

The Petroleum Industry And the Climate Challenge: Is there a Case for a “Petrowende” ?

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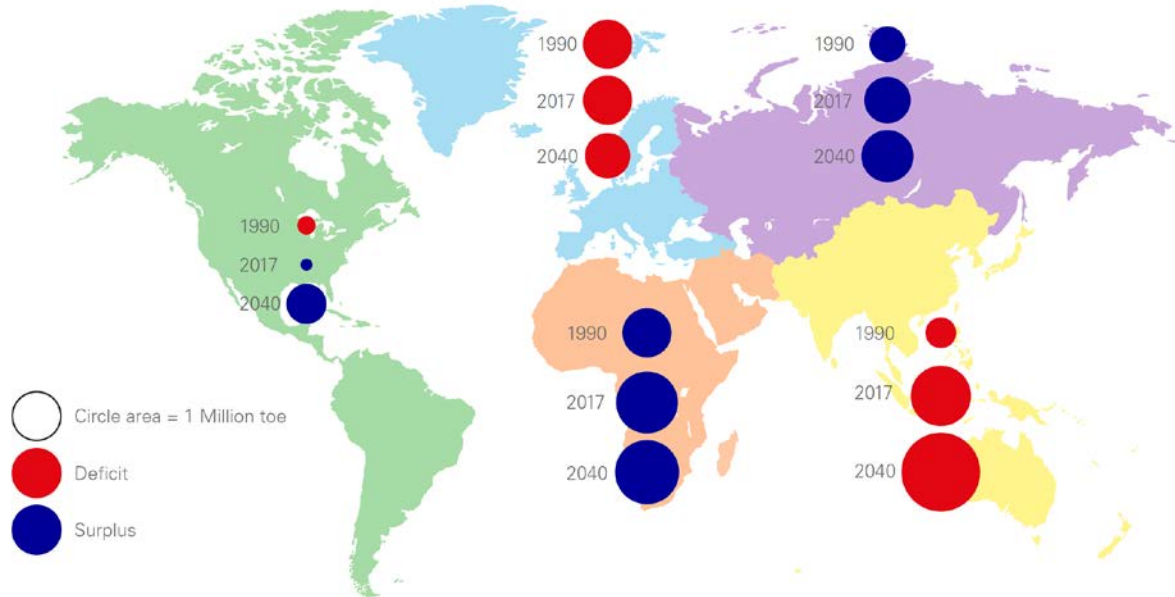
Petroleum and the Climate: Europe a Special Case.

- **European IOC's like BP and Equinor, have started flagging major climate-makeovers.**
- **But Europe is a special case:**
 - Weak resource base, towards the end of commercial reserves
 - Strong pro-climate West-European position – reflecting large petro-deficits and trade balance interests.
- **Other regions in surplus positions are flagging very different agendas:**

Contrasting Regional Patterns of Demand and Production

- America transitioning into a major exporter
- Russia, the Middle East and North Africa maintain a role of key fossil fuel exporters
- China is closest to the European balance

Energy balance of traded fuels (oil, gas, coal)



Peak Oil makes sense for Europe, and China but nowhere else!

Global

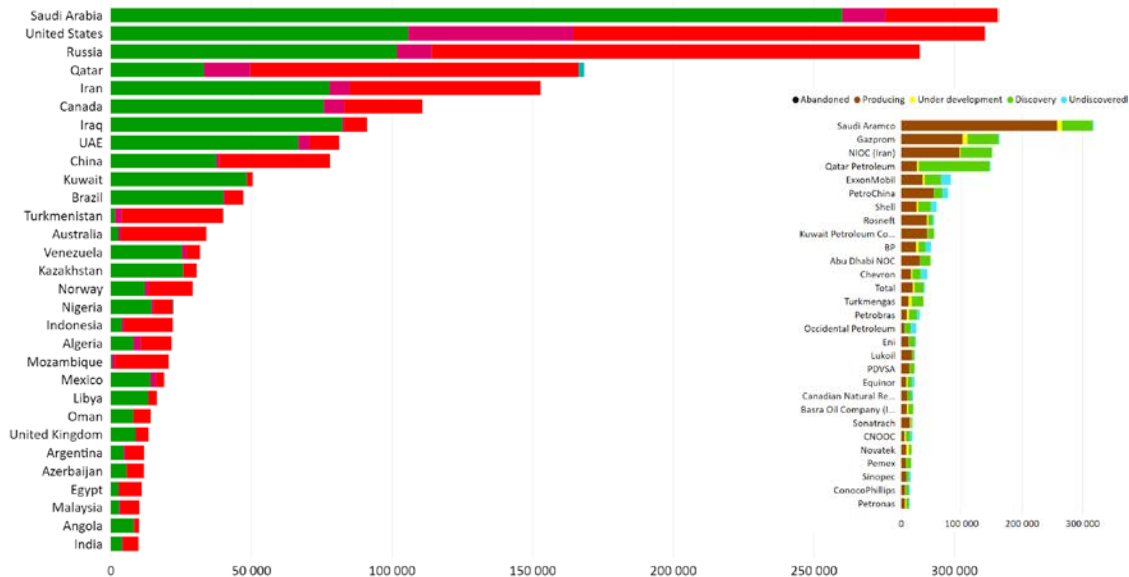
Quantity of resources

Remaining recoverable resources by country

Million boe

"Recoverable reserves are oil and gas that are economically and technically feasible to extract at the existing price of oil".

