

FIVE-YEAR ANNIVERSARY

Special Edition Newsletter

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Mission Innovation celebrates 5 years

On November 30, 2015, at COP21 in Paris, leaders came together to launch Mission Innovation (MI), a global collaboration aimed at accelerating the clean energy revolution. MI is now celebrating its five-year anniversary and progress made in clean energy innovation, whilst working to develop a second phase of MI.



World leaders launch Mission Innovation in 2015 at COP21 in Paris

Since its inception, MI has focused on reinvigorating and accelerating public and private global clean energy innovation with the objective to make clean energy widely affordable as an indispensable part of an effective, long-term global response to our shared climate challenge; necessary to provide affordable and reliable energy for everyone and to promote economic growth; and critical for energy security.

Over the past five years members have raised the profile of clean energy innovation and increased investments by \$4.9 bn annually. From the several accomplishments and new collaborations struck by the Innovation Challenges (ICs), to the launch of the Champions Programme, MI has strengthened international networks between researchers, industry, academia, think tanks, and policymakers.

In the articles that follow, we pause to recognise the important contributions of MI's eight ICs, we celebrate the Champions Programme, and we hear from Student Energy on the importance of continuing to include youth voices in MI's work. Members then describe why they joined MI and outline some of the important activities and collaborations they have undertaken to progress cost reductions and to fast-track the development of clean energy technologies. We also feature celebratory words from some of MI's collaborators and supporters.

While we celebrate our achievements, we acknowledge that the pace of innovation and the scale of transformation remains significantly short of what is needed. Collectively MI members are working to launch a second phase that will build on current successes, whilst driving forward outcomes that will further accelerate the pace of innovation, and thereby facilitate countries' clean energy transitions by advancing the solutions and technologies needed to support national goals.

We look forward to the launch of MI 2.0 at the 6th Mission Innovation Ministerial in Chile in 2021.

Help us expand our network!

We encourage you to share this newsletter and the <u>sign up link</u> with your network and join us on the journey as we develop a second phase of MI.

Looking Back: Four Years of Collaboration through MI's Innovation Challenges



Convening at the Innovation Challenges Face-to-Face Meeting in Delhi, India (November 2019)

The Innovation Challenges (ICs) have been a mainstay of Mission Innovation's efforts to accelerate clean energy innovation. Through these voluntary coalitions, MI members have collaborated on clean energy research, development, and demonstration (RD&D) in eight technology areas — seeking to advance innovations that can transform global energy systems and drive down the cost of technology. Four years after the ICs were established, MI members have much to celebrate.

ICs have strengthened international networks between researchers, industry, academia, think tanks, and policymakers. They have filled a gap where global collaboration had been limited – such as in the areas of <u>clean energy materials</u> and <u>solar fuel technologies</u>. ICs have also paired with IEA Technology Collaboration Programmes (TCPs) and other deployment- and policy-related initiatives to align their respective efforts across the innovation spectrum and to help realize the full potential of energy technologies. These networks are indispensable for advancing technological innovation.

ICs have facilitated the exchange of knowledge and brought together complementary areas of expertise. A great example of how ICs are replicating successful strategies and ideas is through the online information-sharing platforms that the ICs have set up on smart grid technologies and hydrogen valleys. ICs also share research findings, lessons learned, and best practices through workshops, reports, and their day-to-day operations.

ICs have played a critical role in identifying innovation needs. For example, ICs have identified and communicated priority research directions for <u>carbon capture</u>, <u>utilization and storage technologies</u> as well as technology and innovation gaps in the field of <u>advanced biofuels</u>. By enhancing knowledge around the technology and innovation challenges that confront the global community, IC findings can help to inform priorities for national RD&D and international collaboration.

Lastly, ICs have delivered on collaborative RD&D projects. For instance, by combining financial resources and technical expertise, members have invested in projects that advance <u>off-grid access to electricity</u>. ICs have also stimulated private sector interest in clean energy solutions, such as those used in the <u>heating and cooling of buildings</u>. Meanwhile, ICs perform collaborative research and development and promote and facilitate joint funding calls, with the aim of advancing performance breakthroughs in priority areas.

Over the past four years, ICs have delivered on a variety of projects – from prize competitions, technology roadmaps, joint funding calls, workshops, to information sharing platforms. At the heart of all this work, MI members recognize that we can go further and faster in accelerating clean energy innovation when we work together. The knowledge, networks, and momentum generated by the ICs put MI members in good stead, as MI looks to amplify its impact beyond 2020.

For more information on the work of the Innovation Challenges, refer to the <u>IC Impact Report</u> and <u>MI's</u> Innovation Challenges webpage.

Mission Innovation Champions: creating a community of visionaries from around the world, working to accelerate the clean energy revolution



As Mission Innovation (MI) moves forward with plans for an even more ambitious second phase, there is a growing recognition for the need to continue building our international platform for collaboration. Afterall, an ambitious vision on decarbonising societies requires ambitious individuals, working nationally, and collaborating internationally.

As part of its Action Plan, MI aims to stimulate greater awareness amongst members and the wider clean energy community of the transformational potential of energy innovation. Recognising the catalytic and strategic role of individual innovators in accelerating the clean energy transition and the need to scale up support across the next wave of clean energy technology leaders, MI members jointly launched the Champions Programme in 2018.

Since that time, the MI Champions Programme, supported by the European Commission, has recognized 40 innovators from academia, companies and public R&D organizations across 21 different MI member countries through the "MI Champion" award. The first cohort of the Champions Programme saw 19 innovators receiving the award at the fourth MI Ministerial meeting in Vancouver (May 2019). In June 2020, EC Commissioner Mariya Gabriel chaired an online award ceremony with the second cohort of 21 Champions.

The "MI Champion" award globally acknowledges the cutting-edge work of these innovators to develop cleaner and more affordable technologies, contributing to global efforts in clean energy innovation. By supporting cross-border exchanges of ideas and talent, and building a community of visionaries committed

to clean energy research and development, this program activates and engages a new generation of researchers, inventors and leaders. Additionally, the work of these innovators can have a real multiplier effect on the innovation ecosystem, with the MI endorsement further enhancing the significant potential to accelerate the clean energy transition.

