Energy: transitions and risks

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Overview: modern contradictions

Coal in France: back in the game?

The Loi Energie under discussion could establish *an emission cap applicable from 1 January 2022, for fossil fuel-based electricity production facilities located in continental metropolitan France and emitting more than 0.550 tonnes CO2eq / MWh*.

The draft measure, drafted with the help of the Council of State, postpones setting a ceiling and *leaves open the possibility of continuing to produce electricity from coal after 2022,* "for a small number hours"

Overview: modern contradictions

California: Failure caused by climate risks?

Pacific Gas and Electric is a company that was just bankrupted by climate change. It won't be the last (The Washington Post), Jan 2018

Pacific Gas and Electric Company (PG&E) filed for bankruptcy on January 29, 2019. The Californian energy supplier, which was valued at more than $25 billion at the beginning of November 2018, was, mere months later, only worth $4 billion following suspicions of responsibility in the fires that ravaged northern California, killing 86 people and destroying 15,000 homes.

Overview: modern contradictions?

Is there a market failure? If so we need a price

"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind." (Lord Kelvin, 1824-1907)

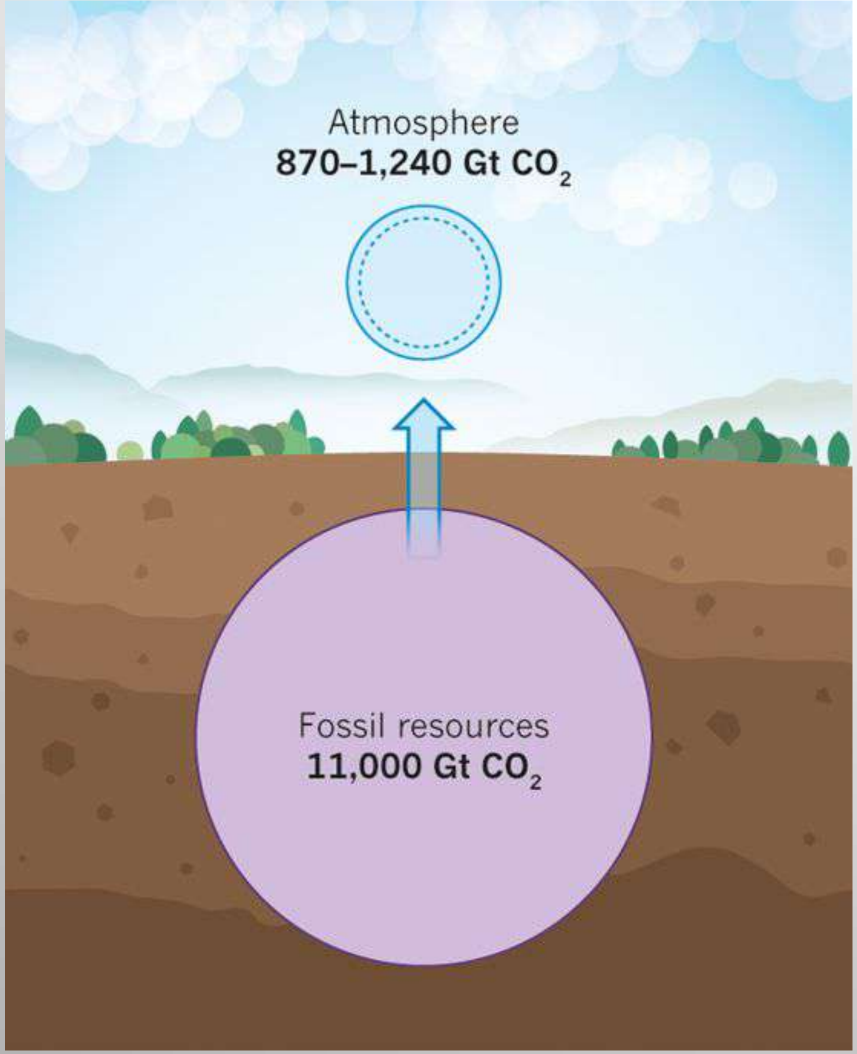
From Beyond Ratings

Energy: Transitions and Risks
Agenda

- Who bears these risks
  - Unburnable carbon
  - Stranded assets and the Paris Agreement
- Metrics: attempts to create specific stress tests
- Normative standpoint: carbon pricing, feebates and other instruments

Unburnable Carbon

Unburnable Carbon



- McGlade and Ekins (Nature, 2015) report that the carbon contained in fossil-fuel reserves (equivalent to 11,000 gigatonnes of carbon dioxide) is much more than the amount that can be emitted as CO_2 to the atmosphere (870–1,240 Gt) if global warming is to be limited to 2 °C above the average global temperature of pre-industrial times.

