IEA Energy Innovation Forum 2024

Fostering innovative, clean energy technology for rapid global energy transitions

An event of the International Energy Agency's 50th Anniversary Ministerial meeting

13 February 2024
OECD Conference Centre
2, rue André Pascal, Paris

DETAILED AGENDA AS OF 7 FEBRUARY 2024

For five decades, the International Energy Agency has been cooperating with international experts to help set the energy technology agenda and convene decision-makers, advising governments all around the world. The IEA hosts a unique international Technology Collaboration Programme, the framework for which was developed from 1974 and now boasts about 6 000 experts from 55 countries in 39 longstanding and self-governing programmes. The IEA also works with numerous multilateral initiatives, including Mission Innovation and the Clean Energy Ministerial.

This work has never been as important as it is today, with innovation required to play a critical role in enabling faster transitions to a clean and secure energy sector at net-zero emissions. Many factors influence how quickly new and improved technologies emerge, including resources for R&D, market attractiveness, costs of finance and the ease of knowledge exchange and trade. The outcomes are inherently uncertain but there are tools available to minimise risks. It is time to renew the commitment to supporting the innovators, investors and policy makers that are challenging the status quo of energy production and use to build a new energy economy.

The Energy Innovation Forum will discuss the main challenges that slow progress from the lab to the hands of early adopters, and the initiatives that show how governments can work seamlessly with innovators – whether in large firms or new start-ups – to overcome these challenges. **The conclusions will be passed directly to ministers of countries representing some 80% of global energy consumption**.

The Forum takes place during the first day of the celebration of the **50th Anniversary of the IEA**. It is structured around four major sessions: the needs and opportunities of emerging market and developing economies; faster progress towards emissions-free industrial heat; best practices for large-scale demonstration programmes; and the priority actions for the IEA and the international community.

The scope of the discussion is broad and will touch upon all factors that support innovators to spend more money on clean energy R&D, prototyping, pilot testing and demonstration – all the activities that carry technology risk for investors. Market-based policies and standards are included among these factors to the extent that they incentivise the ideation, refinement and adaptation of hardware and software. All clean energy technologies are within scope, from those for the supply, distribution and transformation of energy with dramatically lower emissions, , to those for critical minerals, manufacturing the related equipment and making the consumption of energy cleaner, more efficient, more equitable or more flexible.

The participants – more than 200 experts – have been invited from the worlds of government, companies, start-ups, research, international finance and venture capital investment. From these stakeholders – many of whom are united by their willingness to put capital at risk in support of new clean energy technology ideas, and their desire to move faster – we hope to gather insights into the gaps in the global policy and investment landscape, and how the IEA can support further and faster progress. Other related events will take place throughout the day on 13 February, offering exceptional opportunities for networking and participation.

The event responds to the invitation to the IEA in the G7 Leaders' Clean Energy Economy Action Plan 2023 to convene an international forum on the topic of energy innovation, including shining a spotlight on the needs and challenges of emerging market and developing economies and listening to innovators about what would help them move faster.

Contact: IEA Energy Technology Policy Division energyinnovation@iea.org

Further reading: Energy Technology Perspectives 2023; IEA Net Zero Roadmap; Tracking clean energy technology innovation; ETP Clean Energy Technology Guide; ETP special report on clean energy innovation; The State of Clean Technology Manufacturing – November 2023 Update

08:30 Welcome and keynote speeches

Room: CC1

Streaming: Live on iea.org

Format: Stage + theatre seating

Seating plan: Free seating. Seats reserved for speakers in the front row.

On stage at the start: Akshat Rathi

Objectives: Welcome and inspire all participants to contribute throughout the day to a unique event that marries the innovation agenda with the IEA's ministerial deliberations. Set the scene for the topics to be covered.

08:30 Event is opened by the moderator **Akshat Rathi**, Senior Reporter for Climate, Bloomberg News.

