



## **U.S. Manufacturing Plan**

## **Introduction**

This U.S. Manufacturing Plan provides the strategy by which the REMADE Institute will meet its goal of strengthening U.S. manufacturing competitiveness while engaging a wide range of stakeholders that may include foreign participants.

By delivering technology innovations that reduce primary material consumption in energy-intensive industries, developing pathways toward feed- stock “better than cost and energy parity” for key materials, and facilitating the widespread application of new enabling platform technologies across multiple industries, REMADE will directly transform the energy and emissions foot-print of U.S. manufacturing. Thanks to the lower cost structure, cheaper feedstock’s, and increased production capacity that REMADE innovations will enable, materials manufacturers in energy-intensive industries will find themselves more globally competitive.

Because the focus of the REMADE Institute is Manufacturing Readiness Level (MRL) 4 through MRL 7, and recognizing that it can often take two to three years for a technology to move from MRL 7 to full production, in addition to the specific commitments of the plan detailed below, the Institute will incorporate the following mechanisms into to its operations to deliver benefit to U.S. manufacturing.

### Educational

- Provide education and tools to help manufacturers recognize currently available technologies to reduce energy intensity and material consumption.

### Strategic Investment Planning

- Evaluate technologies identified in the DOE Bandwidth Studies for potential inclusion into the REMADE Institute technology roadmap.
- Engage key manufacturers as part of the annual strategic investment plan (SIP) update in order to increase awareness of and buy-in for the technology roadmap.
- Validate that topics selected for inclusion in the SIP will deliver benefits aligned to the six key technical performance metrics (TPMs) prior to release of the SIP.
- Obtain buy-in from manufacturers confirming their interest in investing in technologies the Institute is developing assuming project teams can meet their technology milestones.

### Project Selection/Project Award

- Confirm details of the required project technology transition plans with project teams to identify potential gaps in the technology transition plans that will need to be addressed and ensure the plan is designed to deliver benefit to the U.S. economy.

### Project Execution

- Perform Critical Technology Element (CTE)/ Technology Readiness Level (TRL) assessments for each REMADE project to facilitate active management of the Institute's product portfolio.
- Incorporate MRL transition agreements between project teams and pilot facilities/manufacturers for projects expected to achieve MRL6 or MRL7.

### Technology Portfolio Management

- As part of the Institute's annual report, include a summary of the starting, current and pending MRL for each project and actively manage the portfolio to achieve Institute goals.
- Perform annual evaluations of Institute's success in selecting projects that deliver benefits aligned with the TPMs, managing project execution, transitioning technology.
- Engage the DOE and Institute members as part of the annual review process. Where performance gaps exist, modify technology management strategy to improve execution.

By focusing on technology transition considerations as part of the annual SIP update, project selection, and project execution, the Institute will ensure that there is sufficient buy-in for the technologies that are developed. Furthermore, projects will be positioned for further scale-up, delivering substantive impacts to Institute members and U.S. manufacturers.

**Provide Education and Tools.** As part of the DOE Bandwidth Studies, two categories of opportunities were called out: (a) State-of-the-Art (SOA) energy consumption, and (b) Practical Minimum (PM) energy consumption. SOA energy consumption identified the minimum amount of energy required assuming the adoption of the best technologies and practices available worldwide. Although these technologies are sufficiently mature that they would fall outside of the REMADE technology portfolio, as part of our engagement with U.S. manufacturers and the DOE, we will vigorously work to highlight those state-of-the-art energy consumption opportunities that represent adoption of the best technologies and practices available worldwide. By exposing U.S. manufacturers to these opportunities, many of which could occur independent of REMADE Institute activities, we will help facilitate the transformation of energy-intensive industries.

**Leverage DOE Bandwidth Studies During Preparation of the SIP.** The second category of opportunities called out in the DOE Bandwidth Studies is the practical minimum (PM) technologies, which are technologies currently under development worldwide. As part of the annual SIP update, the REMADE Institute will consider these as potential development topics to be pursued. Where appropriate, REMADE may consider pursuit of joint technology programs with organizations where development efforts are underway.

**Engage Key Manufacturers During Development of the SIP.** In 2010, there were about 15 BF/BOF steelmaking facilities operated by five companies and 112 EAF steelmaking facilities operated by

over 50 companies in the U.S. (U.S.GS 2012a). In addition, in 2010, there were nine primary aluminum smelter facilities in operation by five companies (U.S.GS 2011c). As part of the annual SIP update, the REMADE Institute will engage these companies, as well as others across energy-intensive industries, to identify barriers these manufacturers experience. Doing so may identify potential pathways to market for the technologies that the Institute will develop. Where these companies are not already members, this activity will provide an additional opportunity for recruitment.

These engagements will help the REMADE Institute understand where manufacturers' pain points are, how they experience the barriers called out in the REMADE FOA, and how technology that the Institute might develop will fit into their eco-systems, including their internal qualification processes and adoption by their customers.

