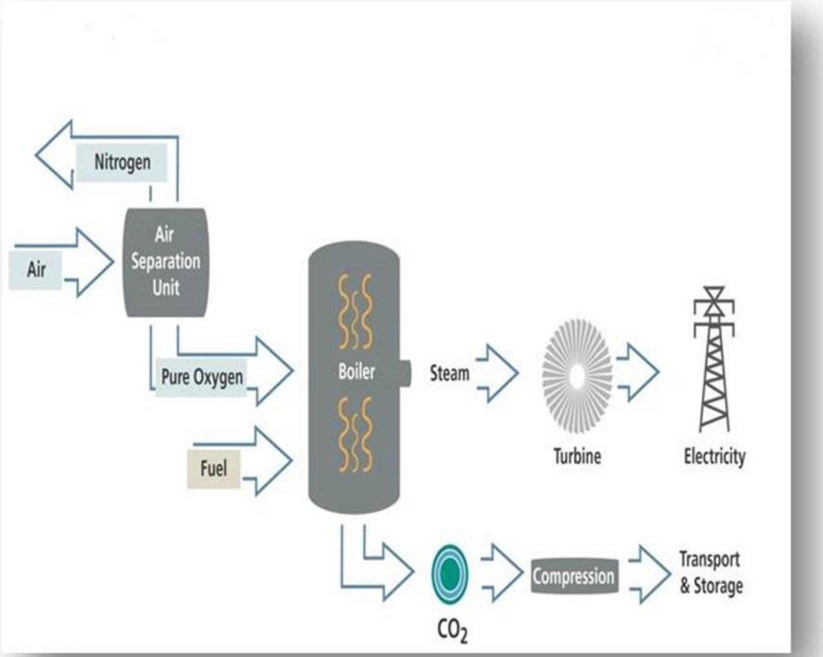
How is CO_2 captured? Pre-combustion

- The fuel is converted into a gaseous mixture of hydrogen and CO_2.
- The hydrogen is separated and burnt to generate electricity, while CO_2 is compressed for storage.
- Process more complex than in post-combustion, thus more difficult to be applied to existing power plants.



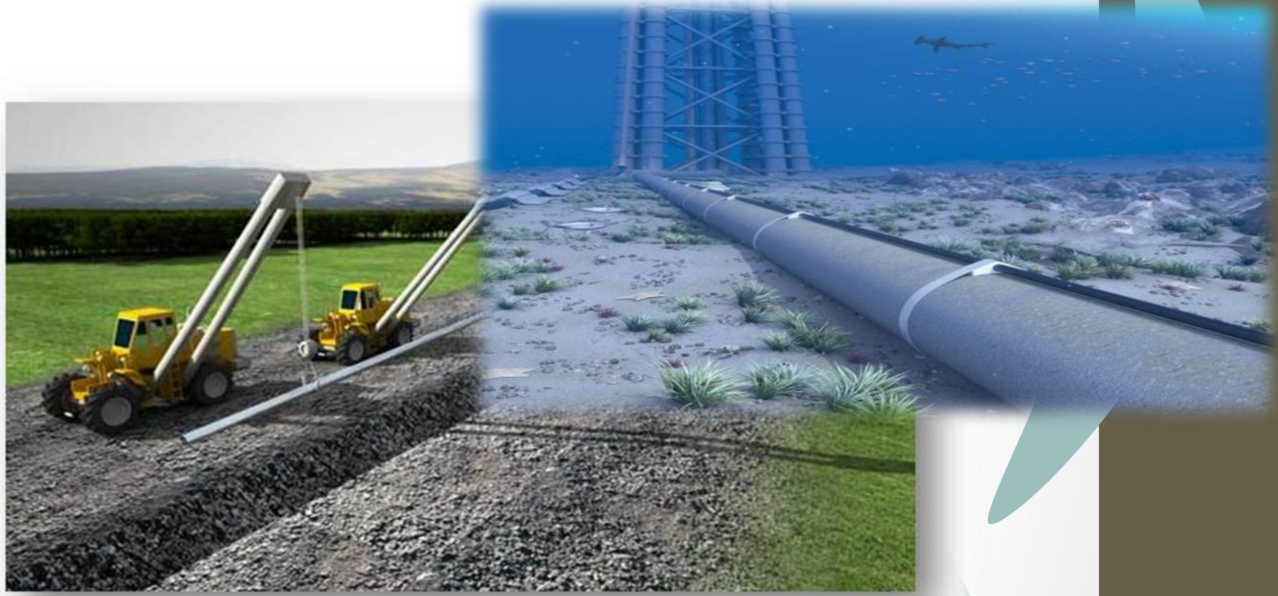
How is CO_2 captured? Oxyfuel-combustion

- Rather than air, pure oxygen is used for combustion of fuel.
- Exhaust gas is mainly water vapor and CO_2.
- CO_2 easily separated; produces a high purity CO_2 stream.



How is CO_2 transported?

- **Pipelines** – are and will be the most common method of transport
- **Truck and rail** – possible for small quantities
- **Ship** – an alternative option (similar to shipment of LPG)

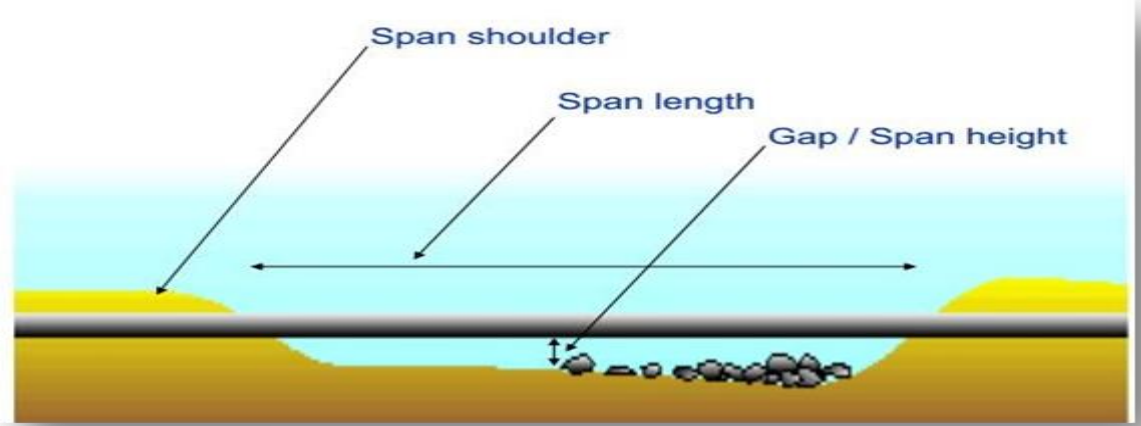


CO_2 Transportation

- Extensive network of pipelines exists, but scale will have to increase (100x in 30-40years).
- Hubs and networks, as well as re-use, will lower barriers to entry for projects.

Key Risks

- Corrosion
- Ductile fracture
- Free-spans



Free spans
Source: unattributed

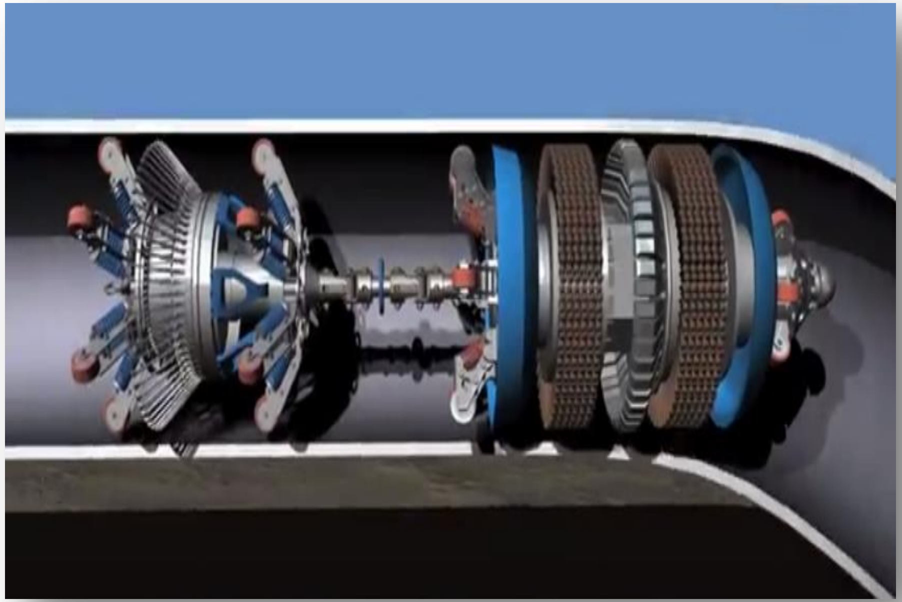
Corrosion and wall thinning in a pipeline
Source: NDT.net

CO_2 Transportation

Mitigating risks

- Running «intelligent pigs» and continuous monitoring

- These measures reduce the risk significantly and increase the costs only slightly

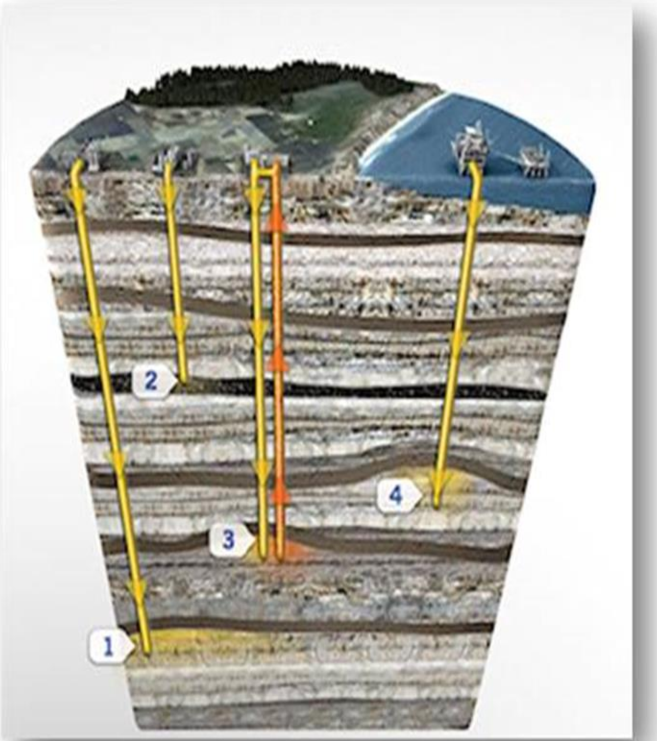


An example of an intelligent pig

How and where is CO_2 stored?