The. Hon. Eamon Ryan, Minister for the Environment, Climate, Communications and Transport, Ireland

Dr. Fatih Birol, Executive Director, IEA

The Hon. John F. Kerry, U.S. Special Presidential Envoy for Climate

08:55 Screening of IEA video "The case for energy innovation action"

09:00 A 30-minute discussion will be moderated between three innovators that are scaling up clean energy technologies around the world.

Fezile Dhlamini, CEO, Green Scooters

Leah Ellis, CEO, Sublime Systems

Maria Persson Gulda, CTO, H2 Green Steel

09:30 Break

09:45 Reflections on 50 years of global cooperation and future needs

Room: CC9

Streaming: Live on iea.org

Format: Panel discussion at a table with additional seating in a second row

Seating plan: Table seats allocated in advance with nameplates. Free seating behind.

Objectives: Illustrate the great extent to which energy technologies have been transformed over recent decades and how governments have been central to these successes. Hear about the energy innovation priorities of countries and their visions for international cooperation in coming

years. Communicate the importance of acting quickly and engaging all stakeholders around the world.

Background

Solar PV and wind are on track to account for 25% of all electricity generated worldwide in 2028. But from the first prototype, it took 30 years to the commercialisation of solar PV and a further 30 years to deliver 1% of global electricity supply.

For the innovative technologies being tested today, we need to move much faster. The IEA's updated Net Zero Roadmap shows 35% of emissions reductions needed to reach net zero by 2050 must come from technologies that are still in development today. The history of innovation shows that this is possible, but it requires strong international collaboration.

In 2023 the finance flowing to clean energy entrepreneurs fell to just over USD 30 billion in venture capital, down from over USD 40 billion in 2022. This illustrates tougher conditions for entrepreneurs and innovators, including higher capital costs.

On the other hand, according to IEA data, public spending on energy R&D grew by 10% to $44 billion in 2022, driven by growth in China in particular. The clean energy share of this was 80%. However, as a share of GDP this is much lower than it was in the 1980s, and less than 5% of public clean energy R&D spending was in emerging market and developing economies.

Innovation is an important driver of long-term economic prosperity, and clean energy innovation presents a huge opportunity to all countries. If countries deliver on their own climate pledges, the global market for key mass-manufactured clean technologies would rise towards one trillion dollars per year next decade.

For mass-manufactured technologies, "learning rates" can be powerful: the costs of solar PV and Li-ion batteries have fallen steadily by over 95% as they have scaled up in favourable markets since 2000. Key clean energy technology costs fell 80% on average since 2010.

The IEA explored the possible effects of weak international cooperation, especially for technologies with high exposure to international trade and where co-operation is needed to achieve scale and avoid duplication. Such as case could push back the achievement of global net zero emissions by several decades.

09:45 The first 30-minute panel will be moderated by **Timur Gül**, Chief Energy Technology Officer, IEA.

H.E. Kadri Simson, European Union Commissioner for Energy

The Hon. Jonathan Wilkinson, Minister of Energy and Natural Resources, Canada

H. E. Davis Chirchir, Minister of Energy and Petroleum, Kenya

10:15 The second 30-minute panel will be moderated by **Akshat Rathi**.

Agnes da Costa, Director, ANEEL, Brazil

Jonathan Pershing, Program Director of Environment, Hewlett Foundation

Henrik Stiesdal, Founder and CTO, Stiesdal A/S

10:45 Break

11:00 Expanding and enhancing the flow of new technologies

Room: CC9

Streaming: Live on iea.org

Format: Roundtable with additional seating in a second row.

Seating plan: Table seats allocated in advance with nameplates. Free seating behind.

Objectives: Gather a wide range of expert views on the status of energy technology innovation today and where more efforts need to be directed. Learn about the most promising initiatives that deserve to be promoted and replicated to ensure that clean energy innovation is accessible and aligned with the needs of net-zero commitments in all countries.