"As a Mission Innovation Champion, I would like to focus on not only the maturation of individual technologies but also the open discussions to integrate all-scale clean energy technologies toward the innovation of our future society", said the Japanese Champion, Yoshiki Takagiwa.

"I believe that we all have a duty to guide our economies towards sustainable and rapid change, and I personally feel really responsible for achieving the EC Green Deal goals. The MI Champion title gives great visibility that I intend to use when speaking to top-level executives, investors and politicians," echoed EC Champion, Marisa Hernandez.

MI Champions are representative of a much broader network of thousands of individual innovators around the world, working to bring new clean energy solutions to society. The global policy-making community, gathered under the MI banner, can and must play an important role in enabling these innovators to support accelerating the transition.





We are in a critical decade for climate action, and we know that empowering young people around the world to lead and implement climate solutions will be essential to ensuring that the energy transition prioritizes both rapid decarbonization and global equity. At Student Energy, we see young people developing innovative solutions to complex energy challenges in their communities on a regular basis, even as they grapple with a global pandemic, pursue higher education, and build their careers in an uncertain economic climate. We are encouraged to see Mission Innovation's ongoing efforts to engage young people, and hope to see stronger commitments from governments and energy leaders around the world to invest in youth-led solutions.

In 2019, Student Energy brought a global cohort of young leaders to the 10th Clean Energy Ministerial and 4th Mission Innovation Ministerial, and we saw firsthand what young people bring to the table - here's a quick recap of what we learned:

 Intergenerational collaboration: Recognizing that CEM/MI's member countries are operating in diverse political and economic contexts, youth delegates sought to find common ground across geography and across generations. Delegates advocated for intergenerational collaboration and the importance of co-creating solutions, as young people will be most affected by decisions made in spaces like CEM/MI, and because young people can be powerful allies in building public support for climate action.

- Systems thinking: CEM/MI's youth delegates are keenly aware that transitioning the energy system
 involves more than switching technologies, as they discussed solutions for every part of the energy
 system, from production to transport to end use. Delegates also raised important issues around
 gender and racial equity, economic access, and climate justice, and emphasized that clean energy
 solutions must also be just and equitable.
- Raised ambition: Echoing their peers around the world, the young leaders' delegation conveyed the
 need to implement solutions that match the scale and urgency of the climate crisis, and urged their
 energy leaders to take bolder action.

A full recap of the CEM/MI Young Leaders Forum is available <u>here</u>.

As we celebrate the 5th anniversary of Mission Innovation, Student Energy is looking forward to supporting and working together in the coming years to reach our shared goal of a sustainable and equitable energy future for all.

About Student Energy:

Student Energy is a global youth-led organization empowering the next generation of leaders who are accelerating the transition to a sustainable, equitable energy future. We work with a network of 50,000 young people from over 120 countries. Through core programs like <u>Chapters</u>, the <u>Leaders Fellowship</u>, and <u>Greenpreneurs</u>, Student Energy empowers young people with the skills and networks they need to be systems-level critical thinkers who can take action on complex energy challenges in their local communities, and in their academic and professional careers. Student Energy also creates <u>space for young people to act</u> within decision-making institutions by working with governments, companies, and organizations to identify how they can meaningfully engage young people in their work.

Austria celebrates Mission Innovation's 5-year anniversary



Mission Innovation Week Austria, 2019: greetings from Austria to MI-4 in Vancouver (photo: © Christian Spanik)

Austria joined MI in 2018 because we believe this public-public-private partnership will stimulate technology markets of new dimensions and with high dynamic. The Austrian government is, together with the Austrian industry, actively contributing to the goals of Mission Innovation.

Since joining MI in 2018, activities of the energy research and innovation communities in Austria were bundled, and collaborations were intensified. The highlight of the MI Austria activities is the annual Mission Innovation Austria week, the platform for all drivers and shapers of innovation in the energy system of the future. In the first edition in May 2019, 400 participants from 16 countries met in Stegersbach and Oberwart, (south of Vienna) to discuss current developments with stakeholders from industry, policy and research in a series of parallel events. The Mission Innovation Week 2020 was held completely online and focused on Energy Communities. Best practices from research, innovation showcases and market trends were presented in six live sessions between April and July. The Austrian highlights in Mission Innovation are presented in two brochures: Energy Innovations made in Austria – the green deal for a climate neutral future 2020 and Austria's Way into the Future of Energy (2019).

Under MI, in partnership with Sweden, we initiated the "MICall19 on storage solutions," a series built upon the existing funding mechanisms of the Joint Programming Platform ERA-NET Smart Energy Systems and JPI Urban Europe. The first multilateral MI call for projects was launched with a total budget of €22.5 million. 16 countries participated and are involved in 58 projects. 13 projects received a share of €14.2 million (Austrian funding: €2.7 million for 4 projects).

The Joint Call 2020 on digital transformation for green energy transition ("MICall20") will open in the 4th quarter 2020. The aim is to support transnational research and innovation activities unleashing the potential of digital transformation for a sustainable energy society. The total available budget exceeds € 27 million (including funding from the European Commission).

Austria is a proud member of MI and looks forward to continued collaboration.

Brazil celebrates Mission Innovation's 5-year anniversary

Brazil is one of the founding Members of Mission Innovation, created in November 2015 with the main goal of doubling, in the following five years, public and public-oriented investment in RD&D of clean energy technologies. As we finally reach that five-year milestone, it is time to evaluate Brazil's progress and the impact of MI.

Investment has indeed increased in our country in that period. However, one of the main challenges we have identified when tracking our investment progress is the myriad of domestic public stakeholders that have specific funds or policies to foster clean energy innovation, each with different rules, measurement methodologies and priorities. This complex landscape posed major challenges to the measurement and monitoring of the total national investment in support of clean energy RD&D, as well as other indicators. It was clear for us that an integrated, comprehensive and structured database on the overall Brazilian investment in clean energy technologies, combined with long-term energy scenarios, could be used as a guide to improve public policies and governance, foster partnerships between the public and private sectors, and diffuse clean energy solutions and innovations, therefore boosting the impact of our investments.

In order to lay the foundation for that database, the Energy Big Push project was created, under the coordination of the Energy Research Office (EPE), the UN Economic Commission for Latin America and the Caribbean (ECLAC) and the Center for Strategic Studies and Management, with the support from the Ministry of Mines and Energy (MME) and Ministry of Science, Technology and Innovation (MCTI). We also relied on the International Energy Agency expertise and the support of the many public institutions involved in funding RD&D in the energy sector.