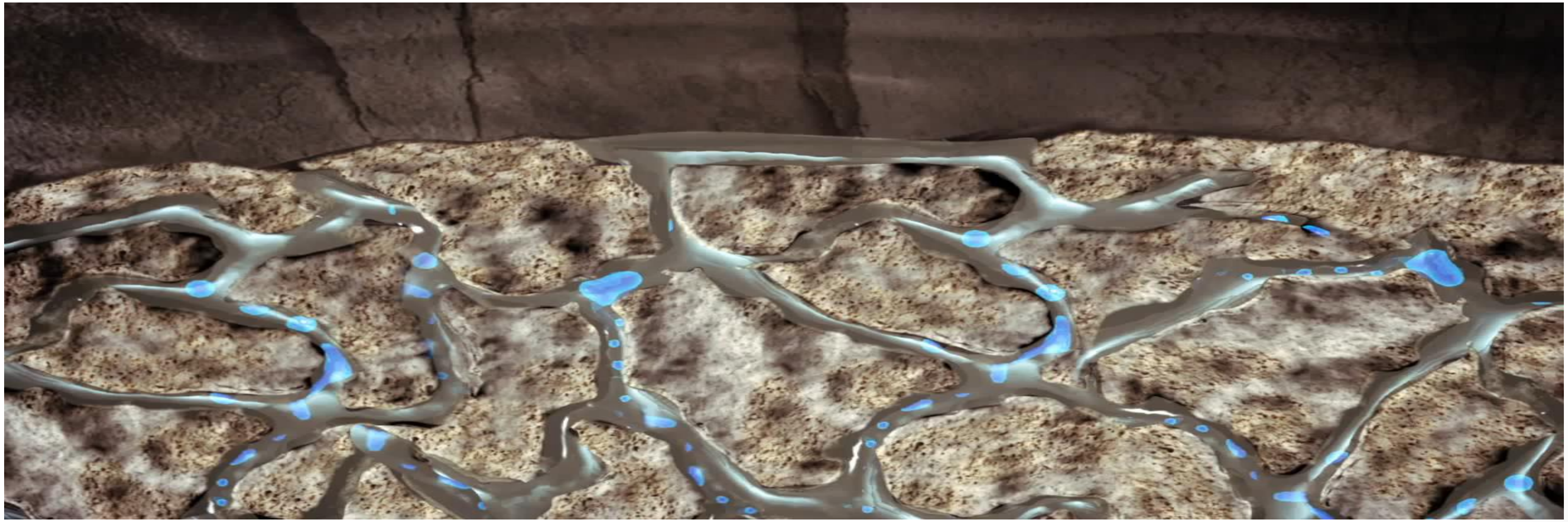
Where?

1. Saline formations
2. Injection into deep un-mineable coal seams
3. Use of CO_2 for enhanced oil recovery (EOR)
4. Depleted oil and gas reservoirs



What happens underground?

- **Structural/stratigraphic trapping**
  - Most dominant trapping mechanism.
  - With a man-made CO_2 storage site, the injection wells drilled through the cap-rock would be sealed with solid physical plugs made of steel and cement.



What happens underground?

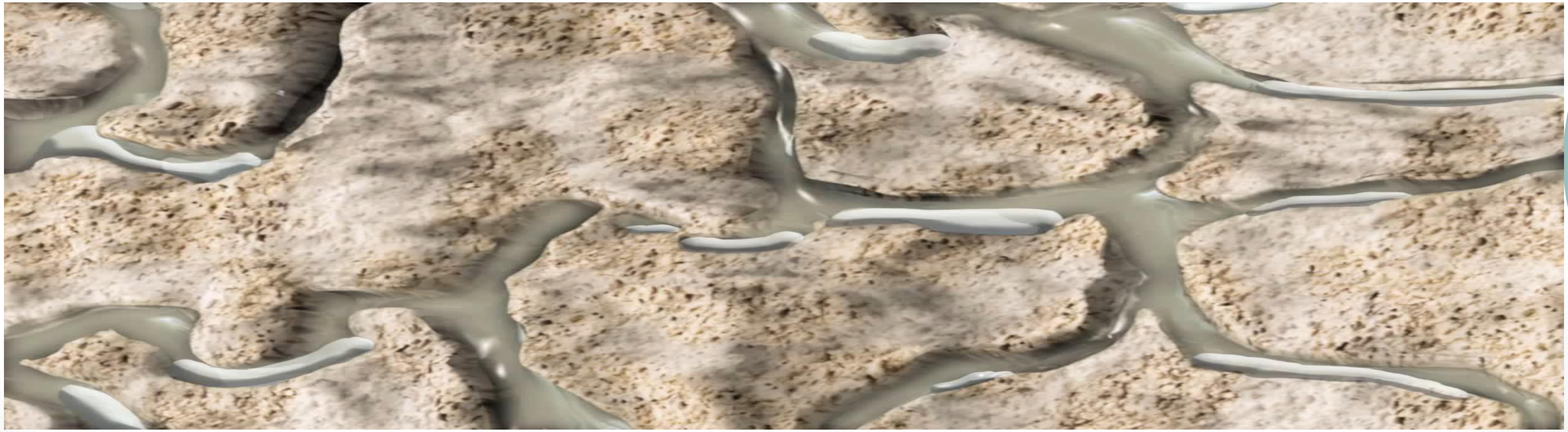
- **Residual trapping**
  - Once injected, the supercritical CO_2 moves through the porous rock, which acts like a sponge.
  - As it moves, some CO_2 is left behind as disconnected - or **residual** - droplets in the pore spaces.

What happens underground?

- **Solubility trapping**
  - CO_2 dissolves in other already present fluids (salt water or brine) in its gaseous and supercritical state (i.e. sugar dissolving in tea).
  - As a result, the salt water containing CO_2 is denser than the surrounding fluids, so it will sink to the bottom of the rock formation over time, trapping the CO_2 even more securely.

What happens underground?

- **Mineral trapping**
  - Occurs because, when CO_2 dissolves in water it forms a weak carbonic acid. Over a long period, however, this weak acid can react with the minerals in the surrounding rock to form solid carbonate minerals.
  - This process can be rapid or very slow (depending on the chemistry of the rock and water in a specific storage site) but it effectively binds CO_2 to the rock.

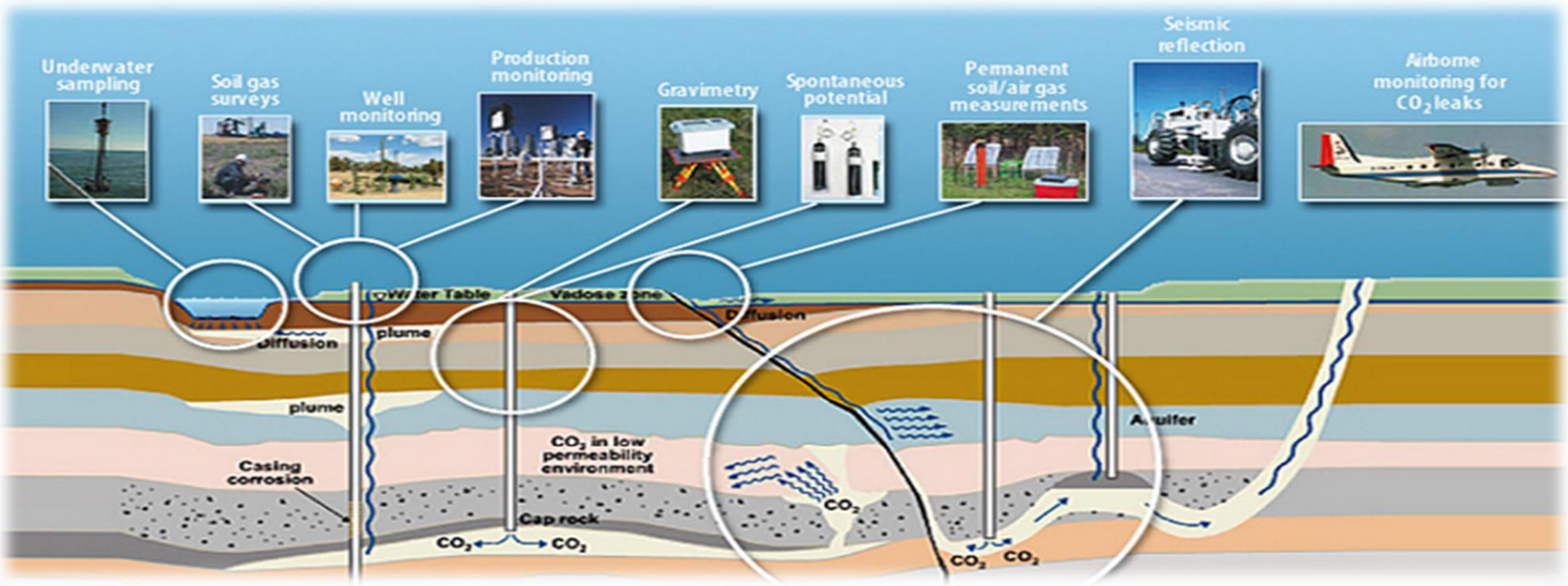


Enhanced Oil Recovery (EOR)

- A tertiary method of oil recovery and can enable significant additional quantities of oil to be extracted.
- Two methods for EOR using CO_2 : one uses just CO_2, whilst the other alternate injection of CO_2 and water, to move oil through the reservoir and towards production wells.

Measurement, Monitoring and Verification of the stored CO_2

- **How is CO_2 monitored?**
  - Monitoring systems can be categorized into *deep*- and *shallow*-focused.



Source: CO2 Capture Project (2018).

Measurement, Monitoring and Verification of the stored CO_2

- **Why?:**
  - To verify the amount and composition of CO_2 being put into underground storage
  - To understand how the CO_2 is behaving once underground
  - To provide early warning if things are not going as planned
  - To provide assurance of long–term storage integrity
  - To measure any leakage that might occur

Why CCS?

- CCS is necessary to meet the Paris Agreement targets – one of several initiatives required. Renewables and nuclear alone are not enough. To reach Paris's 2°C target, 14% of global cummulative emission reductions must be derived from CCS.

- To achieve Paris Agreement objectives, CCS needs to be afforded **policy parity** – equitable consideration, recognition and support with other low-carbon technologies.

- CCS is the only clean technology capable of decarbonising major industry (steel, cement, fertiliser, pulp and paper, petrochemicals).

CCS at a crossroads: glass half full or empty?

- From 1990s – 2009, great growth in CCS; demonstration projects, papers, rise in R&D budgets.

- Since 2009, progress has been slow: funding dried up, no cap-and-trade program in US, and the NER300 program in the EU produced zero demonstration projects. However, technology and legal frameworks still progressed.

- Going forward, CCS needs to be driven by climate policy and the resulting climate markets. These have been very slow in developing.
  - Market pull + technology push.

CCS: Where are we now?

- CCS technology is available; albeit still costly.

- IEA found that almost **4,000 million tonnes per annum** (Mtpa) of CO_2 need to **be stored in 2040** to meet a 2C scenario. **Current** CCS **capacities** for projects in operation or under construction are approximately **40 Mtpa**. Those in operation, capture and store 24 Mtpa.

