

Briefing paper developed as part of the
Partnering to Accelerate Sustainable Energy Innovation project

Bold Ideas to Accelerate Sustainable Energy Innovation

In collaboration with KPMG

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Introduction

Energy consumption and production activities account for two-thirds of global greenhouse gas (GHG) emissions. As such, the energy sector also holds the greatest potential for slowing GHG-driven climate change. Accelerating the pace of innovation and developing multiple nascent sustainable energy technologies for large-scale commercial deployment is critical in this regard. Despite the recent surge in investment in clean energy and the evolution of enabling policies, investment at the research and development stage remains low and the many solutions required to reduce our carbon footprint are not progressing fast enough¹. High risks, low returns and a long lead time to maturity for deep-tech energy solutions do not make them sufficiently attractive propositions for private investors.

Recognizing the need to significantly accelerate the pace of innovation in sustainable energy in order to meet the goals of the Paris Agreement on climate change, and to reap broader economic benefits, the World Economic Forum launched the project Partnering to Accelerate Sustainable Energy Innovation following the Annual Meeting in Davos in 2017. The project provides a platform for public-private dialogue and action to address in advance systemic challenges to sustainable energy innovation.

A global transition to a low-carbon future requires a systemic and multistakeholder approach, with regulatory policies, public funding programmes and innovation alliances being key catalysts in smoothing the process, in addition to reducing the financial and regulatory hurdles that stand in the way of energy innovation.

This briefing paper presents six “bold ideas” with the potential to trigger a step change in sustainable energy innovation. The ideas were developed by the World Economic Forum in collaboration with KPMG, with many interviews, conferences, conference calls and workshops providing expert input. These concepts and other insights are part of the whitepaper [Accelerating Sustainable Energy Innovation](#), which was launched during the third Mission Innovation (MI) ministerial meeting in Malmö in May 2018 as part of an ongoing collaboration between MI and the World Economic Forum.

The six bold ideas, selected from a long list of options, were the ones that encountered the highest level of interest from experts within the energy ecosystem. We selected ideas that tackle systemic barriers to energy innovation across technologies and regions, and that can be addressed through increased public-private collaboration, building upon existing resources and institutions.

The six ideas can be divided into three pillars for impact:



Pillars for impact

 Financial	 Regulatory	 Institutional
<ol style="list-style-type: none"> 1. Align public and private investment through automatic co-investment mechanisms 2. Establish an independent sustainable energy innovation fund (SEIF) 	<ol style="list-style-type: none"> 3. Increase the role of strategic public procurement in energy innovation 4. Develop and implement energy roadmaps through public-private collaboration 	<ol style="list-style-type: none"> 5. Create national institutions for energy innovation 6. Establish super-transparency of public R&D expenditure

The mechanisms and principles described in this briefing paper are based on insights, as well as existing examples and best practices, but are not meant to be seen as ready-made solutions. Instead, they are intended to inspire and encourage discussion between stakeholders on the appeal, feasibility, and implementation of the bold ideas at national and international levels. Depending on national and other circumstances, some of these ideas will naturally be more applicable, easier to implement and have greater benefits than others. This paper does not go into that level of detail.

As part of Partnering to Accelerate Sustainable Energy Innovation, the World Economic Forum and KPMG seek to develop these concepts further and explore concrete implementation opportunities in collaboration with interested organizations.

1. Aligning public and private investment through automatic co-investment mechanisms

This bold idea proposes establishing effective public-private co-investment mechanisms to support and finance start-ups engaged in deep-tech energy innovation. Public authorities would select highly qualified private investors as partners for investment in innovative projects, rather than selecting projects. Once the private investor has decided to back a project, the public authority would match the investment with public funding. Alternatively, where the private investor was proposing a project, the co-investment would be made semi-automatically, after due diligence. In both cases, this idea would ensure a streamlined process with low transaction costs and effective targeting of the funds.

