Workshops on R&D Opportunities in Clean Energy Innovation

A How-To Guide for Mission Innovation Members

June 2017

MISSION INNOVATION
Accelerating the Clean Energy Revolution

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Accelerating the Clean Energy Revolution

An Information Resource developed on behalf of the Mission Innovation Secretariat

Contents

Preface

This guide presents a suggested step-by-step approach for Mission Innovation (MI) members who want to plan and execute an R&D Opportunities Workshop. This approach draws on a range of experience in organizing successful technical workshops. The document is tailored to the needs of MI member countries interested in holding one or more workshops to obtain expert input on energy research investments and potential collaborations that could accelerate innovation. This guide presents one approach among many; country- or topic-specific factors may require considerable modifications or alternative approaches. The intended audience for this guide is government officials and their designees responsible for hosting, planning, and executing such workshops, as well as other MI points of contact, country representatives, and interested stakeholders.

Acknowledgements

Introduction

Mission Innovation (MI) is an international initiative to reinvigorate and accelerate global clean energy innovation and make clean energy widely affordable. The 23 MI members, which include 22 countries and the European Union, have committed to make significant investments in clean energy research and development (R&D) to improve technology performance, reduce costs, avoid harmful emissions, and promote economic growth. While each MI member organizes its own clean energy R&D portfolio to serve national priorities, members may also pursue opportunities to cooperate in areas of shared interest to leverage complementary assets and further accelerate progress.

MI Workshops on R&D Opportunities in clean energy innovation provide a way for MI member countries to pursue both of these aims. Workshops can help them build robust domestic energy research portfolios *and* identify prospects for bi-lateral or multi-lateral R&D collaborations. These workshops are multi-day, carefully planned and structured working meetings. They are generally invitation-only and not open to the public.

Well-organized MI R&D Opportunities Workshops focus on a selected energy topic or emerging knowledge frontier. The format for these events brings together experts from relevant scientific disciplines to (1) jointly identify and prioritize clean energy areas that are ripe for further investigation and (2) explore collaborative research opportunities that will benefit from cooperation on high-impact scientific research.

MI R&D Opportunities Workshops serve the following purposes:

- **Provide expert guidance to inform R&D investment decisions.** Thoughtful exploration of how and where to invest in research will maximize the effectiveness of available funding for clean energy R&D. Workshops provide a structured approach for gathering expert insight from scientists and industry on the most promising areas for investment. Workshop results can be used as input for government officials deciding on research directions, priorities, and tenders—reinforced by the expert judgments of scientists.

> **Mission Innovation at a Glance**
>
> Launched at the Paris Climate Conference in 2015, Mission Innovation is a global initiative of 22 nations and the European Union. Together, MI members represent about 60% of the world's population, 70% of GDP, and more than 80% of government investment in clean energy research. The MI goal is to significantly accelerate the pace of innovation, reduce costs, achieve performance breakthroughs, and make clean energy technologies widely affordable and reliable worldwide.
>
> MI members make enormous investments in clean energy R&D, driving economic growth and catalyzing progress in technology areas that could make a significant impact in the fight to avoid the worst consequences of climate change. MI members coordinate with businesses and investors and seek opportunities to cooperate with partner nations on R&D needs, projects, and best practices.

- **Inspire the research community.** By assembling top experts on a given topic, workshops enable researchers to discover new approaches, strengthen bonds across sectors, forge new partnerships, and encourage them to take action to solve some of the toughest challenges to energy innovation.

- **Facilitate intergovernmental collaboration.** Workshops foster information sharing and uncover opportunities for bi-lateral or multi-lateral collaborations or joint research partnerships.

- **Spur transformational change.** If past experience is an indicator, successful workshops will give rise to the types of scientific collaboration and game-changing solutions needed to increase energy security, stimulate economic growth, and cost-effectively transition to a low-carbon future. [See examples of impacts from other R&D opportunity workshops in the box at right.]

An MI R&D Opportunities Workshop has the following features:

- A **topic area** in which intensified explorations could lead to meaningful advancements or breakthroughs to solve pressing clean energy challenges, with related R&D opportunities pre-competitive in nature and therefore conducive to cooperation among countries, companies, and research institutes.

- A **pre-workshop report** that describes the current state of technology and/or status of the field, and the associated innovation and technology challenges. This background report serves as a resource for workshop participants and the larger clean energy research community.

- **Structured workshop sessions** that promote productive discussions among scientific experts. The discussions identify priority research directions, further R&D needed on the topic to address key challenges, and related areas for potential collaboration among MI members.

- **A final workshop report** that summarizes the findings, including priority research directions and potential collaboration opportunities. MI members can use the report to inform self-directed R&D

Sample Outcomes of R&D Opportunity Workshops in the United States

Over 15 years, the U.S. Department of Energy (DOE) sponsored a series of 18 R&D Workshops at which experts from academia, national labs, industry, U.S. agencies, and other countries explored opportunities in basic energy research. The workshop results now serve as resources to guide disruptive basic energy research and accelerate innovation. Example outcomes include the following:

- Basis for establishing 60 Energy Frontier Research Centers, each of which focuses basic research on one area of technology innovation. Collaborative research at these centers has spun off at least 10 start-ups and helped more than 90 companies. Related outputs include 7,700 publications, 640 patent applications, and 100 licenses for intellectual property.

- Influenced the formation of five DOE Innovation Hubs—integrated research centers that combine basic and applied research with engineering to accelerate innovation in critical areas.

- Basis for tenders, funding opportunity announcements soliciting grant proposals, and research calls from the Advanced Research Projects Agency–Energy (ARPA-E).

investment decisions, guide potential public–private partnerships, mobilize research communities, and launch research efforts with other members to achieve mutual benefit.

MI R&D Opportunities Workshops can be conducted as a series, with each workshop focused on a separate theme. For example, the first workshop could focus broadly on the overarching status and challenges of a particular technology area, generate high-level priority research directions, and identify potential R&D synergies among countries. Subsequent workshops could hone in on specific aspects of the technology area or research to develop roadmaps, identify potential joint research projects, and outline action plans to achieve transformational changes.

About This Guide

This guide outlines key steps in planning and implementing an R&D Opportunities Workshop, highlights best practices, and provides examples of materials and templates. Users are encouraged to view the document as a reference guide, skipping directly to the sections of interest and referring to other sections as needed. While many support staff will not need to read the guide from cover to cover, those responsible for integrating the various activities are likely to benefit from a thorough read of the document.

Some of the key steps in planning and executing a workshop are outlined in Figure 1, along with a proposed timeline for staying on track during the planning process. Each step is cross-referenced with corresponding sections of the guide (noted in parentheses) so that users can easily find further information. Throughout the document, the blue sidebar boxes provide examples, explanations, and amplifications or other details, while the gold boxes identify best practices.

Activities in Figure 1 are loosely grouped under three main categories: Workshop Structure and Content; Administration and Coordination; and Logistics. Activities under Logistics are typically the responsibility of the Logistics Coordinator; assignments of responsibility are more distributed in the other two categories. All members of the Workshop Planning Team will need to clearly communicate and coordinate their activities and progress (see *Section 2*).

Figure 1. Planning Flow Chart
(Find activity details in the document section indicated in parentheses.)

Workshop Structure & Content	Administration & Coordination	Logistics	Time prior to workshop
Select workshop topic (1)	Recruit workshop Chairs and assemble planning team (2)	Select dates and location (12)	6 months
Establish workshop charge (4)	Establish workshop budget (3)		
Develop concept document and panel topics (5)	Identify experts (6)		
Conduct bibliometric analysis (6)	Recruit Panel Leads (6)	Secure venue (12)	5 months
Begin developing pre-workshop materials (9)	Set up a workshop website (7)		
	Invite experts; track responses; follow-up (8)		
Develop agenda; plan sessions (10)			4 months
Outline workshop report (10.4)	Recruit Speakers and writers; provide guidance (6)		3 months
Develop input and output templates for panels (10.2)	Invite Observers (8)	Arrange for equipment and room set-up (12)	
		Coordinate meal arrangements (12)	2 months
	Coach Panel Leads to run sessions (10.2)		
	Distribute pre-workshop materials to participants (9)		1 month

Figure 1. Planning Flow Chart (continued)

Workshop Structure & Content

Administration & Coordination

Logistics

Time prior to workshop

Print and assemble badges, other materials (12)

Confirm room, meals, and equipment setup (12)

Hold pre-meeting with Panel Leads, Chairs (10.2)

Set up check-in desk, signage (12)

Gather and load speaker slides (10.1)

Coordinate with venue staff for meals, equipment (12)

Capture workshop discussion, completed output materials (10)

Generate draft report (11)

Circulate and finalize report (13)

Share and publicize workshop findings (13)

Days before workshop

During workshop

1-2 months following workshop

1. Select Workshop Topic

Timing: 6+ months prior to workshop
Responsible party: Representatives from MI Host(s)

Mission Innovation member countries interested in hosting an R&D Opportunities Workshop will want to select a topic suited to their national circumstances and priorities. The topic should be one for which additional scientific insight might be particularly helpful to government decision-makers responsible for research directions and funding opportunities. For example, there may be a lack of information and consensus on R&D needs in fields with novel or rapidly emerging technologies. Ideally, the workshop topic should be suitable for information exchange and collaboration among sectors and governments (see box at right).

The main workshop topic may align with the MI Innovation Challenges or other fields or promising technologies that address pressing energy needs. Developed by MI members through a collaborative process, Innovation Challenges are global calls to action. They are intended to attract international attention and accelerate research, development, and demonstration in areas that could make a significant impact on global clean energy technology. An R&D Opportunities Workshop provides a logical step for participating countries to convene experts on the topic of an Innovation Challenge to identify key opportunities for research and collaboration.

Once a topic has been selected, the MI member country interested in hosting the workshop should inform the MI Secretariat. The MI Secretariat, along with the MI Steering Committee, will help to connect the workshop hosts with other MI members potentially interested in the topic, and may offer other assistance—such as suggesting experts to participate or individuals to serve on the Technical Workshop Committee (see *Section 2*). MI members may choose to host an R&D Opportunities Workshop alone or co-host it with one or more other member countries.

Consider Workshop Topics That Focus on Early-stage R&D

Under Mission Innovation, national programs may emphasize a range of investments, including applied R&D, technology demonstrations, and technology-to-market activities. Given sensitivities about international competitiveness, activities in late-stage R&D and near-commercial technologies are often left to the domestic strategies of each MI member and its self-selected partners. International partnership activities in these areas are typically governed carefully to protect intellectual property. Early-stage research activities are characteristically pre-competitive, so they may provide greater opportunities for intergovernmental cooperation. Early-stage R&D is a natural fit for collaboration, scientific exchanges, and information sharing across boundaries.

Basic science and early-stage R&D provide the foundational knowledge and new ideas needed for transformative breakthroughs in energy systems. Basic energy research in specific technological areas ("use-inspired") can create new knowledge, explore novel approaches, open new avenues of technological progress, and feed the innovation pipeline for more applied public and private R&D investment.

2. Assemble Workshop Planning Team

Timing: 6+ months prior to workshop
Responsible party: Representatives of MI Host country

The MI country or countries hosting an R&D Opportunities Workshop identify individuals to serve on the Technical Workshop Committee and recruit workshop Chairs—with assistance from the MI Secretariat and MI Steering Committee, if needed. Once the Technical Workshop Committee has been established, members of that committee should recruit or assign appropriate individuals to serve on the Workshop Planning Team. Members of the Workshop Planning Team (shown in Figure 2) are typically officials or staff members of host government agencies and supporting organizations or consultancies. The participating experts typically volunteer their time and expertise, although their travel expenses may be reimbursed at the discretion of the Workshop Hosts.

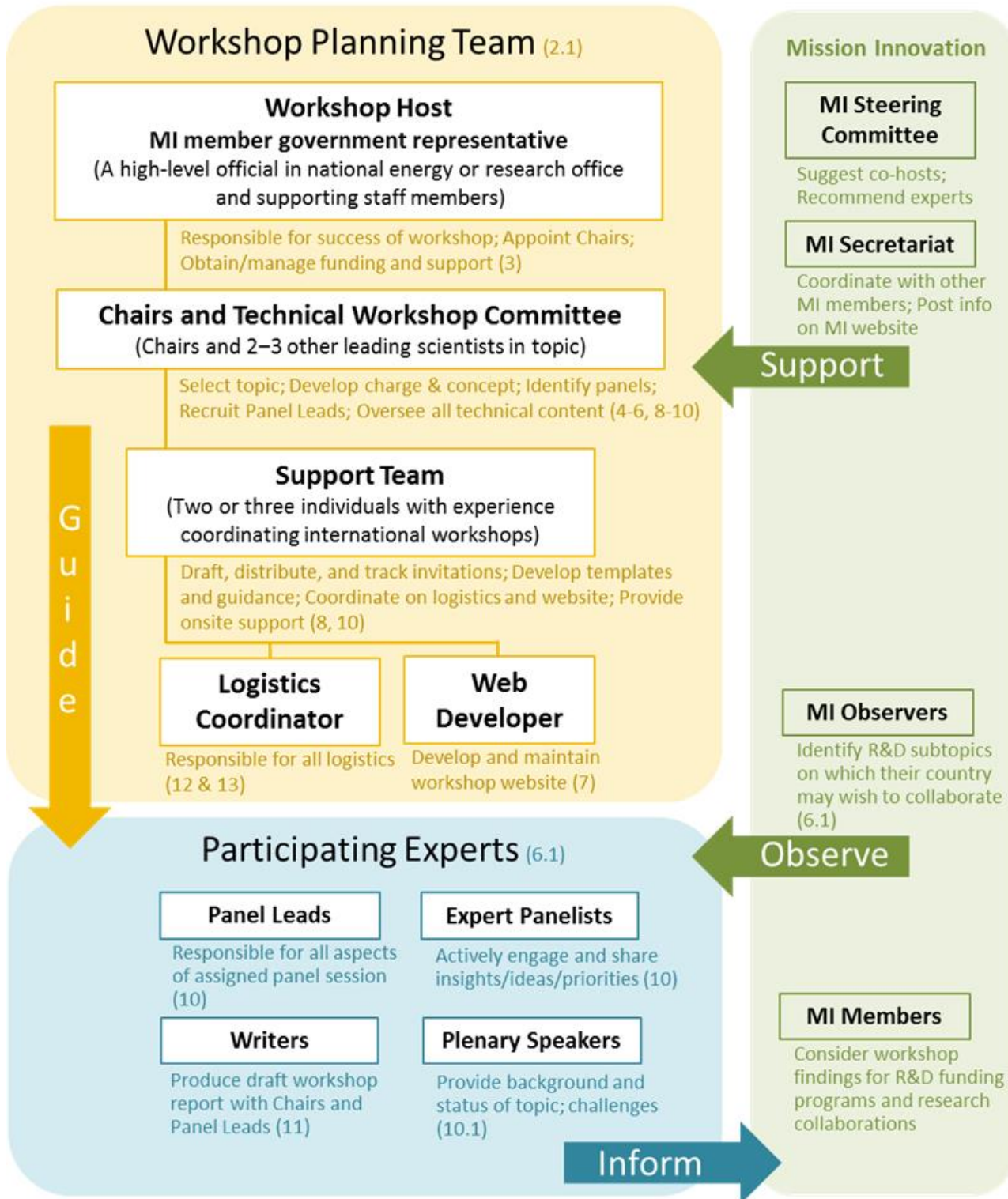## 2.1 WORKSHOP PLANNING TEAM

Workshop Hosts

Workshop Hosts are the sponsoring entity or entities for the workshop. Hosts are represented by senior-level officials from energy and/or research-related government offices or affiliated organizations, and supporting staff members. The Workshop Host representatives are responsible for assembling a Technical Workshop Committee, securing funding for the workshop, contracting for workshop support, and managing budgets. They are responsible for the success of the workshop and accountable to higher-levels within the organizational structure of their government.

