ONE SIZE DOES NOT FIT ALL

A mix of policies will be needed in the next stages of decarbonisation

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In 2020, for the first time, both the UK and the EU-27 generated more power from renewable sources than from fossil fuels.[1] The cost of electricity from technologies such as wind and solar PV has come down rapidly in the last decade[2], as a result of learnings and scale economies from increased deployment, spurred on by financial support for renewable energy. As renewable electricity has become increasingly cost-competitive with conventional power generation, many countries in Europe have now been able to pare back renewable subsidies.

LEARNING-BY-DOING: THE CASE FOR PUBLIC SUPPORT

There's an economic rationale for government support for large-scale deployment for maturing renewable and low-carbon technologies. Firm A could invest in new approaches to producing (say) wind turbines that may unlock further potential future cost reductions, but this also comes with an up-front cost to Firm A. Where firms can learn from one another, the benefits (cost reductions) arising from Firm A's investments may spill over to other firms, which do not share in Firm A's investment cost. Since Firm A cannot capture these spillovers, it is incentivised to carry out less innovative activity than would be desirable from society's perspective. The same is true for all firms in the industry. Subsidising renewable and low-carbon deployment is one way of correcting this distortion.

It's tempting to think that public support for large-scale rollouts is therefore the template for future decarbonisation efforts, and that the lessons learned from the experience with solar PV and wind could be transferred to the 'next big low-carbon thing' (based on the figure below, say, hydrogen or transport).

[1] See "Europe's Power Sector in 2020", published by Ember and Agora Energiewende" and "Digest of UK Energy Statistics (DUKES) 2021" Chapter 5: electricity, published by BEIS.

[2] In USD terms, according to analysis by the International Renewable Energy Agency (IRENA), "levelized" costs (i.e. average costs per MWh generated, including capital costs) for solar PV have fallen by 85% between 2010 and 2020 while those of onshore wind have fallen by 56%. See IRENA (2021), Renewable Power Generation Costs in 2020.

EXEC SUMMARY

Financial support for large-scale renewable power deployment has helped costs to come down rapidly over the last decade. But mass roll-outs will not always be the optimal solution (at least, not in isolation) as decarbonisation spreads to other sectors (such as heat, industry and transport) and deepens in the power sector. Policymakers will need to ramp up existing efforts to understand how well different clean technologies perform, and establish out how best to incentivise their uptake.

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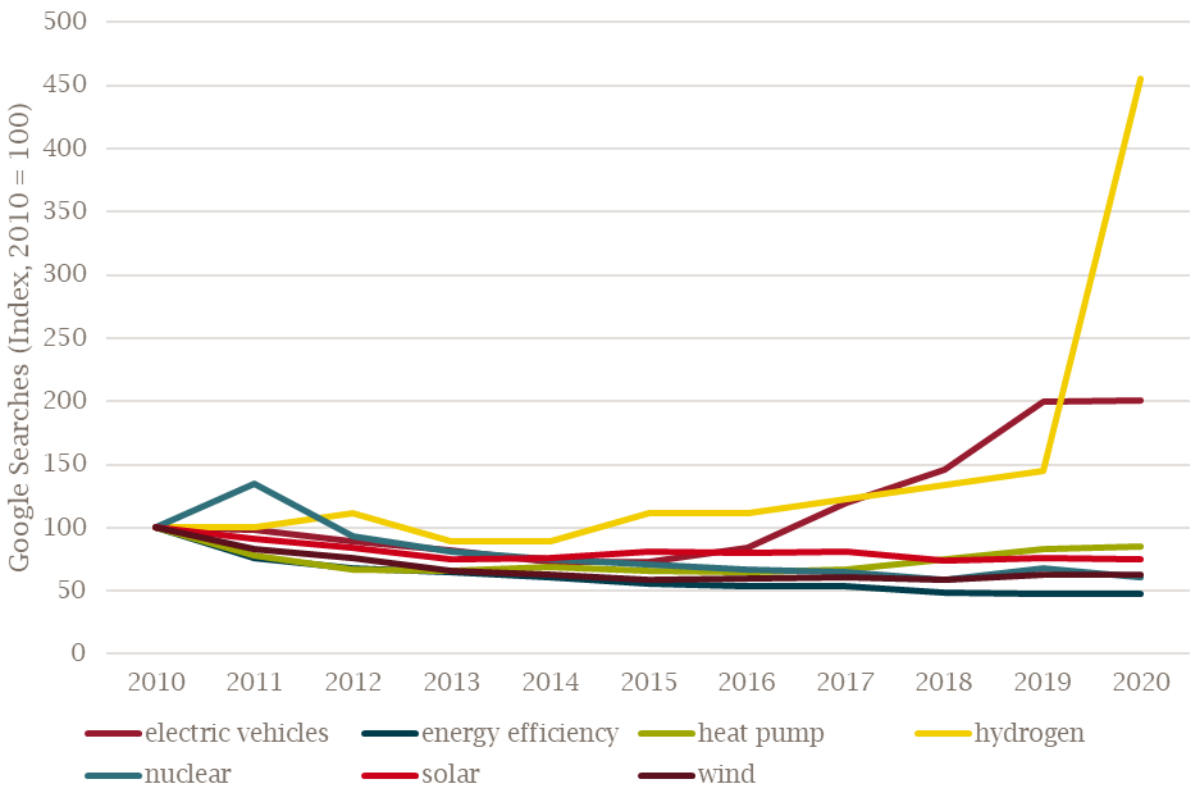
FIGURE 1