Image: Harvard Project on Climate Agreements

Unburnable Carbon and 1.5 degrees

- The 1.5°C IEA carbon budget is likely to be 200-415GtCO_2 from 2011 to 2100 for different likelihoods.
- The IPCC AR5 estimates for the same time period are slightly higher – from 400-550GtCO_2.
- In both instances removing the CO_2 emissions from the fossil fuel sector from 2011 to date leaves very little budget left for the sector to the end of the century.

- Caveats
  - Time Frame, sectors inclusion,
  - Gases included
  - Probability of achieving a temperature increase
  - Cliamte modeling
  - Carbon Capture technologies
- All of this modifies the burden sharing on on oil, gas and other fossil fuels

Unburnable Carbon: transition risk

- Climate policy creates a shift (*transition risk*)
  - Imposing a limit on the use of fossil fuels transfers economic benefits (known as rents) from resource owners to those who obtain the right to use the remaining burnable reserves.

- Is there a price of this risk?

Stock market and unburnable carbon

- McGlade and Ekins (Nature, 2015) prompted an average *stock price drop of 1.5% to 2% for 63 largest U.S. oil and gas firms*.
- Later, in 2012–2013, the press "discovered" this article, writing hundreds of stories on the grim consequences of unburnable carbon for fossil fuel companies.
- A small negative reaction to these later stories, mostly in the two weeks following their publication occurred. This *limited market response* contrasts with the predictions of some analysts and commentators of a substantial decline in the shareholder value of fossil fuel companies from a carbon bubble.

Science and the stock market: Investors' recognition ofunburnable carbonPaul A. Griffin, Amy Myers Jaffe, DavidH.Lont, RosaDominguez-Faus (2015)

Stranded Assets

Stranded Assets: Preliminary definition

- Different definitions for economists (‘economic loss’), accountants (‘impairment’), regulators (‘stranded costs’), and investors (‘financial loss’) make it difficult for different disciplines and professions to communicate with each other about very similar and overlapping concepts.

- Caldecott et al. (2013) proposed ‘meta’ definition to encompass all of these different definitions: ‘*stranded assets are assets that have suffered from unanticipated or premature write-downs, devaluations, or conversion to liabilities*’ *asset stranding are increasingly environment-related*

Stranded Assets: some numbers

Asset Stranding requirements to meet the Paris Agreement

Alexander Pfeiffer, Cameron Hepburn, Adrien Vogt-Schilb and Ben Caldecott
Environmental Research Letters, Volume 13, Number 5 2018

Stranded Assets

- Even though the growth of emission commitments has slowed down in recent years, currently operating generators still commit us to emissions (~300 $GtCO_2$) above the levels compatible with the average 1.5 °C–2 °C scenario (~240 $GtCO_2$).

- Furthermore, the current pipeline of power plants would add almost the same amount of additional commitments (~270 $GtCO_2$). Even if the entire pipeline was cancelled, therefore, ~20% of global capacity would need to be stranded to meet the climate goals set out in the Paris Agreement.

Committed emissions from existing and planned power plants and asset stranding required to meet the Paris Agreement

Alexander Pfeiffer, Cameron Hepburn, Adrien Vogt-Schilb[3] and Ben Caldecott[2]

Metrics

Metrics

- The literature on stress testing energy transition risks displays a variety of possible methodologies.

- In the banking sector there are some examples of stress tests of loan portfolios based on scenarios where the carbon price increases.
- The University of Cambridge Institute for Sustainability Leadership (2015) combines macroeconomic simulations of energy transition scenarios with industry-specific risk factors to gauge the potential losses for investment portfolios.
- Thomä et al. (2017) analyze the exposures of Swiss asset managers to a selected set of industries that are vulnerable to energy transition risk, and consider how these industries may be affected under various energy transition scenarios.