Technical Workshop Committee

The Technical Workshop Committee is the primary decision-making body responsible for planning and implementing the workshop and delivering outcomes. The Technical Workshop Committee conceptualizes the workshop and holds decision-making authority over workshop process and content. The Technical Workshop Committee also provides high-level direction, develops the workshop charge, identifies topics for the panel sessions, and generally ensures that preparations for the workshop are on track. After the workshop, the Technical Workshop Committee is responsible for delivering the final workshop report.

Individuals serving in the Technical Workshop Committee are recruited by the Workshop Hosts—with assistance (if requested) from the MI Secretariat and MI Steering Committee. The Technical Workshop Committee usually consists of four or five individuals, including the Chair(s) (see below), representative(s) from the MI member government(s) hosting or co-hosting the workshop, and other highly respected members of the scientific community. Additional details on the role and qualifications of the Chair(s) are provided below. Other individuals on the Committee should have strong scientific backgrounds and proven technical leadership qualifications. Each member must be able to devote ample time (about four hours or more per week) to the workshop effort during critical planning stages.

Figure 2. Introduction to Main Roles & Responsibilities
(See document sections in parentheses for full details.)

Workshop Planning Team (2.1)

Workshop Host
MI member government representative
(A high-level official in national energy or research office and supporting staff members)

Responsible for success of workshop; Appoint Chairs; Obtain/manage funding and support (3)

Chairs and Technical Workshop Committee
(Chairs and 2–3 other leading scientists in topic)

Select topic; Develop charge & concept; Identify panels; Recruit Panel Leads; Oversee all technical content (4-6, 8-10)

Support Team
(Two or three individuals with experience coordinating international workshops)

Draft, distribute, and track invitations; Develop templates and guidance; Coordinate on logistics and website; Provide onsite support (8, 10)

Logistics Coordinator

Responsible for all logistics (12 & 13)

Web Developer

Develop and maintain workshop website (7)

Guide

Participating Experts (6.1)

Panel Leads

Responsible for all aspects of assigned panel session (10)

Expert Panelists

Actively engage and share insights/ideas/priorities (10)

Writers

Produce draft workshop report with Chairs and Panel Leads (11)

Plenary Speakers

Provide background and status of topic; challenges (10.1)

Mission Innovation

MI Steering Committee

Suggest co-hosts; Recommend experts

MI Secretariat

Coordinate with other MI members; Post info on MI website

Support

MI Observers

Identify R&D subtopics on which their country may wish to collaborate (6.1)

Observe

MI Members

Consider workshop findings for R&D funding programs and research collaborations

Inform

Chairs (part of the Technical Workshop Committee)

Workshops are led by one or two Chairs. As the subject-matter leads of the Technical Workshop Committee. They provide overall direction, ensure technical accuracy, and afford insight on the specific topics to cover. They oversee the selection of invited experts, development of the concept document and background materials, workshop design and planning elements, and structure of the workshop report. They may also reach out personally to top-tier experts to secure their participation in the workshop. During the workshop, the Chairs listen in on the discussions and provide high-level direction, observations, and findings. They are not actively involved in the workshop discussions in the same manner as expert participants. Rather, they move from session to session, listen to the discussions, ensure that progress is on track and in scope, and provide advice if needed. They are also available during the workshop to provide guidance, answer clarifying questions, or refocus discussions, if needed. After the workshop, they may be lead authors or editors of the final workshop report.

The Chair(s) should be accomplished leaders in scientific research with experience in managing complex scientific community endeavors, such as distinguished members of a country's National Academy of Sciences. These individuals should be well-regarded, big-picture thinkers and strong communicators with leadership and project management skills.

The time commitment can be considerable, so workshops are often led by two Chairs rather than a single Chair, splitting the duties between two individuals. Chairs should anticipate spending about four hours per week during the planning stages (starting about six months prior to the workshop) and up to 20 hours per week immediately before and after the workshop (half these amounts if the Chair duties are split). If the Chair(s) choose to be responsible for developing the pre-workshop materials, the time commitment is even greater (See *Section 9*).

Support Team

The Support Team provides planning, administrative, and coordination support for the workshop. This Team works closely with and supports the Technical Workshop Committee and Chair(s). It typically consists of two or three individuals—often from the host country—who have substantial coordination experience from similar workshops. The Support Team assists with numerous planning activities, such as managing participant lists; drafting and distributing invitations and tracking responses; supporting the drafting of agendas and session times; developing guidance materials and templates; and liaising with the Web Developer and Logistics Coordinator regarding registration, badges, signage, and other materials. The Team may also assist with the pre-workshop background documents. During the workshop, the Team typically supports the Logistics Coordinator onsite, helping with registration check-in and other duties.

Logistics Coordinator

A highly capable Logistics Coordinator is essential for a well-run workshop. The person in this role works closely with and supports the Chair(s) and others on the Technical Workshop Committee. The Logistics Coordinator should be familiar with the city and venue options where the meeting will be held and have

event planning expertise for similarly sized events. The Logistics Coordinator is responsible for all logistics support related to the workshop (see *Section 12*).

Web Developer

The Web Developer is responsible for developing a workshop website and maintaining it throughout the entire project. In some cases, the Web Developer can design and build the workshop website and then allow the Support Team or others to modify and update it using a content management system. In such cases, the Web Developer has a heavy time commitment during the initial planning stages of the workshop and a minimal one thereafter, for as-needed site maintenance or troubleshooting (see *Section 7*).

3. Establish and Track Workshop Budget

Timing: Begin 6 months prior to the workshop
Responsible Party: Workshop Hosts
Sample budget: Appendix A

The MI host country provides funding for the workshop and is responsible for managing the budget. Typically, the host country or countries are expected to pay for the following:

- Logistics expenses, which typically cover workshop meeting rooms, food and beverages for participants during the workshop, and in-room equipment (e.g., screens, microphones, and projectors)

- Materials production for signage, badges, reports, and other hand-outs

- Travel expenses for Speakers and Panel Leads (see *Section 6*)

- Travel expenses (as needed) for the Technical Workshop Committee and Chairs, Support Team, and Logistics Coordinator

- Labor costs for contract support, such as the Support Team, Web Developer, and Logistics Coordinator

The host country or countries may also choose to pay the travel expenses of invited experts in addition to those of the Speakers and Panel Leads. Other attendees, including Observers, normally are responsible for their own expenses. See *Appendix B* for factors to consider regarding travel expense reimbursements for participants.

Typical three-day workshops might cost US$ 200,000–300,000. Several factors can substantially affect the cost of hosting a workshop. These include the number of participants, location of the workshop (city, venue, meeting room, and equipment costs), meeting duration (number of days), whether experts are reimbursed for travel expenses, and the labor cost for planning and support staff. A sample budget is provided in *Appendix A*.

4. Establish Workshop Charge

Timing: 6 months prior to workshop
Responsible party: Technical Workshop Committee

The workshop charge is a simple overarching statement that concisely conveys the purpose and focus of the workshop. It should include an end goal or milestone (see text box). The charge elaborates on the workshop topic by introducing the specific aspect(s) to be examined and why (e.g., emissions reductions, cost savings, economic growth). The charge provides participants, MI members, and other interested parties with a succinct summary of the workshop's purpose. The charge also provides a brief, high-level summary that guides the Workshop Planning Team (see *Section 2.1*) in its detailed planning.

> **Example Workshop Charge**
>
> Identify the opportunities and basic research needed to enable wide use of evolving advanced transportation fuels, focusing on new or emerging technologies with the potential to significantly transform fuel production, efficiency, and emissions by 2030.

5. Develop Concept Document and Panel Topics

Timing: 6 months prior to workshop
Responsible party: Technical Workshop Committee
Sample concept document: Appendix C

Concept Document

The concept document provides a brief overview of the workshop topic, objectives, and other important elements in two or three pages. Initially, the audience for the concept document is internal: members of the Technical Workshop Committee will develop and use it themselves. At this early stage, the purpose is to ensure that all members of the Committee understand and are in agreement with key features of the workshop. Once the Committee comes to full agreement, the concept document can be used to communicate additional details about the workshop to MI members and other stakeholders. The information in the concept document can help MI countries suggest appropriate speakers, observers, and experts for the workshop. The concept document may later support communications with workshop participants, explaining important workshop elements. This information can be disseminated via the website (see *Section 7*) and invitation letter (see *Section 8*).

Elements of the concept document include the following:

- *Context:* Background and framing for the workshop, including the rationale and significance of the topic and identification of any prior assessments, analyses, or other relevant studies.

- *Workshop Charge:* Statement of purpose, areas of focus, and high-level goals (see *Section 4*).

- *Objectives:* Relevant details on expectations, outcomes, and deliverables from the workshop.

- *Panel Topics:* Definition and scope of each panel topic (see below) and an explanation of any important relationships between panel topics.

- *Workshop Execution:* Basic outline of how the workshop will be structured, including a high-level draft agenda, if possible. Approximate workshop dates and location, if known.

- *Participants:* Backgrounds, expertise, and other qualifications of experts and other attendees (see *Section 6*) needed to address the topic both holistically and in sufficient depth to attain workshop goals. The approximate number of people, if known.

Panel Topics

Panel topics are determined during development of the concept document. They focus on specific aspects or sub-topics of the overall workshop scope or may align with particular program missions or energy strategies. Panel topics are examined in separate rooms during the workshop. Panel sessions run in parallel and usually consist of groups of about 10-20 experts.

> **Panel Topics: Best Practice**
>
> Panel topics should be orthogonal (independent, with minimal overlap), if possible. Panel topics should be clearly scoped and carefully defined to avoid confusion.

Breaking the workshop into sub-topics for in-depth discussion in separate panel sessions encourages substantive discourse in small groups, increasing participation and interaction among experts. This approach typically enables a longer and deeper exploration of the topics and elicits valuable ideas and insights from the participants. Separate but parallel panel sessions also allow the workshop to cover more ground than it would if all sessions focused on a single topic, both in terms of sub-topic areas and related issues within each area (including R&D priorities and possible collaborative efforts).

A crosscutting panel may be appropriate for discussions that span several topics. For workshops with crosscutting panels, it is important that panels have an opportunity to coordinate during the workshop to avoid overlap or gaps (see *Section 10.2*).

6. Identify Experts and Recruit Panel Leads

Timing: Begin 5-6 months prior to the workshop
Responsible party: Technical Workshop Committee
Example tracking spreadsheet: Appendix D

The Technical Workshop Committee develops an initial list of experts to consider inviting to the workshop. Information about each candidate's scientific background, affiliation, areas of expertise, and other attributes should be recorded along with their contact details. This list is compiled largely on the basis of the professional networks and contacts of Committee members. The Technical Workshop Committee is encouraged to contact the [MI Secretariat](#) for further recommendations of experts. On this initial list, notes on potential participants should highlight their potential contributions to specific panel topics as well as their suitability to serve as Panel Leads.

Skilled Panel Leads are critical to the success of the meeting (see *Section 6.1*), so all candidates must be carefully reviewed by the Technical Workshop Committee. Once the list of top-tier candidates has been

approved, Committee members can arrange to reach out personally to invite those candidates who they know or recommended. The Committee member should accurately convey to the Panel Leads candidates the significant level of effort involved in planning, execution, and follow-up. The Committee should consider recruiting two Panel Leads for each panel to share the workload.

The Panel Leads should then identify experts who they would like to have on their panels and add them to the initial list of experts developed by the Technical Workshop Committee. These candidate participants should possess strong scientific backgrounds and the ability to clearly convey complex technical concepts. The Chair(s) and Panel Leads work together to refine this expanded list into a prioritized list of participants. A strong panel group will be diverse in terms of research focus area (suited to the panel topics), gender, geography (e.g., nationality, level of urbanization, stage of economic development), and affiliation (academia, industry, government, and non-government organizations).[1]

> **Participants: Best Practice**
>
> Workshop success ultimately rests on gathering the right mix of first-rate experts. The Chair(s) should individually review and approve everyone on the list of potential experts. In some cases, everyone on the Technical Workshop Committee should also review the list.

Bibliometric analysis or bibliometrics can assist in identifying experts to consider for the panels and may also support other planning steps. As described in *Appendix F*, a bibliometric analysis begins with the creation of a list of publications identified by searching on strings of keywords that characterize the scope of the workshop. Quantitative analysis of the resulting bibliography can then assess the importance and productivity of the research appearing in different journals and can identify the most highly cited publications, which will be helpful in the development of pre-workshop materials. Bibliometrics can also rank the importance and productivity of research by different countries, institutes, and researchers, which will direct workshop organizers to key hubs of research or to particular researchers who might make excellent Speakers, Panel Leads, or expert participants. By identifying trending research topics and the innovation ecosystem of particular countries, institutes, and fields of science and technology, bibliometrics is also useful in developing strategies to effectively implement workshop findings and recommendations.

6.1   PARTICIPATING EXPERTS AND OBSERVERS

Highly qualified experts are carefully selected and invited to volunteer their time and expertise to provide context on the workshop topic, plan and run the panel sessions, participate on the panels, and write up the results. These experts and invited observers from other MI countries and the MI Steering Committee are critical to the ultimate success of the workshop. These dedicated individuals agree to serve as Speakers, Panel Leads, Panelists, and Writers. MI members may send observers to the workshops to bring back information on technologies and opportunities. The obserevrs are instrumental in connecting opportunities and interests to help form collaborative R&D teams for innovation.

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[1]   Note that diverse representation does not necessarily mean equivalent numbers of participants. For example, the panel topic may necessitate greater (or less) representation from academia, industry, government, or NGOs.

Speakers

Expert Speakers can deliver short (30 minutes or less) presentations that provide background or context for the workshop topic. Typically, Speakers give their presentations on the first day of the workshop during the opening plenary. If the agenda is time-constrained, Speakers can present during lunch. Plenary Speakers can be industry, academic, or government leaders or otherwise recognized experts in the field. Good Speakers are able to provide adequate context for the workshop topics, offer different perspectives, and inject energy and motivate participants to engage actively in the workshop.

> **Speaker Guidance: Best Practice**
>
> For the plenary, instruct Speakers to provide details about the current state of technology or key challenges/barriers. Advise them to refrain from providing their own ideas/solutions to those challenges or details of their own research. Those topics should be saved for discussions during the panel sessions.

