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GOVERNING INNOVATION TO DELIVER CLIMATE NEUTRALITY

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The objective to achieve net zero emissions of greenhouse gases by 2050 and the desire to drive economic growth through the European Green Deal are ‘game changer’ policies. Those policies that are critical to successful delivery of these new objectives must be re-oriented and aligned with the challenges involved. Innovation policy is one such area.

A new ‘learning governance’ process is required that involves the maintenance of latest technical knowledge and expertise at its heart. An independent ‘Clean Economy Observatory’ should be established to fulfil this function. It can drive ‘learning by doing’ through recommending the needs for large-scale deployment pilots as well as identifying the ‘pathway critical challenges’ or ‘missions’ that must be addressed to ensure the delivery of net zero remains a realistic prospect. It would also be instrumental in stopping innovation initiatives that are failing to deliver.

This briefing note explains the rationale for the new governance process and sets out how the key functions need to interact¹.

¹ This paper was written as the COVID-19 crisis was emerging. COVID-19 will raise its own research questions, including about interactions between pandemics and responding to other crises such as climate change. At the time of writing, this did not change our mind about the appropriate response to climate



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Context

The EU has adopted a net zero greenhouse gas emissions target for 2050 and is starting to consider how the broader policy agenda can be aligned with this decision. The proposed European Green Deal (EGD) has an important role to play in driving policy alignment, as well as moving the discussion beyond simple technical delivery and towards economic opportunity.

EU innovation policy must be central to the overall package designed to deliver net zero and to support the goals of the EGD. Whilst the basic technologies already exist to make significant progress towards net zero, many are in the early stages of development, have very high costs, or are difficult to deploy at the rate necessary. Equally important, success is likely to depend on major changes in the behaviour of EU citizens and when and how this might happen remains unknown. Innovation will be essential in improving existing technologies and their deployment potential, opening new technology pathways, and creating the attractive new lifestyle choices that will be needed to command public support for the transition.

Hitherto, the discussions about aligning EU Innovation processes with net zero delivery have revolved around the size of the overall budget and the proportion that is 'mainstreamed' for climate purposes. Whilst the overall level of spend is extremely important, poor targeting and management of this budget could undermine net zero delivery and the growth ambitions of the EGD.

This note explains where innovation must fit into net zero delivery processes and proposes how it should be governed. **It sits alongside two other papers:** an overarching framing paper which defines broad principles for EU research and innovation policy to ensure alignment with the EGD, and a paper which identifies priority research and innovation challenges that need to be addressed.

The decade of choices

There is, as yet, no agreed EU pathway to net zero, either in terms of overall emissions trajectory or how this might be divided between sectors or member states. However, most commentators agree that the power system must be rapidly decarbonised and early steps taken to improve overall efficiency and electrify other sectors where this is a viable proposition, such as heating, light vehicle transport and certain industrial processes. In other areas, the way

change – indeed we hope the thoughts expressed here can be helpful and complementary to the response to COVID-19.



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forward is less clear. For example, there is no obviously preferred way to decarbonise fuel for heavy goods transport, shipping and aviation or to provide high grade industrial heat. Moreover, the options to transform agriculture and land use are at a relatively early stage of discussion.

The previous innovation priorities have focused on creating new technology options with the expectation that they will be deployed through market processes, perhaps with the support of financial incentives such as feed-in-tariffs or grants. The ongoing improvements to product design and resulting cost reduction are then expected to emerge through competition and the desire to grow market share.

The defining features of the new net zero paradigm are not only the extent of the changes required but the rate at which they must happen. We have neither the time nor the money to keep the option of all potential pathways open. Some choices about the future need to be made now and deployment pushed forward at pace. Other choices can be left open for now, on the basis that the risks are too great and we will be in a better position to move forward later. However, many of those will also require firm decisions to be made in the coming years, to meet the challenge of net zero.

We are moving from the decade of creating options to the decade of making choices and the role of innovation must change to ensure this transition is a success.

The role of innovation

Innovation will rightly continue to operate at many levels from fundamental ‘blue sky’ research to business improvements driven by a short-term commercial imperative. However, it has a critical role to play in meeting the net zero and Green Deal challenges and, in this regard, it must be strongly targeted on delivering the outcomes that are required. There are two distinct aspects to innovation which are important.