● Oil ● NGL ● Gas ● Other liquids

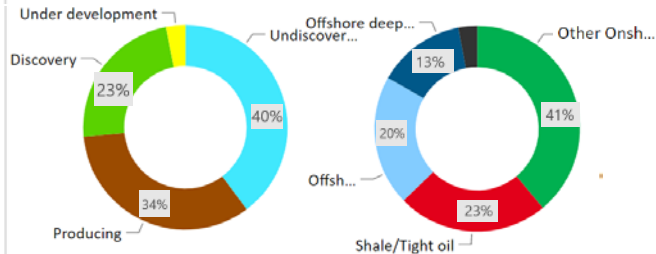


Remaining recoverable resources

Million boe

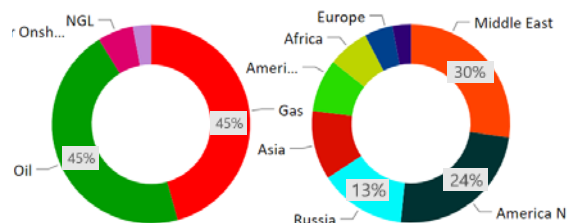
Life Cycle category

Resource type



Hydrocarbon

Continent



Snapshots of other regions

- **Russia**

- Winning the oil price wars with Saudi Arabia and the US
- Modernization of the regions – building gas infrastructure
- Remarkable oil spills, most recent in Norilsk – diesel tank corroded

- **Saudi Arabia & Middle East**

- Clean Petroleum – to become ‘best in class’
- Dealing with flaring
- Renewables to be handled by other companies

- **Africa**

- Emerging oil economies, hardly willing to forsake oil welfare
- Issues with flaring

- **US**

- Renewed momentum for US petro industry with fracking and shale oil/gas production
- Concern with local pollution chemicals and water in the fracking process.
- Trump discards climate issues.
- Industry has been late and reluctant to deal with climate issues.

- **Latin America**

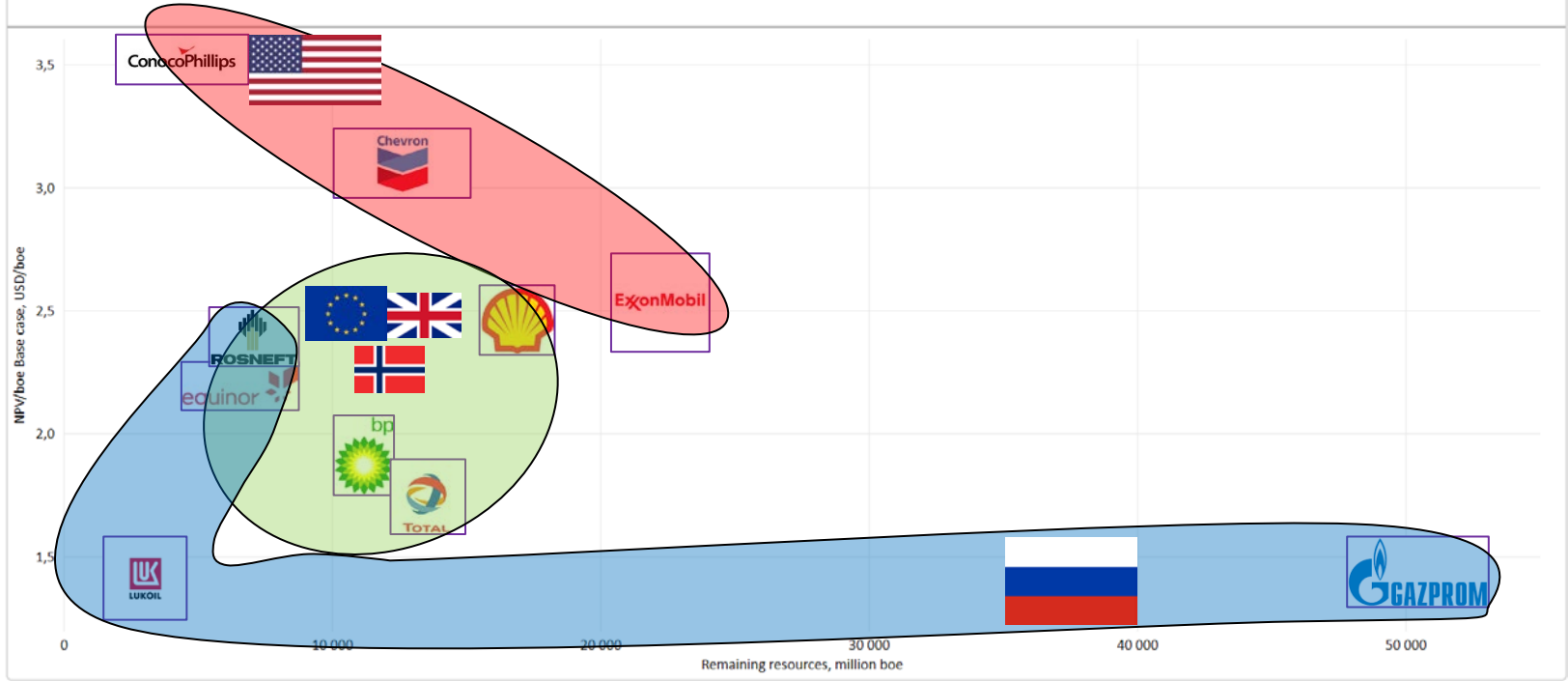
- Struggling to win the battle against corruption
- Focus on enhancing profitability
- Little capacity to deal with climate issues
- At best – moving towards clean oil.