The origins of the Energy Big Push project go back to mid-2018. After all the preparation works, including designing the terms of reference and finding project partners and funding, it finally kicked-off in the beginning of 2019. The following results were presented on October, 2020: I) a structure and methodology proposal for a data collection and management tool on public and private investments for the research, development and demonstration of sustainable energy technologies; ii) the mapping of technical, economic, social and environmental variables and parameters for an assessment on the performance of sustainable energy solutions and; iii) proposed strategic lines and priority instruments, focused on innovation, to accelerate Brazil's energy transition.

For us, the goal now is to turn this project into a domestic built-in process under the Brazilian government, and that objective is well under way. Brazil is certainly better equipped now than five years ago to keep ourselves on track for our energy transition.

Canada celebrates five years of collaboration under Mission Innovation



Canada proudly hosted the 4th Mission Innovation Ministerial on May 28, 2019 in Vancouver, British Columbia

Prime Minister Justin Trudeau stood alongside other world leaders to launch Mission Innovation (MI) at COP21 in 2015, because innovation and clean technologies are key components of the Government of Canada's approach to promoting sustainable economic growth and will play a crucial role in Canada's transformation into a low-carbon economy.

Five years later, Canada's reasons for being involved in MI hold true, and its commitment remains unwavering. MI echoes Canada's belief that climate action presents huge opportunities. Building on the momentum of the last five years, Canada strongly endorses a second, outcomes-focused phase of MI. Our collaborative efforts under MI will play a big role in a green recovery from COVID-19, spurring innovation and bringing about environmental sustainability, economic stability, good jobs, and a better, cleaner world.

Since MI's launch, Canada has been an active member and proudly remains on track to meet its doubling target of \$775-million in 2019-20. Canada has participated in all eight Innovation Challenges (ICs), and brought MI members together for the 4th Mission Innovation Ministerial on May 28, 2019, in Vancouver, British Columbia. MI-4 was an inclusive, dynamic and engaging platform that allowed members to demonstrate the impact of investments and raise collective ambition in clean energy innovation.

MI enables Canada and its international partners to find creative solutions to common challenges by sharing expertise, engaging stakeholders, and delivering new collaborative projects. As co-lead of IC4 (Sustainable Biofuels), Canada worked with other countries to advance global collaboration on sustainable biofuels, informing global innovation priorities, exchanging best practices, and promoting funding opportunities for advanced biofuels RD&D. Meanwhile, through its leadership of IC6 (Clean Energy Materials), Canada helped establish an international network on sustainable materials and accelerate the discovery and development of advanced materials for a variety of technology applications. As part of these efforts, Canada has deployed a key enabling technology (Materials Acceleration Platforms), and more recently, started construction on a new research facility to advance materials discovery and innovation.

In line with MI's goal of bringing together public and private investments, Canada was pleased to partner with Breakthrough Energy, a coalition of global investors led by Bill Gates, working together to build high-potential clean energy companies. This partnership has seen the launch of *Breakthrough Energy Solutions Canada*, providing 10 Canadian firms with public seed funding and the potential for follow-on private investment. These firms are working on cutting-edge solutions that can significantly reduce GHG emissions in the buildings, transportation, industry, and electricity sectors in Canada and around the world.

Over the years, Canada has seen how participation in MI directly supports our outcomes-oriented approach to energy innovation policy and programs. As the Government of Canada seeks to exceed its 2030 emissions reduction goal and achieve net-zero emissions by 2050, Canada looks forward to continued collaboration with MI members and collaborators in order to leverage resources, and enable inclusive innovation.

Chile celebrates Mission Innovation's 5-year anniversary

Chile joined MI in 2015 because it recognized urgency of the fight against climate change and the need for international collaboration to realize the kinds of technological innovations necessary to meet our climate ambition and drastically reduce greenhouse gas emissions.

From the beginning of Mission Innovation in 2015, Chile began its own increasingly ambitious clean energy transition process. Since then, Chile has increased its renewable energy generation, electromobility has played an important role, and hydrogen and batteries based on lithium were identified as the most important energy carriers in the coming years. Chile has also committed to two crucial challenges: decarbonization of the electrical matrix by 2040 and carbon neutrality by 2050. To accomplish those national goals, innovation is the key enabler for Chile's economic and social progress and Mission Innovation is the hub for cooperation and sharing experiences.

In 2019 Chile launched a call for the first Chilean Clean Technology Institute that will be the largest research initiative in Chile and will be focused on solar energy, green hydrogen and energy storage based on lithium solutions. In partnership with public institutions, national and international companies and universities, this initiative is a result of the shared issues discussed under the framework of MI and national priorities.

Chile is a proud member of MI and looks forward to hosting the 6th MI Ministerial, launching the next phase of Mission Innovation, in which Chile aims to play a crucial role as the organization continues its role to lead international clean energy ambition and innovation at a time when accelerating decarbonization efforts are vital. Chile is committed to fully participating in the work of this next important phase for MI, especially in the efforts to integrate high penetrations of renewable electricity, to decarbonize diverse sectors of the economy and to scaling-up the green hydrogen industry.

China celebrates Mission Innovation's 5-year anniversary

Group Photo of Ministers in MI-2

In support of economic growth, energy access and security, and an urgent and lasting global response to climate change, China jointly announced Mission Innovation in 2015. This initiative can help accelerate the pace of clean energy innovation to achieve performance breakthroughs and cost reductions to provide affordable and reliable clean energy solutions that will revolutionize energy systems throughout the world over the next two decades and beyond.

Our participation in MI helps promote academic exchanges and cooperation in IC fields. For example, every year the Institute of Electrical Engineering, Chinese Academy of Sciences (IEE CAS) holds workshops for Ministry of Science and Technology (MoST) and the Chinese participating institutes/companies in MI IC groups. In addition, IEE CAS is in charge of editing strategic research reports, providing suggestions for technology development and international cooperation concerning MI ICs. To amplify the domestic influence of MI and build momentum around the second phase, IEE CAS set up MI Official WeChat Account to share latest MI progress, academic reports, as well as events forecast.