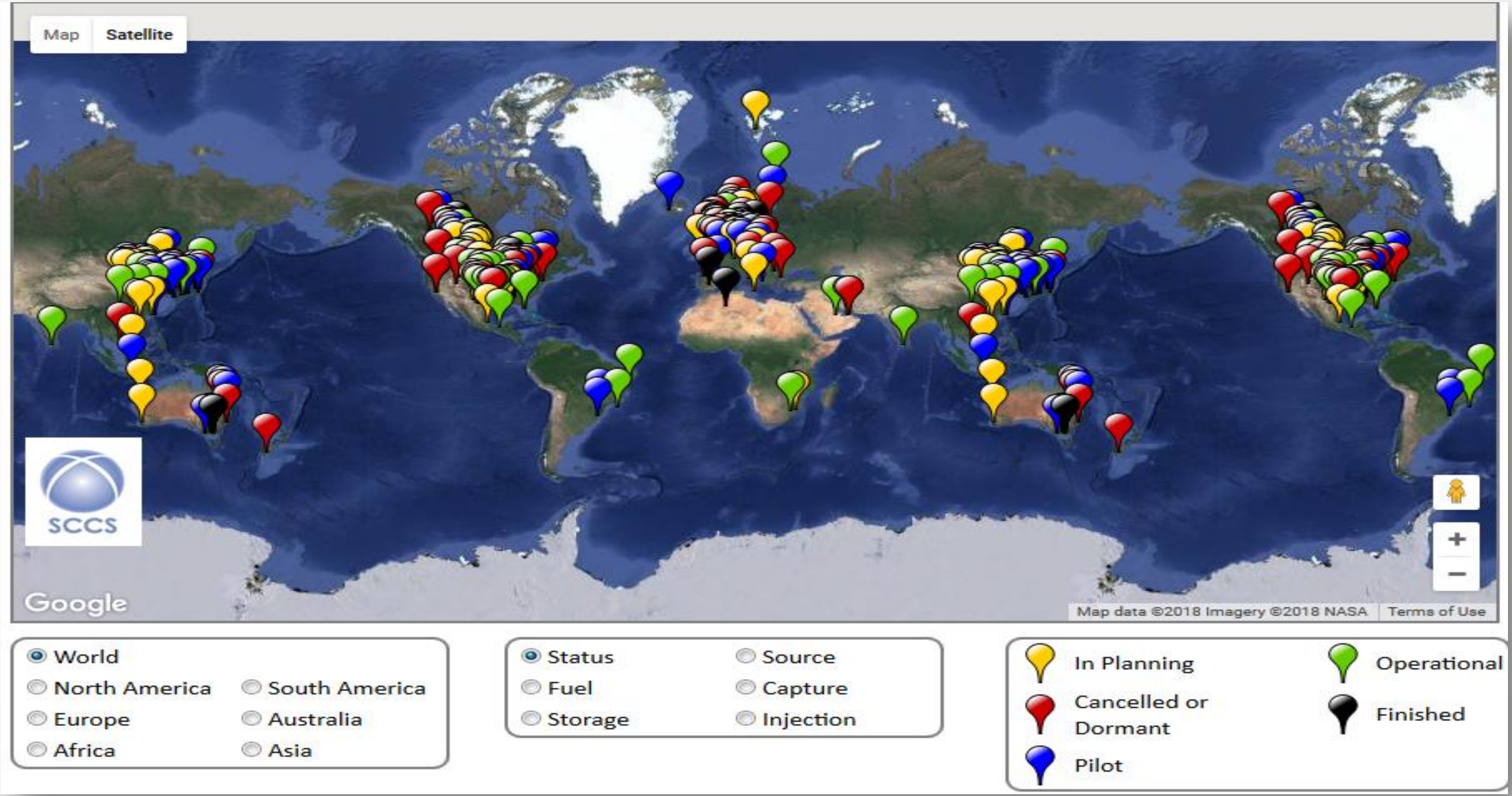
CCS: Where are we now?

- Currently, **17 large-scale CCS facilities are operating globally**, with 4 coming on stream in 2018.

- Hundreds pilot and demonstration-scale projects and other CCS initiatives in place.

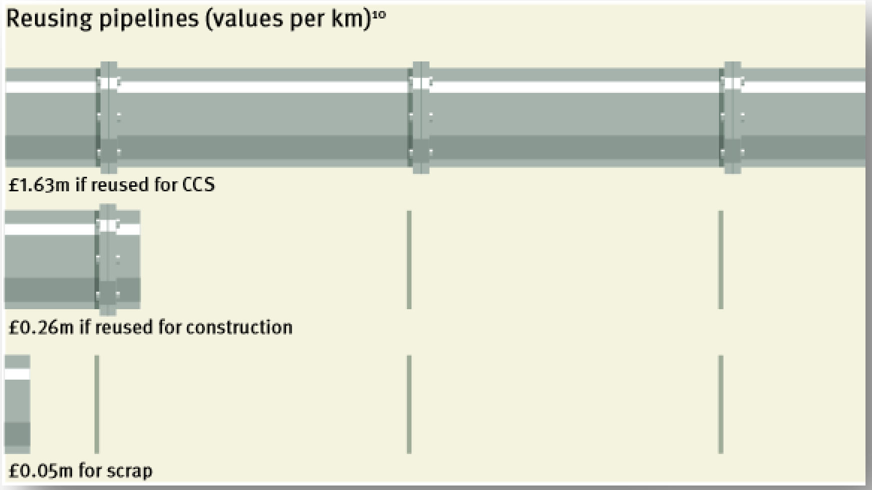
- Focus has shifted from CCS on power to CCS on industry.

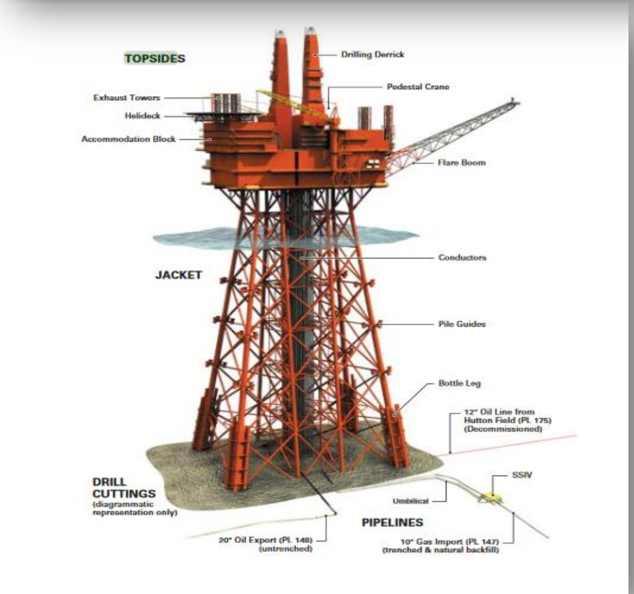
CCS: Where are we now?



Source: Scottish Carbon Capture & Storage (2018). Map available at: www.sccs.org.uk/map

Opportunities: re-using infrastructure





Platforms: technically feasible to re-use, but practically unlikely. Operational costs likely too high.

Wells: Given the technical difficulties, risks and economic realities, new wells are most likely to be required for CO_2 storage.

Pipelines: The cost of re-using a pipeline is between 1% and 10% of the cost of a new pipeline.

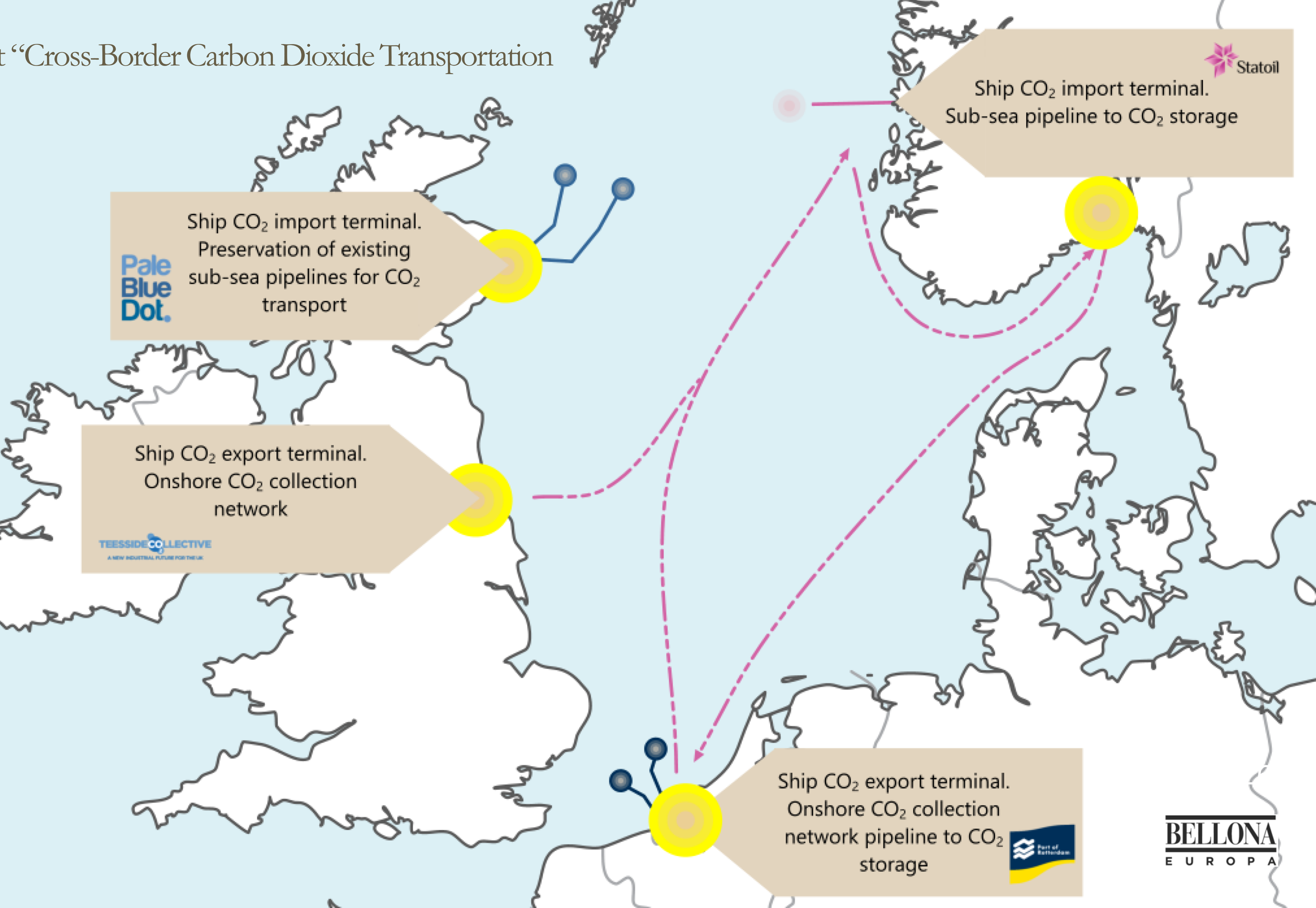
2017 Accepted PCI List “Cross-Border Carbon Dioxide Transportation Infrastructure“