11:00 The moderator, **Akshat Rathi**, will introduce three opening speakers:

Evelyn Wang, Director, ARPA-E, United States Department of Energy

Pinakin Chaubal, Chief Technology Officer, ArcelorMittal

Kojo Ako-Asare, Managing Director, Decarbonization Partners

11:30 A 1-hour roundtable discussion will be moderated by **Akshat Rathi.** Concise interventions that respond to one of the questions below will be invited from all participants in the room. Participants will also have the chance to direct questions back to the opening speakers. Those who wish to speak can turn their nameplate vertically or raise their hand. Table seats will have microphones and there will be a roving mic for other seats. Key points will be noted and conveyed to the conclusions at the end of the day by IEA staff.

Questions to be tackled:

Which technology areas are vital for net zero emissions but still neglected?

Where are the weak links in the financing, support and market signals for getting to products from prototypes, and for which technologies?

Which risks are most poorly understood by public and private stakeholders, and are incentives calibrated to deliver secure, equitable value chains?

Which impactful approaches to policy and partnerships should be replicated in more countries?

12:30 Breakout 1: Spurring innovation for emerging market and developing economies

Room: CC4

Format: Roundtable with additional seating in a second row

Seating plan: Table seats allocated in advance with nameplates. Free seating behind.

Catering: Lunchboxes will be distributed to all in the session.

Objectives: Showcase the major opportunity for emerging market and developing economies (EMDEs) to participate in clean energy value chains – for economic prosperity, health and environmental benefits. Learn about the factors that hinder technology innovation in these countries and how they can be overcome. Identify technology gaps that must be addressed if EMDEs are to realise their climate goals. Explore different possible models for: domestic innovation; partnerships for technology import and adaptation; or other forms of international cooperation.

Background:

Emerging market and developing economies would account for over 40% of the world's energy investment to shift the world on to a 1.5ºC pathway.

The world cannot tackle climate change without appropriate technology solutions for all regions, yet most R&D and investment in clean energy is not targeted towards key objectives such as energy access or deployment of low-emissions infrastructure in fast-growing regions.

Innovation will be faster if all the world's brightest innovators focus on it. Emerging economies' energy innovation capacities lag advanced economies: 91% of patenting for low-carbon energy is from Europe, Japan, USA, Korea, China (2010-19). EMDE share of clean energy innovation spending is 2-5% of the global total today (excl. China).

If clean energy technologies become the growth engine for fast-growing economies to 2050, it will accelerate climate policy progress worldwide. Energy and climate policy that also supports the international competitiveness of local businesses is more easily supported.

The effectiveness of international cooperation on clean energy technologies will determine the speed of energy transitions globally.

But there is still insufficient knowledge of what policies work in different contexts, the status of clean energy innovation around the world and the effective modes of cooperation.

12:30 The session's objectives and format will be introduced by the moderator, **Sunyoung Suh**, Cleantech Innovation Specialist, UNIDO. Sunyoung will ask each speaker a scene-setting question to allow them to give a 5-minute pitch (with max one slide) to ignite the subsequent roundtable discussion.

Warit Rattanachuen, Assistant Governor-Research, Innovation and Business Development, Electricity Generating Authority of Thailand (EGAT), Thailand

Samir Rachidi, Director General, IRESEN, Morocco

James Mwangi, CEO, Africa Climate Ventures, Founder, Climate Action Platform - Africa (CAP-A)

Constanza Levicán, President, Climatech Chile and CEO, Suncast

Sunyoung will follow up with some clarifying questions among the four of you before opening to the floor.

13:00 A 1-hour roundtable discussion will be moderated by **Sunyoung Suh.** Concise interventions that respond to one of the questions below will be invited from all participants in the room. Participants will also have the chance to direct questions back to the opening speakers. Those who wish to speak can turn their nameplate vertically or raise their hand. Table seats will have

microphones and there will be a roving mic for other seats. Approximately two key messages will be drafted by IEA staff and the moderator after the session and presented in the concluding 14:30 session of the Energy Innovation Forum.

Questions to be tackled:

How are the challenges for clean energy innovators different in emerging market and developing economies compared with other countries?

Are there gaps in the global technology portfolio for achieving net zero transitions in these countries, including optimisation and adaptation of technologies from elsewhere for local contexts?