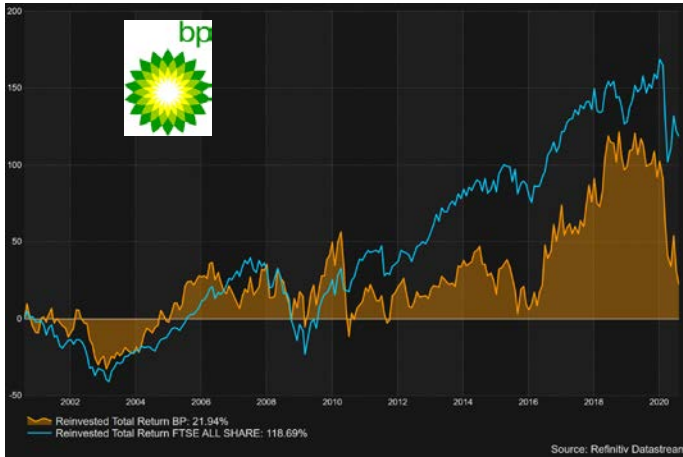
- **China**

- Ensuring growth
- Strong climate policy, but through other companies

Weak Link between resources and share price (next slides)

Remaining resources and NPV per boe for not yet developed resources

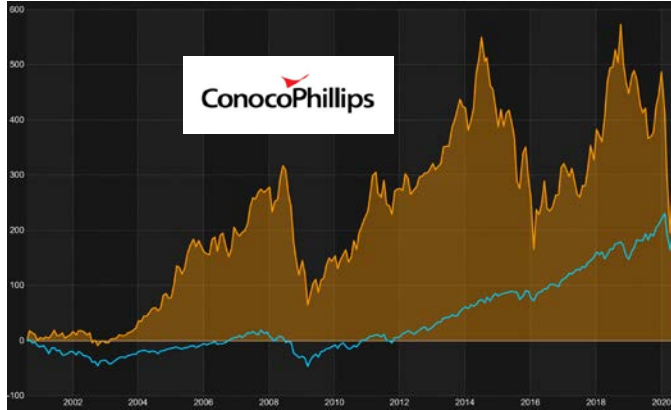
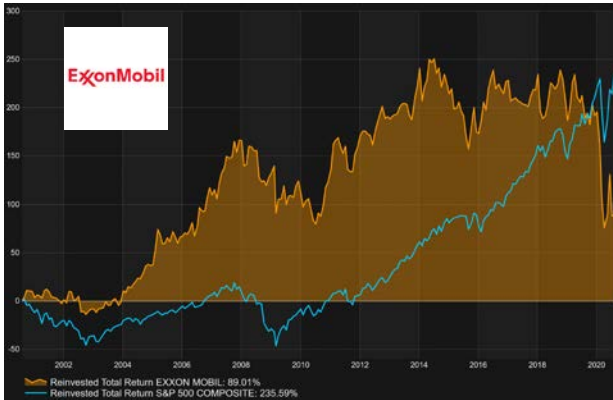




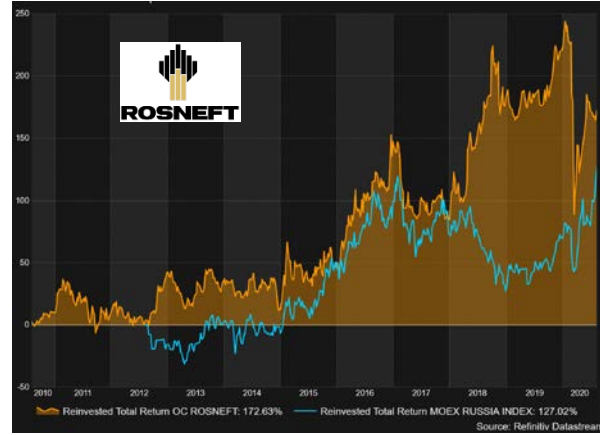
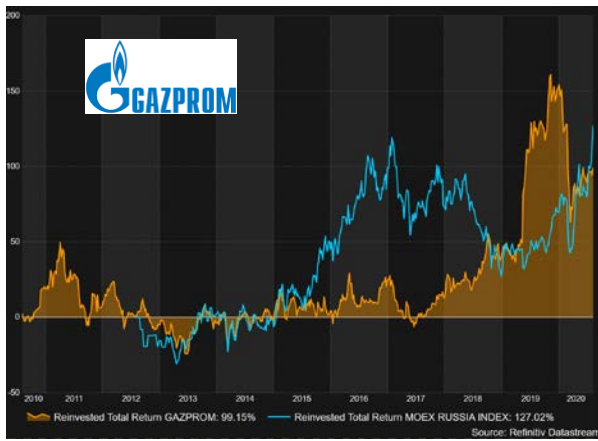
BP and Shell not Quite up To standards



Equinor And Total doing better



The American Oil Majors
Are doing Better than the Europeans



Lukoil the Winner in Russia

WHAT ARE THE CLIMATE OPTIONS FOR UPSTREAM PETROLEUM INDUSTRY

CONVENTIONAL

- Clean Carbon
- Cost Efficiency

TRANSITIONAL

- CCS & hydrogen
- Renewables..