Challenge

It has been recognized that the innovators who are capable of developing transformative solutions are not getting sufficient access to public funding, notwithstanding the significant number of initiatives and programmes in place around the world. There is a financing gap at critical stages of energy technology development, and public and private funding sources are not always aligned. Allocation of direct public grants is inefficient and public authorities face high transaction costs in identifying target investees.

Key challenges include:

Sustainable energy innovation		<ul style="list-style-type: none"> – Lack of precedent for transformative innovation in the sustainable energy area to date. – The significant capital expenditure required to commercialize ideas. – Lack of private funding leading to overdependence on public funding.
The innovators		<ul style="list-style-type: none"> – Very little financial support for early-stage research even if it is groundbreaking. – Public support schemes tend to be bureaucratic and administratively burdensome and lack the necessary transparency required. – Placing an obligation on innovators to secure matching funding. – Fear of equity dilution forces many energy innovators to do it alone and not seek funding support. – Concerns over the protection of intellectual property can also cause innovators to avoid public funding opportunities.
Public sector investors		<ul style="list-style-type: none"> – Challenge of identifying the innovators. – Challenge of determining the most appropriate projects to invest in (finding an appropriate investment focus). – Ongoing monitoring and safeguarding of investments made. – Requirements for strict adherence to internal rules, thereby preventing the flexibility required to nurture innovation. – Lack of commercial, financial and entrepreneurial skills in the public sector. – Lack of accountability.
Private investors		<ul style="list-style-type: none"> – Too much risk associated with sustainable energy innovation for the type of returns that can be generated. – Access to investment projects and investable innovators is an issue. – No suitable structures to make investments into – unlike, say, software innovation where there is an active VC and angel market.

Proposal

This proposal advocates for co-investment instruments catering to risk factors unique to energy technology research and development, which enable private investment to be matched with public investment in breakthrough innovations. This could be initiated by a public authority that uses an open and transparent process, based on predetermined eligibility criteria, to select a number of private investors who are highly knowledgeable about sustainable energy technologies and solutions. With this approach, the authority would be “picking partners” (i.e. high-quality private investors) rather than “picking winners” (i.e. technologies or start-up ventures). These partners would be responsible for the investments and, assuming some agreed safeguards and criteria for investment, would in turn attract automatic or semi-automatic co-investment from the public sector.

While such funding mechanisms already exist ², they are rarely focused on energy innovation. To be effective, the co-investment instruments should have this focus, along with the scale and range to ensure an abundant flow of deals, transparent governance, a strong flow of information on the sustainable technologies, and a network of experts offering technical and commercial support. The target private investors, such as venture capitalists (VCs) or angel investors, should be those with the appetite to put up risk capital in search of higher returns, but they would also need

the security of aligned public funding to mitigate risk. Public funding would be mostly in the form of loans or grants, rather than equity. Given the national focus of most early-stage risk capital investors, the proposed co-investment instrument would likely be established at a national level, though an international approach (e.g. at EU level) should not be excluded.

Benefits

The proposed idea can significantly improve efficiency in the allocation of public funding. The use of private investor expertise in sourcing and management ensures that funding goes to the companies offering the greatest commercial potential, as well as lowering transaction costs for all parties. It reduces the risks for start-ups and private investors, enabling them to attract more private capital. The co-investment instrument could also be designed in such a way that, if desired, the public sector receives a payback where ventures are highly successful.

The EU announced its intention to develop a public-private co-investment instrument, as part of the broader European Innovation Council, at the MI meeting in May.³ An established example of public-private co-investment is Business Finland Venture Capital, owned by the Finnish state. It invests in VCs, which in turn invest in early-stage companies.⁴

Stakeholders

For the implementation of a public-private co-investment mechanism, the following stakeholder groups should be involved:



The project sponsor, leading the implementation process, could be either a public authority (at national or international level) or a group of private investors (e.g. VC or angel associations).