Source: Frontier Economics, based on Google Trends data

MASS ROLL-OUTS ARE NOT A CURE-ALL

Large scale deployment of renewables in the power system has (so far) been a relatively low-regret option. Decarbonising the electricity system is a key enabler of decarbonisation of other sectors (through electrification) and levels of intermittent renewable deployment in larger power markets have yet to reach levels that fundamentally challenge market and system design. And over the last 10 years, it has become increasingly clear how the costs of renewable policy have tumbled with deployment.

However, mass roll-outs are unlikely to be as low regret in the case of technologies such as electric vehicles and hydrogen from electrolysis. This is partly since the business cases for such technologies rely in large part on cheap clean electricity. While reductions in capital costs are possible, they will make less of a contribution to reductions in overall costs.

In addition, the technological landscape is more diverse for “hard-to-abate” sectors such as heavy transport and industry or for ensuring the “firmness” of electricity supplies in a completely zero-carbon system, and the evidence on how different technologies perform is constantly evolving. The flow of new research is clearly to be welcomed. But it means we need to be careful before identifying any particular technology as a silver bullet (or dismissing it entirely).

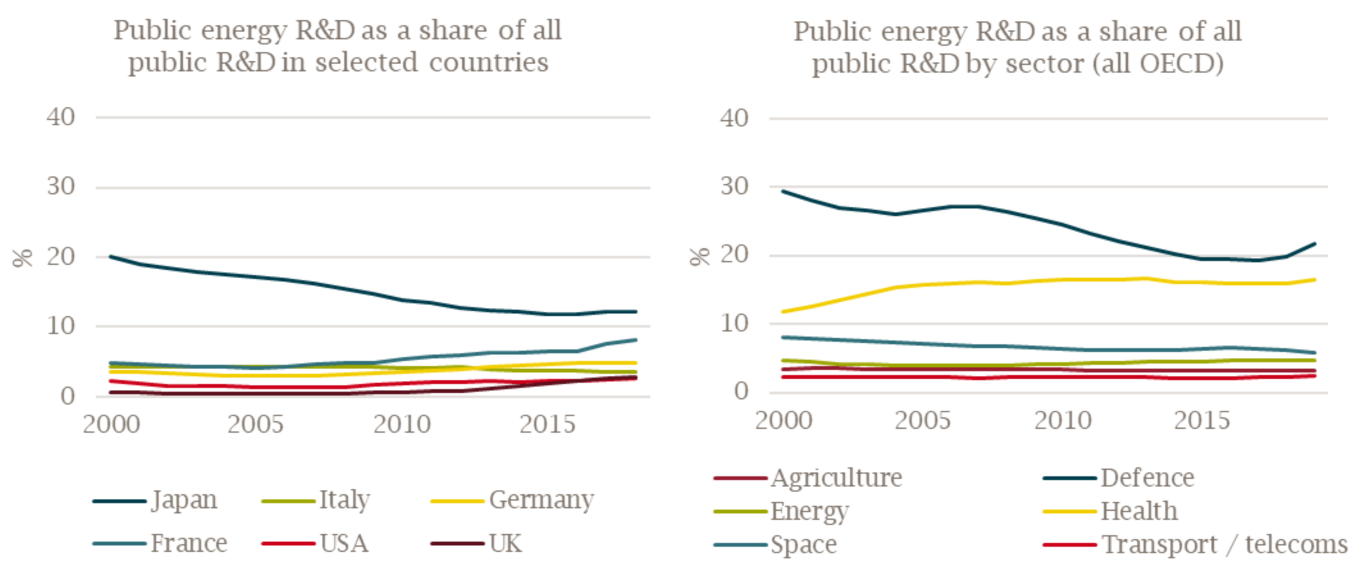
- Headline coverage of new studies may bely the complexity of the underlying analysis and the importance of particular assumptions. Research outcomes that are very uncertain in reality can therefore easily become received wisdom through repeated citations.
- It may not be immediately obvious how the results of a given study may be transposed to different geographies (given differences in energy mixes, market design and regulatory frameworks).
- Technology research is often backed by energy systems modelling. While this can be hugely helpful, it may lead to a focus on what can be modelled, to the detriment of technologies and behavioural effects that are less easily parameterised.