Panel Leads

Panel Leads are perhaps the most important individuals in the ability of a workshop to successfully generate desired outcomes. They are responsible for leading a specific workshop topic area in a small group setting of about 10–20 people, collectively referred to as the "panel." Panel Leads should be well-respected experts in the relevant topic, have a breadth of knowledge beyond their own research results, possess experience moderating groups, and have excellent communication skills.

Based on guidance from the Chair(s) and the Technical Workshop Committee, Panel Leads help plan and lead the execution of a panel session and deliver outputs. Responsibilities include the following:

- Work with the Chair(s) and the Technical Workshop Committee to identify experts and Writers (see below) to participate on the panel.

- Plan the panel session in coordination with the Chair(s), Technical Workshop Committee, and other Panel Leads.

- Contact the experts on the panel prior to the workshop to explain expectations and plans.

- Facilitate panel discussions, keeping the group in scope and on time—driving the group toward outcomes.

- Gather input from the experts on the panel during the panel session and summarize findings.

- Contribute his or her own insight and expertise to the discussion while ensuring that all experts on the panel are heard.

- Oversee relevant sections of the workshop report, including writing and/or editing sections relevant to the assigned panel topic(s).

These responsibilities require a significant amount of effort. Each panel should consider having two Panel Leads to reduce the workload on any one individual. Panel Leads should expect to devote about four hours

per week for three months prior to the workshop, 10 hours per day during the event, and then up to 40 hours following the meeting to develop the workshop report.

Experts/Panelists

Expert participants (also referred to as panel members or panelists) are assigned to panel sessions on specific topics prior to the workshop. Their responsibility is to offer the panel their scientific and technical knowledge, expertise, and judgment. As panelists, they are encouraged to be active and creative and to engage other experts in productive debate. Experts should have a relevant scientific background, a reasonable breadth and depth of expertise in the focus topic, and the ability to effectively express their ideas—verbally and in writing—in a workshop setting.

Writers

Writers are experts recruited specifically to capture and summarize findings from the workshop and to assist in developing a report on the workshop results. At the request of the Panel Leads, Writers may also assist in developing the summary report-outs for specific panel sessions presented at the closing plenary. The Panel Leads and Chair(s) recruit the Writers prior to the workshop and give them guidance in the form of outlines and, ideally, sample sections of comparable reports. Writers must be able to understand the content and nuances of scientific discussions on their assigned topic(s), accurately summarize those discussions, identify and integrate supporting information, and work closely with the Chair(s), Panel Leads, and other Writers to produce a well-organized, clearly written report.

Observers

Observers are individuals who are invited to attend the workshop in a listening capacity and bring back to their home organizations information on technologies and collaboration opportunities.. Although they do not actively participate in the sessions, Panel Leads may ask Observers to provide their perspective on an issue, answer a question, or suggest MI member countries for specific collaborations. As with other experts—Observers must be invited to attend.

7. Set Up Workshop Website

Timing: 5 months prior to the workshop
Responsible Party: Web Developer
Example website: Appendix G

The workshop website provides a go-to portal for information about the workshop. The content should be easy to navigate. Elements typically include the workshop charge, background or context, agenda (once available), registration (see side bar entitled Online Registration), event logistics, and contact details. Text for the website

> **Website: Best Practice**
>
> Experts receive many speaking invitations, so the website must clearly convey the workshop's value and link to Mission Innovation. Listing the recognized experts on the Technical Workshop Committee will also lend credibility to the event. Send the MI Secretariat details of the workshop to post on the main MI website events page. This helps legitimize the workshop as an official MI event—as distinct from "spam."

can be extracted from the concept document (see *Section 5*). The website can also provide information about roles, speakers, key references, pre-workshop materials, and expectations for participants. Logistical information should include the venue, nearby hotels (with links to their websites), nearby airports, ground transportation options, and visa requirements. Depending on the host country, the website may need to provide information and contact details for attendees who require visas.

During the workshop, the website can be used to post announcements and work-in-progress documents actively under development by the panels. After the workshop, the website can share presentation slides, preliminary and final versions of the workshop report, and next steps or events.

The website can also be designed as a file-sharing site through which participants can upload and download files. This functionality increases the complexity of the website, including the need for password protection, but it can serve as a useful collaboration tool for workshop participants.

> ### Online Registration
>
> For invitation-only workshops, requiring participants to register via the workshop website serves the following purposes:
>
> - Provides online registration and a mechanism for payment, if there is a fee to attend. Web systems that process payments charge a fee equal to about 5%–10% of the registration amount.
>
> - Collects information from the attendees about dietary restrictions (e.g., vegan, food allergies) or other special needs (e.g., wheelchair access).

8. Send and Track Invitations

Timing: Begin 5 months prior to workshop
Responsible party: Technical Workshop Committee
Example tracking spreadsheet: Appendix D
Example invitation letter: Appendix E

> ### Workshop Email Account: Best Practice
>
> Set up an email for the workshop to avoid placing the burden of invitation and response tracking on one individual. Bear in mind, however, that invitations may need to be seen as originating from a "known" user's email so that recipients will know that the invitation is not "spam."

The list of potential expert participants (see *Section 6*) can be categorized by tiers. Tier 1 candidates represent the "ideal" panel for a specific topic, with high-quality panelists and broad representation (geography, discipline, etc.—see *Section 6*). Other candidates may be categorized as Tier 2 or possibly Tier 3, as it is unlikely that all Tier 1 candidates will be available to attend.

The initial tiered list for each panel is provided to the Support Team to develop a tracking spreadsheet (see *Appendix D*) and will check across lists to ensure there are no duplicates. The Team then issues formal invitations to all Tier 1 candidates and tracks the responses (in some cases these invitations will follow up on personal invitations extended earlier by the Chair(s) and Panel Leads). To increase the likelihood that Tier 1 candidates will accept the invitation, see the Best Practice box with suggested best practices for inviting experts.

The Team then tracks and relays the responses to the Chair(s) and Panel Leads. When a Tier 1 candidate declines, the Chair(s) direct the Team to invite a specific expert from the next tier, continuing to balance needed expertise and diverse representation. Additional experts can be added to the list, if needed.

9. Develop Pre-workshop Background Report

Timing: Begin 5 months prior to workshop
Responsible Party: Technical Workshop Committee and/or additional experts

A key ingredient for a successful workshop is the production of a pre-workshop background report to help participants prepare for the meeting. This factual report provides background on the workshop topic and updates its status, based on key papers and the latest publications. The report provides common context and language that will help participants reach a shared understanding of the fundamental issues and recent trends or developments in the workshop topic. This common ground is especially important in the international context, since developments in the topic areas may vary widely among countries. In addition, the report should refer participants to relevant papers, technology roadmaps, or assessments. Ideally, the chapters in the background report will align with the panel topics. This structure will help participants refer to the relevant sections when generating new ideas and research directions. As appropriate, the background report or excerpts may also be included in the final workshop report.

Drafting of the background report should begin about five months prior to the workshop so that it can be made available to participants four to six weeks before the event. This schedule should give the participants sufficient time to review it and start thinking about research opportunities. The Chair(s) or others on the Technical Workshop Committee should direct development of the report; they may choose to draft it themselves and/or solicit assistance from other experts.

Inviting Experts: Best Practice

The following techniques can boost invitation acceptance rates by invited experts:

- Clearly state the importance and impact of the workshop. For example, what is the expected outcome and how will it be used?

- Mention the highly placed meeting sponsors, such as country energy and/or research offices and affiliated universities.

- List the names of the Chair(s) or other well-known experts involved in the workshop.

- Send invitations at least four months in advance of the workshop.

- Identify contacts who know the targeted experts and supplement the formal invitations with personal outreach.

- Set up a professional-looking website with clear information.

- Choose an attractive location and convenient meeting date (e.g., avoiding national holidays and religious holy days).

10. Develop Agenda and Plan Sessions

Timing: 4 months prior to the workshop
Responsible parties: Technical Workshop Committee, Panel Leads, and Support Team
Example agenda: Appendix H

Drafting the workshop agenda and planning the workshop plenary and panel sessions (see *Section 5*) go hand in hand. They are iterative processes that will require updating as the workshop takes form. The main elements of the agenda, such as the number of days in the workshop and the amount of time devoted to each panel sessions, should be agreed upon early in the planning process. Refinements to specific time slots for the sessions, speakers, and presentation topics can be made closer to the workshop date. Small changes to the agenda may be needed up until just a few weeks before the workshop.

The R&D Opportunities Workshop agenda typically uses the following general structure:

- Opening plenary
- Panel sessions in small groups
- Closing plenary
- Writing session

A description of each part is provided below. A workshop may include other plenaries in addition to the opening and closing ones (see below). It is ultimately up to the Chair(s) and the Technical Workshop Committee, with assistance from the Support Team, to determine the most effective design for their workshop. The guidance herein provides an approach that has been effective in similarly focused R&D Opportunities Workshops.

In developing the agenda, bear in mind that the workshop is a valuable opportunity for experts in the field to network with one another, inspiring new approaches or solutions. If possible, the agenda should include ample opportunity for networking—either through informal gatherings or more structured interaction.

10.1 OPENING PLENARY

The opening plenary serves numerous functions:

- Gather and welcome all participants
- Highlight the importance and aims of the meeting
- Provide an overview of what is expected of the participants during the workshop
- Provide high-level background on the core topic and define key terms
- Present the challenges that workshop seeks to address

> **Opening Plenary: Best Practice**
>
> Keep the opening plenary short (½ day at most). Plenaries are useful for one-way communication to large groups but are not conducive to deep discussion. Participants are likely to listen alertly for a few hours but can become disengaged if the plenary is too long. A shorter plenary allows more time for active discussion in the panels.

- Provide instructions for the panel sessions and make logistics announcements.

The opening plenary is attended by all participants and is therefore usually held in a large room or auditorium. A representative from the Technical Workshop Committee (see *Section 2.1*) usually opens the plenary by introducing the senior-most official from the host country in attendance at the event. That senior official then welcomes participants and makes opening remarks that underscore the importance of the workshop. The official is followed by the Chair (or Chairs), who provides an overview of the workshop, the workshop charge, the long-term goal or vision for the topic, desired workshop outputs, and how the outputs will support the long-term goal. The Chair(s) should also explain the roles of participating experts and observers. The Chair(s) or Panel Leads may provide brief overviews for each panel topic so that all attendees understand the scope, boundaries, and any overlaps with other panels.

The opening plenary should ideally feature two or three speakers who can concisely provide context for the core topic and introduce overarching issues or challenges. They may talk about the status of the technology (e.g., summarizing the

Opening the Plenary

Presentation slides should be pre-loaded on a laptop connected to the projector and tested prior to the session. Microphones or lavaliers should be set up for the speakers, and at least two roving microphones should be available to take questions from the audience (see *Section 12*).

Support staff should be assigned to keep the opening plenary on schedule, holding up cards to let speakers when their time is nearly up. Some flexibility should be built into the agenda for questions and overruns. Note takers may be used to capture key messages from the speakers and from discussions elicited by questions from the audience. If the speakers grant permission, copies of the presentation slides may be posted on the website or used in the final report.

Example set-up for plenary session

background report), critical scientific challenges that the workshop seeks to address, or high-level perspectives from different sectors (e.g., academia, industry, government). A representative from Mission Innovation should also be introduced at this opening plenary so that participants understand the link between the workshop objectives and the goals of Mission Innovation.

Plenary sessions are usually held at the opening and closing of the workshop. However, a plenary may be held at the end of each day to briefly share the findings of the panel sessions and identify areas of potential synergy or overlap between panels. These sessions may provide additional slots for plenary Speakers.

> ### Plenary Speakers: Best Practice
>
> To assure relevance and avoid redundancy, provide clear guidance for plenary Speakers regarding the length and focus of their talks. For example, one might describe the state of current technology or key challenges unique to a sector. The scope covered by plenary speakers should be relevant to all panels, not just a subset or single panel.

10.2 PANEL SESSIONS

Panel sessions are held in separate, smaller rooms so that groups of about 10-20 experts (at least 6 and no more than 25) may delve deeply into pre-defined sub-topics of the workshop. Panel sessions constitute the core of the workshop; they are the engine that drives the workshop toward meaningful findings. During these work sessions, the Panel Leads help each group come up with ideas that can then be discussed and analyzed in depth. The panel sessions take up a majority of the allotted time for the workshop and can last anywhere from one to three days. Key purposes of the panel sessions are to:

> ### Report Outline: Best Practice
>
> A workshop report outline should be developed prior to the workshop. During the opening plenary, note-takers can use the outline as a template for organizing their notes on presentations by plenary speakers.

- Enable substantive and detailed discussions on a certain aspect of the workshop topic

- Ensure the panel group has a common understanding of main elements of the current state of technology in the sub-topic area (if necessary)

- Ensure the group recognizes and understands the key scientific and research challenges facing the sub-topic area (if necessary)

> ### Panel Preparatory Materials
>
> Panel Leads plan their session process, focus questions, and templates (with examples) in advance of the workshop. Panel Leads may send these materials to experts on their panel prior to the meeting along with the background report (see *Section 9*) and any additional suggested reading.

- Identify the research directions most likely to have the greatest impact in addressing the challenges or meeting the goals of the workshop topic

- Find synergies and identify opportunities for potential collaboration among MI countries.

The Panel Leads run the panel sessions (see box). To perform this task properly, the Panel Leads must have strong technical and scientific expertise in the panel sub-topic area, possess strong listening and communications skills, and be able draw ideas out from a group (see *Section 6.1*).

Careful planning prior to the workshop is essential to deliver the desired panel outcomes and make each session a success. The Chair(s) and others on the Technical Workshop Committee may work with the Panel Leads to determine the specific outputs that they expect each panel session to deliver.

Highly specific guidance on the desired output will generally be most helpful for the panels. For example, the guidance may specify that by the end of the first day, each panel should have identified three or four significant scientific challenges in the sub-topic area and generated 5–10 research directions to address those challenges. By the end of the second day, panels may be expected to have selected 3–5 top research priorities and identified several opportunities for collaboration on each. By the end of the workshop (at the conclusion of the writing session), each panel session may be expected to produce one or two pages describing each of up to three priority research directions and associated collaboration opportunities. The Panel Leads should communicate these expectations and provide sample outputs to the panel participants prior to and during the workshop sessions.

Based on the desired outputs, Panel Leads develop a process for their session with guidance from the Technical Workshop Committee. The agenda and process used for generating the outputs in each panel session may vary among panels but should be broadly structured as follows (see *Appendix I* for an example Panel Lead Agenda):

- Introductions
- Overview and instructions

Panel Session Objectives for Panel Leads

- Confirm the purpose and intended outputs
- Explain the process and obtain buy-in from the group
- Manage the process, driving discussion toward outputs
- Keep the group on time and in scope
- Ensure everyone gets a chance to participate
- Implement the system for capturing content

Discussions with Panelists Prior to Workshop

Panel Leads work closely with panelists before, during, and after the workshop. Background materials are gathered and distributed to the panelists, potentially including a document on the panel topic and focus questions. Panel Leads might even collaborate with select experts to produce these materials. Meeting preparation could include group teleconferences or emails to go over the session strategy—priming participants to fully engage and contribute. If focus questions are shared prior to the workshop, Panel Leads should also distribute templates or sample responses and clarify as needed.