Questions for further discussion and consideration:

- How can an instrument be made sufficiently attractive to private investors and yet ensure that it increases private funding in energy deep-tech rather than being a subsidy to the investors?
- How should the investment criteria?
- What attributes other than co-investment – e.g. mentorship, collaboration and financial discipline – can be built into the programme to ensure a high success rate for the instrument and the innovators?

2. Establish an independent sustainable energy innovation fund (SEIF)

This bold idea proposes establishing a fund to finance innovative and sustainable energy technology projects, blending public and private sources of capital.

Challenge

This proposal addresses similar challenges to those described in the previous bold idea, though it focuses on tackling the difficulty in finding “smart” investors and the risks faced by investors in individual projects.

Proposal

The proposed SEIF could enable both public and private investors to back innovative energy technologies on a risk-adjusted basis. This proposal differs from the previously described automatic co-investment instrument by targeting a different investor class, taking a portfolio approach and appointing a professional investment manager. The SEIF would also apply the principles of blended finance, which has proved a successful tool in mitigating the high risks – e.g. macroeconomic, political, tax or currency – inherent in clean energy investments in developing countries.⁵ Even though the risks in innovation processes, mainly technological, are different, the mechanisms used in development finance could well be replicated in this new context.

The key principle is that the investors would have to be appropriately remunerated for the underlying risks, including sharing of any above-average profits between the investors and the innovators. Other principles are:

- No support would be provided in the form of grant aid.
- The investment would typically take the form of debt (convertible or otherwise) or equity (equity being the most likely given the risk).
- Each investment would be negotiated separately between the SEIF and the innovator.
- Different techniques should be considered to protect innovators from too much dilution of their economic interest, e.g. where they are giving away too much equity too soon.

The proposed fund would have an investment manager who would be responsible for deal origination, deal execution and ongoing management of the investments. Selecting someone with the requisite technical and commercial understanding of sustainable energy innovation is vital. In practice, the investment manager might need to buy in some specialist scientific and technical expertise on a case-by-case basis.

The instrument issued by the SEIF might be in the form of a green bond, adherent to the principles of the Climate Bonds Initiative. Green bonds have become a key instrument in energy transition, particularly in emerging economies,⁶ and would be split into two tranches – a senior note and a mezzanine note. The idea is that the public investors (at least initially) would take the mezzanine note, which would be the tranche most at risk because holders of the senior note are first in line for any cash available for distribution to the investors – in other words, the mezzanine noteholder takes the “first loss” position.

Both the senior and mezzanine note would have a stapled equity interest to allow all of the investors to participate in any remaining surplus in the SEIF on a proportionate basis.



Benefits

Key benefits of the sustainable energy innovation fund:



- To create a partnership model between public and private capital using blended finance instruments that allocate different degrees of risk to investors depending on preference.



- To create a framework for a more professional and methodical approach to the determination and evaluation of the types of sustainable energy innovation to be supported.



- To incentivize innovators to avail of the blended finance facility by ensuring that any “super-profits” are shared appropriately and that innovators reap the benefits of successful innovation.



- To provide full protection for any intellectual property created as a result of sustainable energy innovation.



- To provide finance across the spectrum from early-stage research projects through to pre-commercial innovation on a balanced basis.

There are many global blended finance funds active in development finance in emerging economies. These have a focus on clean and renewable energy, though they are not targeted at accelerating sustainable energy innovation, and use blended finance as an innovative way to mobilize capital. The aim of these impact funds is to generate financial returns and at the same time achieve measurable development impact. Examples are the Danish Climate Investment Fund,⁷ the IFC Catalyst Fund,⁸ Aavishkaar India II Company Limited,⁹ the Armstrong Southeast Asia Clean Energy Fund,¹⁰ Climate Investment Funds – Clean Technology Fund (CTF),¹¹ the Global Climate Partnership Fund¹² and the Global Energy Efficiency and Renewable Energy Fund.¹³

Stakeholders

A critical process for an SEIF, as with any investment fund, is identifying and sourcing investors. Normally, this role would be undertaken by the investment adviser, who would typically also be the promoter. This is not actually the position in this instance, but there are certain advisers or specialist providers who could take on this role. Clearly, only private investors who are acceptable to the initial public investors would be taken on board and this would be a more limited population than usual, particularly given the high degree of risk with investments of this nature.