Examples of our accomplishments under MI:

- ➤ Significant Contribution to the Doubling Plan: In 2018, the Chinese government R&D investment in the field of clean energy was \$6.3 billion, ranking first among member states for three consecutive years.
- ➤ Successfully hosted the Second Mission Innovation Ministerial (MI-2): On 6–8 June 2017, MI-2 was hosted by the People's Republic of China in Beijing. The meeting provided an opportunity to leverage

- high-level political will and private-sector leadership to drive ambitious, real-world clean energy policies and actions.
- As the IC1 colead, jointly held six Smart Grids Deep-Dive workshops with Italy, and India for IC1 during 2016 to 2019.
- As the IC4 colead, successfully hosted the conference "Mission Innovation The 2nd International Conference on Sustainable Biofuels" on April 2-4, 2019 in Yantai for IC4.
- A Large Number of International Cooperation Achievements: China has taken the Lead in organizing nearly 10 international seminars, supported the MI Secretariat in the preparation of the MI Beyond 2020 programmatic document, and led the release of numerous global consulting reports such as the National Report on Smart Grid Innovation Challenges.

As we mark the fifth anniversary of Mission Innovation, China would like to express sincere congratulations on the great accomplishment of MI in reinvigorating and accelerating global clean energy innovation. And we look forward to closely collaborating with all the members in MI and making further efforts to the second phase.

Denmark celebrates Mission Innovation's 5-year anniversary

Denmark joined MI in 2015 from a commitment to combat climate change by strengthen our dedicated public investment in clean energy research, development and demonstration focusing on reduction of technology costs and CO2 emissions and with an emphasis on innovative projects that can be replicated and scaled up with the involvement of private investors.

Since then, Denmark's specific budget lines for national research, development and demonstration of clean energy have increased from DKK 292 million to DKK 509.5 million in 2019.

Under MI, leading national experts from Danish Universities have participated in several Mission Innovation Challenges. Denmark has played a central role in advancing the smart grid challenge, by contributing to the IC 1 Smart Grids Innovation Challenge Country Report 2019 and by co-hosting a total of four events on Flexibility in the energy system, Smart grid solution sprints, Next generation city action and MI energy hack.

MI has allowed Denmark to establish collaborations and secure European funding under Horizon 2020 for the BIG-MAP: BatteryInterface Genome − Materials Acceleration Platform. The BIG-MAP Platform is a large (€20 million) collaborative research project, which builds upon the fundamental ideas and concepts developed under IC6.

Denmark is a proud member of MI and looks forward to continued collaboration in the next phase.

European Union celebrates Mission Innovation's 5-year anniversary: Successful collaboration remembered through 5 major achievements

When the European Union, represented by the European Commission, joined MI in 2016, we knew that we were joining forces with the world's leading countries in clean energy research, united with private partners behind a shared vision on the fight against climate change. We saw the potential of accelerating technologies which would bring transition towards a cleaner, less polluting energy system world wide. With the European Green Deal, and the ambition to become the first carbon neutral continent, Europe is leading the way towards a world in which clean energy is available and affordable to all.



Mission Innovation inaugural Ministerial (L-R): **Tord Lien**, Minister of Petroleum and Energy, Norway; **PedroJoaquín Coldwell**, Secretary of Energy, Mexico; **James Gordon Carr**, former Minister, Natural Resources Canada; **Maroš Šefčovič**, Vice President, Energy Union; **Harsh Vardhan**, Cabinet Minister of Science & Technology and Earth Sciences, India and **Ernest Moniz**, Secretary of Energy, US (https://enb.iisd.org/energy/mi/2016/)

Over the last five years, our partnerships in Mission Innovation has brought many opportunities for cooperation on energy innovation with other global research programs. We have also been able to exchange best practices, avoid duplication of efforts and get inspiration from different approaches. Through Mission Innovation we have massively increased public research funding for clean energy and ensured that the work of our researchers and innovators is open to the world. For this fifth anniversary we would like to showcase five highlights of the many benefits of our participation:

1. Increasing EU clean energy funding

EU programmes contributed over USD 0.5 billion to the USD 4.9 billion increase in annual investment in clean energy innovation since MI's launch. EU funding supported clean energy projects at different levels of technological maturity, in line with the priorities of the EU Energy Union Strategy: energy security, efficiency and renewables, but also the integration of the energy market and climate action.

2. Supporting MI Innovation Champions

Under MI, the EU designed, developed and implemented the Mission Innovation Champions programme – a prize programme that recognizes and supports innovative individuals who are accelerating the clean energy revolution by working on key clean energy research and technology developments. By supporting cross-border exchanges of ideas and talent, and by building a community of visionaries committed to the promise of clean energy research and development, the program activates and engages a new generation of researchers, inventors and leaders. The first cohort of MI Champions was announced in May 2019. The European Commission continued its leadership of the MI Champions programme by launching a second cohort of MI Champions programme in June 2020.

3. Creating a hydrogen valleys

Working with partners on the Innovation Challenge for hydrogen, the EU funded a hydrogen valleys platform, which includes detailed information about 30+ hydrogen valleys across the world which can be used as a lessons learnt platform and can guide policy making. We plan to fund further hydrogen valley projects through the EU's Clean Hydrogen Partnership that is in preparation. The platform will go live in January 2021 with more information available at https://www.h2v.eu/

4. Launching Breakthrough Energy Ventures – Europe with Bill Gates

In October 2018, the EU created <u>Breakthrough Energy Ventures – Europe</u> (BEV-E), an investment facility for promising early-stages companies developing disruptive technologies that can reduce greenhouse gas emissions in electricity, transport, agriculture, manufacturing and buildings. The program is co-funded equally by the Bill Gates-led Breakthrough Energy and InnovFin, a financial instrument funded by the EU Horizon 2020, which guaranteed the contribution by the European Investment Bank.

5. Developing the Comfort and Climate Box

Our participation in the <u>Innovation Challenge for affordable heating and cooling in buildings</u> resulted in developing the Comfort and Climate Box, an innovative concept to improve energy efficiency in buildings. The Box integrates heating, cooling, and energy storage solutions into a compact and multifunctional device, compatible with a smart energy grid. It is designed to receive multiple energy inputs, use and store energy to provide heating and cooling for a building at the lowest cost, with the lowest impact on the electricity grid, or in a way that generates the lowest amount of CO₂ emissions.