- Common understanding: discussion on the current state of technology and major challenges (if necessary)

- Idea generation: brainstorming of research directions (divergent discussion phase)

- Idea prioritization: analysis and selection of priority research directions (convergent discussion phase)

- Description and elaboration of priorities

- Opportunities for collaboration to address priority research

- Summary of findings for panel report-out

The panel sessions begin with **introductions**. Depending on the number of participants and the available time, Panel Leads might ask panelists to respond to an ice-breaker question during introductions. For example, each participant might be asked to state their name, affiliation, relevant subject expertise, and a favorite hobby or pastime unrelated to work. The objective is to establish a level of comfort and collegiality among the participants.

Following introductions, the Panel Leads should provide an **opening and instructions** for the group, going over the panel's objectives, the agenda and process, and ground rules. At this time it would also be appropriate to ask if anyone has questions.

The specific objectives, deliverables, and processes used in the panel sessions will vary by workshop. In general, the key objectives are the identification of priority research directions and collaboration opportunities. The primary deliverable is typically a short summary of the priority research directions that will appear in the workshop report. The process is outlined below.

Guidance for Panel Leads: Best Practice

The Chair(s) and others from the Technical Workshop Committee should provide guidance to the Panel Leads in planning their sessions yet give them some flexibility in deciding the format, selection of experts, assignment of roles, and even session duration (if meeting rooms are available). For example, some panels may prefer to reconvene in the evening, while others might prefer to stick to a traditional working schedule. Such flexibility allows Panel Leads to assume greater ownership and structure the session in a manner that maximizes the productivity of their set of participants.

In advance of the group discussion on research directions, the group will need a common understanding of the **state of technology and the major challenges**. This part of the session should be kept brief. The pre-meeting background report will have already introduced the 'state of technology' topic and, ideally, the opening plenary will have covered the major challenges. Nonetheless, experts have varying backgrounds and often hold differences of opinion on foundational subjects. Panel Leads must strike a balance between allowing enough discussion of these perspectives and moving the panel toward the next agenda items. Panel Leads may choose to provide a five-minute summary of the 'state of technology' materials (or ask another expert on the panel to provide the summary) and limit follow-up questions/discussion to another 10-20

minutes. The Panel Leads (or other designee) may take notes on a flip chart or on a projected screen during the discussion to capture the main points.

To identify key scientific challenges to the specific panel topic, the Panel Leads (or designee) may begin by summarizing applicable challenges identified during the opening plenary or based on personal knowledge. This summary may be projected on a screen or written on a flip chart. The panel should be given about 10-20 minutes to react to the summary and make additions or corrections. As experts, they will be knowledgeable on the topics, and it is useful to recognize any differences in perspective within the group. This part of the session is not intended to build consensus; disagreement among the experts on these topics should be accepted (and noted) by the Panel Leads. Disagreements should not prevent the group from proceeding to the next part of the session: generating research ideas for addressing key challenges.

The process for gathering input on research directions begins with an **idea generation step**. This step involves eliciting panelist responses to a carefully crafted **focus question**. Prior to the workshop, the Panel Leads work closely with the Chair(s) to define a good focus question, which has the following characteristics:

- Can generate a broad range of potential solutions to one or more of the identified challenges

- Elicits creativity and provokes deep thinking

- Does not have an empirically right or wrong answer

The group brainstorms a variety of responses to the focus question and briefly explains those responses. Participants should be encouraged to be creative and not bound by current limits or beliefs. Critiques and analysis are not allowed during this portion of the session. At this stage, the objective is to raise all relevant ideas, regardless of their practicality or other barriers.

While focus questions are presented during the panel session, they can also be shared with expert participants ahead of time to help them prepare. As homework, each participant may be asked to bring to the workshop at least one idea that answers the topic focus question. These initial ideas, along with those raised at the meeting, would then be brought up and discussed during the panel session to harness the group dynamic. Panels should take advantage of the multiple perspectives that experts from around the world bring to the table, draw from those, and

> ### Sample Focus Questions
>
> - What are the most important research directions needed to significantly reduce the cost and increase the reliability of components for off-grid PV?
>
> - What research areas have the greatest potential to enable dramatic reductions in the cost of post-combustion carbon capture from large industrial sources?

> ### Share Panel Templates: Best Practice
>
> Panel Leads should generate and share templates and/or example responses to focus questions to ensure that panelists understand the level of specificity they are expected to provide. For example, the template could specify:
>
> - One priority research direction
>
> - A short description of it
>
> - The potential impacts
>
> A similar template could be created for collaboration opportunities.

together develop ideas that are ultimately far more robust and innovative than those generated individually.

The panel session agenda should provide enough time for each participant to contribute an idea followed by a brief discussion and follow-up questions. If the focus question is not shared in advance of the workshop, Panel Leads should allow the participants several minutes during the session to think about the question before responding. After each participant has had the opportunity to present their first idea, the group will be encouraged to explore those ideas more fully (e.g., expand or elaborate on the research direction or potential impacts) and present any additional ideas. Depending on the time available and the number of participants, each response to the focus question should be limited to a few minutes of explanation or discussion. This rapid pace allows for more active conversation and helps keep participants actively engaged. As each participant speaks, the Panel Leads (or a designated note-taker) can list the key points on a flip chart, white board, or laptop hooked up to a projector (see adjoining box).

The **idea prioritization step** involves categorizing and then prioritizing the ideas identified during the idea *generation* step. The panelists need not reach consensus but should engage in discussion and healthy debate to organize, combine, and prioritize ideas. The result should be a short list of top ideas (e.g., 3–5 priority research directions) that will be included in the workshop report (*Section 11*). In advance of the session, the Panel Leads should consider potential schemes for categorizing and prioritizing the ideas and note some potential selection criteria (e.g., ability to have a long-term impact, likelihood of creating a technology breakthrough, etc.).

To begin categorizing, the Panel Leads may ask the participants to suggest categories for the ideas generated by the group. Through discussions moderated by the Panel Leads, each idea should eventually be placed in one of the categories, using a laptop-with-projector, flip chart, or white board. Categorizing helps the group refine and combine similar ideas. If just 3–5 categories are developed, each with priority research directions supported by similar or associated ideas, the group will have produced the desired output (e.g., 3–5 priority research directions). Alternatively, if the

Capturing Content

Flip chart or white board: Content at each stage can be captured by taking photos of the flip chart or white board. The Panel Leads should confirm with the panel that key elements have been captured accurately and completely before moving to the next step in the agenda.

Laptop and projector: Panel Leads (or designee) can take summary notes in real time on a laptop and project them onto a screen. The resulting notes are usually sufficient to capture high-level findings but not detailed proceedings. Since this can be a fairly intense process, Panel Leads or other designees may take turns at the laptop.

Techniques for Prioritizing Ideas

- Clearly define the criteria for assessing priority (e.g., potential for impact by 2020 or 2030, likelihood of success, diversity of research pathways, etc.)

- Ensure that each participant has a chance to voice their opinion on priorities

- Ask group to vote on their priorities

- Review the voting results with the group and consider amending ideas to bring in related concepts that did not quite merit priority based on the vote.

number of categories or ideas within categories are still too large, further refinement and prioritization will be needed (see text box entitled Techniques for Prioritizing Ideas).

Depending on the interactivity of the group, the number of participants, and the subject matter, the "idea generation" and "idea prioritization" steps together will require at least four hours and may take more than 12 hours. The Panel Leads will need to decide when to transition from the "idea generation" to the "idea prioritization" phase, taking care to spend adequate time on each of these steps. The compression and prioritization of ideas can be the most challenging part of the session to moderate as it is largely unscripted and may generate firm differences of opinion among panelists. Panel Leads should recognize that the panel's output need not represent a full consensus; the session may need to proceed to prioritization voting once panelists have had a chance to share their differing opinions, even if those opinions show no sign of converging.

The next step is to **describe and elaborate** on the selected priority research directions. Details are needed on each research direction, such as: its significance, the specific barriers or challenges it addresses, potential impacts, stakeholders and potential partners, milestones, timeframes, etc. This information is best gathered by dividing the panel participants into small subgroups of three to four people and assigning each subgroup to complete a worksheet for one or two priority research directions. An example worksheet is provided in *Appendix J*.

> ### Worksheets: Best Practice
>
> Design the worksheet to solicit more detailed expert *judgments* on the research direction, such as the reasons it is important. *Factual* details about the research directions can be added after the workshop. In addition, align the worksheet with Mission Innovation metrics (e.g., ask for experts' insights on expected medium-term impacts (by 2020) and long-term impacts (by 2030).

Panel sub-group completing a worksheet using oversized paper attached to the wall

Opportunities for collaborative research are another key outcome of the panels. To facilitate this outcome, observers from Mission Innovation countries may be encouraged to identify the research directions that their country might be interested in pursuing, potentially in collaboration with another country. During the panel sessions, these potential areas for collaboration can be captured by the Panel Leads on a flip chart or laptop, or panelists could add them to the relevant worksheets.

Depending on familiarity with country-specific interests and research capabilities, panelists may suggest specific projects on which two or more MI member countries might collaborate to effectively leverage resources or create synergies that would accelerate technology progress. After the workshop, MI representatives could communicate these suggestions to specific member governments as ideas for bi-lateral or multi-lateral collaboration.

Toward the end of the panel session (or at interim points during the workshop), each panel will develop **report outs** to summarize their findings for the plenary audience. These report-outs provide an opportunity for the experts and Mission Innovation representatives who attended other panels to ask questions or comment on the findings—often adding useful insight or opening new avenues of enquiry. Prior to the workshop, the Chair(s) should develop a template for the report-outs (see *Section 10.3*), often in the form of presentation slides (see *Appendix K)*, and share them with the Panel Leads. Reports-outs presented at the closing plenary typically draw from the completed worksheets.

> ### Coordinating Among Panels
>
> A successful workshop typically requires both "on-site" participation and "behind the scenes" planning and execution. During the parallel panel sessions, the Chair(s) play a key role in ensuring that the sessions and agenda proceed as planned. To do this, the Chairs float among sessions to observe and provide guidance as needed.
>
> Panel Leads, Chairs, and others on the Technical Workshop Committee may wish to convene informally at the start and/or end of each day to discuss progress. This informal meeting can help to identify and adjust for any overlaps in the ideas generated by separate panels. The meeting also allows the Chair(s) to identify overarching themes emerging from the

10.3 CLOSING PLENARY

The workshop ends with a closing plenary session that highlights salient findings and next steps. Specifically, the closing plenary should accomplish the following:

- Summarize findings via report-outs from each of the panels

- Allow time for the audience to ask brief questions or provide an observation on each report-out presentation

> ### Closing Plenary: Best Practice
>
> Keeping the report-out presentations brief will help maintain a high energy level among the participants and allow more time for interactive questions and answers. The closing session follows consecutive days of a tiring workshop; participants will appreciate succinct summaries.

- Identify overarching themes uncovered during the workshop

- Articulate next steps and future plans

- Thank the attendees

The closing plenary draws solely on the information gathered during the panel sessions and should not introduce new material. Each panel delivers a short report-out presentation (about 10-15 minutes) to convey its key findings and conclusions, including the selected priority research directions (possibly noting details from the worksheet, such as elements, timing, and impacts) and identified opportunities for collaboration. A sample template for report-out presentation slides (to be completed during the panel sessions) is provided in *Appendix K.*

During the panel report-outs, the Chair(s) should be looking for key themes and noting challenges or solutions that crosscut different topic areas. There may be a dedicated crosscutting panel that touches on most or all of the key themes, challenges, or solutions—but in less depth than the topical panels (see *Section 5*). The Chair(s) should present their perspective on the overarching findings from the workshop and outline the next steps for drafting and communicating the report. In addition, a representative from the host country or Technical Workshop Committee may discuss linkages between the workshop findings and Mission Innovation goals, highlighting potential collaborations identified during the workshop. At the conclusion, the workshop host should thank the attendees and adjourn the meeting (except for the writers).

10.4 WRITING SESSION

This session is held at the end of the workshop so that selected participants (Chair(s), Writers, Panel Leads) can write the first draft of the workshop report (see *Section 11*). While the report is drafted immediately after the workshop, the Chair(s) should sketch an outline of the report prior to the workshop. This outline and

Workshop writing session, with chapter writers placed at the same tables to facilitate collaboration

the specific writing assignments are communicated to the Panel Leads and Writers in advance of the workshop, so that the writing team is well prepared. The outline also helps provide an understanding of the type of content that should be captured for the report during the panel sessions. The Chair(s) and Panel Leads will manage the distribution of work among the Writers. (e.g., a single Writer may be assigned to write a report section for one or more priority research direction or collaboration opportunity).

The advantage of holding a writing session at the workshop is to capture the summarizing thoughts and details from the experts while the panel discussions and topics are still fresh in their memory. It also helps maintain the momentum from the workshop—before experts return to their regular jobs—and allows the writers to collaborate in person. This approach also helps avoid gaps in content or overlap between sections.

Checklist for Producing a Useful Workshop Report

- ☐ Identify and invite the right experts
- ☐ Develop preparatory materials such as pre-workshop background materials
- ☐ Develop guidance on expected outputs for panels; provide samples
- ☐ Develop detailed agenda for panel sessions
- ☐ Develop well-crafted focus questions
- ☐ Develop criteria for prioritizing ideas
- ☐ Develop worksheet for experts to complete during panels sessions to elaborate on selected priorities
- ☐ Develop report-out template to help panels structure and present their findings
- ☐ Determine how content will be captured during workshop
- ☐ Assign roles for participants on panel, such as note-takers and writers
- ☐ Develop workshop report outline prior to meeting
- ☐ Inform writers of expectations and share preliminary outline for workshop report
- ☐ Contact panelists via email and/or conference calls prior to meeting regarding pre-workshop background materials, templates, expectations, etc.

11. Workshop Report

Timing: Outline prior to workshop, collect content and develop first draft during workshop, and finalize about two months after workshop
Responsible parties: Writers, Panel Leads, and Technical Workshop Committee

The main deliverable of the workshop is a report that clearly details the workshop findings. This report should include the following elements:

- Executive summary

- Introduction: Discussion on current state of the science or technology and key major challenges

- Results
  – Describe priority research directions
  – Describe collaborative opportunities
- Conclusions and Next Steps

The workshop report is intended to serve as a key resource for the international research community, governments, and the private sector, helping to inform national R&D policies and programs. Mission Innovation members may draw on the report findings to launch collaborative research efforts or refocus their research programs/portfolios to include priority research directions.

The final report should communicate key findings in language that can be easily understood by non-scientists, but it should also provide the scientific community with the rich technical details required to clearly define the priority research directions and opportunities discussed in the panel sessions. For example, the executive summary may be developed for a non-scientific audience while the main body of the report provides greater technical detail. Well-crafted reports make use of figures, side bars, and other visual elements that help explain and highlight important points.