Target investors would be the growing number of entities keen to get involved with the sustainability agenda, including multilateral organizations, national governments, philanthropic organizations, oil and gas and power companies, and other investors with a focus on responsible investment.

Questions for further discussion and consideration:

- How can different countries overcome national interests to align and take the first step forward?
- Can existing international institutions or funds be employed to establish a global fund dedicated to accelerating sustainable energy innovation?
- To what extent should a fund go beyond financial support in helping innovators get to market?

3. Increase the role of public procurement in energy innovation

Under this bold idea, public procurement would move into the mainstream as a way to accelerate development and commercialization. This would be achieved by providing first markets for innovative energy technologies and solutions that are ready for commercial deployment or are in pre-commercial stages of development.

Challenge

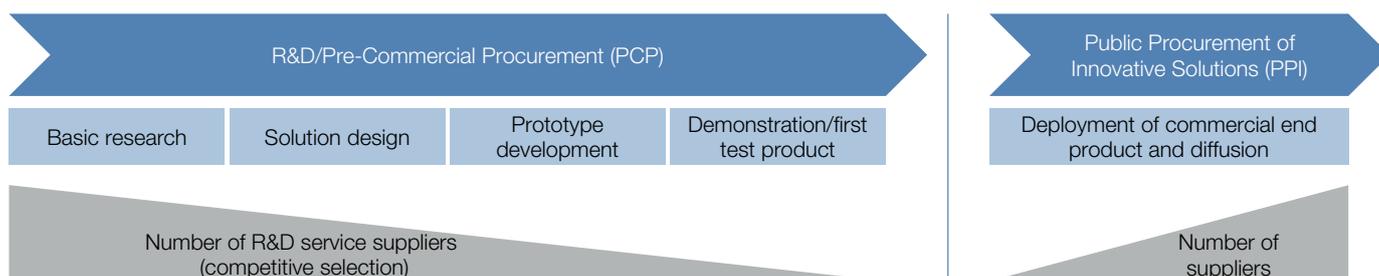
Public R&D expenditure has so far mainly sought to address the supply side (research) through grants, soft loans and other incentives. Yet to get to market, innovative solutions face the challenge of securing first buyers while competing with established alternatives. Most R&D and innovation programmes operate independently of public procurement programmes, which are often limited to off-the-shelf procurement of least-cost, secure and proven solutions, e.g. for efficient lighting and in the transportation sector. The life-cycle value of solutions and the positive multiplier effects of public procurement on new technologies are often neglected.

Proposal

The public sector, at central and local levels, takes up large volumes of energy solutions. Public procurement can be an enabler of innovation for technologies at all parts of the development cycle, from the pre-commercial stage to the later stages.

In the early stages, Pre-Commercial Procurement (PCP) serves as a mechanism for competitively sourcing R&D for the design, development and prototyping of solutions – for public-sector use – that do not exist in the market. It allows the public sector to actively shape the research agenda, and helps the most efficient and cost-effective, though nascent, technologies attract the necessary capital. PCP is a preparatory step that enables the public authority to select alternative solutions relatively early before making a full commitment to purchase the product on a full-scale commercial basis.¹⁴

In the later stages, Public Procurement of Innovative Solutions (PPI) helps the public sector act as a test market or as a first buyer for newly developed and market-ready solutions, so helping them achieve cost effectiveness and economies of scale. Strategic public procurement, combining these two mechanisms, can allow the public sector to fast-track innovation for technologies and solutions at different stages of maturity.