Are there technologies for which some emerging market and developing countries already have a competitive advantage that could be built upon by strategic R&D projects or partnerships?

What 2-3 actions do you think would make the biggest difference in the near term towards the long-term goal of durable competitiveness in clean energy value chains (e.g. finance for innovators; opportunity analysis; R&D spending; skills development: regulatory change; multilateral cooperation)?

12:30 Breakout 2: Technology focus on industrial heat

Room: CC6

Format: Roundtable with additional seating in a second row

Seating plan: Table seats allocated in advance with nameplates. Free seating behind.

Catering: Lunchboxes will be distributed to all in the session.

Objectives: Highlight the rapid and exciting progress that has been made in recent years towards decarbonising an emissions source often labelled “hard-to-abate”. Describe the different options and their maturity, and communicate a realistic timeline for commercialisation of the solutions with effective government and corporate support. Identify high-impact follow up actions that could be undertaken by the IEA and its partners.

Background:

Industrial heat makes up two-thirds of industrial energy demand and almost one-fifth of global energy consumption. It also constitutes most of the direct industrial CO_2 emitted each year, as most industrial heat originates from fossil-fuel combustion. Despite these impressive figures, industrial heat was, until recently, often missing analyses of clean energy solutions.

Government and corporate net-zero commitments have changed this picture, forcing attention onto the issue of how to deliver heat without fossil fuel combustion and spurring a surge of innovation. Start-ups in this area have raised around half a billion dollars since 2020.

Many of the technologies needed to substitute electricity for fossil fuels are already commercially available for low and medium temperature heat up to 400 °C. Over 90% of

heat in light industry can be tackled with heat pumps, electric boilers, thermal energy storage and resistance heaters, but high temperature heat is more difficult and technologies remain at prototype stage.

Emerging technologies include: direct electrification via resistance, electro-magnetism, sensible heat storage or motor friction; indirect electrification or CCUS via hydrogen; direct use of renewables via geothermal, concentrating solar or bioenergy. Some are already more mature than others.

In the IEA Net Zero Emissions by 2050 Scenario, a push to electrify processes leads to a 40% rise in industrial electricity demand to 9 000 TWh, with 60% of the rise in heavy industries.

The most competitive technologies in different regions and applications are uncertain, yet the available time for taking these options from pilot scale to being the industry-wide standard is very short in the context of net-zero emissions by 2050.

This is compounded by uncertain future electricity and fuel prices for industrial users in coming years. Energy costs will determine the success of these technologies, perhaps more so than capital costs and technical efficiency. Energy costs depend on broader energy policy.

At the same time, demand for industrial products with low emissions intensity is not yet large enough to drive investment in long-lived heat supply assets, and recent inflationary pressures have made it more difficult to finance new companies and projects.

Nearly all countries aspire to maintain or develop their industrial capacity and attract investment in cleaner production. Success will depend on well-coordinated energy policy and industrial policy, as well as rapid exchange of knowledge as projects accumulate experience with these technologies.

12:30 The session's objectives and format will be introduced by the moderator, **Julia Reinaud,** Senior Director, Europe, Breakthrough Energy. Julia will ask each speaker a scene-setting question to allow them to give a 5-minute pitch (with max one slide) to ignite the subsequent roundtable discussion.

Erika Sanchez Garrido, EMEA Sustainability Director, Dow

Tim McCaffery, Global Investment Director, Siam Cement Group

Joonas Rauramo, CEO, Coolbrook

Pia Dorfinger, Director Start-up Ecosystem, German Energy Agency

Juila will follow up with some clarifying questions among the four of you before opening to the floor.

13:00 A 1-hour roundtable discussion will be moderated by **Julia Reinaud.** Concise interventions that respond to one of the questions below will be invited from all participants in the room. Participants will also have the chance to direct questions back to the opening speakers. Those who wish to speak can turn their nameplate vertically or raise their hand. Table seats will have microphones and there will be a roving mic for other seats. Approximately two key messages will be drafted by IEA staff and the moderator after the session and presented in the concluding 14:30 session of the Energy Innovation Forum.