Statoil - CO_2 Cross Border Transport Connections project

Port of Rotterdam Authority – The Rotterdam Nucleus

Tees Valley Combined Authority – Teesside CO_2 Hub

Pale Blue Dot – CO_2 Sapling Transport Infrastructure Project

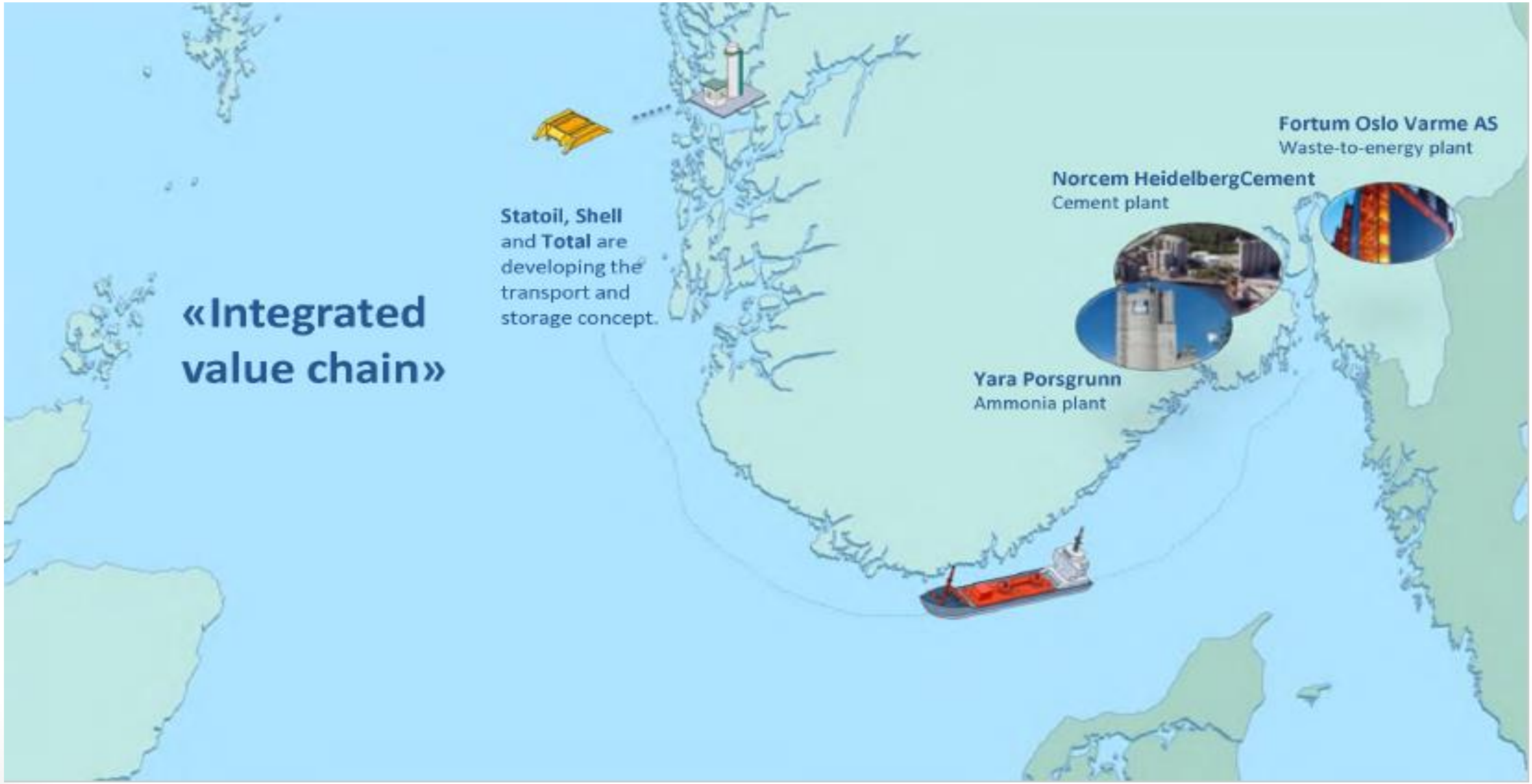


CCS in the UK: Project ACORN

- **Goal:** develop smallest viable full chain Industrial CCS project

- The project will involve:
  - Repurpose or rebuild an existing CO_2 capture plant at the coastal St. Fergus gas processing plant in NE Scotland
  - New CO_2 gathering, conditioning and compression technology.
  - An existing offshore pipeline for CO_2 transportation to the selected from a portfolio of existing gas pipelines awaiting decommissioning
  - Injection into a subsurface storage site close to the pipeline corridor using proven subsea well.

Norway's industrial CCS project



Source: Gassnova (2018).

Obstacles to commercialisation of CCS

- Lack of policy parity and financial incentives
- Capital Expenditure
- Public awareness/acceptability
- Legal and regulatory requirements?
- Lack of technology
- Security and lack of storage sites

CCU and synthetic fuels

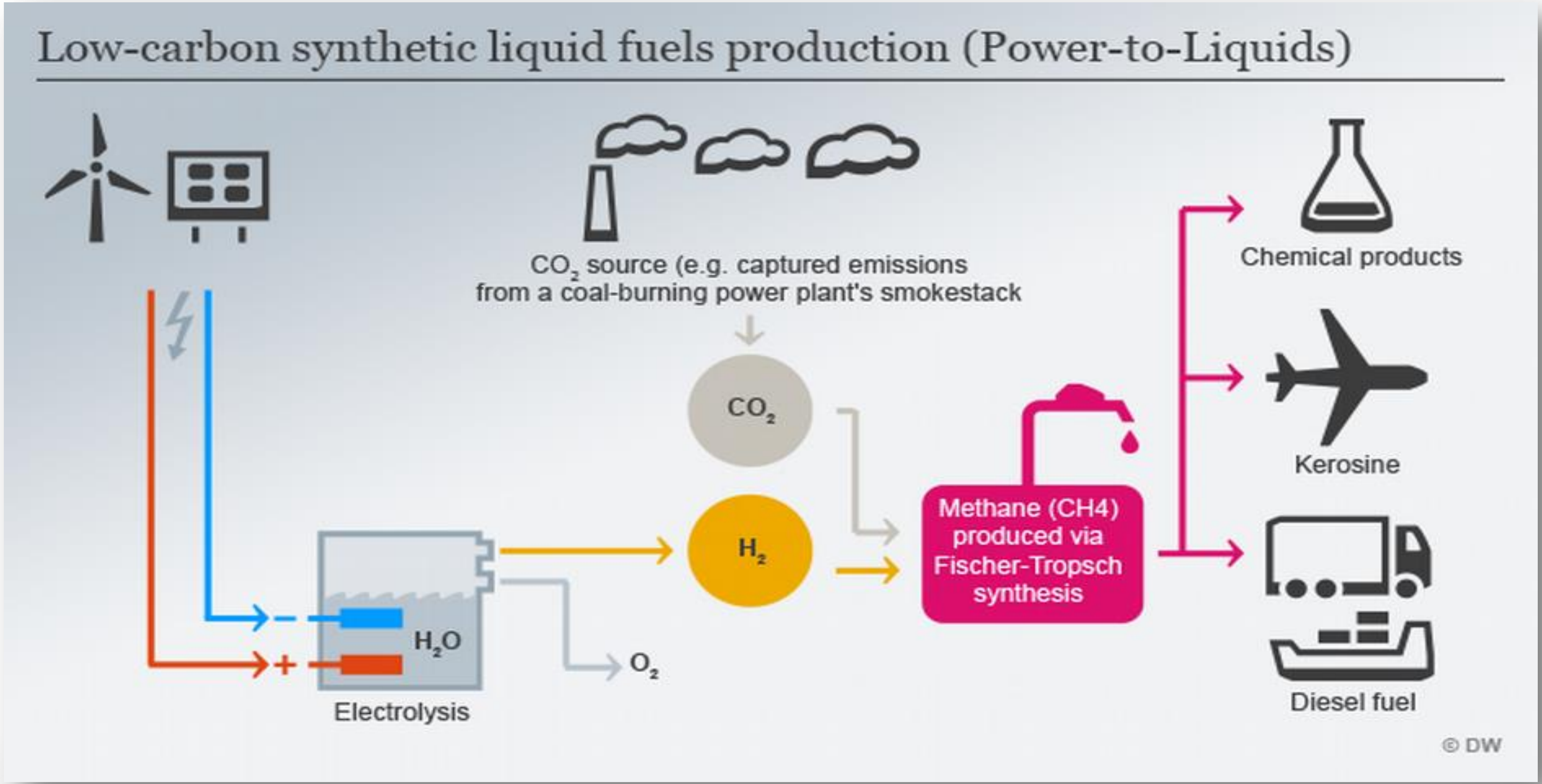
- CCU: an option for reducing carbon emissions by converting captured CO_2 into commercially viable products such as bio-oils, chemicals, fertilisers and fuels.

- "e-fuels"/synthetic fuels: a greenwashing machine?

- Production of synthetic fuels pushed by industrial stakeholders (i.e. Audi) as renewable technology.

Source: Bellona Europa (2018).

Synthetic fuels – a.k.a. Power-to-Liquids



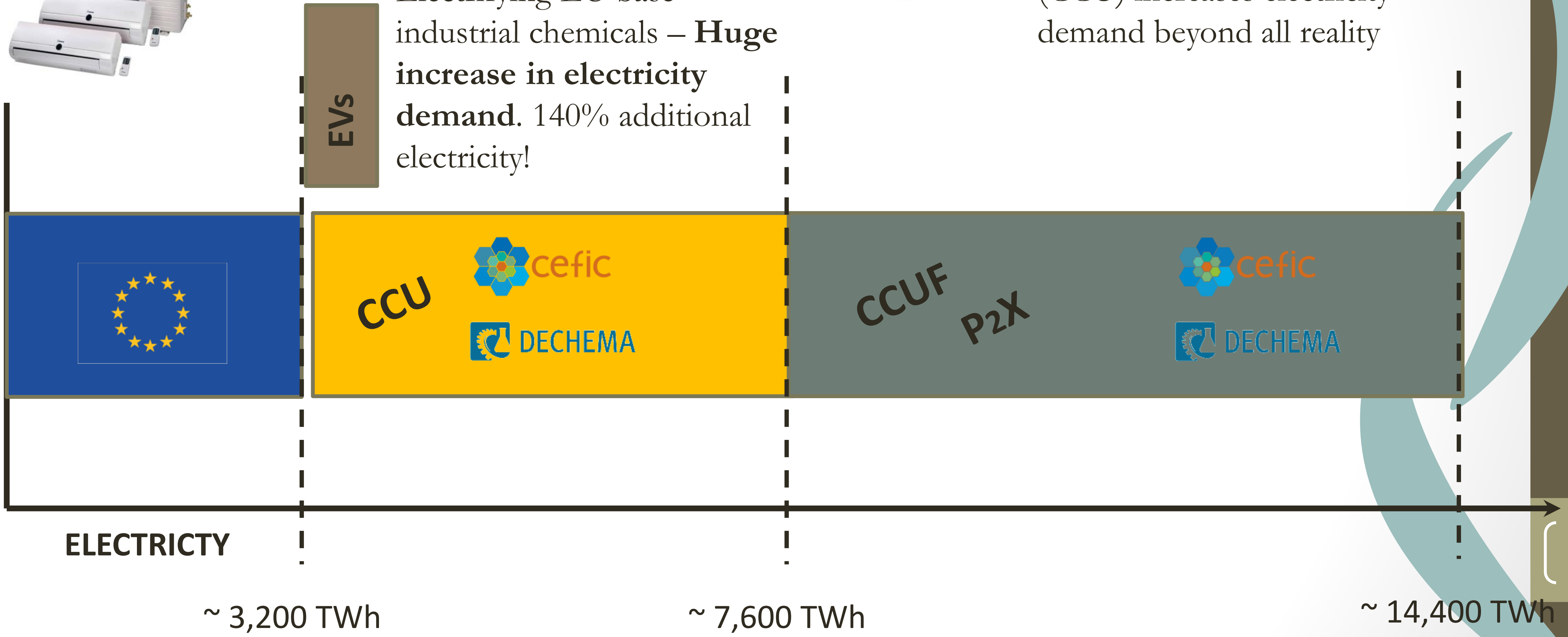
Source: DW (2018).