The Winners in Petroleum industry

- **The winners will be those companies that:**
 1. Have the greenest petroleum
 2. Can produce at the lowest cost

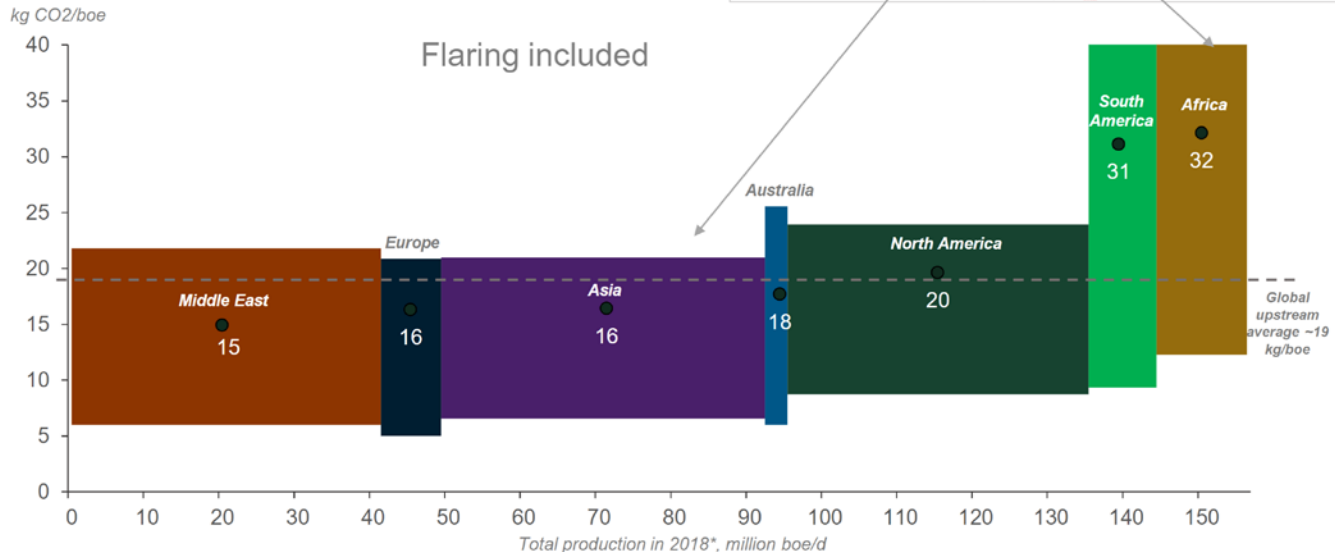
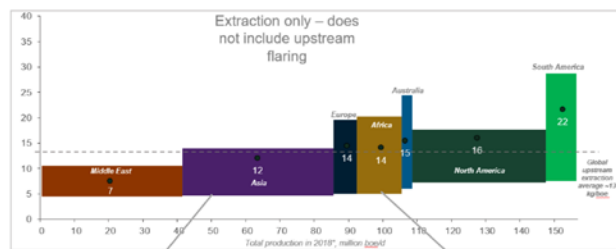
Clean Carbon



RYSTAD ENERGY

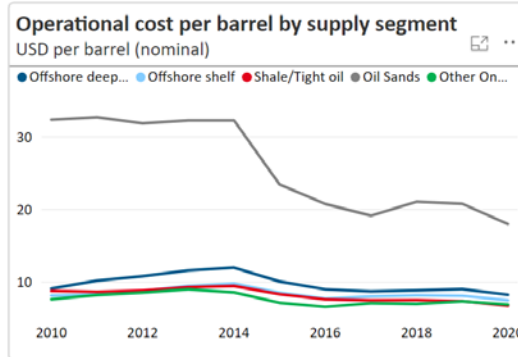
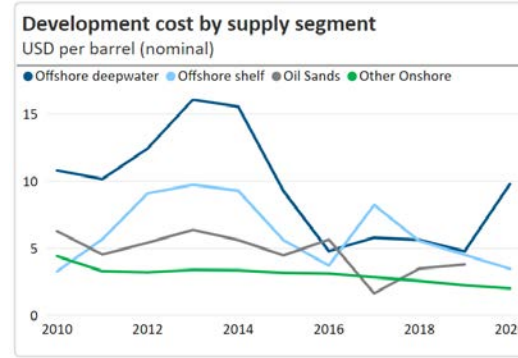
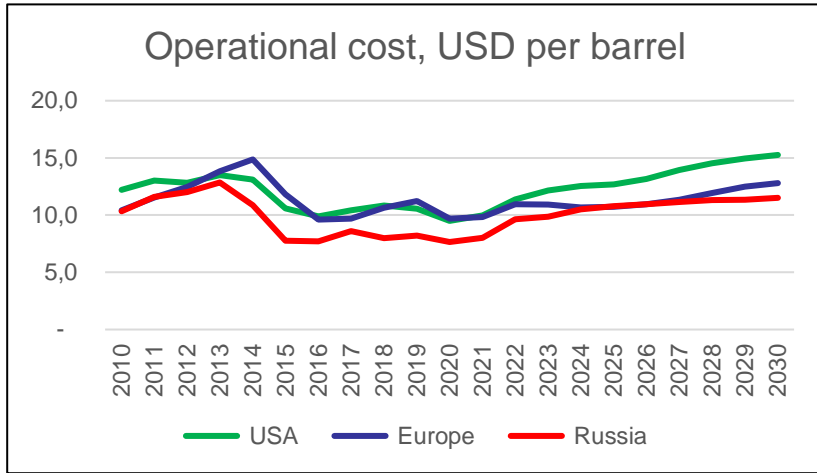
Global CO₂ intensity curve 2018 for O&G production
Upstream CO₂ intensity (extraction + flaring), kg CO₂/boe

- Value weighted average CO₂ intensity in the region (kg CO₂/boe)
- ▨ Boxes indicate 25th - 75th percentile range



Source: Rystad Energy research and analysis; Rystad Energy EmissionCube

Cost Efficiency



TRANSITIONAL

Equinor: Blue Hydrogen with CCS



Hydrogen will be a key contributor to the energy transition. Here's what Equinor is doing.

As an effective and environmentally-friendly energy carrier, hydrogen will make a key contribution to sustainable development of energy. Many people consider it to be the ultimate fuel of the future. Equinor is participating in several significant hydrogen projects. For more details, see below.