Questions to be tackled:

How should energy and industrial policy take into account the latest technical developments in this area as well as expectations for future energy prices?

Is there any one-size-fits-all solution or do different regions and sectors have different technology needs?

Are some countries more attractive than others for early projects, subsequent deployment and equipment manufacture? What factors will determine the location of investments? What is the appropriate benchmark for assessing competitiveness of different applications?

Corporate R&D and partnerships with industrial companies are crucial. What holds back corporate risk-taking and how can governments help catalyse investment and replicate projects? What factors underpin the existing good examples around the world?

Why is international cooperation so important in this area and how can the IEA's analytical capabilities or convening power catalyse progress?

12:30 Breakout 3: Managing risks for successful demos

Room: CC10

Format: Roundtable with additional seating in a second row

Seating plan: Table seats allocated in advance with nameplates. Free seating behind.

Catering: Lunchboxes will be distributed to all in the session.

Objectives: Showcase the efforts that governments are making to support companies that want to take on the early-mover risks of demonstrating large-scale low-emissions technologies. Identify the elements that have made for successful investment decisions and results from such projects. Explore how these effective practices can be replicated to deliver a global portfolio of needed demonstration projects at lowest cost and over the shortest period up to 2035.

Background:

Large-scale demonstration projects are complex, first-of-a-kind (or close follow-ons) that operate at commercial scale and have a price tag of several hundreds of thousands of dollars up to several billion dollars.

Typically, the market for the products of these projects, such as low-emissions industrial products or electricity, is underdeveloped and uncertain but expected to grow rapidly.

IEA analysis assessed a need for at least $90 billion in public funding worldwide by 2026 to complete a portfolio of large-scale demonstration projects this decade to bring to market the technologies required to achieve net zero emissions by 2050. This estimate assumes a minimal portfolio that tests technologies in a range of contexts and rapidly shares the results.

In 2022 at the Global Clean Energy Action Forum, 16 countries committed $94 billion that would fund projects towards this target.

The IEA's demonstration project database currently includes 351 projects in planning or operation around the world.

Relevant clean energy demonstrations this decade include: near-zero emission steel; carbon capture and storage for hydrogen, industrial application or direct air capture of CO_2; floating offshore wind; small or advanced nuclear reactors; advanced biofuels from cellulosic feedstocks; new configurations of electrolysers and renewables for hydrogen;

alternative drivetrain container ships; cracking of ammonia to hydrogen; synthetic fuels from hydrogen and CO_2; bulk chemicals from non-fossil sources.

First-of-a-kind projects are a vital step in technology development but are often the most expensive examples of the technology before costs come down in subsequent installations. This makes them difficult to finance privately as they are in an uncomfortable space between VC and infrastructure finance. In addition, recent inflationary pressures have raised financing costs for such projects.

Governments typically play a key role in providing some non-dilutive or highly concessional capital, but public budgets are often limited, programmes are intermittent, and governments can in practice find it difficult to take on as much risk as theory suggests they should.

Fortunately, new financing options are becoming available, including flexible, concessional private finance.

12:30 The session's objectives and format will be introduced by the moderator, **Rhian-Mari Thomas**, CEO, Green Finance Institute. Rhian-Mari will ask each speaker a scene-setting question to allow them to give a 5-minute pitch (with max one slide) to ignite the subsequent roundtable discussion.

David M. Turk, U.S. Deputy Secretary of Energy

Iimura Akiko, Executive Director, NEDO Japan

Benoît Potier, Chairman of the Board of Directors, Air Liquide

Mario Fernandez, Head of Catalyst, Breakthrough Energy

Rhian-Mari will follow up with some clarifying questions among the four of you before opening to the floor.

13:00 A 1-hour roundtable discussion will be moderated by **Rhian-Mari Thomas.** Concise interventions that respond to one of the questions below will be invited from all participants in the room. Participants will also have the chance to direct questions back to the opening speakers. Those who wish to speak can turn their nameplate vertically or raise their hand. Table seats will have microphones and there will be a roving mic for other seats. Approximately two key messages will be drafted by IEA staff and the moderator after the session and presented in the concluding 14.30 session of the Energy Innovation Forum.