Metrics

- The Cambridge Centre for Sustainable Finance (2016) surveys fourteen case studies of individual financial institutions that have conducted stress tests, scenario analysis or related exercises with respect to climate-related risks.

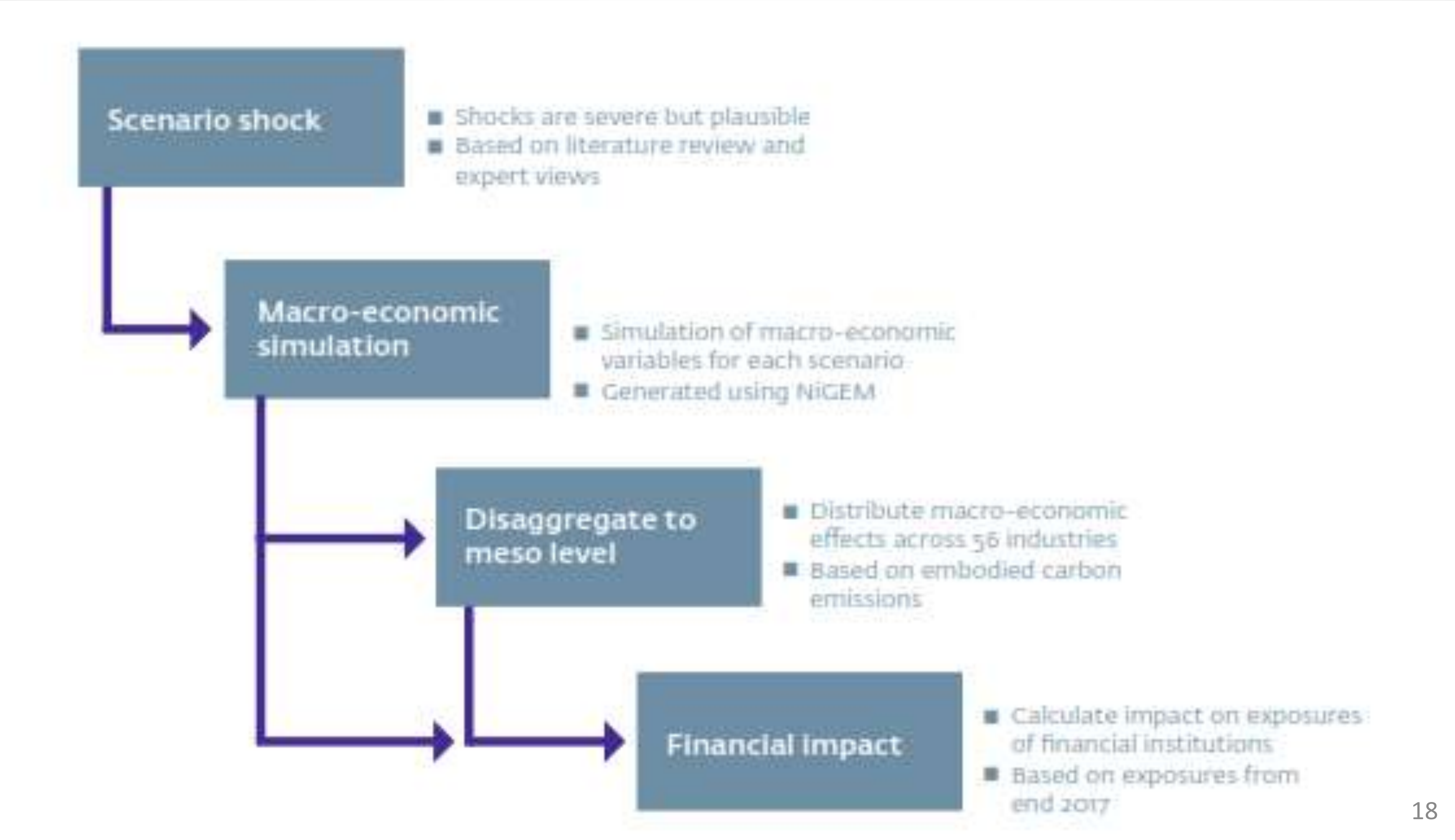
- Battiston et al. (2017) assess the exposure of the EU financial system to energy transition risks by analyzing financial institutions' equity and bond exposures to selected industries that are considered particularly vulnerable to energy transition risk.