Source: WEF, EU¹⁵

In order to facilitate the spread of innovative solutions through public procurement, an initial step could be to specify binding and quantifiable targets and good public procurement practices that could be shared with different authorities.

Furthermore, the public procurement tender criteria should step away from an approach based simply on the lowest purchase price to consider life-cycle costs as well as sustainability and efficiency. Strategic public procurement should coexist with other demand-side policies, such as green procurement regulations, equipment certifications and tax incentives.

Benefits

Competitive pre-commercial activity should result in cost-effective solutions and improve the effectiveness of public services and operations. It offers innovative technologies the possibility of achieving the necessary commercial scale at a faster pace by triggering a positive multiplier effect on sales.

There is an increasing awareness of the importance of procurement as a pillar of public policy and the role it must play in fostering energy efficiency and the transition to a low-carbon economy. In 2015, the OECD developed a "Recommendation of the Council on Public Procurement" to enable a strategic use of public procurement, and proposed a framework that can be applied at all levels of the public sector. It takes a holistic approach, embedding public procurement into the wider governance structure.¹⁶

The EU is seeking to encourage the use of innovative products through initiatives included in a public procurement package to transform the energy system. The aim is to create a robust policy framework for public authorities and manufacturers to provide additional demand-side pull for innovative sustainable energy technologies with a focus on public transport.¹⁷ At the MI ministerial meeting in Malmö, the Swedish government announced the "Challenge for Sweden" promoting disruptive innovations through public-private procurement partnerships.¹⁸

A good example of PCP is Wave Energy Scotland,¹⁹ a public procurement programme that helps innovative tidal energy

solutions reach commercial scale. The UK's Small Business Research Initiative (SBRI) is a programme seeking to match public-sector needs with innovative solutions from small and medium-sized businesses in supporting commercialization by providing targeted seed funding.²⁰ A PPI best practice is the procurement of 200 million LED light bulbs by the Indian government in 2017, which had a substantial impact on energy saving and CO2 reduction.²¹

Stakeholders

The implementation of the proposed mechanisms requires the involvement of various stakeholders, such as policy-makers, public procurers, technology experts and entrepreneurs. The project sponsor could be a public authority or consortium at a national, regional, city or local level.

Questions for further discussion and consideration:

- How can administrative hurdles be lowered for public procurement programmes to allow them to be more commonly used to provide first markets for pre-commercial or proven sustainable energy technologies?
- How can the issues of public acceptance and risks to the public sector be minimized?



4. Develop and implement energy roadmaps through public-private collaboration

This bold idea proposes creating a multistakeholder consensus on how sustainable energy technologies and solutions with high potential – but which are currently advancing slowly – could be developed faster in order to achieve energy and climate policy targets. This could involve key public and private actors synchronizing better by defining key hurdles to be overcome, creating a credible fast-track through the different R&D and innovation stages, and outlining practical actions that could be taken to achieve this.

Challenge

In Energy Technology Perspective, a survey in 2017, the International Energy Agency (IEA) found that only a few areas of energy technology were on track to achieve sustainability goals. It demonstrated that technologies provided with clear policy signals and guidance (such as photovoltaics/PV, onshore wind and electric vehicles) had shown the most substantial progress.

Technology roadmaps, or plans for future action, have been developed and used extensively by policy-makers and industries as tools to govern the innovation process, primarily taking a techno-economic perspective. The IEA has developed 32 roadmaps for 21 different technologies and provided a clear definition and framework for them. Organizations such as the Hydrogen Council²² have bundled technology sector expertise and developed frameworks and roadmaps for specific technologies. The roadmaps for sustainable energy innovation have enabled cooperation and investment in R&D, facilitating a transition towards consensus views on the future of technological development, and identifying needs and priorities in terms of R&D, and market and regulatory needs such as codes and standards.