"Mission Innovation demonstrated over the past five years that by working together we can increase investment and accelerate innovation for clean energy. It's time to raise the game and demonstrate, through missions, how technological innovation can address global challenges. The European Green Deal will lead the way, but more carbon neutral continents are needed for clean and sustainable planet."

- Maryia Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth

The EU remains a proud member of MI and looks forward to collaboration with current members and partners. We hope that other countries and partners will be inspired by MI achievements and encouraged by its enthusiasm further to accelerate clean energy transition for all.



Finland celebrates Mission Innovation's 5-year anniversary

The Smart Otaniemi pilot platform is a living lab bringing together more than 100 companies and research institutions to innovate smart energy solutions.

Finland joined MI in 2016 because we have a long history of developing innovative energy solutions.

MI has allowed us to participate in the Smart Energy Systems ERA-Net call, a joint innovation funding call led by Austria and with 18 countries and regions participating. The call received 26 applications from Finland in 2019, and €3 million funding was reserved for the call.

The Finnish parliament passed a bill banning the use of coal as an energy source by the end of 2029. This has activated a host of innovation activities, as large utility companies are racing to comply with the ban. A total of €90 million of financial support will be awarded to companies that successfully remove coal from energy production by the end of 2025.

Under MI Finland has funded several projects and enabled the creation of high potential ecosystems in the area of MI themes. Examples of accomplishments under MI:

Green E2 high potential ecosystem, the idea of which is to create a cross-sectoral network for global business in Finland. New business is expected in three areas: green hydrogen, technologies and "e-products" (chemicals and fuels).

Smart Energy Åland/Flexens develops and implements a full society scale demo on the Åland Islands. The area will become a unique place for companies to test new energy solutions and it will also act as a reference for the Finnish export industry.

Smart Otaniemi serves as a showroom and pilot platform for new smart energy solutions (smart energy, buildings, transport, communication). It is a living lab with real customers involved. Focus is especially on utilizing all types of data.

Finland is a proud member of MI and looks forward to continued collaboration.





Germany joined MI in 2015 because the transformation of our energy systems towards reliable and cost effective clean energy is a fundamental part of an effective, long-term global response to our shared climate challenge. A step-change in global effort is required to accelerate the pace of technological advance and cost reduction for clean energy. Research and development are an indispensable prerequisite to achieve these goals with our knowledge, creativity and inventive spirit being our most important resources. We need to work together with all interested countries and bundle our competencies. For these reasons, Germany welcomes and supports MI.

Germany has participated in the MI Champions Programme and the MICall19 funding programme as a direct result of Mission Innovation. In addition, the involvement in innovation challenges, in particular IC5 and IC8 has contributed to the shaping of energy research policy in Germany. Knowledge sharing has been an important element of the various activities so far, making innovations from Germany better known in the world and bringing insights from other countries to Germany.

Participation in MI has allowed us to:

- Strongly increased national funding for innovations for the energy transition, within the framework of a new Energy Research Programme published in 2018.
- Hydrogen Innovation Challenge Workshop held in Berlin in October 2018.
- Contributed to Converting Sunlight Roadmap within IC5.
- Solutions from Germany featured in the MI 2020 Solutions report, the MI Breakthroughs as well as the 1.5°C compatibility framework.

- Contributed to Smart Grids Country Reports of IC1, as well as many other reports, surveys, workshops and collaborations.

Germany is a proud member of MI and looks forward to continued collaboration.

India celebrates Mission Innovation's 5-year anniversary

India is one of the three countries responsible for crystallizing the global initiative to accelerate the pace of innovation and make clean energy widely affordable, which culminated in Mission Innovation. Being a founding member and as a Steering Committee member, India has played an active role in all Mission Innovation activities.

The Collaborative and Consultative approach under MI has allowed India to reinvigorate and accelerate public and private global Innovation efforts. The large-scale activities under Mission Innovation mandate include the collaborative R&D approach (Funding opportunity



PM: Narendra Modi addressing at the Innovation Summit in COP 21, in Paris, France

Announcement), Increased Private Sector Engagement under Clean Energy International Incubation Centre (CEIIC), Clean Energy Investment and Technology Innovations (MoS&T-IEA), Scaling the potential of Clean Energy Innovation (MI Champions). These activities are enabling capacity building, thus enhancing the foundation of knowledge within disciplines. In addition, they are playing a pivotal role in technology translation from fundamental research to applied R&D effectively and efficiently. These activities are accelerating the disruption of current pathways and cost curves and promoting the integration of ideas and solutions across disciplines, sectors, and technologies to deliver impact at the energy sector scale. These modalities will help address multi-sectoral energy challenges (mobility, connection, structures, generation, and processes).

Under MI, India has successfully stimulated global and national innovation efforts by increasing public investments, private sector & start-up engagement (CEIIC). It has steered the innovation ecosystem for affordable and accessible energy for all.

India funded 9 RD&D projects under IC1 (US\$ 5million: engaging 17 Indian Institutes, 22 Foreign Institutes and 15 Industries); 9 demo projects under IC2 (US\$ 5 Million), 35 collaborative R&D projects under IC3 and IC5 (total budget: US\$ 12 million) engaging 17 and 7 MI members respectively, 8 innovators under IC7 Global Cooling Prize (the US\$1 million) engaging 31 countries. Under Sustainable Biofuels (IC4), a total of 14 R&D programs (national & international bilateral programs) are being supported engaging over 14 Indian institutes, 21 foreign institutes and 4 industries respectively. India has initiated three R&D programs including national and international bilateral programs which are strategically aligned to IC7 (40 R&D projects, US\$ 1million: engaging over 50 Indian Institutes, 15 foreign institutes and 20 industries).

The unique Research and Innovation (R&I) model platform (CEIIC), developed under MI mandate resulted in 25 Clean energy winning solutions and has been instrumental in providing support to innovators from "Proof of Concept "to pre-commercialization stage" covering Breakthrough Clean technology, Innovative Waste to Energy, Energy Efficiency and Energy Access converging and offering transforming potential, the way the world produces and consumes energy.