This is **all the electricity produced in Europe**. It is used for everything from lighting, air-conditioning, heating, industry etc.

If **all passenger cars in Europe were electric**, the increase in electricity is significant – but not world changing. Approx. 800 TWh

Electrifying EU base industrial chemicals – **Huge increase in electricity demand**. 140% additional electricity!

Adding **Power to Liquid** (CCU) increases electricity demand beyond all reality



BREAK

The Policy and Legal Dimensions of CCS

- Relevant actors: fossil fuel industry, environmental and scientific community, general public, governments.

- The story is complicated by diversity of competing economic, geopolitical and environmental priorities.

- In the end, like other technologies, CCS faces the dense web of political and policy arguments, connotations and questions:
  - What is the broader climate and energy strategy? How does CCS fit into it?

Politics and Policy of CCS

- **Key interconnected and overlapping areas:**
  - Legal issues: legal instruments around the world, property rights, liability, including transfer of responsibility for storage from private to public ownership.
  - Economic issues: assessments of CAPEX and OPEX, costs per ton of carbon avoided, extent of industry vs. government contribution.

- Regulatory frameworks: examining how existing frameworks can be amended and expanded to encompass CCS; balancing responsibilities among industry and public bodies and between national and international agencies.

- Public acceptability and communication: public knowledge remains low. Communications and outreach strategies around CCS is crucial.

Policy, legal and regulatory developments by region

The Americas: United States

- Fossil fuel power plants contribute 1/3 of total CO_2 emissions by sector
- Clean Power Plan: by 2030, reduce CO_2 emissions by 32% below 2005 levels. Will Trump repeal it?
- US energy and climate context:
  - i) historic reliance on cheap energy resources,
  - ii) large current and future dependence on domestic coal,
  - iii) heavy dependence on imported oil coupled with political concerns about energy security, and
  - iv) significant regional differentiation in terms of energy production/consumption

Three critical issues related to politics and policy of CCS advancement in the US:

- The power of coal in US politics and growing opposition to coal
- US – international interactions in CCS advancements
- Public perception of CCS

Policy, legal and regulatory developments by region

Canada

- Has realized long-term policy, legal and regulatory ambitions with entry into force of the CO_2 performance standards for coal-fired power plants, adopted in 2015.

- Enabling policy frameworks developed in Alberta and Saskatchewan contributed to a number of key large-scale projects becoming operational in in 2014/2015.

Policy, legal and regulatory developments by region

Europe

- 2006 Green Paper on Energy introduced CCS alongside measures to increase energy efficiency and production of renewables.

- In 2009, with revised ETS Directive, 300 million emission unit allowances from the New Entrance Reserve (NER) were set aside to demonstrate up to 12 large-scale CCS demonstration projects, and other innovative renewable energy technologies. No CCS projects ever received any funds.

- Essentially, Europe cannot meet its long-term GHG reduction targets without CCS. Commission estimated that **it would cost Europe 40% more to reach its CO_2 emission reduction targets without CCS**.

Policy, legal and regulatory developments by region

Middle East and Asia Pacific

- In the Middle East, large-projects are in operation and significant R&D efforts are under way – i.e. the Emirates Steel Industries CCS Project.
- Australian federal and state governments have supported projects through funding and development of legislation.
- In the region, Japan and China remain at the forefront in promoting CCS demonstration and deployment. Both signaled commitment to CCS, but need to enhance legal and regulatory models to support deployment.

Policy, legal and regulatory developments vary by region

- Differences between jurisdictions in the way CCS has been integrated into climate change policies and long-term strategies (even within the EU).
- Time of engagement with CCS: Norway (late 1990s), Australia, Canada, US (early 2000s), Germany, Netherlands, UK and the EU (2005-2008).
- While CCS always relates to climate change, its political importance is closely linked to contextual factors. Scale and nature of fossil fuel dependency in the electricity sector constitutes one of the key national variables.

Legal and Regulatory Landscape for CCS

- Development of law and regulation to support the deployment CCS has proven an important aspect of a national policy response to the technology.

- Appropriate legal frameworks could drive the adoption of carbon capture and storage technology.

- The landscape is vastly different between regions; Australia, Canada, Denmark, UK and the US stand out with most advanced and comprehensive frameworks.

Legal and Regulatory Landscape for CCS in Europe

- The EU has a common legal framework (2009 EU CCS Directive) which covers all CO_2 storage and lifetime of storage sites. Reviewed in 2015; no major changes.

- Majority of the MS have chosen to limit or prohibit CCS activities in their countries.

- Addressing legal and regulatory aspects has been primarily achieved through amendments to existing environmental and energy laws (i.e. UK‘s Energy Act).

Legal and Regulatory Landscape for CCS in Europe

EU CCS Directive

- Extensive requirements for selecting CO_2 storage sites; no storage possible without a storage permit.

- Closure and post-closure obligations also covered, and criteria for the transfer of responsibility from the operator to the Member State are set out.

- The operator must establish a financial security before the injection of CO_2 starts to ensure that the requirements of the CCS Directive and the Emissions Trading Directive can be met.

Main remaining legal and regulatory issues/challenges

- **Long-term (open-ended) financial liability**
  - Financial security and financial mechanism uncertainty - Art. 19 & 20 in EU CCS Directive.
  - Lack of clear calculation method for amount of financial security required, and uncertainty in amount and form of financial contribution for post-transfer of liability costs.

- **Transfer of responsibility**
  - The minimum 20 years rule and lack of clear criteria – delays investment decisions.

Main remaining legal and regulatory issues/challenges

- **Third-party access**
  - Art. 21 in EU CCS Directive
  - Regulations in UK fairly well understood and considered fair, but potential issues could arise in the future

- **Fundamentally, nothing is missing, but clarity on certain issues is necessary.**

EU CCS Directive – overcoming the barriers: Industry responses

- "I don't see any major issues in the regulatory framework…it is more about the education and familiarity."

- Can be overcome best by close collaboration between project developers and the relevant authorities.

- **Key steps:**
  - Work on reducing bureaucratic obstacles (i.e. streamline the permitting process).
  - Remove or fix the open-ended liability issue.
  - Increase investment support for monitoring and verification technologies.

Regulating CO_2 storage in the United States

- Both federal and state/provincial legal and regulatory regimes need to be considered.
- Federal-level legislation developed under the existing Underground Injection Control (UIC) framework and the Safe Drinking Water Act.
- CCS still not dealt with in a fully-integrated, comprehensive manner at either the federal or state level.

Regulating CO_2 storage in the United States

Underground Injection Control Program

- A new class of well (Class VI) added in 2010.
- Class VI rules apply only for permanent geologic sequestration. Wells injecting CO_2 for EOR remain Class II wells.
- Requirements of Class VI wells differ from other well classes - generally they are more stringent. One difference is in the size of the area of review – much larger for Class VI wells.

QUIZ

Day 2

The history of the Bellona Foundation

International context

Founded in

1986

40 employees

Working on	with
nuclear issues, Arctic issues, climate change mitigation, fossil fuels, renewable energy, energy efficiency, carbon capture and storage, Russian human rights issues	politicians, bureaucrats within ministries and agencies, decision-makers in business, media, other non-profit organizations and foundations, participants in research and education.*

1993

2015

1989

*Any partner willing to contribute to solutions for environmental challenges.

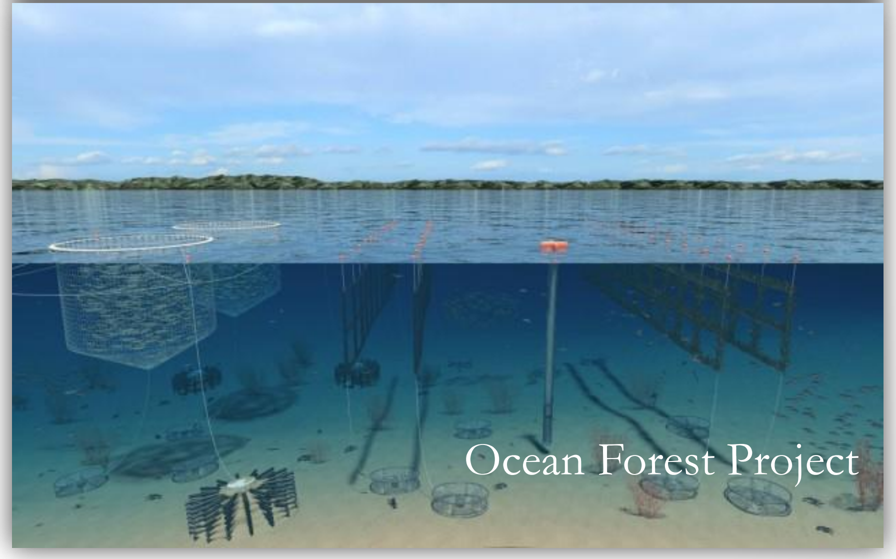
BELLONA EUROPA

The history of the Bellona Foundation

International context

The Bellona foundation today:

- Raising attention: hearings, workshops, press;
- EU advocacy;
- In-house research;
- Membership in various fora and partnerships;
- Co-founder in projects eRoute 71, Sahara Forest, and Ocean Forest, and BEBA (Bellona Energy Storage, Battery & Applications).



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The history of the Bellona Foundation

European context

Founded in

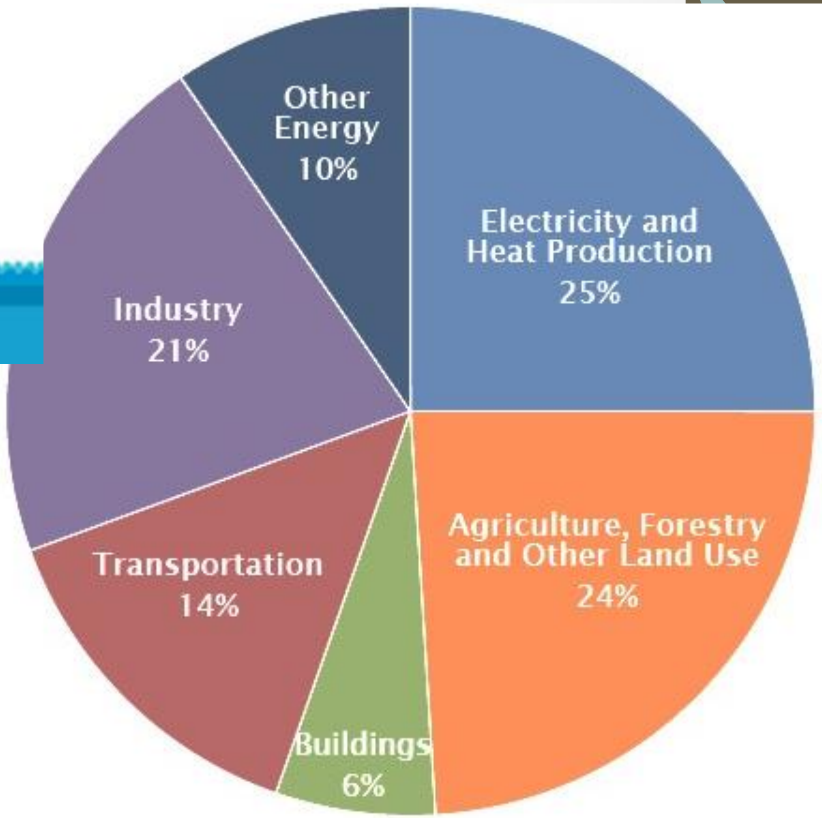
1994

7 employees

Has worked on	with
Nuclear waste, electronic waste, Arctic policies and the petroleum industry	EU Parliament, European Commission, advisory and working groups, other NGOs, research and academic institutes etc.