Firstly, choices over pathways to net zero will be driven by expectations of future technology costs and deployment potentials (including the potential for behaviour change). It will only be possible to discover more about these assumptions through practical experience of deployment. The learning curve (see box below) is extremely powerful and can drive costs way below initial expectations. This form of innovation must be stimulated through significant deployment programmes and the learnings and best practises widely shared and



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fed back into revised expectations for the future that can be used to inform important decisions.

Box: The learning curve – the example of renewable energy

In any environment where a task is continually repeated, after a period, there is an improvement in performance and a reduction in the time taken to complete the task. This is known as the ‘learning curve’ and it is particularly important in industrial processes manufacturing large quantities of a product where significant efficiency improvements can be achieved.

The learning curve has been extremely important in driving cost reductions of renewable energy sources since most of the costs are associated with upfront manufacture and installation. Thereafter, apart from operation and maintenance costs, the cost of energy production is essentially free. As more renewable energy technologies have been manufactured and installed at scale, the learning curve has driven significant reductions in the cost of electricity production.

Fossil-fuelled power generation technologies cannot benefit from the learning curve to the same degree since the cost of fuel is the dominant factor in determining the overall cost of energy production. Similarly, nuclear power plants have not seen cost reductions since their manufacture and installation is infrequent and involves many bespoke elements.

Contrary to previous expectations and as a result of extensive deployment, the costs of solar and wind technologies have significantly reduced, and they are now competitive with fossil-fuelled technologies in most geographies.

The second key area of innovation involves opening new high value pathways to net zero. In some areas, current decarbonisation options are too expensive or impractical to deploy at scale. Targeted innovation programmes can be focused on resolving such challenges within a prescribed timescale, either through exploring the potential to significantly improve existing options or creating radical new ‘breakthrough’ alternatives.

The governance of innovation to deliver net zero must be designed to capture these two important elements:



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- > *Incremental*: Referring to areas where it is already possible to deploy technologies or approaches at scale but where significant on-going ‘learning by doing’ will be necessary to improve performance, reduce costs and support lifestyle change.
 - > *Breakthrough (or pathway critical challenges/missions)*: Where knowledge gaps exist and new solutions are required if net zero is to be delivered in a technically, economically, and politically acceptable way.

The ‘Clean Economy Observatory’

It is not possible to be certain which decarbonisation pathways will turn out to be most effective and create the best value for citizens but it necessary to find a way to make the choices and identify the priorities that will allow progress to be made at the required rate. Active management of uncertainty uses the best available current information to identify those choices that need to be made now and those where it is important to retain options going forward. These decisions should be based on a single, internally consistent, and up-to-date analysis of current and future technology including costs and deployment potential and their associated uncertainty. Central to this work will be the development of views on how citizen behaviour and lifestyle choices might evolve and how technology choices interact with these behavioural issues.

Undertaking this analysis of decarbonisation pathways would be an extremely important and potentially controversial task. It must be about long-term strategic political goals rather than short-term political pressures. Also, it must seek options that are for the benefit of all citizens rather than narrow vested interests of industries or sectors. This suggests independence from current institutions and requires a high degree of technical competence. The EU should, therefore, establish a ‘Clean Economy Observatory’ that will provide a shared evidence base and be responsible for owning unbiased current views of behaviour change, technology, and resource capabilities and costs along with how these will develop in future. Apart from being essential to guide priority infrastructure investment decisions², it would lie at the heart of both incremental and breakthrough innovation efforts to deliver net zero.

Firstly, the Observatory would act as the ‘learning body’ that would review and assimilate key learnings from deployment activities including large scale

² See ‘EU Energy System Decarbonisation Policy – Breaking the Logjam’, E3G, November 2019



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deployment pilots. It would use this information to update decarbonisation pathway analyses and it would make this information available to all member states to help develop their national plans. A key objective as the innovation learning body would be to promote learning by doing and it would recommend to the relevant EU decision making body where high value deployment programmes exist which are worthy of public funding. It would also be able to identify where innovation initiatives are not delivering the benefits initially envisaged and further expenditure should be stopped and diverted elsewhere.

The second objective of the Observatory would be to identify those areas where major improvements in the performance of current technologies, or changes in citizen behaviour, are required. These can be framed as ‘pathway critical challenges’ or ‘missions’ and would be accompanied by the timescales over which research and innovation must yield results. These challenges can then be allocated to a relevant challenge owner to progress the work that is required.