The MI Champions (global) selected under MI are Scaling the Potential of Clean Energy Innovation in the area(s) of Off-grid access to electricity (<u>Micro-solar dome and solar water pump</u>) and <u>Ocean energy systems</u>. Till today **15000 Micro-Solar dome installed benefitting 70,000 people in India.**

This proactive, curated and demand-driven "collaborative" approach under Mission Innovation has helped identify cutting edge innovation and S&T developments, convene wider Stakeholders, identify national research strengths and potential synergies for international cooperation.

India has successfully stimulated national and global innovation efforts by increasing public investments and enhancing collaboration around shared clean energy innovation interests. India is actively participating in shaping the next phase of MI (2.0). India being a key member is working towards the development of affordable, reliable, and widely available clean energy resources. India's focus has been on Research & innovation, reduced costs, and uncovering new approaches to how we produce, use, store, and distribute energy. India is a proud member of MI and looks forward to continued collaboration.

For the next phase of MI (2.0), India being a key member is working towards the development of affordable, reliable, and widely available clean energy resources. The main aim is to focus on Research & innovation, reduced costs, and uncovering new approaches to how we produce, use, store, and distribute energy. India is a proud member of MI and looks forward to continued collaboration.

Italy celebrates Mission Innovation's 5-year anniversary and looks forward to supporting its second phase



Italian Cleantech Research & Innovation stand organized during MI Ministerial in Vancouver (2019)



Mission Innovation IC1 public event on November 23rd 2018 in Rome

Italy joined MI in 2015 considering the crucial role of RD&D activities in the clean energy sector to reach the decarbonisation targets: MI is a strategic opportunity to accelerate public and private investments in clean energy technologies and promote new international sectorial collaborations.

Mission Innovation acts as pivotal initiative for the public RD&D energy research, development and innovation activities. Within other results, MI contributed to:

- allocate new public financing sources dedicated to RD&D activities in the clean energy sector;
- develop new bilateral agreements of Scientific and Technological Cooperation among international public research centers (i.e. Italy/India Cooperation agreement on Joint application for Strategic key programme for international scientific technological cooperation— RSE Roorkee);
- enforce the collaboration among the National Research Centres involved in the development of cleantechactivites:
- favour the synergy among the Ministries and given substance and resources to the Italian R&I activities planned under our 5th Dimension (R&I&C) of the National Energy and Climate Plan (NECP) set at European level;
- present to national stakeholders the opportunities that innovative clean technologies and international collaborations can offer (i.e. green hydrogen);
- promote sectorial excellences at global level (i.e. MI Champions).



and business models.

Under MI, Italy set up <u>The Hydrogen Task Force</u> gathering the national public and private stakeholders active in the H2 sector in order to promote the development of green hydrogen projects.

Italy has also promoted The Smart Grids Innovation Accelerator (SGIA), a cloud-based online platform to share policy, regulatory, technical and financial knowledge related to smart grid solutions. By centralizing this information into one database, IC1 seeks to share best practices, promote replication, enhance public-private collaboration and information sharing, and foresees upcoming enabling technologies

Through this activity, and thanks to MI, IC1 members, including Italy, are strengthening cross-border networks: they are combining their expertise and experiences into a central repository and they are engaging stakeholders on opportunities to contribute to and benefit from the platform.

Italy is proud to be member of MI and looks forward to promoting its activities at national and global level. Moreover, Italy is strongly committed to involve their excellences active at public and private level in the new sectoral Missions set by MI 2.0.

The Netherlands celebrates Mission Innovation's 5-year anniversary

The Netherlands joined MI in 2016 because research, development and demonstration of clean energy technologies (besides creating the necessary market conditions) are crucial to help achieve the long-term goal of a sustainable low-carbon energy system. And since we are all facing the same challenge, international collaboration can significantly contribute to the pace of our combined RD&D.

Mission Innovation has been able to create focus and mass on shared challenges. MI facilitates knowledge sharing between MI-members. Members can, for example, cooperate on areas they excel at. This creates a focus of means and efforts, further accelerating the pace of innovation in that field. Members can also share knowledge across different areas of expertise, allowing more focus and mass without creating innovation gaps. Furthermore, MI has strongly encouraged an increase of both public and private investment in innovation. So by using the expertise of MI-members, sharing knowledge and increasing investments, Mission Innovation has been able to accelerate the climate and energy transition in a more cost-effective way than would have been possible without international cooperation.

In line with the MI-doubling target, the public funding of The Netherlands for climate and energy innovation significantly increased since 2016. With the Climate Envelop in 2018, the Dutch cabinet assigned an additional M€300 per year, with a focus on pilots and demonstration projects. Through the combination of increasing public funding and the Climate Envelop, The Netherlands has met its MI doubling target in the third year of being a MI-member.

Under the flag of Mission Innovation The Netherlands provided the project-leadership for the international development of a Comfort Climate Box under the Heating & Cooling Challenge. This stimulates an active cooperation between international initiatives (IEA TCP's and MI IC7), integral approach of innovation (not just technical but also social and legal aspects).

In cooperation with MI-IC4 members, The Netherlands has co-shaped the biofuture platform report and a Horizon 2020 work program for advanced biofuels which can contribute to the objectives of MI-IC4.

Also, we participate in a second ACT ERA-NET cofund call of €30 million to internationally accelerate CCUS technologies, with a reference to the MI-IC3 report on Priority Research Directions (PRDs).

Furthermore, connected to MI-IC8, The Northern Netherlands has been selected by the Fuel Cell and Hydrogen Joint Undertaking (FCH JU) as the first European Hydrogen Valley.

The Netherlands is a proud member of MI and looks forward to continued collaboration.

Japan celebrates Mission Innovation's 5-year anniversary

To respond to the Paris agreement adopted at COP21 in 2015, Japan joined MI in June 2016 to accelerate the R&D of innovative technologies for drastically reducing GHG emissions in the long-term.

In April 2016, Japan has established a new national strategy, the "National Energy and Environment Innovation Strategy towards 2050 (NESTI2050)". Under this strategy, Japan will identify such promising technologies as next-generation batteries and technologies related to hydrogen and will focus on conducting R&Ds on these technologies.

In June 2019, Japan has formulated the "Long-Term Strategy under the Paris Agreement" as Growth Strategy, and submitted it to the United Nations.