The outline for the report that was developed prior to the workshop (see *Section 10.4*) will guide the collection of content during the meeting, the structured writing session on the final day of the workshop, and the ensuing post-workshop development of the report.

The report introduction may incorporate sections of the pre-workshop background materials, notes from the opening plenary presentations, and findings from related panel session discussions. The core of the report—the workshop findings—will be drafted by the Chair(s), Panel Leads, and designated Writers during the writing session of the workshop. These initial drafts can be completed after the workshop and delivered to the Chair(s) on a pre-established timeline (generally in about three weeks). Figures, graphs, side bars and other elements should be added within this timeframe as well.

Appendices should include, at a minimum: the list of experts for each panel, list of observers, agenda, and relevant pre-workshop background materials. The Support Team may need to assist in compiling and assembling the report. Once all of the sections have been drafted and compiled, a technical editor can review the entire report and edit for consistency.

The compiled draft is then circulated for review and feedback by the Chair(s) and the rest of the Technical Workshop Committee and Panel Leads. Panel Leads may opt to share the report or portions of it with select members of their panel to obtain clarification or verify accuracy and completeness. The Chair(s), with the support of the Support Team, will incorporate the edits and address feedback. Multiple rounds of review and feedback may be necessary. The final draft will undergo a quality assurance check (final technical edit) before the Chair(s) approve its publication, usually about two months after the workshop.

12. Logistics

Timing: Starting at least 6 months before the Workshop (some venues may require more lead time)
Responsible parties: Logistics Coordinator, Workshop Hosts

Planning and organizing logistics for a major international workshop requires a significant effort. Well-planned workshops run seamlessly, and the logistics go unnoticed by participants. Achieving this seamlessness requires extensive and careful planning. Any problem with the logistics—meeting rooms, venue, registration, equipment, meals, etc.—can have a negative impact on the entire event.

Successful logistics planning requires a designated Logistics Coordinator with substantial international event planning experience (see *Section 2.1*). While the logistics for a Mission Innovation R&D Opportunities Workshop are fairly similar to those for other international workshops, a few considerations are specific to these workshops. This section provides the basic elements of logistics planning specifically for MI R&D Opportunity workshops.

12.1 LOGISTICS PLANNING

- **Select Workshop Dates:** Avoid major holidays (even if the holiday is not observed in the host country). Consider dates just prior to or following another major workshop/conference that is likely to attract many of the same experts. If many target participants are in academia, consider typical academic calendars. Ideally, several potential dates can be chosen to allow some flexibility in selecting and securing the specific location and venue.

- **Select Location:** Consider accessibility in terms of travel (e.g., proximity to major international airports, ease of travel to and from the base locations of many participants). In some cases, the climate for the location must be taken into account (e.g., avoiding winter in a cold climate or summer in a desert), although "shoulder" or "off-peak" seasons can offer venue discounts (see box).

- **Select Venue:** Consider holding the workshop in a hotel with conference facilities. Although hotels can be more pricey, they are often more convenient for participants and offer full-service meeting rooms. "Full service" may include room set-up, audio/visual equipment, meals, beverage breaks, and technical support. Hotels may also offer room blocks for guest lodging.

The venue should be "right-sized" to comfortably accommodate all parts of the workshop (i.e., the right number of appropriately sized rooms for the plenary, panel sessions, and meals). The venue must offer equipment and technology support throughout the duration of the workshop, or if it does not, it must allow third-party vendors to provide this service. If catering is not available, the venue should be near a choice of restaurants for lunch and dinner.

> **Location Tip**
>
> Workshops held during an off-peak travel season can reduce travel and venue hosting costs and increase the available options. Even meetings held at resort facilities during the off-peak can be less expensive than facilities held in major cities during the same season.

Venues often vary considerably in terms of quality, cost, and pricing structures, so this is one area in which it pays to "shop around." Include the cost for all meeting rooms, equipment, meals, service, etc. when comparing prices—not just meeting room rental fees. Most arrangements can be negotiated with the venue or vendor. Retain an experienced Logistics Coordinator to identify options and negotiate terms.

- **Identify Equipment and Materials Needed:** Equipment needed for the various sessions should be determined by the Chair(s) with assistance from the Support Team (see *Appendix L*). The Logistics Coordinator will make the arrangements with the venue.

- **Determine Room Set-Up:** Room setup plays a valuable role in encouraging active engagement and discussion among participants. Panel rooms, in particular, should be arranged so that experts are able to see each other and also have a clear view of the presentation screen or flip chart. Often, a U-shape table arrangement works best. In such an arrangement, the Panel Leads are seated at the top of the "U." (See *Appendix M* for additional options and details).

Example room setup for panel session

- **Determine Meals and Catering:** Workshop Hosts provide attendees with lunch; depending on the meeting start time, they may also provide breakfast. Dinners are normally not provided by the Workshop Hosts. In-house catering services are often the only onsite lunch option. Although it is generally more costly than outside options, it is fast and convenient for participants. Catering options should take into consideration any dietary restrictions, which can be gathered during the registration process on the workshop website (see *Section 7*). Healthy snacks, coffee, tea, and water should also be made available. Nearby restaurant options for dinner should be provided to the participants in the logistics information.

- **Collect Logistics Information:** Gather logistics details and communicate all relevant or important information to participants (see side bar).

- **Assess Need for Interpretation Services:** The workshops are not expected to provide interpretation services unless they are offered by the host country itself. These workshops are working sessions with highly specific technical terminology that may be extremely difficult for most translators to follow.

- **Develop Meeting Materials:** A simple logo or standard design can be developed to brand the workshop and associated materials. The logo/design should appear on all workshop materials and the website. The Mission Innovation logo should also be used where appropriate. Contact the MI Secretariat (secretariat@mission-innovation.net) to obtain a high-resolution version of the Mission Innovation logo.

  Printed materials should be generated at least one month prior to the workshop. Some last-minute adjustments can be made to the badges, name tents, and lists of participants. Printed meeting materials include the following:

  - Signs: Depending on the layout of the venue, a few large signs (about 2' x 3') may be printed with the workshop name and logo and placed in the lobby to direct participants to the plenary room. Smaller signs may be posted outside the entrance to each panel room.

  - Workshop Booklet or Folder with the following information:
    - Final agenda
    - List of participants and observers
    - List of speakers with short bios and/or overview of presentation topic
    - Basic logistics information, including restaurant options in the area and a floor map of the venue (with panel rooms clearly marked)

Logistics Package

About eight weeks before the workshop, the Logistics Coordinator should develop detailed information for the participants, including:

- Information about the venue and a web link

- Travel information, including nearby airport(s), shuttles, and car services, with approximate prices for local travel to and from the airport(s)

- Hotel information:
  - Addresses
  - Links to websites
  - Links to registration and/or contact information
  - Room block passwords, prices, and closeout dates

- Visa information can be posted to the workshop website and circulated to attendees via email. It is a good opportunity to remind attendees to check whether a visa will be needed.

Note: Some non-hotel venues require advance paperwork from non-citizens for entry to the venue (for example, if the workshop will be held in a government office building). Be sure to provide this paperwork to attendees well in advance and track its submission and approval.

- Badges and name tents for all participants, including several blank ones
- Copies of the Pre-Workshop Background Report
- Other working materials, such as report outlines or worksheets for the panel sessions.

12.2 LOGISTICS EXECUTION

Many logistical details must be addressed or rechecked immediately prior to and during the workshop. Accurate execution of these details is the responsibility of the Logistics Coordinator and assistants.

- **Coordination with Venue Staff:** The Logistics Coordinator should communicate and work closely with venue staff regarding specific requirements for the workshop and any last minute changes (e.g., changes to room set-up, catering/meals, and equipment needs). The Logistics Coordinator should also obtain a list of emergency points of contact—including the venue events manager, the lead technician supporting the audio-visual equipment, and the person in charge of catering for the event—in case of unforeseen issues.

- **Onsite set-up:** On the day prior to the workshop or the morning of the event, the Logistics Coordinator, with assistance from venue staff, sets up the registration table in a central location near the opening plenary room and lays out the workshop booklets, other handouts, badges, badge holders, and name tents (for the panels). Signs should be placed at designated locations so that participants can easily find their way to the registration area and meeting rooms. The Logistics Coordinator should check that each room is set up according to plan, including table arrangement, number and placement of chairs, and audio-visual equipment (presence and functionality). A trial run should be conducted of connecting a laptop and using the projection screen should be conducted. Lavaliers or a podium microphone should be prepared for speakers in the plenary, and at least two roving hand-held microphones should be available for questions.

- **Registration desk and participant check-in:** A logistics team member or members will attend the registration table to greet workshop attendees as they arrive. This person checks the names of all arrivals against the registration list, marks the list, and provides the attendee with their badge, agenda, and other handouts. Non-registered participants seeking to join the meeting should first be cleared by the Chair(s) or another member of the Technical Workshop Committee. Blank badges should be available to print or fill out quickly, as needed.

- **Onsite support during the workshop**: Throughout the workshop, either the Logistics Coordinator or a logistics team member must be readily available (at the registration desk or in a prominent spot at the venue) to handle any technical or logistics issues or requests. This person will be the go-to person if any troubleshooting is required, and their mobile phone number should be given to the Chair(s), Panel Leads, and Workshop Host representative.

13. After the Workshop

Timing: Starting immediately after the Workshop
Responsible parties: Chairs/Technical Workshop Committee, Writers, Panel Leads, Logistics Coordinator, Workshop Hosts

Following the workshop the primary remaining task is to develop the workshop report (see *Section 11*). When finalized, this report will be distributed to workshop attendees and other Mission Innovation representatives. The simplest way to distribute the report is to contact the MI Secretariat and request that it be posted on the Mission Innovation website (www.mission-innovation.net). Notify stakeholders via email with a link to the report.

> **Thank-You Notes: Best Practice**
>
> Send follow-up notes to all participants, thanking them for contributing their time and expertise. Let them know, in as much detail as possible, how their contributions will help to accelerate clean energy innovation. See *Appendix O* for an example.

Another recommended follow-up activity is to send a brief survey to all workshop attendees requesting feedback that could help improve future workshops. Questions could cover venue suitability, the length and usefulness of the plenaries, and the effectiveness of the panel sessions and their format. Be sure to include space for other general comments. Lessons learned through either the survey or the workshop itself should be shared with the Workshop Planning Team and MI Secretariat for consideration in planning future events. An example survey is provided in *Appendix N*.

Appendices

A. Illustrative Budget

B. Considerations for Travel Expense Reimbursements

C. Sample Concept Document

D. Sample Participant List and Tracking Spreadsheet

E. Sample Invitation Letter

F. Background on Bibliometric Analysis

G. Sample Workshop Website

H. Sample Agenda

I. Sample Panel Session Agenda

J. Sample Deep-dive Worksheet

K. Sample Report-out Presentation Template

L. Equipment and Materials

M. Room Setup Options

N. Sample Post-meeting Participant Survey

O. Sample Post-meeting Follow-up Note

Appendix A. Illustrative Budget

		Day 1	Day 2	Day 3	Total
Meeting room rental, including setup and takedown					
Plenary - classroom setup for 100; theater for additional 50		$ 5,000	$ 5,000	$ 5,000	
5 Panels - Each with U shape setup for 20		$ 7,500	$ 7,500	--	
Wifi		$ 500	$ 500	$ 500	
Service and tax	30%	$ 3,750	$ 2,250	$ 1,500	
					$ 39,000
Audio/visual for plenary					
Screens		$ 1,500	$ 1,500	$ 3,000	
Rear screen projector		$ 400	$ 400	$ 400	
Wireless microphone for podium		$ 100	$ 100	$ 100	
Wireless lavalier (2)		$ 200	$ 200	$ 200	
Roving microphone (2)		$ 200	$ 200	$ 200	
Confidence monitor		$ 250	$ 250	$ 250	
Laptops		$ 500	$ 500	$ 500	
Sound mixer and speakers		$ 250	$ 250	$ 250	
Laser pointer		$ 50	$ 50	$ 50	
Power strips		$ 200	$ 200	$ 200	
Onsite technician		$ 500	$ 250	$ 250	
Service and tax	30%	$ 1,245	$ 1,170	$ 1,620	
					$ 17,485
Audio/visual equipment for 5 panels					
Projector and screen package		$ 5,000	$ 5,000	--	
Easels, flip charts, white board, power strips		$ 1,000	$ 1,000	--	
Service and tax	30%	$ 1,800	$ 1,800	$ -	
					$ 15,600
Food and Beverage					
Fruit, light breakfast		$ 3,000	$ 3,000	$ 3,000	
Buffet lunch		$ 6,000	$ 6,000	$ 6,000	
Breaks - tea/coffee/snacks		$ 2,250	$ 2,250	$ 2,250	
Service and tax	30%	$ 3,375	$ 3,375	$ 3,375	
					$ 43,875
Registration Fee					
Participant fee received for attendance					$ (10,000)
Materials					
Paper handouts		$ 500			
Signs		$ 1,000			
Name badges		$ 200			
Badge holders; lanyards		$ 250			
Table tents		$ 200			
Shipping		$ 500			
					$ 2,650
Labor -Planning support team, web developer, logistics team					
Planning and preparation		$ 60,000			
Onsite assistance		$ 10,000			
Follow-up and report production		$ 25,000			
					$ 95,000
Travel					
Workshop planning team (including chairs and technical worksho		$ 24,000			
Panel leads and plenary speakers		$ 20,000			
As-needed travel support for additional experts		$ 20,000			
					$ 64,000
TOTAL					$267,610

NOTE: THIS BUDGET SPREADSHEET IS FOR ILLUSTRATIVE PURPOSES. ACTUAL COSTS WILL VARY
CONSIDERABLY BASED ON NUMEROUS FACTORS UNIQUE TO THE WORKSHOP, LOCATION, DATE, ETC.

Key assumptions
100-150 workshop participants
Venue: Moderately priced hotel with conference facilities
Location: Near city with major international airport
Workshop duration: 3 days

Appendix B. Considerations for Travel Expense Reimbursements

The host country may choose to pay some or all of the travel expenses for participating experts. If the host country decides to cover any of these costs, a system or guidance should be set up as early as possible to clarify who is eligible for travel reimbursements and which expenses will and will not be paid. The following are some considerations:

- Will flights and/or hotel rooms be paid in advance, or will the traveler be reimbursed? Hotel rooms can be easily paid as part of an overall contract; paying for travel in advance is more complicated, as prices may change between the request and the booking.

- What approvals are needed?

- How will the payments be handled?

- How many nights at the hotel will be covered? Will this vary with individual travel logistics?

- Will economy/coach/business/first-class flights be covered? If not, how will the portion covered be determined? Will coverage vary with individual travel logistics?

- Will meals not already provided at the workshop be covered?

- Will gratuities be covered?

- Will any hotel amenities (e.g., Wi-Fi in the rooms) be covered?