Main areas of expertise

Industrial decarbonisation



- Carbon capture and storage (CCS) has enormous potential to remove as much as 50% of Europe's CO_2 emissions
- Bellona aims to help in achieving a shared infrastructure solution for CO_2 transport and storage which would enable the industry to tackle their emissions

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Social Dynamics

- What do you understand as the term **RISK?**
- Are we as a society risk-averse or risk-taking when it comes to making and accepting environmental decisions?
- Culture, economic factors, social and political values, trust, risk perception, and worldviews are all important in influencing the public's attitude towards science, and new and emerging technologies (Sturgis and Allum, 2004).

Social Dynamics: Risk society

- Assessing public attitudes and perceptions of new technologies is vital for their future successful implementations.

- There is a clear **distinction between self-reported perception** (i.e. what people think they know) **and the objective assessments of knowledge** (i.e. what people actually know).

- Perceived risks of new technologies often have far greater potential to undermine deployment, than do scientifically determined risk:

Social Dynamics of CCS

- CCS has emerged rapidly and as a crucial technological option for climate change mitigation, but it still faces scepticism and criticism.
- Efficiency gains of governance realized when all stakeholders are involved: the public, different NGOs, industries, political parties and the media.
- Dynamics driven by the notion of uncertainty: economic, political, environmental.

Social Dynamics of CCS

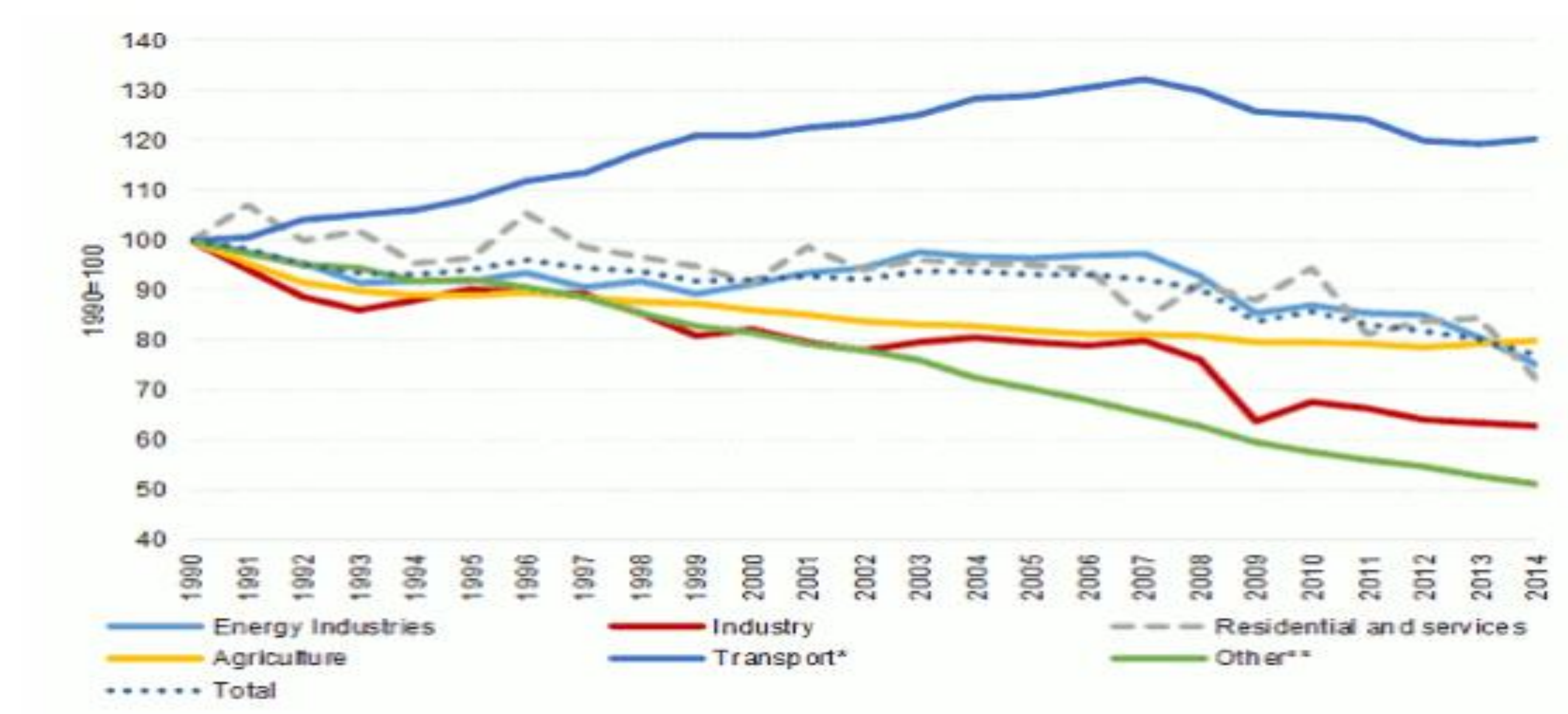
- Public awareness and acceptance of CCS is low. Only about 10% of Europeans have heard of CCS. Awareness of CCS are highest in EU countries that host demonstration projects, such as Germany and in particular the Netherlands (52%).
- Studies show that people are often confused about characteristics of CO_2, such as the fact that it is not toxic or flammable.
- NIMBY: Not in My Back Yard syndrome
- Public participation and engagement is crucial for project development; can most commonly be seen at the development stages of particular projects, such as with licensing and permitting decisions (i.e. consultations).

The role of mass media

- Is it an enabler or inhibitor of (environmental) technologies?
- One of the main contributors to the development of a risk society can be seen in the role of the mass media.
- Risk consciousness, exacerbated by the mass media, indicates that the concept of risk has become the signature of the contemporary society (Strydom, 2002).

Electromobility

Transport emissions: the EU's biggest climate problem



If car makers were to pay the human health bill, how much would the average ICE car cost?

253 million ICE cars in EU 28 today

€600 billion annually in human health costs from fossil transport-induced air pollution (mid-estimate based on European Commission figures)

€2,371 worth of human health costs per fossil car per year

€23,710 of additional costs in terms of human health per ICE car during its lifetime, taking into account the average age of an ICE car in the EU is 9.73 years

€50,150 **would be the average sticker price of an ICE car in the EU: this is double the current average price of €26,436**

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Why electro-mobility matters?

Multiple environmental, health and economic benefits:

- ✓ Meeting EU climate goals and 1.5°C Paris target
- ✓ Reducing air pollutants (NOx, SOx, particulate matter etc)

- ✓ Reducing Europe's dependency on imported oil
- ✓ Creating jobs and boosting economic competitiveness

Vision

Smaller & lighter e-vehicles

Electrified rail & inter-modality

Smart grids and renewables

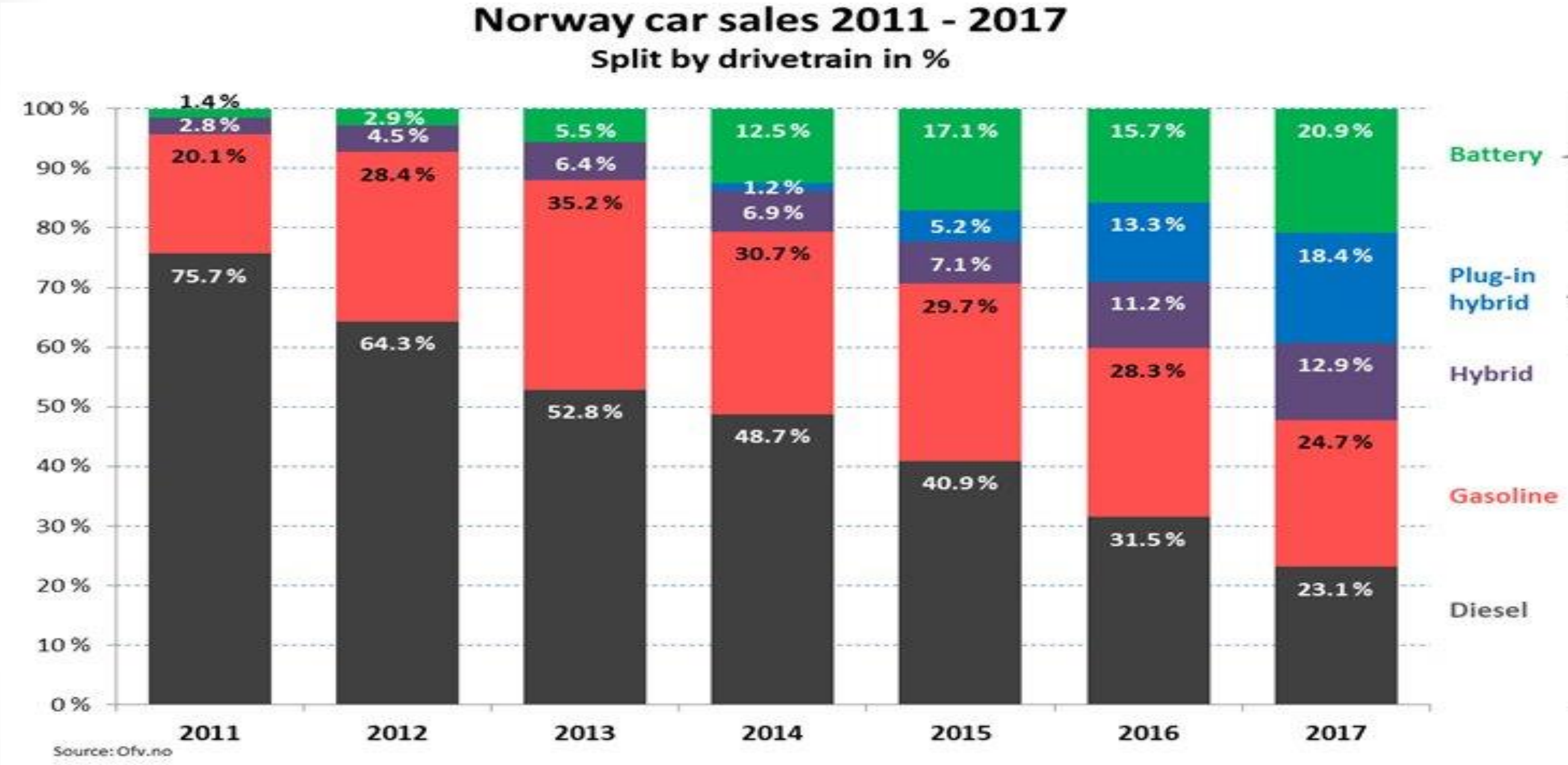
E-cars (sharing)