In January 2020, Japan has successfully formulated the "Environment Innovation Strategy" based on the growth strategy for establishing innovative technologies that enable the reduction of global GHG emissions toward carbon neutrality and further reduction of the accumulated atmospheric CO2 level "Beyond Zero" by 2050. The strategy consists of the "Innovation Actions Plans", "Acceleration Plans" and "Zero-Emission Initiatives".

In October 2020, Japan announced a policy which aims for the realization of a carbon-neutral, decarbonized society by 2050.

The above efforts are in line with the objective of MI.

Japan continues to contribute to MI by participating in IC3, IC5, and IC8 which enable us to utilize the identified technological development.

Since joining in 2016, Japan has reached the doubling commitment for public sector R&D investment aims to solve various issues in today's society including global warming.

Japan will continue to support MI and seek an opportunity to contribute towards the second phase of MI activities.

Norway celebrates Mission Innovation's 5-year anniversary

"The Longship project": The Norwegian government has labelled the investment package 'Longship', recalling the development of fast, reliable ships during the Viking age. Illustration: MPE/Miksmaster Creative.

Norway joined Mission Innovation in 2015 because the Norwegian government acknowledged the need to accelerate clean energy innovation to respond to our shared climate challenge. The government supported the need for a massive push for research, development, dissemination and deployment of clean energy technologies as well as increased international collaboration.

Since the launch in Paris, our dedication to the MI ambitions has grown even stronger. Norway's ambition is to reduce our emissions by 90-95 per cent by 2050 compared to 1990. To achieve this, we believe innovations and technological breakthroughs will be vital. Both breakthroughs and the successful dissemination of new technologies will depend on international co-operation. We also need co-operation between the public and private sector. This is at the core of what Mission Innovation is all about and is exactly why it makes sense to be a member.

In September 2020, Norway officially supported the development of a second phase of Mission Innovation during the digital ministerial meeting hosted by Saudi-Arabia. A few days prior to the Ministerial, we

launched the biggest industrial climate project in our history. Named 'Longship', a funding package of an estimated 25 billion NOK will see the implementation of the first full-scale CCS project in the world. It follows decades of research and pilot projects and marks a major step forward for a critical climate mitigation technology. Longship will contribute to developing carbon capture and storage as an effective climate measure. It will demonstrate that carbon capture and storage is safe and feasible. It will also facilitate learning and cost reductions for others and subsequent projects, both nationally and internationally.

Norway is a proud member of MI and looks forward to continued collaboration.

Republic of Korea celebrates Mission Innovation's 5-year anniversary

The Republic of Korea joined MI in 2015 because our government is committed to executing this investment expansion plan and technology development strategy for focused areas to improve existing technology, save costs and accelerate the time-to-market.

Since the launch of the MI, to refocus Korea's energy R&D on clean energy, seven relevant government ministries and approximately 200 experts from industry, academia and research institutes collaborated to establish the clean energy technology development strategy through the Clean Energy Technology Roadmap. The Republic of Korea's Clean Energy Technology Roadmap marks the milestones for clean energy technology development in order to achieve a low-carbon society, and it helps to realize the energy policy directions of the Korean government. The vision of the roadmap is to "convert the new climate regime crisis into an opportunity for economic growth through clean energy technology innovation." The goals of the roadmap are 1) responding to climate change by contributing to the reduction of greenhouse gas emissions 2) creating new energy business, and 3) leading global technological innovation.

In October 2017, the Republic of Korea established an Energy Transition Roadmap to expand the power generation ratio of renewable energy. Our government plans to implement 3020 renewable energy schemes including the expansion of public participation and improvement of supply conditions to achieve 20% of the renewable energy generation ratio in 2030. Along with an announcement a Hydrogen Economy Energy Roadmap to build a hydrogen industry ecosystem based on hydrogen cars and fuel cells.

Korea Institute of Energy Technology Evaluation and Planning(as refers "KETEP"), a R&D funding agency under MOTIE and a member of Mission Innovation Secretariat, works with members from Austria, Canada, China, EC, Finland, and U.K. KETEP is responsible for collecting and analyzing information on public sector investment in clean energy technology of member countries, and is in charge of the publication of Country Highlight Report, which analyzes R&D investment and efforts to cope with climate change of member countries every year.

The KETEP funds MI-oriented international joint research projects from Dec 2018 to Jan 2021. The budget is around \$1 million USD per project every year. This is delivered in cooperation with the USA, Canada, Germany, and India. KETEP funds a total of eight projects in the field of Innovation Challenges and conducting various activities such as joint workshops, manpower dispatch, joint thesis discussion, research sample exchange, and demonstration plant visits.

The Republic of Korea is a proud member of MI and looks forward to continued collaboration.



Sweden celebrates Mission Innovation's 5-year anniversary

Sweden has had a dedicated energy research and development programme since 1975 and has regarded energy innovation as an integral part of energy policy. We believe that innovation will provide new solutions in the form of products, processes and services that will enable us to meet the energy and climate challenges with greater flexibility and higher cost efficiency. The possibility to join MI in 2015 was therefore very welcome. Global challenges need global efforts.

Through MI, Sweden has chosen to double the parts of our energy R&I that focus on funding for researchers and industry to work bottom-up with solutions to energy challenges and which at the same time support long-term and transformative research and development. This is a part of the total Swedish Energy Research and Innovation funding that is closely related to the goals and the approach of MI.

We have also engaged actively in a number of Innovation Challenges and in the MICall. These initiatives have provided solid platforms for international collaboration in areas that are crucial for meeting our challenges. We believe researchers and entrepreneurs are important for the development of a sustainable energy system and have participated in both years of the MI Champions programme. We have also contributed to the Avoided Emissions Framework and the 1.5°C Compatibility Framework.

The Swedish efforts supporting small and medium sized companies in the energy area with product and business development has increased substantially since 2015. Applying the methods developed within the

Avoided Emission Framework, the companies supported can be estimated to have the potential to decrease the global emissions with more than a billion tons of CO2 equivalents annually. This is of course an estimate and a potential, not a prognosis, but still shows the magnitude of our efforts.

The Swedish City of Malmö was the venue for the third Mission Innovation Ministerial, hosted and arranged by the European Commission, Denmark, Finland, Norway and Sweden and the Nordic Council of Ministers. The Ministerial included many interesting discussions as well as a large number of side events. Sweden is a proud member of MI and looks forward to continued collaboration.