Innovation governance

Achieving the goal of net zero and overcoming the challenges set out above requires a new architecture to deliver immediate progress and capture the benefits of innovation and learning as delivery proceeds. The required functions are set out in the figure below, highlighting those functions that are core to the innovation processes.

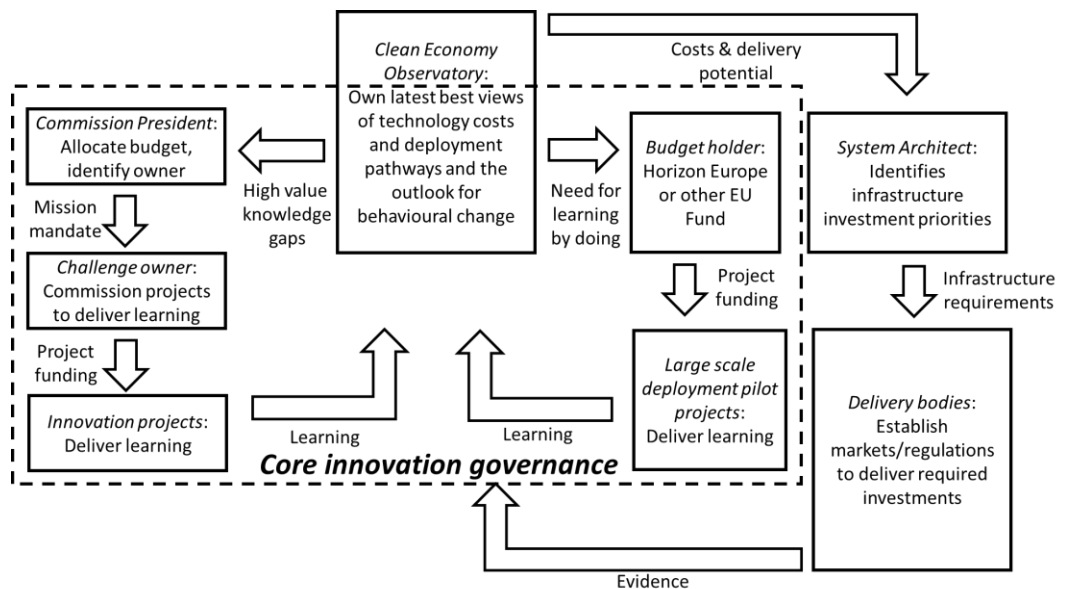


Figure: Net zero delivery architecture including core innovation governance



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The Clean Economy Observatory would act as the mechanism to ensure innovation spend is co-ordinated and aligned with net zero delivery. It would pass recommendations to the relevant authorising body to release funds to support large scale deployment pilots and would remain involved with individual projects to ensure learning is rapidly assimilated into net zero planning processes at EU, national and local levels³.

The concept of missions is already being tested within the Horizon Europe framework and this approach should be extended to solve the key challenges associated with delivering net zero. The Observatory would identify the high value issues that need to be addressed and the period over which substantial progress is required. Recommendations for these ‘net zero pathway critical challenges’ should be sent to the President of the European Commission who can identify a budget (drawing on the various innovation funds available) and a challenge owner. The challenge owner may be the Commissioner of the most relevant directorate and would be expected to establish a steering committee from across the Commission directorates and an expert technical advisory body to help define a programme of research activities. The challenge owner would issue annual reports outlining progress with activities and emerging results.

Conclusions

Adopting a net zero target is a game changer and we should not expect previous policy approaches to remain appropriate in this new situation. Those aspects of policy that are crucial to successful delivery of net zero require refreshment and re-orientation. Innovation is one such area.

This briefing note has emphasised the importance of both incremental ‘learning by doing’ and addressing the big ‘pathway critical challenges’ or ‘missions’. This requires a learning governance process with the maintenance of leading-edge technical expertise as the engine of the innovation process. We recommend that an independent ‘Clean Economy Observatory’ is established to fulfil this function and have set out how it would relate to other aspects of EU innovation governance.

³ It is assumed that high priority projects can be funded from within pre-authorised budget envelopes. If this is not the case, it would be the role of the Commission President to ensure funds are being allocated from the various innovation funds on the highest priority projects.