Questions to be tackled:

What good examples of public or private programmes and finance can be identified around the world? Are there barriers to replicating good examples in different regions, and how does this affect where projects tend to be located?

How can the results and outputs of demo projects be shared as widely as possible to avoid duplication, globalise scale-up and inspire improvements?

What are the priority actions for the global community and what roles can the IEA play?

What are the main causes of disappointments such as unrealised investments, stranded assets or stranded knowledge?

14:00 Break

14:30 Defining an agenda for action for the IEA and other stakeholders

Room: CC9

Streaming: Live on iea.org

Format: Roundtable with additional seating in a second row

Seating plan: Table seats allocated in advance with nameplates. Free seating behind.

Objectives: Stress the value of the Energy Innovation Forum to the IEA Family of countries and the ministerial deliberations in particular. Handover the conclusions of the Forum to ministers. Hear from all participants about their final perspectives on the priorities for the work of the IEA and its partners on technology innovation in coming years.

14:30 Session is opened by **Akshat Rathi** who will introduce the format and running order. He will introduce **Amanda Wilson**, Director General of the Office of Energy Research and Development, Natural Resources Canada and Chair of the IEA Committee on Energy Research and Technology, who will summarise the Forum's sessions and key insights up to that point. Akshat will then invite the next speakers to take the floor.

The. Hon. Eamon Ryan, Minister for the Environment, Climate, Communications and Transport, Ireland

Kiyoto Tsuji, State Minister for Foreign Affairs, Japan

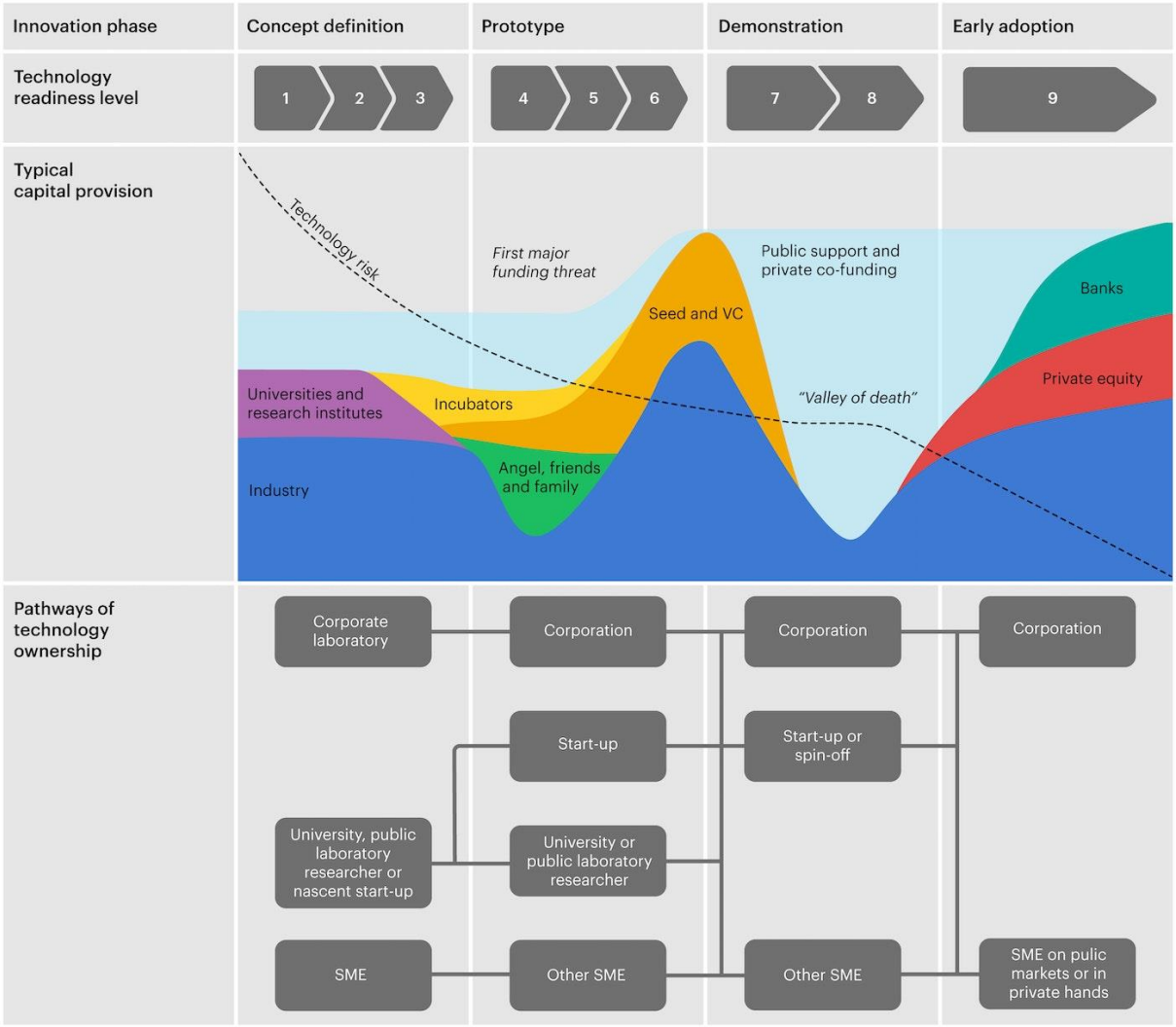
David M. Turk, U.S. Deputy Secretary of Energy