UK celebrates Mission Innovation's 5-year anniversary



John Loughhead, outgoing UK Chair of the Mission Innovation Steering Committee with Dr. Harsh Vardhan, India Minister of Science and Technology in Kolkata, November 2019.

Credit: British Deputy High Commission Kolkata

The UK was a founding member of Mission Innovation in 2015, recognising that to meet the goals of the Paris Agreement we need to accelerate the pace of innovation so that every country and sector can afford bly meet net zero by 2050 or before.

In June 2019, the UK became the first major economy to legally commit to reaching Net Zero by 2050. Innovation is essential to this goal – better products, processes and systems will drive down the cost of clean technologies.

The UK is a global leader in research, development and demonstration, and has committed to increasing support for R&D as a key pillar of our Industrial Strategy to 2.4% of GDP by 2027. Innovation is also central to the UK's recently announcement Ten Point Plan, which includes a commitment to launch the £1 billion Net Zero Innovation Portfolio. This will accelerate increases in the accessibility and attractiveness of clean technologies, enabling them to deliver economic gains whilst generating significantly lower emissions. We want to ensure we harness and support the creativeness, ingenuity and entrepreneurship of our universities and businesses in tackling the challenge of ensuring secure, affordable and clean energy for all.

However, we cannot achieve this alone. We know that by working together, we can make greater progress on clean energy innovation. We can develop solutions faster, increase economies of scale, and bring down costs quicker. This is why the UK has played a leading role in Mission Innovation over the past five years through launching the Innovation Challenges, hosting the Head of Secretariat and Chairing the Steering Committee. The UK has also more than doubled its clean energy innovation spend over the past five years, meeting our original Mission Innovation investment commitment. This has included funding the CryoBattery project, the world's largest and first commercial liquid air battery facility, development of the UK's first Carbon Capture Usage plant and design of the UK's first hydrogen home boilers.

The UK has benefited from the strengthened relationships as a result of Mission Innovation and we have participated in 15 new international collaborations with other MI members. For instance, in September 2017 the Prime Ministers of the UK and Canada agreed a Clean Growth and Climate Change Partnership. On account of this, and supported through our Energy Innovation Programme, we launched the Power Forward Challenge offering over £11 million to develop the best smart energy systems for the 21st Century. The UK also held a £6 million competition with South Korea on Smart Energy Innovation to collaboratively develop innovative smart energy solutions.

The UK has co-led two Innovation Challenges. The Carbon Capture Innovation Challenge co-led with Saudi Arabia has resulted in the expansion of the Accelerating CCUS Technologies to more countries, and the 'Priority Research Directions' identified through Mission Innovation workshops have helped to inform how MI countries invest in CCUS R&D projects, with US\$103 million in investments mobilized for collaborative R&D among MI countries and beyond. The Affordable Heating & Cooling of Buildings Innovation Challenge co-led with the European Commission and United Arab Emirates has resulted in programmes such as the Global Cooling Prize to develop disruptive technologies that can drastically cut cooling emissions with limited cost increases.

Overall, Mission Innovation has raised the importance of accelerating clean energy innovation on the global stage and enhanced knowledge sharing, relationship building and cooperation between countries. The UK is proud to be a leading member of Mission Innovation. Innovation and enhanced global cooperation will be critical to achieving net zero and achieving an ambitious second phase of Mission Innovation is a priority for the UK during our COP26 Presidency.

U.S. Department of Energy celebrates Mission Innovation's 5-year anniversary



U.S. Department of Energy National Laboratories. Photo credit: U.S. DOE STEM Rising program (https://www.energy.gov/science-innovation/stem-rising)

The U.S. joined MI in 2015 because our government is committed to supporting the development of affordable and reliable energy as a foundation for economic growth and energy security. Indeed, reliable, affordable energy goes hand in hand with a strong economy. Innovation in science and technology has been a cornerstone of America's economic progress. The private sector funds and performs the majority of U.S. R&D, but the Federal government has an important role in supporting basic research in areas where industry does not have a strong incentive to invest.

Some key examples of U.S. international engagement under MI include: Carbon Capture Innovation Challenge co-led with Saudi Arabia in 2017; and, the Clean Energy Materials Innovation challenge co-led with Mexico in 2017.

The U.S. Department of Energy (DOE) engages in a wide range of R&D activities in energy and basic science. Research at DOE's 17 National Laboratories is widely recognized across the scientific community as cutting edge. In 2019, U.S. Department of Energy researchers won or shared 42 of the R&D 100 awards, including eight out of 10 "Special Recognition" medals. The annual R&D 100 Awards recognize exceptional new products, technologies and materials that are available for sale or license for their technological significance. DOE's national laboratories have received more than 800 R&D 100 awards since the annual competition

began in 1962. The awards are selected by an independent panel of judges based on the technical significance, uniqueness, and usefulness of projects and technologies from across industry, government, and academia. Many of these projects were developed in collaboration with private companies or academic institutions.

The U.S. is a proud member of MI and looks forward to continued collaboration.

Messages from MI's collaborators and supporters

Video messages

- The International Renewable Energy Agency (IRENA)'s Director-General, Francesco La Camera, offers celebratory words on MI's 5-year anniversary: https://youtu.be/d4at-XhqBHM
- Meredith Adler, Student Energy's Executive Director, offers celebratory words on MI's 5-year anniversary: https://youtu.be/ Jwd RRRPVw

$Statements\, of support\,$



We are glad to collaborate with 'Mission Innovation' and the 'Net-Zero Compatible Innovation Initiative' in supporting the upcoming launch of the UNFCCC Innovation Hub, and in developing methodologies to identify transformative climate solutions and assess the impact of both the development as well as the deployment of these climate solutions.

organization has played a key role in this development.

I look forward to our continued cooperation towards enhancing the use of innovative climate solutions."





"Local and national governments have a critical role to play in accelerating the fight against climate change. One way they can do that is by spreading strong climate strategies around the world. I'm glad to see Mission Innovation and the Global Covenant of Mayors committed to doing exactly

Amanda Eichel Executive Director, Global Covenant of Mayors for Climate and Energy "Cities and citizens are critical players in realizing the vision of Mission Innovation to ensure that the new technologies and innovations generated through the next phase of work will find a place in all of our communities across the globe." MISSION INNOVATION