Once these decisions have been made, a system should be established to track expenses. A form can be developed for eligible attendees to complete and submit, along with receipts (in the case of reimbursement) or requested flights (in the case of pre-payment). A spreadsheet can be used to track the following information:

- Attendees eligible for reimbursement

- Amounts to be reimbursed

- Status of attendees' submitted requests and paperwork

- Status of the payment (submitted for approval, approved, paid)

Another option, which is administratively simpler, is to offer each person who is eligible for travel reimbursement the same amount of funds, regardless of how far they need to travel or other cost considerations. Under this approach, each person would receive the funds and would not be required to save receipts, seek approvals, or submit expense forms. While this approach is more straightforward, a disadvantage of this option is that some participants may receive more funds than needed while others may not receive sufficient funds to cover their costs.

Appendix C. Sample Concept Document

R&D Opportunities Workshop on Energy Storage Technologies

Context

Energy storage technologies support energy security and climate change goals in developed and developing energy systems. These technologies play a crucial role in transitioning the world's economies to a low-carbon future.

While some energy storage technologies are mature or near maturity, high costs and performance challenges limit their widespread use. Many grid applications require high power quality and reliability 24 hours a day, seven days a week; even second-to-second fluctuations may cause major disruptions and incur costs in the tens of billions of dollars annually. Continued development of cost-efficient electricity storage is critical to meeting rising energy demands, effectively leveling the cyclic nature of variable energy sources (e.g., wind and solar), and enabling electric vehicles to match or exceed the range and convenience of internal combustion vehicles. A low-carbon future requires low-cost electricity storage devices with high energy and power densities, rapid recharge times, proven safety, and long service life.

Although energy storage devices have been available for many decades, fundamental gaps persist in understanding the processes that limit their operation and performance. A full understanding of these complex and interrelated processes will help to address existing technology gaps and meet future energy storage requirements.

To foster advancements needed for a low-carbon economy, [Country X] is organizing a three-day Mission Innovation R&D Opportunities Workshop on [Date] to focus on "Jumpstarting Electrical Energy Storage Technologies." Country X has set a goal to reduce its emissions by 20% (from 2005 levels) by 2030—and cost-effective energy storage solutions are crucial to meeting this goal. [Country X] envisions gathering about 100 experts from around the world at this workshop to identify the basic research needs and priorities for accelerating innovation and potentially achieving the needed technology breakthrough in energy storage.

Workshop Charge

Identify the top priorities for basic research and the most promising opportunities to accelerate progress in electrical energy storage, especially as it applies to transportation and the electric grid.

Objectives

This workshop will identify priority needs for basic research that could lead to the kind of breakthroughs needed to meet future energy storage requirements. The Workshop will assemble six panels of experts to focus on separate subtopics; each panel will identify up to three priority research needs as well as key opportunities for members of Mission Innovation and various sectors (government, industry, academia) to conduct collaborative research to address those needs. After the workshop, a detailed report summarizing the discussions and findings will be made available to inform R&D portfolio decisions by member

governments. [Country X] plans to use the workshop report to guide its R&D efforts and investments and to explore promising bi- or multi-lateral collaborative R&D opportunities.

Workshop Execution

The workshop will be held on [Date]. Location and venue TBD.

During the opening plenary session on the first day of the Workshop (June 25th), keynote speakers will provide an overview of the scientific challenges facing electrical energy storage solutions. Following the opening plenary, experts will divide into panels on the following six topics:

- **PANEL 1: Pathways to Simultaneous High Energy and Power**
  In electrical energy storage systems, a combination of electrical, ionic, structural, and chemical effects tend to impose a tradeoff between energy and power. Traditional high-power electrical energy storage systems typically have thin electrodes and require that a significant volume of electrically and ionically conductive material be added into the capacitor or battery electrodes; however, this approach reduces the available space for materials involved in energy storage. A high-energy system can be produced by doing the converse, but the resulting high internal resistances reduce the available power. Even energy storage systems such as flow batteries exhibit a tradeoff between energy and power, given the larger electrode areas and balance of system requirements for high-power flow batteries. In this panel session, participants will focus on identifying priority R&D needs that can help to simultaneously deliver high energy and power.

- **PANEL 2: Structure, Interphases, and Charge Transfer at Electrochemical Interfaces**
  The performance of electrochemical cells relies on the transport of ions, mass, and electrons at the various interfaces of the cell. These interfaces may be either explicit (e.g., solid electrode-liquid electrolyte) or implicit (e.g., between chemically distinct components in a composite electrode). The morphology and physical properties of materials that form these interfaces are important determinants of cell performance. Electrochemistry at these interfaces controls the chemical composition, morphological evolution, and time-dependent degradation of cell performance. There is a critical need for analytical and predictive methods that advance understanding and control of the electrochemical processes at cell interfaces. In this panel session, participants will identify priority R&D needs that enable rational design and synthesis of interphases required for advances in the field.

- **PANEL 3: Time-dependent Phenomena at Electrodes and Electrolytes to Extend Reliability**
  Degradation mechanisms determine storage viability but also pose atomic- to meso-scale mechanistic mysteries affecting storage reversibility and service life. Developing the ability to probe, identify, and quantify unwanted reactions (which are often subtle and happening at the electrode/electrolyte interfaces) will aid efforts to extend the service life of closed electrical energy storage systems with high energy densities. The need to mitigate any irreversible changes during the charge-discharge cycle calls for *operando* and/or *in situ* characterization methods, as well as advanced modeling and simulation methods that can reveal time-dependent behaviors in both the active electrodes and electrode/electrolyte interfaces. In this panel session, participants will identify priority R&D needs for long life and reliability.

- **PANEL 4: Discovery, Synthesis, and Design Strategies for Materials, Structures, and Architectures** Molecular/nano-scale and meso-scale design may ultimately serve material, structure, and architecture end goals, but they have not yet elucidated viable synthesis routes to the targeted materials and architectures. Experimental synthesis based on tailored molecular bonding/reactions shows promise. Statistical and machine learning of structure-architecture-behavior correlations are beginning to emerge, and synthetic design strategies for physiochemical material property control are needed. In this panel session, participants will identify priority R&D needs for discovery, synthesis, and design strategies for materials, structures, and architectures.

- **PANEL 5: Solid-State and Semi-Solid Electrochemical Energy Storage**
  Profound safety and performance benefits may be achieved by controlling side reactions, using higher-voltage and energy-dense electrodes, and potentially simpler materials and synthesis. There is a growing need (and opportunity) to better understand electrochemical potentials, mechanical effects, and reactions at interfaces in solid systems. In this panel session, participants will identify priority R&D needs pertaining to solid-state and semi-solid electrochemical energy storage.

- **PANEL 6: Crosscutting Themes**
  The design of energy storage devices (batteries and capacitors) for tailored applications is a balancing act (energy vs. power, service life, safety, cost, electrode, electrolyte, and the interfaces). Crosscutting topics include: emerging methods in multimodal characterization of energy storage with *operando, in situ* and *ex situ* experimental tools; theory and modeling approaches for fundamental science underlying battery performance and lifetime and their connection to battery technology metrics; and translation of basic science to technology innovation. A broad range of basic research needs common to all energy storage will emerge from this panel discussion.

Each panel will follow the same general structure, as outlined below:
- Overview of the topic, including definitions and scope
- Discussion on the current state of technology and key scientific challenges
- Idea generation for R&D needs
- Discussion and prioritization of R&D needs
- Identification of collaborative opportunities
- Summary of panel findings

Participants

We plan to invite about 150 experts, with the expectation that about 100 will be able to attend. We want to invite recognized experts in the field of energy storage, as described in the panel overview above. Each panel should have broad geographic representation and include two or more experts from industry. Most panel experts will be affiliated with universities, national laboratories, or other research institutes.

Appendix D. Sample Experts List and Invitation Tracker

List of Experts and Observers

Name	Institution	Country	Type of Institu	Email Address	Plenary Speaker	Panel Lead	Writer	Observer only	Tier	Field/Panel t	Invitation Sent	RSVF	Notes	Recommended by
Michelle Anderson	EFGF	Australia	Private Sector	anderson@yahoo.com	X				1	Biosciences	4-May	N		Host Govt
Sam Light	JHFG	Canada	Non Profit	Sam.light@JFHG.com	X				1	Organic chemist	4-May	Y	Agreed to be panel	Canada
Wan Zhang	LKJH	China	Government	zhang@cwea.cn				X	3	Inorganic Chemistry				Chair
Jamie Gonzalez	SDSD	Mexico	Academic	gon@unam.mx					2	Organic Chemistry				Chair
Stacy Center	ASDA	KSA	Private Sector	sc@yahoo.com					1	Organic Chemis	15-May	Y	Can attend Day 1 o	Host Govt
Abdul Sabouni	FFAA	UAE	Non Profit	as@bruce.com					2	Inorganic Chem	30-May	Y	Will need travel su	Host Govt
John Doe	ABCD	US	Academic	johndoe@univ.ed	X				1	Organic chemist	15-May	Y		Chair

(header group: "Potential Workshop Roles" spans Plenary Speaker, Panel Lead, Writer, Observer only)

Participant Diversity Summary

Country	# of Experts	# of Observers	Total
Australia	4	1	5
Canada	15	2	17
China	4	3	7
Denmark	2	0	2
Germany	3	1	4
India	7	0	7
Italy	4	1	5
KSA	1	1	2
Mexico	3	0	3
UAE	2	0	2
UK	12	0	12
US	19	1	20

Type of Institut	# of Experts
Academic	29
Private Sector	11
Non Profit	6
Government	30

Appendix E. Sample Invitation Letter

<div align="right">[Date]</div>

Invitation to: [Name of Workshop]

Dates: [TBD]

Where: [Venue]

                   [Location]

Dear [Name],

On behalf of [name of workshop host(s)/agencies], we are pleased to invite you to join us at the [Name of Workshop] in [location] on [dates]. Your expert understanding of [relevant area of science or technology] will be particularly valuable in helping to achieve the goals of this Workshop—which is part of the global Mission Innovation initiative launched in 2015 at the Paris Climate Conference.

The Workshop brings together top scientists and related specialists representing industry, government, and universities across [number] countries to identify promising research opportunities in the area of [workshop area]. Specific topics to be explored are as follows:

- Panel topic 1
- Panel topic 2
- Panel topic 3
- Panel topic 4

Twenty-three countries have joined Mission Innovation to accelerate innovations that improve the affordability of clean energy around the globe. Member countries focus collaborative research efforts on selected areas, known as "Innovation Challenges," to maximize their collective impacts. This workshop addresses the [name of innovation challenge] and constitutes a critical step in [goal of challenge]. Primary goals are to:

- Identify state-of-the-art technologies and practices used in [workshop topic areas]
- Identify critical R&D priorities in [workshop topic areas]
- Discuss high-impact investment opportunities for R&D and technology development

Workshop results will be published in a report for distribution to Mission Innovation members and research institutions worldwide. Information in the report may help to guide decisions by Mission Innovation countries regarding research priorities in [workshop topic areas], investments, and tenders.

This workshop is by invitation only, and this invitation is non-transferable. There is no registration fee for the workshop.

After an opening plenary session to share recent advancements in [technical area of workshop], workshop participants will spend most of their time with a specialized panel devoted to discussions on one of the four topic areas listed above. We will begin at [time] on [date] and conclude by [time] on [date].

For more information, please visit the workshop website at [url]. Logistics information, the workshop agenda, and information about pre- and post-meeting activities will be posted as they become available.

Kindly send your reply to this invitation to [email address]. We look forward to your participation in this important workshop.

Sincerely,

[Workshop Chairs]

CC:

[Workshop Hosts]

[Mission Innovation Points of Contact]

Appendix F. Background on Bibliometric Analysis

Bibliometric analysis can contribute to workshop success in several ways. It can be used to identify appropriate experts to invite to the workshop, identify research institutes to involve in the event or any follow-on activities, inform development of the pre-workshop report or other background materials, and guide implementation of collaborative research ideas identified at the workshop.

Bibliometric analysis or "bibliometrics" is the statistical analysis of bibliographies. It is a field of analysis that quantitatively examines a set of publications to identify patterns and trends. Bibliometrics can be widely applied to:

- Assess the influence of individual researchers, journals, institutes, and countries
- Assess the magnitude of research activity and productivity across fields
- Identify topical trends
- Characterize patterns of research collaboration and innovation ecosystems.

Given the rapid growth of academic outputs, bibliometrics provides an efficient method to assess volumes of published information—both qualitatively (e.g., identifying topical hotspots and research trends) and quantitatively (e.g., characterizing the temporal and geographic distribution of outputs, prominent researchers, and mainstream journals).

Bibliometrics to assist with identifying experts to invite to the workshop
A metric called the *h-index* attempts to measure the productivity and citation impact of publications by a particular scientist, scholarly journal, or institute. Findings from an h-index analysis on pertinent workshop topics can identify prominent and influential scientists, who may then be considered as potential experts to invite to the workshop. The influence of an individual researcher may be estimated using the h-index and number of total citations of a single article.

Bibliometrics to assist with pre-workshop report or other background materials
Bibliometrics can be used to extract the most-cited publications based on certain keywords. For example, *Table F.1* shows the most-cited articles for "carbon dioxide management" over a 20-year period. Highly cited publications may be useful resources for developing a pre-workshop report or other background materials. The publications may also be distributed for participant review prior to the workshop or summarized in the background section of the workshop report.

Useful background information about the workshop topic can also be gleaned from *content analysis*, a quantitative method for characterizing the coverage of a body of publications. It typically involves counting the incidence of various keywords and other aspects of the content, with the expected results of numbers and percentages (Gao, Hong, and Liu, 2017). This type of analysis enables an objective evaluation of content, helping to analyze "hot" research topics, characterize trends, and anticipate changes in research areas (Du, et al., 2014).

Table F.1. The most cited articles on carbon dioxide management, 1992-2011

Title of Article	Journal	Author	Country	Year of Publication	Total Citations	Citations per Year
Use of US croplands for biofuels increases greenhouse gases through emissions from land-use change	Science	Searchinger, T.	USA	2008	910	227.5
Large-scale impoverishment of Amazonian forests by logging and fire	Nature	Nepstad, DC	USA	1999	559	43.0
Inter-annual variability in global biomass burning emissions from 1997 to 2004	Atmospheric Chemistry And Physics	van der Werf, GR	Nether-lands	2006	457	76.2

Co-word analysis is a specific technique used in content analysis to map the co-occurrences of key words (*Table F.2*), thereby indicating the strength of association between words in textual data, and to identify relationships and interactions between the topics and emerging research trends (Wang, et al., 2016). By presenting quantitative information in multidimensional graphs, co-word analysis may offer an advantage over other content analysis methods (Han, et al., 2014; Zheng, et al., 2016).

Table F.2. Top 20 mostly frequently used keywords during 1990-2016.