However, roadmaps at the scale of individual products or technologies often ignore the complex socio-technical dimensions of low-carbon transition, which inherently requires integration with existing energy architecture, as well as shifts in, for example, institutions, physical infrastructure, user behaviour, supply chains and industry structure. Roadmaps focused on individual products and technologies harness fewer synergies from the pace of technology development in system components and infrastructure requirements, and do not take account of the slow pace of behavioural and regulatory transition. Furthermore, knowing which technologies lag behind in the move to making the whole energy system work efficiently could help participants work together towards a common goal.

Proposal

This proposal advocates that low-carbon transition roadmaps are more systemic, rather than looking through the lens of a specific technology or product, and seek greater alignment among key public and private actors on how the roadmaps can become a reality. This necessitates an approach to system innovation that simultaneously mobilizes interdependent areas such as technology development, market mechanisms, regulations and social innovation.²³

Technical feasibility and cost competitiveness are necessary – but by no means sufficient – criteria for large-scale deployment of sustainable energy innovations. Other factors such as policy uncertainty, entrenched beliefs and values, social acceptance and system inertia play an important role in determining how quickly emerging energy technologies are taken up.²⁴ Technological areas such as carbon capture, low-carbon transport, advanced biofuels and hydrogen technology are cases in point. This requires an understanding of the particular points of intervention required to accelerate developments, based on the viewpoints of a wider set of relevant actors.

Aligning participants in emerging technology innovation with those in mature systems could help identify gaps in the technology landscape, and facilitate the development of knowledge and entrepreneurship, the mobilization of resources, and the spread of knowledge through networks.²⁵ Where roadmaps are driven by consensus among a broad range of stakeholders, the credibility of the process and desirability of the outcomes are enhanced. Additionally, roadmaps should be living documents, allowing for dynamic adjustment and re-evaluation of policies and programmes.

Benefits

Strengthening the collaborative and consultative phases of roadmap development would help focus resources and investments on options that are more likely to succeed in removing key roadblocks to “high-potential” technologies and solutions that are making slow progress today. Roadmaps that acknowledge the inherent complexity and non-linear nature of the innovation process, and consider the economic, social and cultural drivers of diverse stakeholder groups, help preempt risks, overcome bottlenecks and create a consensus on a common approach for innovation.

Stakeholders

This is a challenging undertaking, which would require substantial resources and coordination. This bold idea could build on the IEA’s technology roadmaps or other, similar approaches. A good project sponsor would be the IEA itself or another intergovernmental organization. To create and validate an integrated roadmap and ensure the commitment of the energy ecosystem, a broad range of stakeholders should be involved. Stakeholders should include government and industry representatives, the financial community, entrepreneurs, energy research institutes, technology experts, local government and civil society stakeholders.

Questions for further discussion and consideration:

- How could the right level of detail for a roadmap be defined in order not to oversimplify but also not to lose focus on the overall climate targets?
- How “long term” should a roadmap be in order not to “gaze into a crystal ball” on the one hand, but not be too shortsighted on the other?
- How could the participation and commitment of a relevant and representative group of global stakeholders be achieved. In other words, how do you get all stakeholders “round the table”?



5. Create national institutions for energy innovation

This bold idea proposes establishing national institutions that function as a single voice of public support of energy innovation. Responsibilities would be bundled into these institutions, which would be the public funding authority as well as overseeing and steering the overall process of sustainable energy innovation.

Challenge

In many countries, responsibilities for energy innovation are spread across different institutions and departments, because energy innovation has been subordinate, historically, to the main focus areas of energy policy: security and sustainability of supply. Due to the growing importance of energy innovation and the need for an accelerated process to achieve climate targets, a more coordinated and focused approach is required. The lack of coordination between stakeholders in the innovation ecosystem, and even more so between public-sector authorities, can create unnecessary inefficiencies in the funding process as well as inadequate reporting and a poor flow of information. This eventually causes uncertainty for investors and innovators.

Proposal

Bundling responsibilities for energy innovation into one institution or organization could make a difference in aligning the funding process and improving oversight and transparency.