- In addition, a network analysis is used to gauge potential spillover effects between financial institutions in the case of a disruptive energy transition scenario.

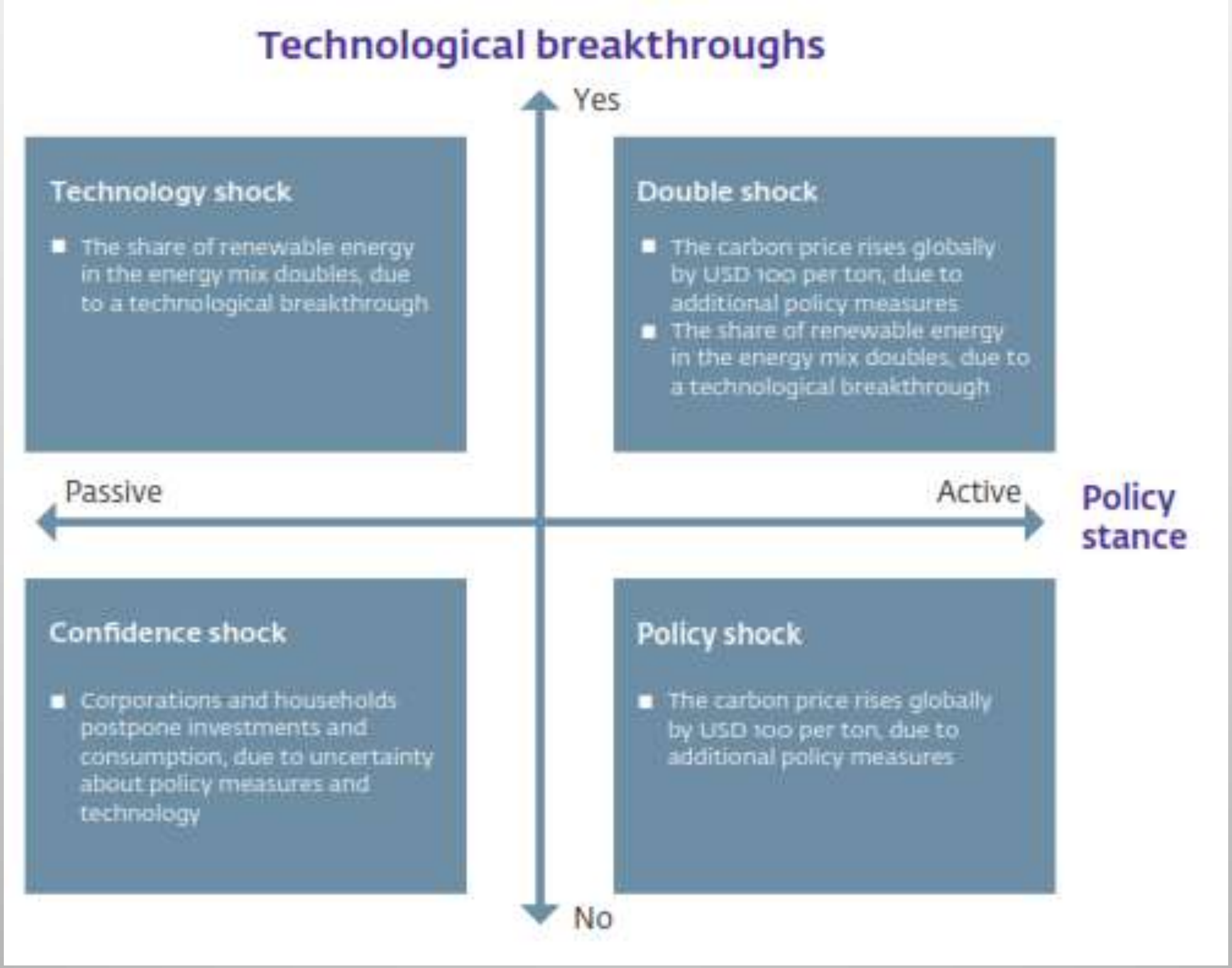
- Lastly, the Task Force on Climate-related Financial Disclosures (2017) provides a number of pointers to help firms to conduct their own scenario analysis for climate-related risks.