With developments in hydrogen technology, the potential for business and emissions reductions is promising. Continuing our decades of energy innovation, we are participating in several projects to show how hydrogen can provide scalable and profitable growth opportunities in the future.

<https://www.equinor.com/en/what-we-do/hydrogen.html>

H21 North of England

"H21 North of England" is a joint report that sets out how 3.7 million homes and 40,000 businesses in the north of England could be converted from natural gas to hydrogen and made emission-free by 2034.

Magnum power plant, the Netherlands

In an innovative joint hydrogen project with Vattenfall and Gasunie, Equinor is participating in converting Vattenfall's Magnum gas-fired power plant in the Netherlands to run on hydrogen, potentially reducing Dutch CO₂ emissions by up to 4 million tonnes per year.

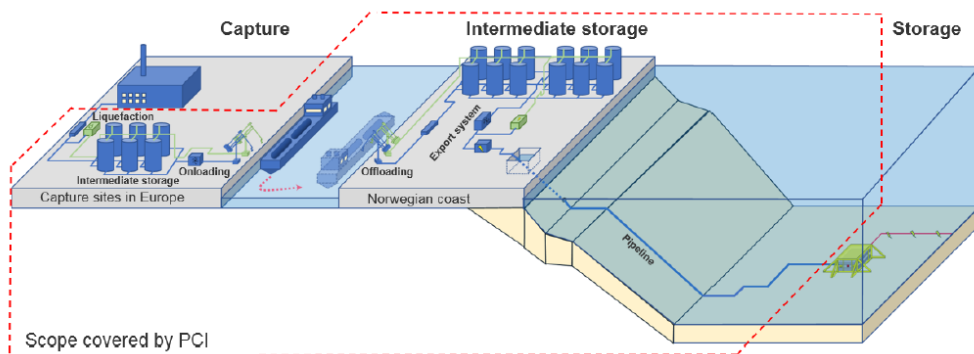
H-vision blue hydrogen project, Rotterdam

Equinor has been partner in the first phase of the H-vision project, a large-scale production and utilisation of blue hydrogen that will allow local industry in Rotterdam to substantially reduce its CO₂ emissions well before 2030.

Northern Light CCS transport and storage in the North Sea

TRANSITIONAL

Parties in the Larger North Sea Carbon-Industrial Ecology Catering for a Complete Carbon Value Chain



Equinor, Shell and Total E&P Norge AS to carry out the concept and FEED studies for developing an open source service for transport and storage of European CO2

Source: Equinor 2019

TRANSITIONAL

Floating Offshore Wind: Deploying Offshore Petro-Knowhow and Technology



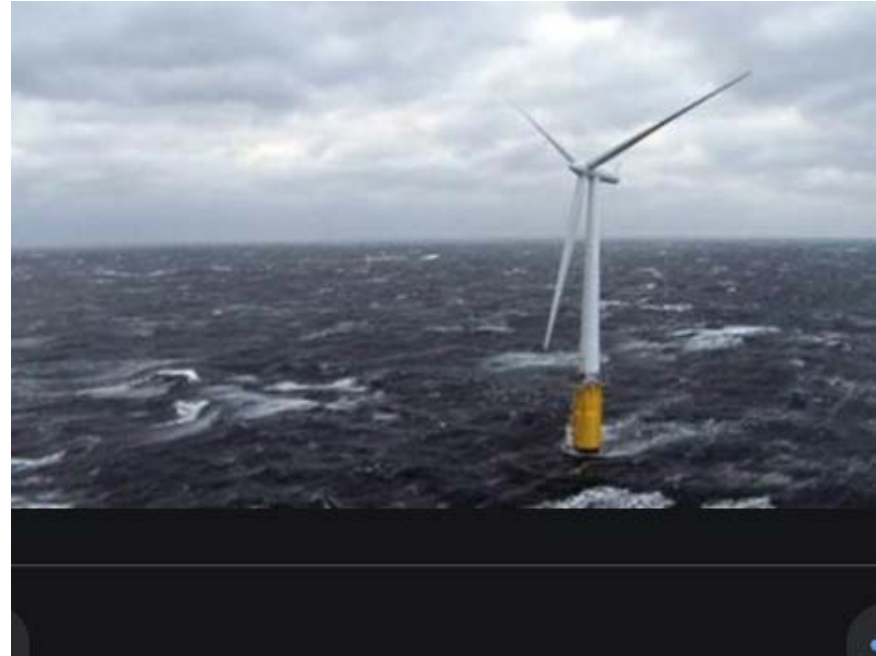
- Environmental friendly clean energy
- Needed to save our planet
- Create jobs and new opportunities

bcw



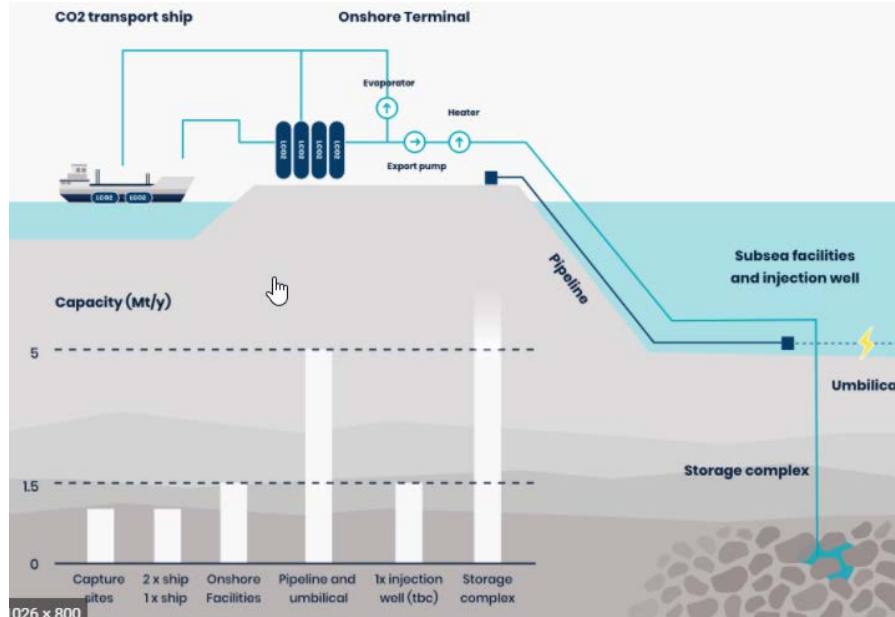
- Destroys nature
- Kill birds
- Unnecessary
- No local benefits