This underlies the importance of resisting the (political) temptation to use mass deployment as a way of demonstrating progress. Stakeholders may tout the importance of de-risked, large-scale, roll-out for the investor perspective. And while this is true, it doesn't help us establish what we should be deploying, and the best way of doing so.

SUPPORTING INNOVATION – RISKY BUT NECESSARY

Public support for clean energy research and development (R&D) and piloting (as distinct from support from deployment) would help boost the quantity and quality of evidence on what works. There are plenty of examples of such initiatives, such as the competition announced by the UK earlier this year for innovation in energy storage technologies[3], and the EU's Horizon and Innovation funds[4]. But data from the IEA suggests that, across OECD countries, public spending on energy R&D still lags far behind spending in other sectors (and that spending in the USA and Europe is particularly low).

FIGURE 2



Source: IEA 'Global-status-of-clean-energy-innovation-in-2020'

[3] https://www.gov.uk/government/publications/longer-duration-energy-storage-demonstration

[4] https://ec.europa.eu/energy/funding-and-contracts/eu-funding-possibilities-in-the-energy-sector_en

While less tangible than erecting wind turbines, the benefits of greater support for R&D could be significant. Previous Frontier work for Global Apollo Programme suggested that modest spending on R&D could have significant benefits (in the trillions of USD out to 2040). The US's Defense Advanced Research Projects Agency (DARPA) is often cited as a shining example of successful government-sponsored R&D. The Economist has stated that "*Moderna's covid-19 vaccine sits alongside weather satellites, GPS, drones, stealth technology, voice interfaces, the personal computer and the internet on the list of innovations for which DARPA can claim at least partial credit*".[5] Many countries are keen to follow the US's example (and the US itself has created a similar agency with a focus on energy).[6]

Spending on R&D is not always guaranteed to deliver technological breakthroughs. However, the political risk can be at least partly mitigated if shared across countries (and this would be more consistent with the nature of the clean innovation challenge – which is almost as international as the climate threat itself). This is part of the rationale for the EU framework for 'Important Projects of Common European Interest' (IPCEI), which streamlines EU State aid rules for countries looking to club together to innovate in value chains for technologies such as batteries and clean hydrogen.

SOLUTIONS ALONG THE WHOLE VALUE CHAIN

Even where it is clear that a particular technology has promise, financial incentives may not be sufficient to deliver efficient outcomes. Policymakers will often need to consider behavioural interventions and co-ordinate between many actors, for example:

- Achieving on energy efficiency in buildings may require interventions to address credit constraints faced by households, or the resolution of a mismatch between the interests of landlords and their tenants.
- Rolling out more electric vehicles needs to go hand in hand with the availability of charging infrastructure.
- Switching whole gas distribution areas to the use of hydrogen may not require simply a build-up of hydrogen production, but also upgrades to infrastructure and the simultaneous replacement of end-user appliances (such as boilers).
- Even where large-scale deployment is the focus, cost-effective commercialisation of technologies may involve thinking about barriers that might exist in the supply chain (for example, related to skills) and possible government action required to resolve such barriers.

It is important that such co-ordination issues are identified, understood and evaluated before defaulting to financial support for deployment alone.

SWAPPING HARD HATS FOR LAB COATS

The need for an improved understanding of how different technologies perform and the most effective combinations of policies for getting them on the ground doesn't preclude action being taken now. Indeed:

[5] "A growing number of governments hope to clone America's DARPA". The Economist, 3 June 2021.

[6] "The rise of 'ARPA-everything' and what it means for science", Nature 595, 483-484 (2021), 8 July 2021.

- Where a choice is clearly low regret, and where scale can provide benefits, it should be pursued quickly.
- Given the urgency of dealing with the climate threat, there may also be a case for 'getting on with' what is known to work (even if there is a chance that other solutions may eventually prove more cost-effective). In the absence of perfect information, policymakers should make informed judgements, based on careful interrogation of the available evidence.

But it is important nonetheless to invest in R&D, trialling and behavioural solutions.

This may seem politically less appealing. There is no "ribbon to cut". These kind of solutions are less likely to be being pushed for by major players in the industry. They are also risky politically: R&D involves making bold gambles on things that may not have an obvious pay-off (if at all), at least not within the electoral cycle.

But there are also risks in ignoring the "boring" stuff. We don't know what the future holds. Today's technology set may later prove to be ineffective or expensive. And with a fuller appreciation of the evidence surrounding technologies and policies, policymakers can better ensure that financial (and administrative) resources are more cost-effectively deployed in the fight against climate change.

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