Metrics

- National Bank, the Netherlands (2018)



Metrics: Scenarios



Appendix: Transition vulnerability factors (TVFs) and equity returns by industry and scenario

NACE code(s)	Industry	TVF (equity returns) Policy shock	Tech shock	Double shock	Confidence shock
A01	Crop and animal production, hunting and related service activities	1 (-6%)	0.5 (-1%)	0.5 (-4%)	1 (-11%)
A02	Forestry and logging	0.9 (-5%)	0.8 (-2%)	0.8 (-6%)	1 (-11%)
A03	Fishing and aquaculture	0.9 (-5%)	0.8 (-2%)	0.8 (-6%)	1 (-11%)

The role of climate policy

The role of climate policy

- Successful climate policy will crucially hinge on the question of whether transition risks can be shared in an equitable way that also ensures resource owners are compensated for their losses

Climate policy instruments

- Alternative policy instruments may reduce stranded assets—and more generally, concentrated and immediate costs—in the transition to low-carbon capital.
  - Instruments: corporate average fuel economy (CAFE) standards in the automobile industry, efficiency standards or mandates for new power plants, buildings and appliances, feebate programs that tax energy-inefficient equipment and subsidize energy-efficient equipment, or subsidized loans and tax breaks for energy efficiency investment.

Climate policy instruments

- All these instruments are similar in that they redirect private investment away from polluting capital and toward clean capital without affecting the existing stock of polluting capital
  - for instance without providing incentive to drive less or operate existing gas power plants instead of existing coal power plants (that is, without creating stranded assets)

Climate policy instruments

- Irrespective of which type of instrument is used, the marginal cost of the climate change policy decomposes as a **technical cost**— the cost of using clean instead of polluting capital — and a temporary **legacy cost** that quantifies society's regret for excessive past irreversible investment in polluting capital.

Climate policy instruments

- In a Ramsey model with clean and polluting capital, irreversible investment and a climate constraint, alternative instruments can be analyzed. They imply different transitions to the same balanced growth path.

- The optimal carbon price minimizes the discounted social cost of the transition to clean capital, but imposes immediate private costs that disproportionately affect the current owners of polluting capital, in particular in the form of stranded assets.

- Carbon price avoids stranded assets but still result in a drop of income for the owners of polluting capital when it is implemented. Second-best standards or feebates on new investment lead to higher total costs but avoid stranded assets, preserve the revenues of vested interests, and smooth abatement costs over individuals and time.

Conclusion

- Once the risk is properly defined, the need for metrics is a crucial point
- There is a trade-off between political feasibility and cost-effectiveness of environmental policies.
- Pricing the risk, based on a precise metrics, is a way to perhaps solve this trade-off
  - if stranded assets are effectively priced and integrated into financial decision-making, capital is less likely to flow to assets that are incompatible with environmental sustainability and more like to flow to those that are.

	Class	Description
PHYSICAL	**Environmental challenges and change**	For example, climate change, water stress, and biodiversity loss.
PHYSICAL	**Changing resource landscapes**	Price and availability of different resources, such as oil, gas, coal and other minerals and metals. For example, Peak oil and the shale gas revolution.
SOCIETAL	**New government regulations**	Introduction of carbon pricing (via taxes and trading schemes), subsidy regimes (e.g. for fossil fuels and renewables), air pollution regulation, disclosure requirements, the 'carbon bubble' and international climate policy.
SOCIETAL	**Technological change**	For example, falling clean technology costs (e.g. solar PV, onshore wind), disruptive technologies, and GMO.
SOCIETAL	**Evolving social norms and consumer behaviour**	For example, fossil fuel divestment campaign, product labelling and certification schemes, consumer preferences.
SOCIETAL	**Litigation and changing statutory interpretations**	For example, court cases, compensation payments, and changes in the way existing laws are applied or interpreted.

Figure 1. **Typology of Environment-related Risk**. Source: Caldecott, Howarth, and McSharry (2013 Caldecott, B., N. Howarth, and P. McSharry. 2013. "Stranded Assets in Agriculture: Protecting Value from Environment-Related Risks."