Interoperable infrastructure & open standards

Electrification of urban bus fleets

United EU advocacy

Lessons from Norway



- No VAT
- No Purchase Tax
- No Annual Road Tax
- Access to Bus Lanes
- No Charges on Toll Roads

- As ICE car, but reduced Purchase Tax

ICE
- VAT (25%)
- Purchase Tax (typical EUR 5000 to 25000)
- Annual Road tax (EUR 300)
- Charges on Toll Roads (often EUR 500 to 2000 per Year)

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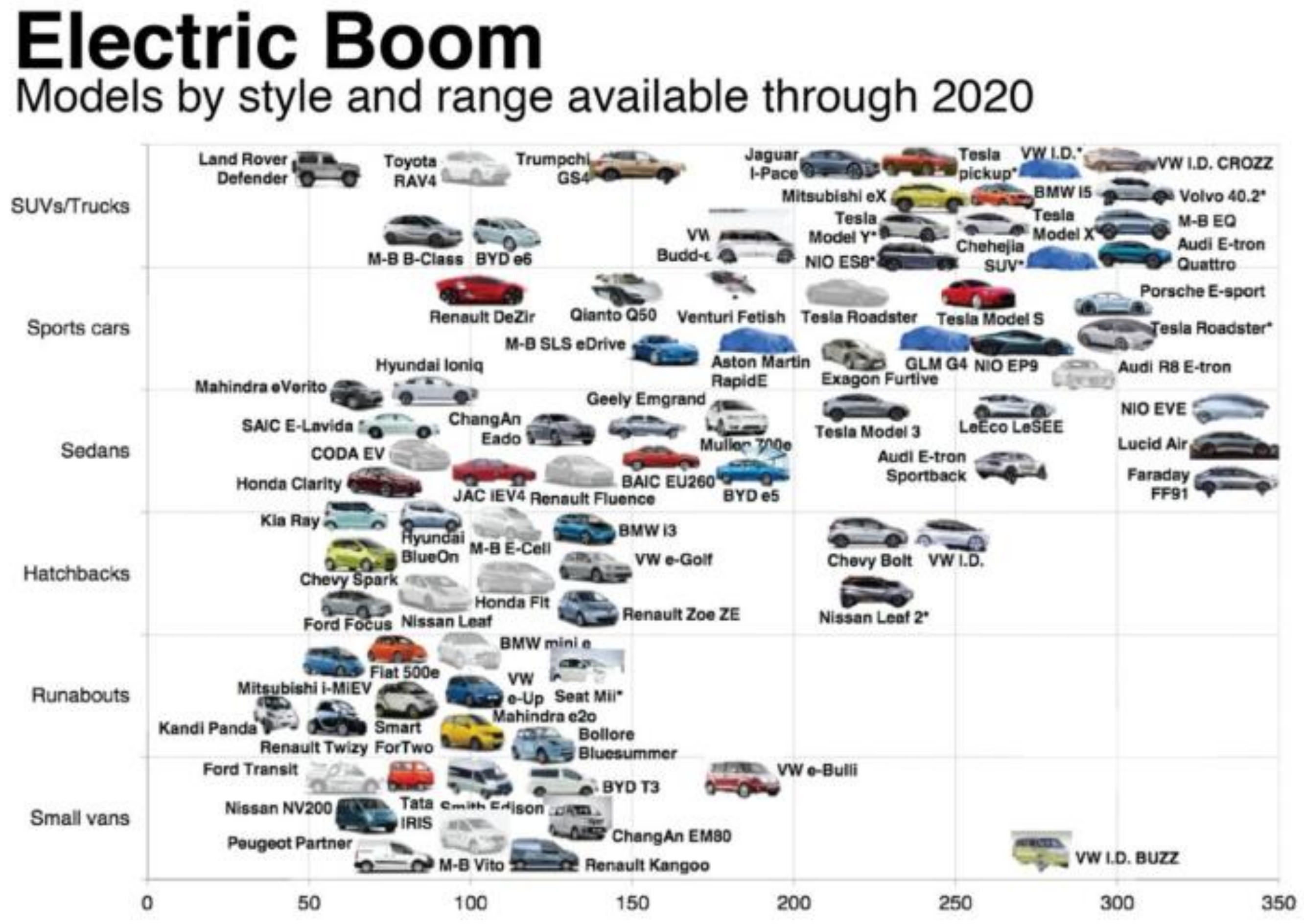
State of EV technology



Range in miles

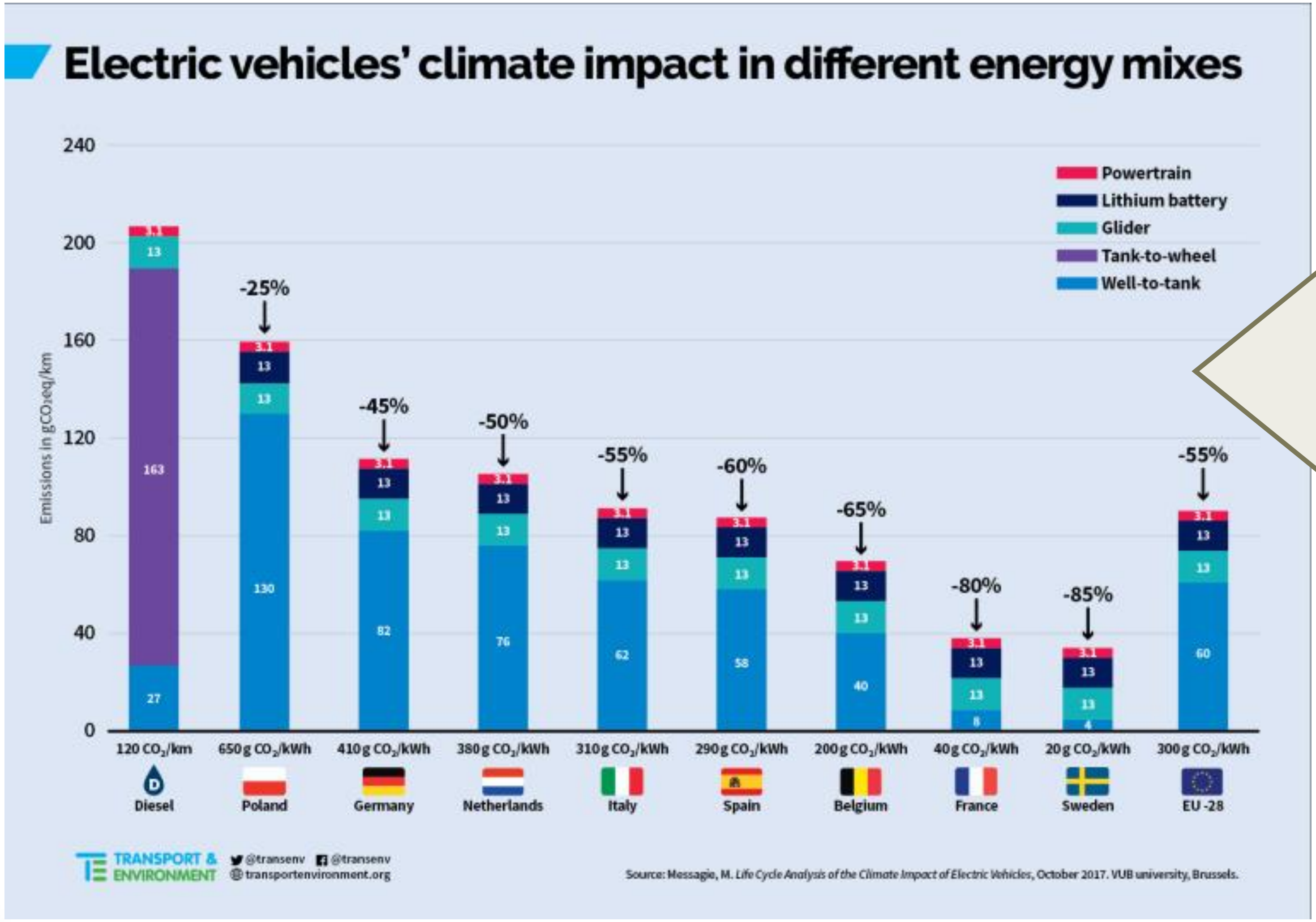
Source: BNEF, 2017

Growing numbers of local and national governments pledging to phase out ICEVs within 2025 – 2030.

All major car manufacturers are investing in electrification.

T&E found that if carmakers fulfil their own announcements, **more than 20% of all cars sold in the EU in 2025** would be BEVs or PHEVs.

CO_2 Emissions: the life-cycle perspective



Source: Transport & Environment, 2017

In a life-cycle perspective, electric vehicles powered with today's EU electricity mix are significantly more climate-friendly than internal combustion engine vehicles.

'How'?

Examples: Policy support measures

Norway

- ✓ VAT exemptions
- ✓ Purchase tax exemptions
- ✓ Annual road tax exemptions
- ✓ Access to bus lanes (local incentive)
- ✓ Toll road charge exemptions
- ✓ Reduced tax for company e-cars

Germany

- ✓ Purchase grant of EUR 4,000
- ✓ Ownership tax benefits
- ✓ Reduced tax on company e-cars
- ✓ Free parking; access to bus lanes (local incentives)

France

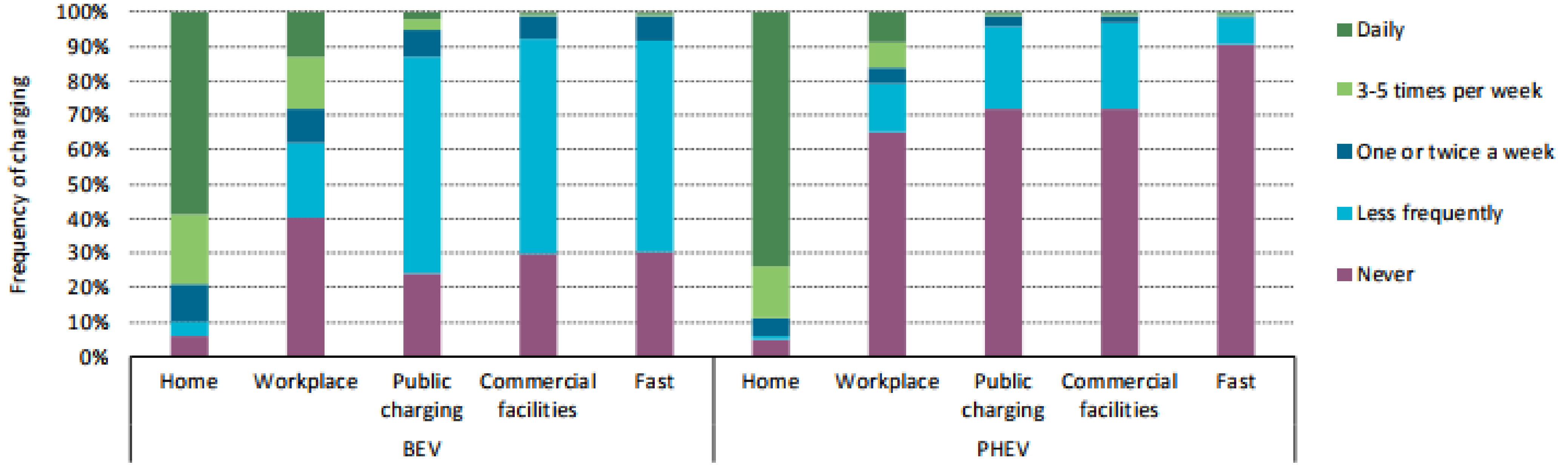
- ✓ Purchase premium of EUR 6,000 under bonus-malus scheme
- ✓ Registration tax benefits
- ✓ Road tax exemptions
- ✓ Reduced tax for company e-cars
- ✓ Easy EV charge point installation
- ✓ Local incentives