Keywords	Total Frequency	Rank				
		1990-1995	1996-2000	2001-2005	2006-2010	2011-2016
Renewable energy↑	1,351	6	10	3	2	1
Biomass	871	1	1	2	5	6
Solar	809	9	6	10	8	4
Wind	519	11	17	15	11	13
CCS↑	1,311	13	13	8	1	2

Bibliometrics to identify countries and research institutes to involve in the workshop or follow-on activities

Typically, bibliometrics are generated from an originating search based on the inclusion of one or more Boolean keyword search queries, such as "solar" or "photovoltaic" and "energy" or "electricity." Alternatively, the search query could specify "energy" and "carbon capture and storage" or "CCS" or "carbon sequestration." The data examined in bibliometric analysis is often collected from the database of the Science Citation Index Expanded (SCI-Expanded) or the Social Sciences Citation Index (SSCI). Findings can reveal which countries and research institutes are the most prominent publishers in a given topic (see Figure F.1). Chairs and Panel Leads may want to use these findings to ensure these countries and institutes are adequately represented at the workshop or engaged as potential partners for specific follow-on activities based on the final workshop report.
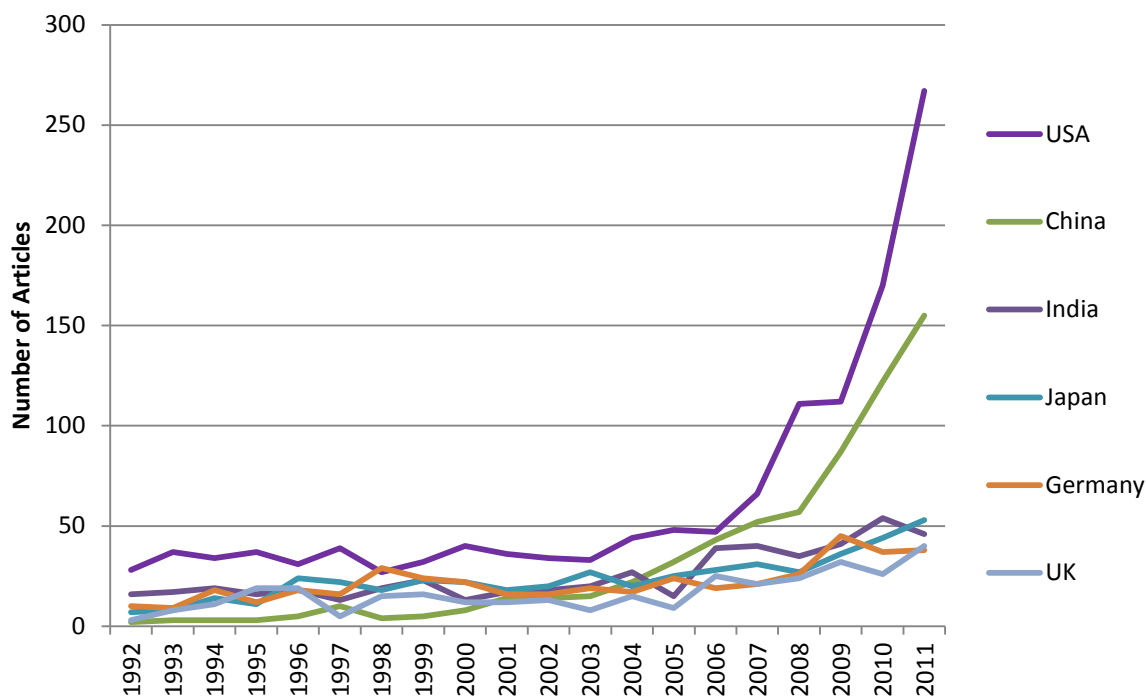
Figure F.1. Countries with the greatest number of publications pertaining to solar energy (Du, et al., 2014)

In addition, generating *relationship maps* can reveal information about the nature of research collaborations within and across countries (see *Figure F.2*). This may shed light on how leading institutes and authors are able to exert strong influence in certain fields, leading to a better understanding of the innovation ecosystem of different institutes and countries (Tang, Shapira, and Youtie, 2015).
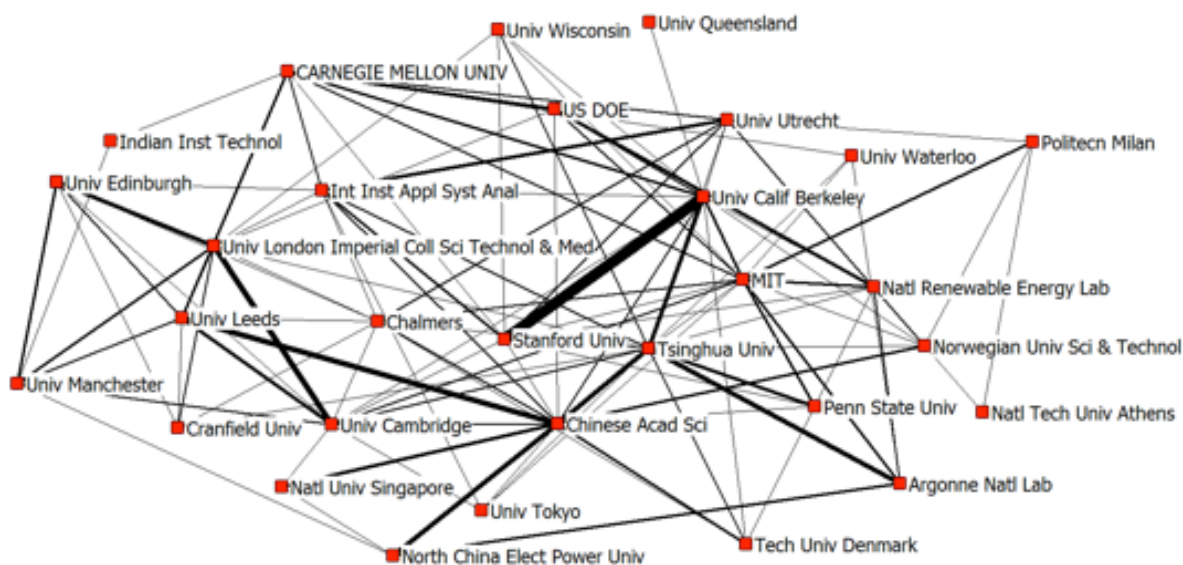

Figure F.2. Relationship map illustrating co-authorship of publications on low-carbon electricity, 1990-2016 (Wang, Wei, and Brown 2017)

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Appendix G. Sample Workshop Website

Home | Background | Agenda | Registration | Venue/Travel | Contacts

11-14 September 2017

ENERGY MATERIALS
INNOVATION WORKSHOP

Expo Santa Fe in Mexico City

REGISTER   LEARN MORE

About the Workshop

The Energy Materials Innovation Workshop will bring together experts from around the world to identify critical research and development (R&D) priorities and gaps in clean energy materials innovation processes and explore opportunities for deeper collaboration.

The invitation-only workshop will convene more than 50 preeminent scientists and experts in advanced theoretical and applied physical chemistry/materials sciences, advanced computing, machine learning, and robotics. Attendees will engage in technical discussions on the state of the field, pre-competitive R&D opportunities, and promising R&D directions. The workshop will include brief plenary presentations and will emphasize small breakout group discussions on high-impact areas.

Traditional cycles of discovery require a tremendous level of effort, taking several years to take each newly discovered molecule through simulation, synthesis and testing, and synthetic procedures. To accelerate this process, this workshop will identify and explore opportunities for combining high-throughput synthesis, high-throughput calculation, and high throughput characterization and apply it to materials discovery. The overarching goal is to combine individual research pathways into an integrated materials innovation approach or "platform." The focus of this workshop is on platform discovery (not focused on specific materials) for:

* Nanomaterials and composites
* Inorganic functional materials
* Organic functional materials

It will not cover processes for structural materials.

Specifically, the workshop will accomplish the following:

* Reveal and understand the tools and platforms being used for materials discovery worldwide
* Identify critical R&D priorities and gaps in each part of the innovation chain for energy materials:
    * Discovery, including theory and computational modeling
    * Synthesis
    * Performance assessment
    * Data analysis
    * Process design and scale-up
* Identify high-impact investment opportunities for R&D and technology development in materials innovation worldwide
* Promote capacity building
* Share information and uncover opportunities for cross-country and multi-partner collaboration and joint research

This expert workshop is part the Clean Energy Materials Innovation Challenge and a global initiative called Mission Innovation. See background for more details.

Outcomes

The results and conclusions of this expert workshop will be published in a detailed report that will be distributed to the 23 Mission Innovation (MI) members' and research institutions worldwide. The report will provide input to inform Mission Innovation countries' decisions regarding research investments, tenders, and priorities in energy materials innovation.

MISSION INNOVATION
Accelerating the Clean Energy Revolution

BACKGROUND

Mission Innovation

Mission Innovation (MI) is a global initiative launched by 20 heads of state, November 2015, in Paris. MI's goal is to accelerate public and private energy innovation to address global energy challenges, make clean energy affordable to consumers, and create jobs and commercial opportunities in the energy sector. Together, the 20 founding partner countries represent 75 percent of the world's carbon dioxide (CO2) emissions from electricity and over 80 percent of the world's clean energy research and development (R&D) investment. Over the past year, MI added three new members: the European Union, Finland, and the Netherlands.

MISSION INNOVATION
Accelerating the Clean Energy Revolution

Clean Energy Materials Innovation Challenge

This expert workshop is part of MI's Clean Energy Materials Innovation Challenge, which is one of seven Innovation Challenges—technology areas where MI countries believe increased international attention would significantly accelerate the global transition to low-carbon economies.

The ultimate goal of this Innovation Challenge is to accelerate the exploration, discovery, and use of new, high-performance, low-cost clean energy materials by an order of magnitude. Participants in the Materials Challenge aim to do this by automating and/or improving each step of the innovation chain of new materials, with the goal of leveraging these to enable an integrated, end-to-end materials innovation approach or "platform."

The Materials Challenge will benefit a wide range of energy sectors and applications. Materials discovery is a key element of the innovation cycle of energy conversion, transmission, and storage technologies—as well as energy use. Specific application areas for new materials include advanced batteries, solar cells and other functional materials, low energy semiconductors, thermal storage, coatings for various applications, and catalysts for the conversion and capture of CO2. Identifying and pursuing prime R&D opportunities will facilitate development of innovative materials and their rapid integration in clean energy applications—thus accelerating the transition to a sustainable future.

Materials Challenge Steering Committee

MI's Clean Energy Materials Innovation Challenge represents a collaborative effort of 18 countries:

- **Mexico and the United States** co-lead the Materials Challenge and devote resources to coordinate the development of a work plan, share high-level information on relevant national plans, and join discussions on new activities.
- **Canada, Denmark, the European Commission, France, Germany, India, Italy, and the United Arab Emirates** devote resources to develop the work plan (e.g., assume responsibility for some tasks), share high-level information on relevant national plans, and join discussions on new activities.
- **Finland, Norway, Republic of Korea, Saudi Arabia, Sweden, the Netherlands, and the United Kingdom** endorse the Materials Challenge, share high-level information on relevant national plans, and join discussions on new activities.

REGISTRATION

Registration is by invitation only. There is no registration fee.

Name *

First Name   Last Name

E-mail *

Company / Organization *

Country *

Phone Number

Country Code   Area Code   Phone Number

Administrative Assistant's Email

Please advise of any special needs, including dietary restrictions:

Submit

Appendix H. Sample Workshop Agenda

Experts' Workshop on R&D Opportunities
Conference Center
City, Country
Date

Day 1

8:00 - 9:00 AM	**Registration/Breakfast**
9:00 - 9:15 AM	Opening Plenary Session – Salon A-C *Welcome* by Senior Official from Host Country
9:15 - 9:45 AM	*Workshop Overview and Charge* by First Workshop Chair
9:45 - 10:00 AM	*Workshop Scope and Structure* by Second Workshop Chair
10:00 - 10:30 AM	Context for Workshop Topic and Example Programs -- First Speaker
10:30– 11:00 AM	**Break**
11:00 – 11:30 AM	Status of the Technology and Key Challenges -- Second Speaker
11:30 – 12:00 PM	Status of the Technology and Key Challenges -- Third Speaker
12:00 - 12:30 PM	*Panel Introductions by* Workshop Chairs and Panel Leads Panel Sessions – Rooms A-D
12:30 - 2:00 PM	**Working Lunch**

2:00 - 5:30 PM	Parallel Panel Sessions
	
	Panel 1: Title of Panel – Room A
	            Name and affiliation of Co-Panel Leads
	
	Panel 2: Title of Panel – Room B
	            Name and affiliation of Co-Panel Leads
	
	Panel 3: Title of Panel – Room C
	            Name and affiliation of Co-Panel Leads
	Panel 4: Title of Panel – Room D
	            Name and affiliation of Co-Panel Leads

5:30 – 7:00 PM	**Break for Dinner** (on own)
7:00 – 10:00 PM	Continued Panel Discussions in the Evening (at the discretion of Panel Leads)

Day 2

8:00 - 9:00 AM	**Breakfast**
9:00 - 9:30 AM	Plenary Session – Salon A-C Perspectives from Industry -- Speaker
9:30 - 10:00 AM	Perspectives from Academia -- Speaker
10:00 - 10:30 AM	Observations and Crosscutting Themes from Day 1 -- Chairs
10:30 - 11:00 AM	**Break** and move to panel sessions
11:00 - 12:30 PM	Panel Sessions – Rooms A-D Parallel Panel Sessions (Continued from Day 1)
12:30 - 2:00 PM	**Working Lunch**
2:00 - 5:30 PM	Panel Discussions (continued) & Preparation for Reports-outs
5:30 -7:00 PM	Break for Dinner (on own)
7:00 – 10:00PM	Continued Panels in the Evening (at the discretion of Panel Leads)

Day 3

8:00 - 9:00 AM	**Breakfast**
	Closing Plenary Session – Salon A-C
9:00 - 9:30 AM	Report from Panel 1 and Q&A
9:30 -10:00 AM	Report from Panel 2 and Q&A
10:00 - 10:30 AM	Report from Panel 3 and Q&A
10:30 - 11:00 AM	Break
11:00 - 11:30 AM	Report from Panel 4 and Q&A
11:30 - 12:00 PM	Discussion
12:00 - 12:15 PM	Overarching Perspectives and Next Steps Chairs
12:15 - 12:30 PM	*Closing Remarks* Representative from Host Country or Technical Workshop Committee
12:30 PM	**Workshop Adjourned**
12:30 - 2:00 PM	**Lunch**
2:00 – 5:30 PM	Writing Session (only chairs, panel leads and designated writers)

Appendix I. Sample Panel Lead Agenda

Day 1

Approx. Time	Activity
12:30 - 2:00pm	**Working Lunch** **Opening and Instructions** • Introductions • Confirm purpose of panel and intended outputs • Stage-Setting Presentations: Perspectives on Panel Topic and Review of Current State of Technology Report. Two or three speakers to present during lunch • Explain panel process for idea generation and discussion; ask for confirmation from group
2:00 – 2:30	**Current State of Technology Review** • Ask for comments on the State of Technology Background Report as it pertains to panel topic; what is missing; what did it get right; what did it get wrong. Allow each person in room a few minutes to respond.
2:30 – 3:00	**Major Challenges Review** • As a group, summarize challenges from plenary that are relevant to this panel and from stage-setting presentations. List summary bullets on flip chart or projected screen. • Encourage participants to make additions or corrections to list of challenges.
3:00 – 3:30	**BREAK**
3:30 – 5:30	**Idea Generation** • Show Focus Question on screen. Allow group to consider question and one-by-one around the room each participant provides response. Responses limited to a few minutes of explanation followed by short group discussion (if necessary). Keep going around room until all ideas are presented. Record key points on screen.
5:30 – 7:00	**Break for Dinner (on own)**
7:00 – 10:00	**Idea Generation continued (if necessary)** • Continue discussion of ideas until all ideas are presented and discussed.