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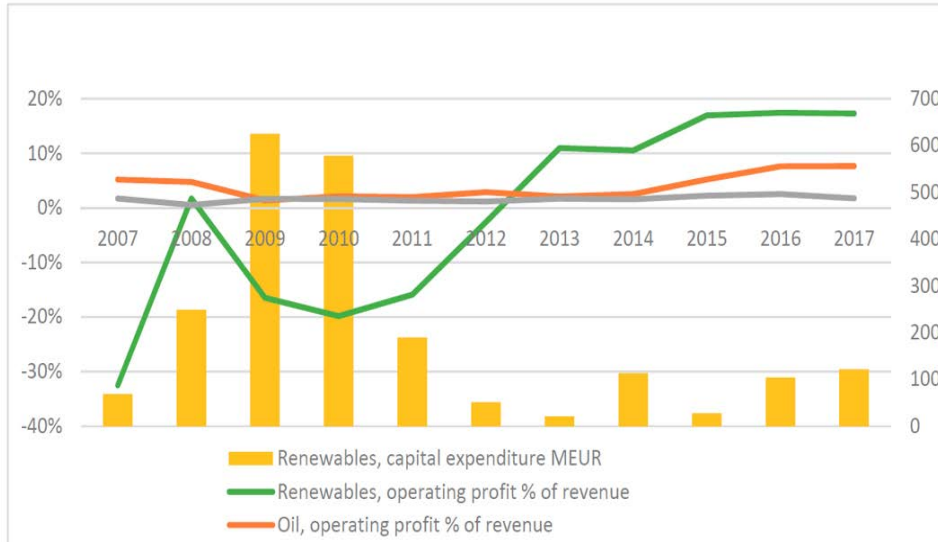
MIDSTREAM OPTIONS

- Transition from Gas pipelines to CCS and hydrogen systems.



DOWNSTREAM OPTIONS

Ex: Neste – Moving Into Biorefining



RETAILING

Retailers: From Petroleum to Energy Stations (examples from Norway)

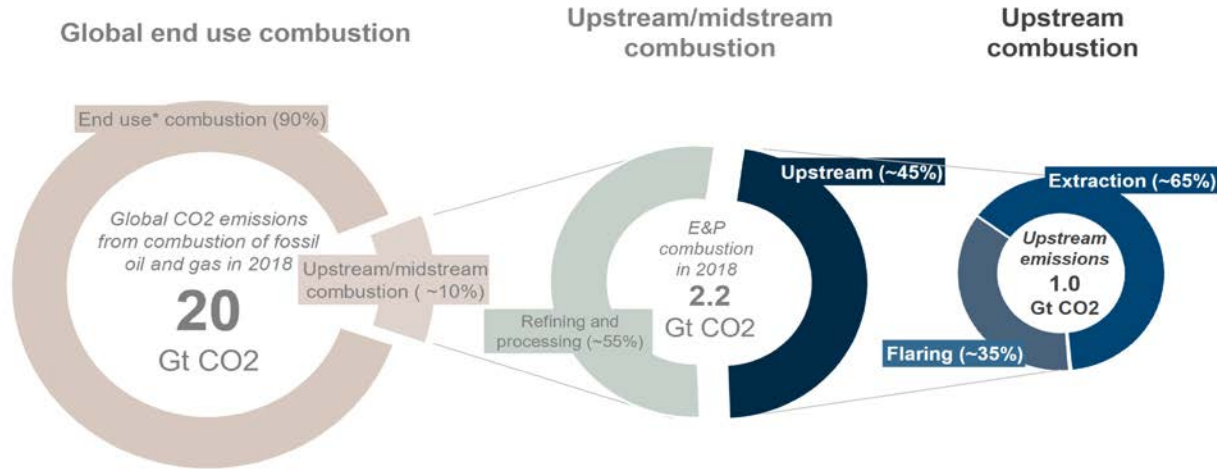


- From part of the petroleum industry to flexible energy companies
- Strong price price competition
- Active response to biofuel requirements
- Dependent on beating petroleum prices for amount outside of sales requirements
- Active developers of el-charging – competition from el-companies

PEAK FOSSIL FUEL CONSUMPTION

Upstream combustion account for about 5% of emissions originating from O&G combustion – 90% is from end users