Netherlands

- ✓ Registration tax exemptions
- ✓ Road tax exemptions
- ✓ Reduced tax on company e-cars

Infrastructure: buildings are key

Figure 13 • Charging habits for a sample of Norwegian electric car users, 2016

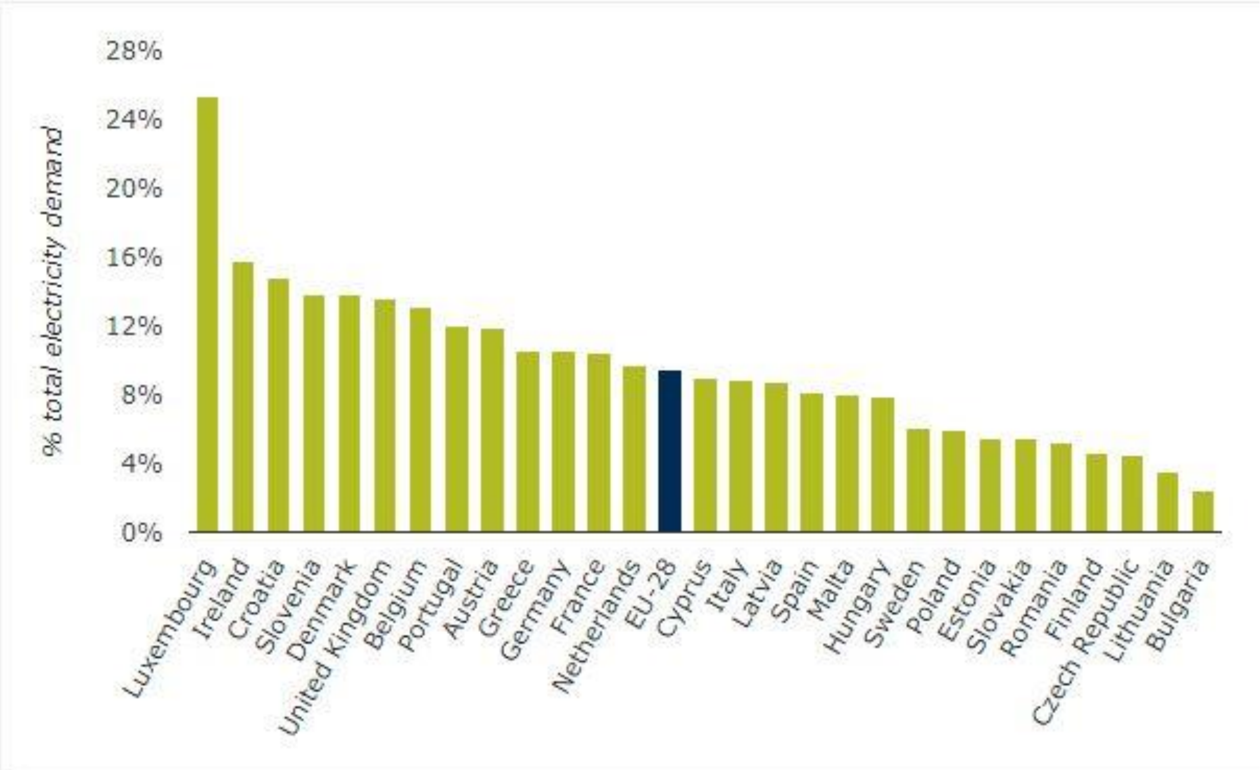


Source: IEA elaboration based on results from Figenbaum and Kolbenstvedt (2016).

Key point: electric car owners charge their vehicles most frequently at home or at work. The third most frequent charging option is publicly accessible slow charging. Fast charging is not frequently used.

Dealing with the additional electricity demand

Figure 1: Electric vehicle energy demand as a percentage of total electricity demand in 2050



Source: European Environment Agency, 2016

The additional electricity demand resulting from EV uptake is relatively low and does not pose major problems to the electricity sector.

An 80% electrified fleet in 2050 results in, on average, 10% increase in electricity demand.

Beyond passenger cars…

Electric bikes – a fast growing market

More than 1.6 million **e-bikes** were sold in the EU in 2016, with yearly growth rates of over 15%.

E-bikes are faster than cars for distances up to 10km in urban areas, making them **ideal vehicles for city trips.**

E-bikes **open up cycling for new groups:** (sub)-urban commuters and elderly.

E-cargo bikes are an ideal solution for fast growing market of **last-mile urban logistics.**

Several countries (e.g. Austria) have successfully boosted e-bike sales through **purchase premium schemes,** other countries are now following suit (e.g. Sweden: 25% of purchase price, max. **€1000;** yearly budget **€35 million** until 2020)

Electrified buses, trucks and municipal service vehicles

The number of **electric buses** in Europe is equally growing – but currently, 98% of the global electric bus fleet is running in China. Some EU cities are picking up the pace, e.g. Paris is electrifying 80% of its bus fleet by 2025.

Electric trucks are also a reality: electric road systems for heavy duty vehicles are operating in Sweden, Germany and the US.

Source: ABB, 2017

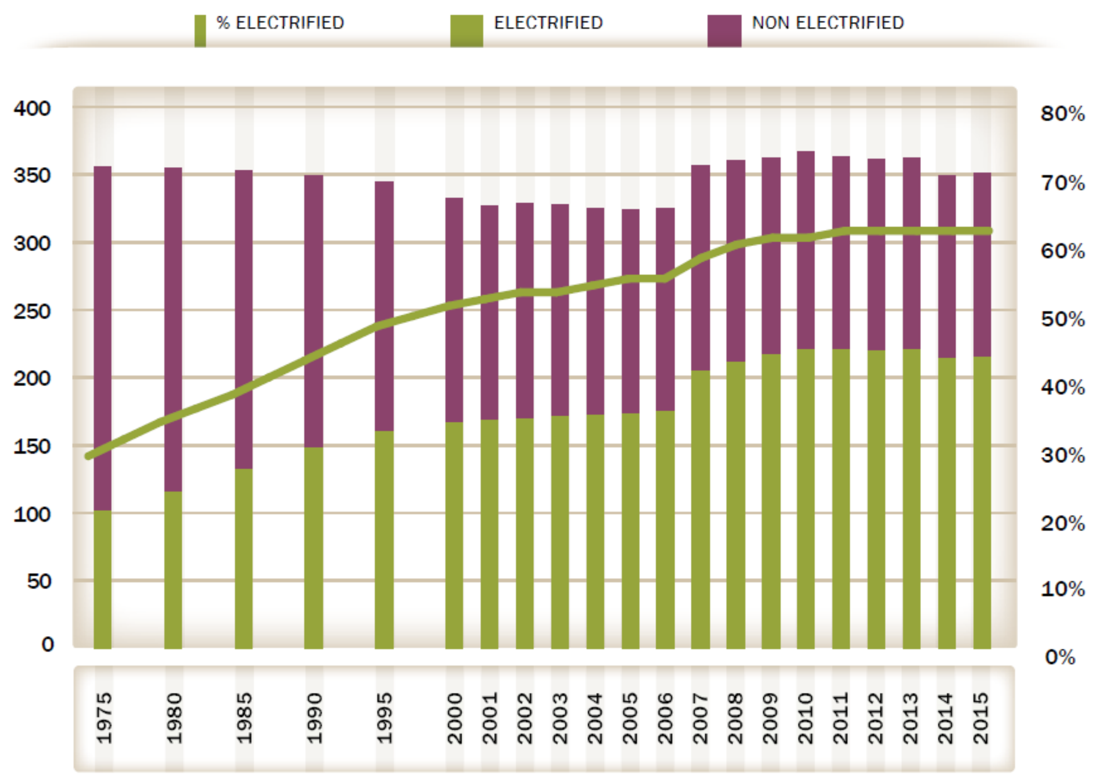
Taxis, post delivery and waste collection also have potential for electrification.

Further electrification of rail & multi-modality

More than 50% of railway lines in Europe, carrying 80% of traffic, are electrified.

Where carbon savings and the economic case of a project are positive, rail network should be further electrified.

Where rail track electrification is not practical, a switch away from diesel-powered trains is possible via electric traction, i.e. fuel cells and battery trains.



From airports and airplanes, to ships

Amsterdam Airport Schiphol to electrify all vehicles operating on the airport itself, as well as passenger and public transport to- and from the airport.

Norway is looking to electrify all planes by 2040 (including all domestic & those operating to neighboring capitals)

Large expansion of shore power in European harbors, and growing numbers of e-ferries.

First electric barges to arrive to Port of Antwerp in August 2018.

EU legislation	Objective	Status/ Timeline
Alternative Fuels Infrastructure Directive (2014/94/EU)	Mandates sufficient numbers of publically accessible charging points, and sets EU-wide standards for charging connectors	National transposition completed or ongoing
Energy Performance of Buildings Directive (2010/33/EC)	Mandates installation of EV charge points or pre-equipment for later installation in buildings	Tentative agreement on EPBD reform, pending official approval by institutions
Clean Vehicles Directive (2009/33/EC)	Sets criteria to orientate public procurement with the aim of fostering market introduction of clean vehicles	Undergoing review
Renewable Energy Directive (2009/28/EC)	Sets targets for the production of RES, and rules determining electricity's role in decarbonising transport	Undergoing review; trilogues to begin this month
CO2 standards for new light duty vehicles (443/2009/EC)	Sets mandatory emission reduction targets for new cars and vans, and encourages ZEV production	Undergoing review
Eurovignette Directive (2011/76/EU)	Sets common rules on distance-related tolls and time-based user charges (vignettes) for HDVs (above 3.5 tonnes) for the use of certain infrastructures	Undergoing review
CO2 standards for heavy duty vehicles	Based on the emission monitoring tool, VECTO, set CO2 standards for new HDVs	EC's legislative proposal expected in first half of 2018
EU Battery Alliance Roadmap	Aimed at creating a strategy for boosting Europe's locally manufactured battery base	To be published during EU Industry Days 22-23 February 2018

Formula to success: a combination of sticks and carrots

Disincentivise production of polluting vehicles through stringent CO_2 and air quality legislation

Stimulate correct consumer and investor behavior by factoring in true environmental and societal costs of ICE cars in their purchase price

Stimulate demand for- and build consumer trust in zero emission vehicles through ambitious public procurement targets

Debate – Press conference

- Split into three groups: capture, transport, and storage.

- Each group gets a scenario and has a mock press conference. Other groups serve as the media and ask questions.

Thank you!
Any Questions?