Day 2

Approx. Time	Activity
11:00 - 12:30pm	**Idea Prioritization** • Review ideas generated by panel on Day 1 • Review process: need to prioritize ideas. Present criteria for assessing priorities. • Ask for categories and organize ideas into the categories as a group. Combine similar ideas.
12:30 – 2:00pm	**Working Lunch** • Discuss strengths and weaknesses of ideas. Allow opportunity for each participant to share opinions. • If necessary, vote on priority ideas to down-select to top 3-5. • Review results and consider amending ideas to bring in related concepts that did not make it as a priority based on the vote
2:00 – 3:30pm	**Describe and Elaborate on Priorities** • Explain process for providing more information on the top 3-5 priorities • Break up into sub-groups of 3-4 people, with each subgroup assigned to one of the top priority ideas, and fill in a 'deep dive spreadsheet' for each.
3:30 – 4:00pm	**BREAK**
4:00 – 5:00pm	**Collaboration Opportunities** • Discuss potential partners and relevant stakeholders for each of the top priorities; identify methods and collaboration opportunities among countries, sectors, and organizations that would accelerate progress.
5:00 – 5:30pm	**Develop Report-Out Slides** • Summarize findings from panel by completing report-out template projected on screen
5:30 – 7:00pm	**Break for Dinner (on own)**
7:00 – 10:00pm	**Continued Panel Time (if necessary)** • Complete any panel session activities that have not yet been finalized

Appendix J. Sample Deep-Dive Worksheet

Short title of research direction: _____

WHAT

Aspects
Describe 3-5 major elements of this research direction.

1)

2)

3)

4)

5)

WHEN

Milestones
Please identify 2-5 milestones for measuring progress.

Start Date: _____

End Date: _____

WHY

Results
Please list the impacts, benefits, or outcomes from pursuing this research direction in near term, medium term, and long term AND the specific barriers or challenges the research area addresses.

Near term

Medium term (by 2020)

Long term (by 2030)

WHY NOT

Obstacles
Please list potential obstacles to achieving success in this research area.

WHO

Potential Collaboration Partners/Stakeholders
Please identify the partners/stakeholders that would help advance this research direction and the potential roles they would play.

Appendix K. Sample Report-out Template

R&D Opportunities Workshop

Panel Group 1
Report-out

Additions to the Current State of Technology Background Report

- Point 1
- Point 2
- Point 3

Major Challenges

- Challenge 1
- Challenge 2
- Challenge 3

Priority Research Directions

- Title of research direction 1
- Title of research direction 2
- Title of research direction 3

Priority Research Direction 1

- Description
- Impacts (Near, Medium, Long term)
- Key milestones
- Main obstacles
- Collaborative opportunities

Priority Research Direction 2

- Description
- Impacts (Near, Medium, Long term)
- Key milestones
- Main obstacles
- Collaborative opportunities

Appendix L. Equipment and Materials

The Logistics Coordinator should work with the Chairs to determine exactly what equipment will be needed for the plenary sessions (e.g., screens), panel sessions (e.g., white boards), and for overall support (e.g., a photocopier). They should work with the Panel Leads to determine equipment needs in the panel rooms.

Once the list of needs is assembled, the Logistics Coordinator should make arrangements to have the equipment provided. The Coordinator will need to work through the venue (e.g., to obtain power strips) and may need to work with third-party vendors (e.g., to obtain office supply materials). The price and availability of rental equipment will have been considered during venue selection.

Possible Equipment and Materials for Plenary

- Screens
- Projectors
- Laptops
- Remotes
- Laser pointers
- Microphone system
- Power strips and outlets
- Notepads
- Pens/markers

Possible Equipment and Materials for Panels

- Easels and flip charts
- Whiteboards
- Markers
- Tape/Push pins (for posting materials on boards)
- Camera

Possible Additional Equipment

- Copying and printing equipment
- Easels for signs
- Portable badge printer
- Lanyards or badge holders

Appendix M. Room Setup

The five most common room setups are **classroom**, **theater**, **rounds, crescent rounds**, and **U-shape**.

The plenaries are usually set up in classroom or theater style, which enables a large group of people to fit in the room while allowing each attendee to have a clear line of sight to the speakers and presenters.

Classroom has rows of tables with chairs facing the staging area. Space permitting, this is the preferred setup for workshop plenaries. See *Figure M.1*.

Rule of thumb for room size: around 240 square feet (73 square meters) per 10 people

Theater consists of rows of chairs facing the staging area. This seating arrangement allows for the greatest number of people in a given room. See *Figure M.2*.

Rule of thumb for room size: around 90 square feet (27 square meters) per 10 people
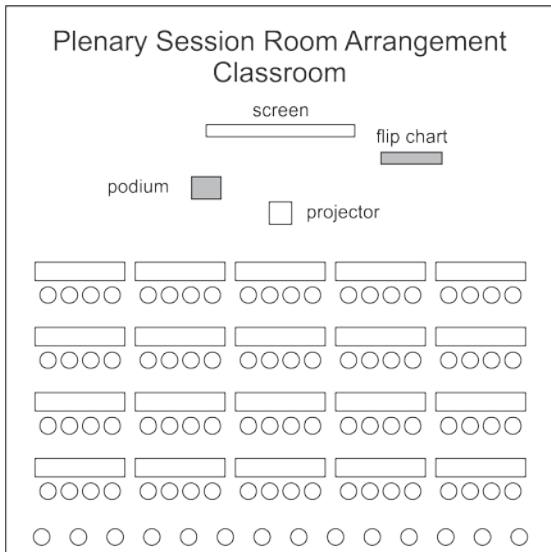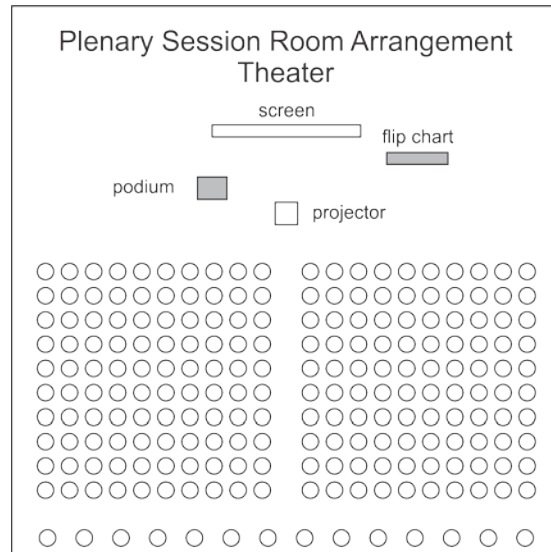

Figure M.1 – Classroom setup

Figure M.2 – Theater setup

Rounds consist of several round tables with people seated around each. This setup is appropriate for working lunches and the writing session. Rounds can also be used in the plenary, space permitting. This setup has the advantage of facilitating conversation among attendees at the same table. See *Figure M.3*.

Rule of thumb for room size: around 120 square feet (35 square meters) per 10 people

The setup can be modified by having chairs on only one side of the tables or setting up the tables in a semicircular shape with chairs only on the rounded side of the tables. This allows participants to have a line of sight to the speaker without having to turn around their chairs. This setup is commonly referred to as "**Crescent Rounds** or **Half Rounds**." See *Figure M.4*.

Rule of thumb for room size: around 175 square feet (53 square meters) per 10 people
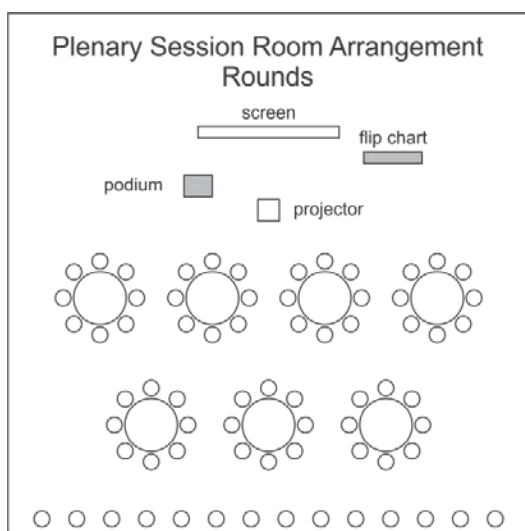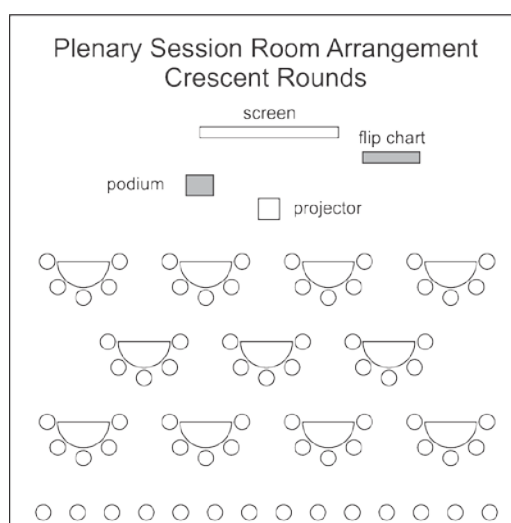

Figure M.3 –Rounds setup

Figure M.4 – Crescent Rounds setup

U-shape is a series of connected tables set up in the shape of the letter U, with chairs around the perimeter. This setup is most common for panel sessions, as participants can easily see each other, the presenter, and visual (e.g., a flip chart or screen). The setup also allows for a work surface for each participant. Observers usually sit along the perimeter of the room, not at the table. See *Figure M.5*.

Rule of thumb for room size: around 350 square feet (100 square meters) per 10 people

A variation on the U-shape is the **boardroom** setup. For smaller panel sessions (of about 12 or fewer participants), the boardroom is a good option. This arrangement is also an acceptable alternative in the panel sessions if the tables at the venue cannot be configured into a U-shape or if the room is not large enough to accommodate a U-shape setup. See *Figure M.6*.

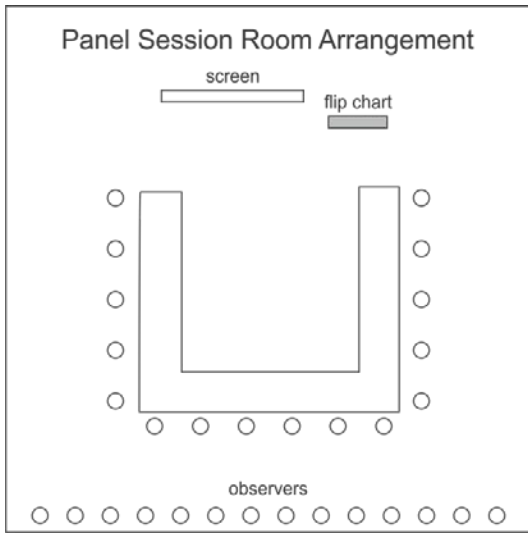Rule of thumb for room size: around 175 square feet (53 square meters) per 10 people
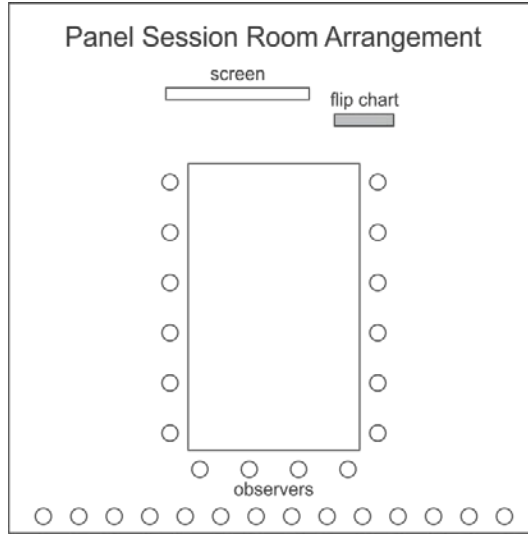
Figure M.5 – U-Shape setup

Figure M.6 – Boardroom setup

Appendix N. Sample Post-Meeting Participant Survey

Post-Workshop Survey

Your responses to the following will help us to make the next workshop even better.

Could you see and hear the presenters?   ☐ Yes   ☐ No

Were you able to express your views?   ☐ Yes   ☐ No

What I most enjoyed:

What I least enjoyed:

What I suggest you add:

What I suggest you change:

Thank you for your help!

Appendix O. Sample Post-Meeting Follow-up Note

Letterhead

Dear _____,

    Thank you for your active (leadership and) participation in the R&D Opportunities Workshop held in [location] on [dates]. The event was a great success because you and other leading experts in [scientific field] contributed your knowledge, time, and insights, helping to identify top research needs and promising opportunities for collaborative research efforts.

    The closing plenary session touched on many exciting opportunities to make real progress in [topic] and help the world move toward a low-carbon future. We are currently preparing the detailed summaries of each panel session for the workshop report, which we expect to post on the Workshop website <hyperlink> within the next [three] weeks.

    As mentioned at the Workshop, the final report will be widely distributed among the 23 members of Mission Innovation. The contents may be used to help inform and guide their government and research institutions as they build targeted research portfolios for attaining ambitious clean energy goals. We expect the report will open new doors for groundbreaking research.

    Again, thank you so much for making time in your busy schedule to support this worthwhile mission. We thoroughly enjoyed having you at the R&D Opportunities Workshop, and we sincerely hope that you will be able to join us at future workshops in this series. Your enthusiasm for the topic, grasp of the related science, and collaborative approach are deeply appreciated.

Best regards,

Host Representatives/Chairs

Index to Responsibilities by Position

(Page number mentions include sidebars)

Workshop Host Country Representative: Specific mentions on pages 6–10, 16, 19, 27, and 29

Chair(s) of Technical Workshop Committee: Familiarity with entire document is recommended.

Technical Workshop Committee: Specific mentions on pages 6–14, 16–19, 21–22, 25, 27–29, 33, and 53

Panel Lead: Familiarity with entire document from page 13 on is recommended.

Support Team: Specific mentions on pages 9–10, 16, 18, and 29–30

Plenary Speaker: Specific mentions on pages 14, 19, and 20

Writers: Specific mentions on pages 15, 27–29, and 33

Logistics Coordinator: Specific mentions on pages 9-10, 15, 19, 29–37, 43, and 58

Web Developer: Specific mentions on pages 9–11, 15–17, 19, 31–33, 43, 48, and 63

Observer: Specific mentions on pages 7, 10–11, 13, 15, 19, 25, 29, and 32

Front and back cover image: Adobe stock 31923568