The proposition entails establishing a national energy innovation institution, with the state (e.g. the ministry for energy, climate or innovation) as the main stakeholder. The entity would be responsible for the national energy innovation agenda and act to ensure a coordinated collaboration with the private sector and all other stakeholders (innovators, investors and academia). It should have an overview of the innovation “stream” and steer the process according to a national roadmap to support achieving climate targets. While the institution would not be the government body responsible for formulating policies, it could act as an adviser to the government to support the implementation of innovation-friendly policies. Furthermore, it could engage with institutions from other countries for alignment with the global energy innovation process.

The institution could provide guidance to innovators by building up its own network of highly qualified entrepreneurial experts and project managers, and it would also be the main public funding authority for energy innovation and encourage private investment through supporting mechanisms that mitigate risk. Its focus should be supporting projects from the early research phase until successful commercialization of a product or solutions.

Benefits

A national institution focusing on energy innovation could be instrumental in connecting isolated groups of experts and overcoming the gaps that prevent faster conversion of basic research into a commercially feasible project. It could serve as the “go to” entity for different actors across the energy innovation ecosystem, ensure continuity of public commitment to energy innovation, and keep funding stable and predictable as well as independent of political cycles.

The institution could improve access to early-stage finance, allow better knowledge sharing through research collaboration, and provide resources for demonstration and implementation in a timely and well-targeted manner, while at the same time enabling innovation through a more systematic use of “regulatory sandboxes” – or rules that keep up with the fast pace of change and innovation.

Innovation institutions have been implemented in different countries, though not all of them have a specific focus on sustainable energy solutions. In the USA, ARPA-E is a national institution established within the US Department of Energy. It sponsors R&D projects not yet mature enough for private-sector investment funding and provides programme managers who are actively involved in the projects.²⁶ Other examples, such as the Australian Institute of Energy, are not funding authorities but promote understanding and awareness of energy issues and provide a knowledge platform for players in the energy innovation industry.²⁷ The Israel Innovation Authority does not have a focus on energy but bundles responsibilities for innovation under one roof and provides funding, guidance and a knowledge platform.²⁸ The Namibia Energy Institute has a mission to facilitate innovation in its emerging economy, though it does not provide public funding. Its vision is also to be a leading institute for energy research and development in Africa and beyond.²⁹

Stakeholders

This bold idea could be implemented at a national level. The main project sponsor should be the energy ministry (or similar), which would be the main stakeholder in the energy innovation institution.

It could be a new institution, or an existing one that is given both a wider mandate and the resources to do its job. There should be consultation with the following stakeholders when an institution is being revamped or set up from scratch:



Questions for further discussion and consideration:

- How can national institutions ensure widespread dissemination of government-funded research, as well as positioning themselves as enablers of entrepreneurship in energy innovation?
- How can we get the national institutions of different countries to cooperate with each other on the overall climate agenda? How can cross-border collaboration (e.g. sharing of ideas) be enhanced?

6. Establish “super-transparency” of public R&D expenditure

This bold idea proposes combining a number of different measures, mechanisms and tools to make the public R&D funding process more efficient by increasing the transparency of opportunities of public funding schemes for innovators. The effectiveness and necessity for these measures must be assessed on a country-by-country basis and they could be implemented individually or in combination.

Challenge

In discussions with investors and entrepreneurs, a primary issue often addressed is the lack of transparency and visibility of opportunities for public grants and funds and the lack of information on overall public expenditure on energy R&D. This includes government programmes in national research centres, universities and funds flowing into international collaborative efforts. Often, there is not enough clarity on the decision-making process for funding and too much rigidity in the conditions required to qualify. Application processes are cumbersome, which increases the hurdles for entrepreneurs and investors in getting access to public funding, and sources of information are often only in the

national language, making it much more difficult for foreign entrepreneurs and investors to apply. In many countries, the level of digitization of information and processes still falls short of modern standards and the requirements of innovators seeking funding. Application processes require a lot of paperwork, which is a source of inefficiency and potential loss of information. There is seldom a virtual or physical point of contact or information.