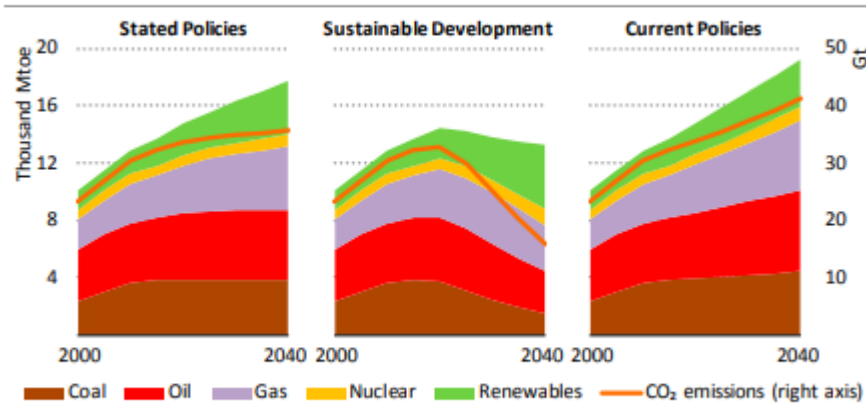
Estimated CO2 emissions from oil and gas combustion globally in 2018



* End use combustion include industry, power plants, transportation, etc.
Source: Rystad Energy research and analysis

Oil demand

Figure 1.1 ▶ World primary energy demand by fuel and related CO₂ emissions by scenario

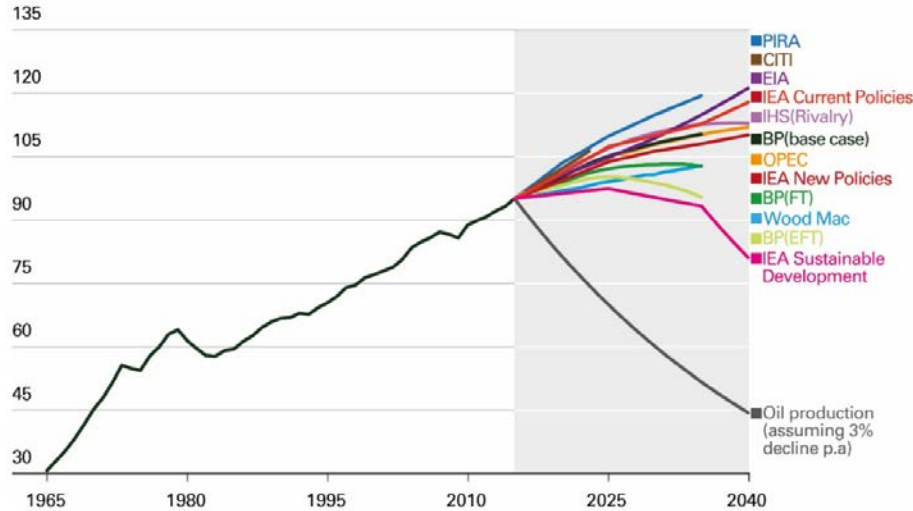


Existing policies and announced targets slow growth in global emissions to 2040, but they are not strong enough to force a peak in an expanding energy system