15:00 The format of the final part of the Forum will be explained by **Akshat Rathi.** Up to one hour is available for a *tour-de-table* in which all participants will have the opportunity to signal that they wish to give a 30-second pitch for what they hope will be concluded from the day or what actions the IEA and ministers could take in the next year after the Forum to accelerate clean energy innovation. Those who wish to speak can turn their nameplate vertically or raise their hand. Table seats will have microphones and there will be a roving mic for other seats.

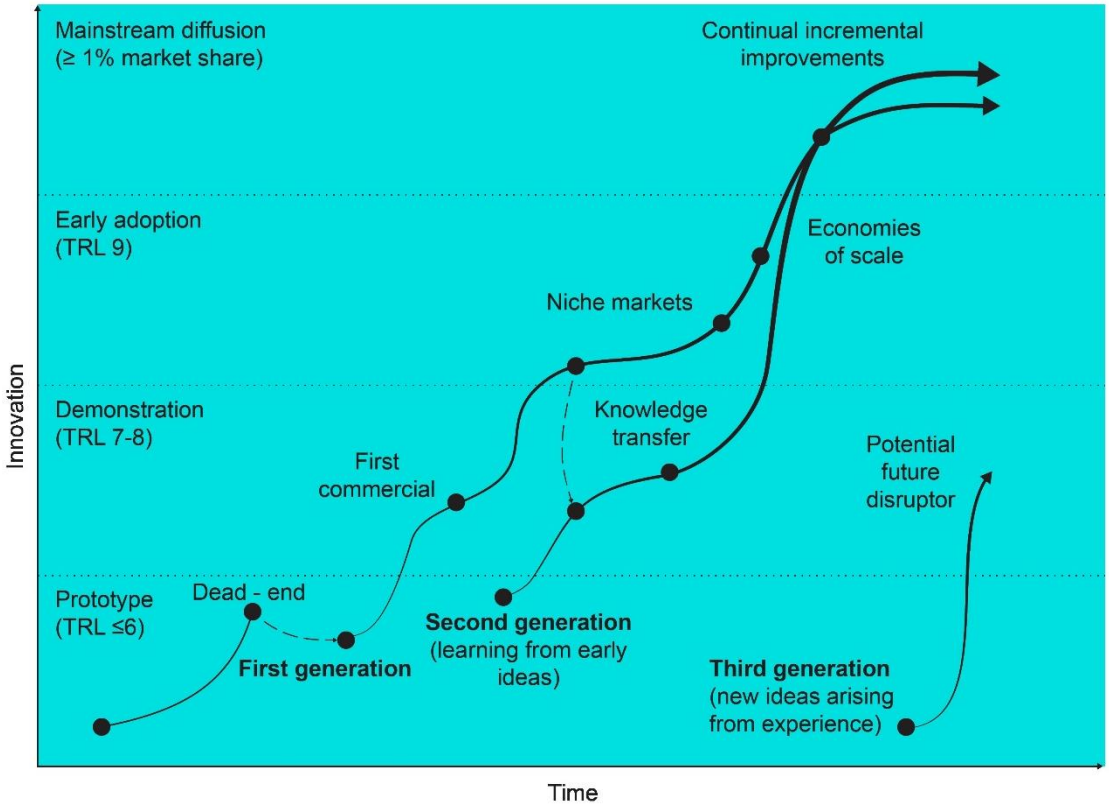
By 16:00 Timur Gül, Chief Energy Technology Officer, IEA, to provide closing remarks.