Decentralized responsibilities for public funding, perhaps spread across different authorities or departments, mean potential applicants struggle to gain full oversight of the available funding programmes, which are often not coordinated or aligned. As a consequence, applicants find that a lot of their work is duplicated, while the lack of information on total public funds available for energy innovation R&D makes it hard for them to assess their chances of securing funds in the time required.

Proposal

Governments could lead the way in increasing transparency as they have fewer competitive concerns than the private sector and have an interest in raising awareness in the private sector and among innovators about government programmes and funding opportunities.

The following action plan could help improve the information flow to applicants and reduce inefficiencies in the public sector funding process:

- Create a well-structured government website bundling all information on national public funding opportunities (including the application process, requirements, availability of funds and the time frame until funding).
- Provide all information in the principal foreign languages to attract foreign investors and entrepreneurs.
- “Digitize” the application process for all public funding via a single online portal, putting applicants fully in the

picture on process status, availability of funds, timing etc., and reducing process inefficiencies (e.g. duplicated work, poor coordination between authorities) for the government. The online portal would also act as a single point of contact for the applicants.

- Ensure a clear allocation of government responsibilities for energy innovation and funding, either by bundling the responsibilities within one institution or by creating alignment and good communication between the different institutions involved.
- Establish regular (e.g. quarterly) reporting on public R&D expenditure with clearly defined goals and essential performance indicators to measure progress and success and identify inefficiencies and levers for improvement. This could include aggregating information across different agencies to yield a centralized repository of the annual volume of public energy research expenditure.
- International coordination through institutions such as Mission Innovation could further aggregate the information already consolidated at country level and make it easier for users of public funding to find the best opportunities globally.

Benefits

The implementation of these measures could significantly reduce the hurdles facing innovators in applying for public funding by increasing visibility on possibilities and opportunities. Clarity on budget and timing is crucial for innovators if they are to align these applications with their private financing rounds. This is especially relevant for early-stage technology innovations. More transparency on R&D expenditure and innovation trends would help stakeholders (businesses, academics and innovators/start-ups) identify any underinvestment (compared with other sectors) and monitor the effectiveness of spending on specific technologies, as well as allowing for better use of available resources and the prioritization of certain areas.

Stakeholders

The sponsors driving these measures and helping identify inefficiencies and levers for optimization should be national government authorities. Support and advice from other stakeholder groups could be included to improve transparency of government funding. The process should involve the main public authorities involved in energy innovation.

Question for discussion:

- What measures could be adopted at an international level (e.g. via Mission Innovation)?

Concluding remarks

To put some of these bold ideas on the road to implementation, the World Economic Forum and KPMG are approaching various stakeholders in the global energy community, including investors and innovators as well as governments in Mission Innovation member countries. As the World Economic Forum is not in itself an implementing body, the intent is to identify sponsors across the energy ecosystem to take the ideas to the next level. In doing so, it is important to build on instruments and institutions that have already been put in place and encourage cooperation and collaboration. Some of the ideas described in this document could be implemented at national level, others internationally, and the roadmap, schedule and effort needed to put them into practice would depend greatly on the sponsors and stakeholders involved, as well as the requirements of different countries. Ideally, countries and organizations would learn from the experiences of other nations in making some bold ideas a reality to achieve a truly interconnected arena for energy innovation across regions.

In addition to the specific work on the six bold ideas, this project has helped raise the profile of sustainable energy innovation and its critical importance to the climate change agenda. This in turn will encourage greater collaboration and interaction between the investment and innovation communities.

The World Economic Forum and KPMG would like to thank all parties involved in developing the concepts of the bold ideas and taking the first steps to implementation. We are keen and committed to continuing to offer our expertise and our public-private network to support the energy community on the global climate action agenda.

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