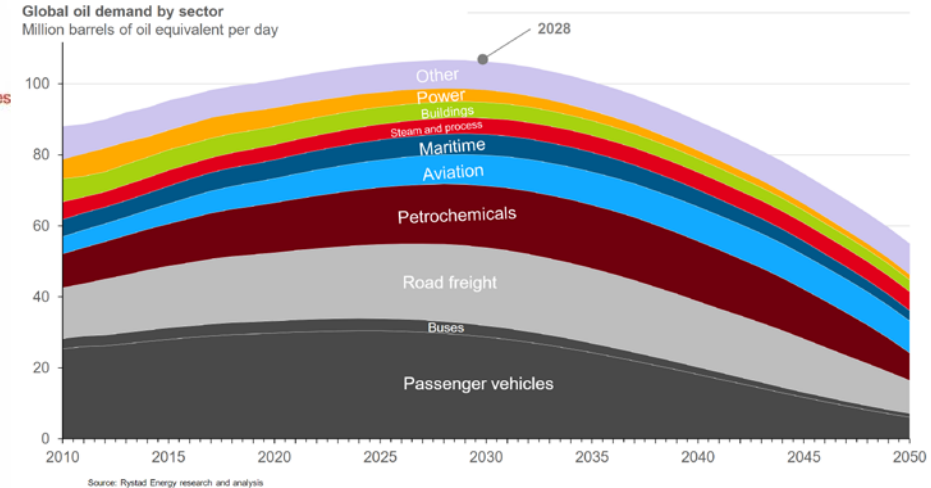
IEA Energy Demand forecast

Demand Forecasts, BP and Rystad

World oil demand (Mb/d) predictions vary strongly



Potential peak oil demand in 2028 at 107 million bbl/d

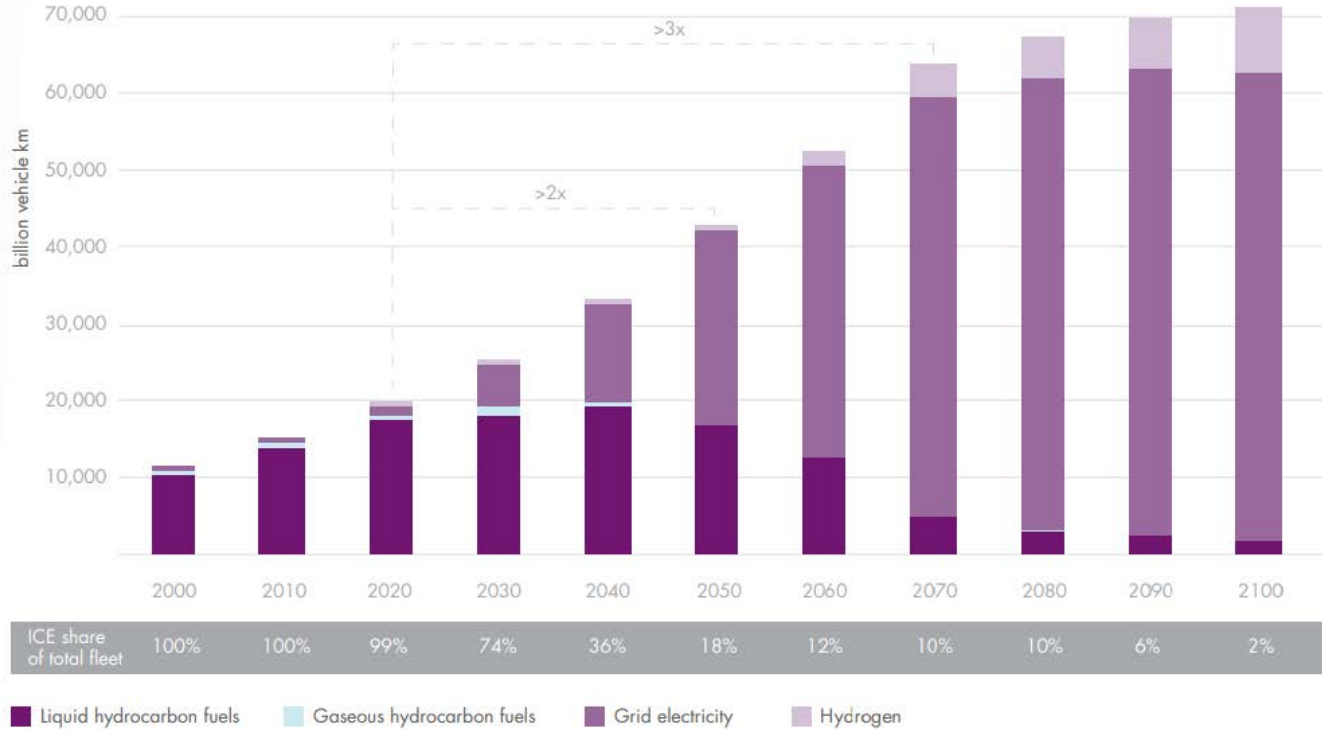


*Per 6. February 2020, Rystad Energy



[BP Outlook \(link\)](#)

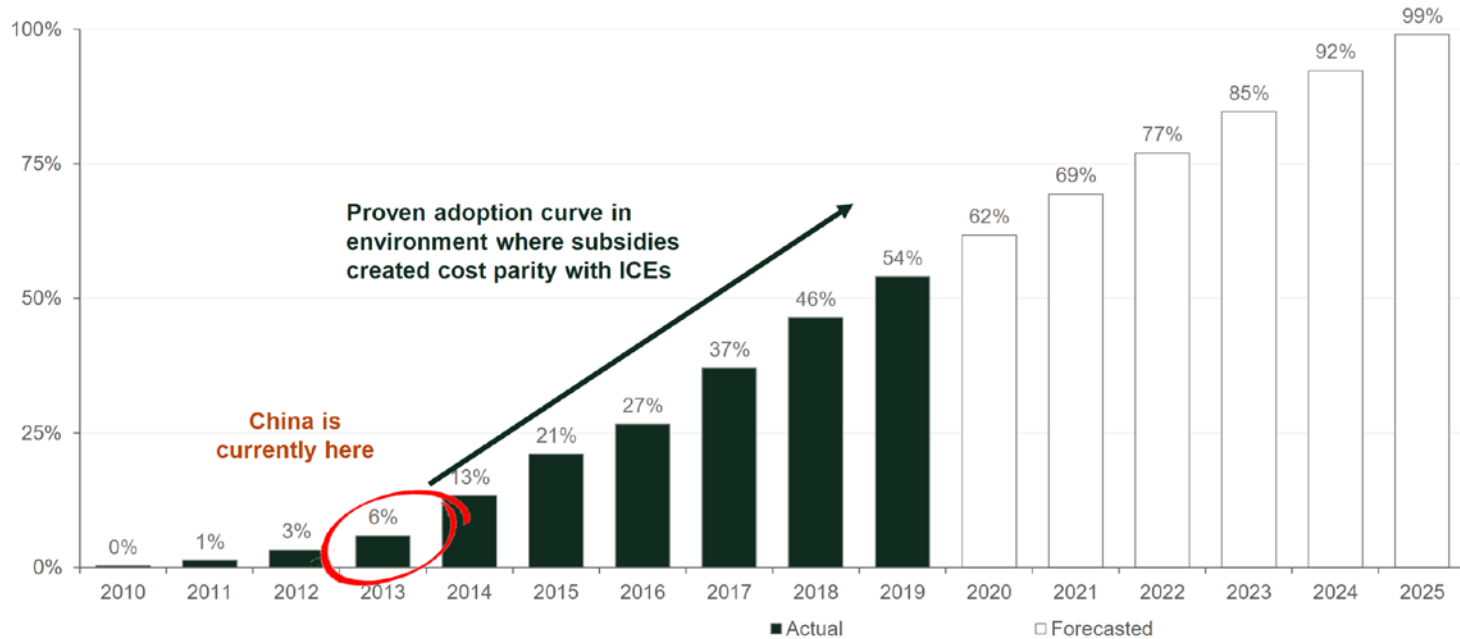
ENERGY SERVICE BY CARRIER FOR PASSENGER TRANSPORT (ROAD) IN SKY



Source: Shell analysis, Sky scenario.

Less than 10 years to 50% EV in Norway

Electric vehicle sales in Norway
Share of total sales



Source: Norwegian car sales statistics: Rystad Energy

Conclusion

- **Petrowende will come with the Autowende – and other consumer changes.**
- **There are plenty options for interesting business models for ex-petro industry.**
- **Different parts of the value chain will have different agendas.**