Selected IEA graphics

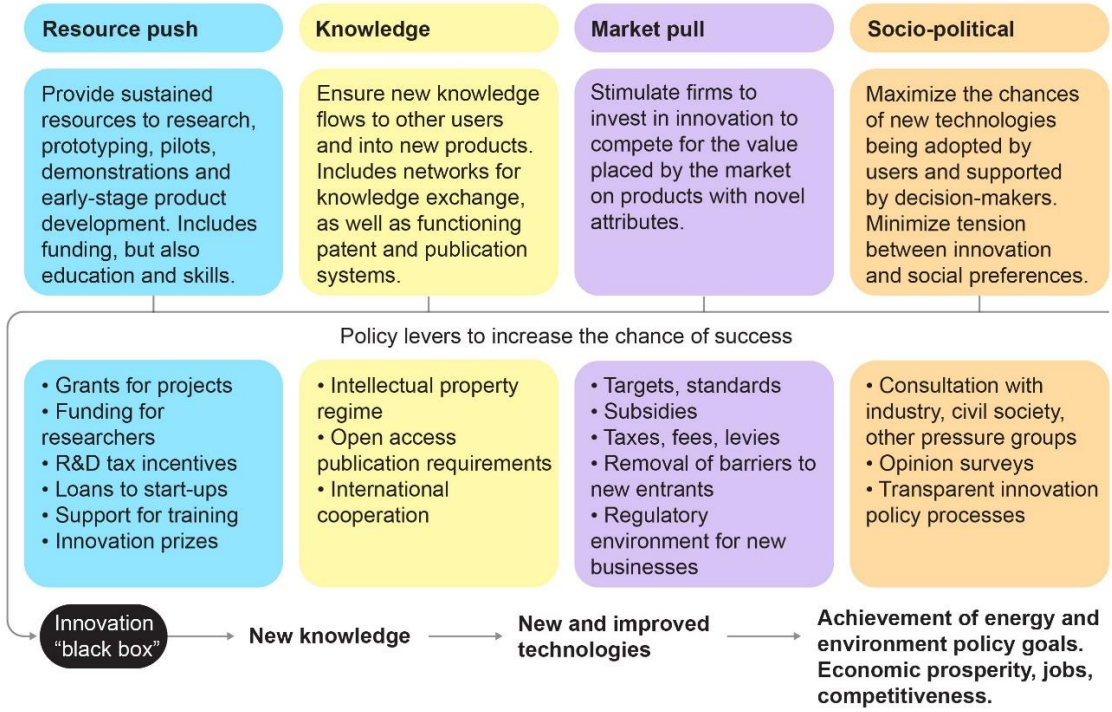
Representative capital provision, public funding gaps and ownership pathways for new clean energy technologies



Four stages of technology innovation and the feedbacks and spillovers that improve successive generations of designs



Four pillars of effective energy innovation systems



Low-carbon energy technology types mapped according to their general attributes of size and modularity versus barriers to market entry