**Validate Alignment Between Potential SIP Topics and Six Technical Performance Metrics.** To deliver impact to U.S. manufacturing, it is imperative that the REMADE Institute identify projects that will deliver substantive impact against the six TPMs called out in the FOA. Using the analysis framework and tools to be developed by the Systems Integration and Analysis node, the REMADE Institute will assess the potential impact of each concept being considered for inclusion in the SIP at the outset. As the SIP is translated into project calls, this same level of rigor will be applied.

**Seek Technology Transition Partners Early.** As difficult as it may be to traverse the so-called "valley of death", it is equally important to generate pull with the manufacturers that may adopt the technologies developed by the REMADE Institute. Rather than waiting until a project is near completion, the identification of technology partners must start as soon as projects are launched (or before). This approach of engaging with manufacturers will also provide the Institute an opportunity to identify where there is sufficient technology pull to warrant further action.

**Clarify Technology Transition Plans Prior to Project Award.** In the same manner that the REMADE Institute will develop consistent protocols, data harmonization, and evaluation frameworks for assessing the energy, material, and GHG impact of various technologies, the Institute will also apply a consistent framework for evaluation of the technology transition plans developed by proposal teams. With members across industry, academia, and the national labs, this will be an important part of actively managing the REMADE technology portfolio. Preliminary commercialization and/or transition plans will be part of the project selection criteria. Further, once a project is selected for award, the REMADE Institute will require presentation of a more detailed technology transition plan within the first three months of the project, as well as an update to this plan at project completion.

**Conduct CTE/TRL Assessments.** A critical part of Technology Readiness Assessments (TRAs) or Manufacturing Readiness Assessments (MRAs) is the identification of the CTEs for each project individually and for the institute as a whole. Equally important, there needs to be a consistent process for evaluating the TRL/MRL for each project.

Evaluation of the CTE/TRL for each project selected for award will enable the institute to

understand the critical technologies that are being developed and enable Institute leadership to understand how to disseminate the project results to other Institute members and how to scale or commercialize the technology. The REMADE Institute intends to initiate this activity at the outset.

**Incorporate Manufacturing Readiness Level Transition Agreements.** The determination of the MRL requires evaluation of many factors beyond technology. It also incorporates design, cost and funding, materials, process capability, quality, workforce, facilities, and manufacturing management. To insure development robust technology transition planning, industry frequently uses MRL transition agreements, which detail the requirements between the manufacturing technology developer and the customer. By going element by element through the MRL checklist, both parties identify the issues that each of them must address before the technology is ready to be transitioned. MRL transition agreements formalize these requirements early in a project, thereby giving each party sufficient time to prepare for a successful transition. The REMADE Institute will utilize transition agreements for all projects expected to reach MRL 6 or MRL 7 by the end of the project.

**Actively Manage the Institute's Technology Portfolio.** Similar to a business, the REMADE Institute's ability to achieve sustainability requires an active process for managing its current and future technology portfolio. Utilizing many of the elements described earlier in this Manufacturing Plan, the REMADE Institute will prepare an annual report that summarizes the following information about the project portfolio:

- Summary of the starting, current and pending MRL for each project
- Project management performance for each project, highlighting how well each project is performing relative to the project plan and evaluation of changes required for more effective project management
- Technology performance for each project, detailing whether the project is on track to deliver the benefits against the six TPMs
- Technology transition performance, reviewing whether technology transition plans are in place and how effectively technology transition is occurring
- Financial performance, highlighting how Institute funds are being allocated and whether adjustments need to be made to the current portfolio or future project calls
- Recommendations for actions the Institute will take to improve performance in the coming year.

**Involve DOE and Institute Membership During Annual Reviews.** To position the REMADE Institute for long-term success, the annual review process must also engage the DOE and institute membership. Their active involvement, best-practice sharing, and continued feedback on what the Institute can do more effectively will be critical.

## The Plan

As a condition of membership, all members of the REMADE Institute are required to agree to this U.S. Manufacturing Plan, including the following standard U.S. Competitiveness Provision of the Department of Energy (DOE) Award. This plan will also be included in the award terms and conditions of any REMADE subcontract awards.

The Members agree that a goal of the REMADE Institute is to provide substantial benefit to the U.S. economy. In exchange for the benefits received through the Institute, the Member agrees to the following:

- (1) Products embodying Intellectual Property developed under the Institute (i.e. REMADE IP as defined in the REMADE Institute Intellectual Property Management Plan (IPMP)) shall be substantially manufactured in the United States; and
- (2) Process, services, and improvements thereof, which are considered REMADE IP as defined in the REMADE Institute IPMP shall be incorporated into the Member's manufacturing facilities in the United States either prior to or simultaneously with implementation outside the United States. Such processes, services, and improvements, when implemented outside the United States, shall not result in reduction of the use of the same processes, services, or improvements in the United States; and
- (3) Process, services, and improvements thereof, which are considered REMADE IP as defined in the REMADE IPMP, shall be initially demonstrated at the Member's manufacturing facilities in the United States or at a REMADE Institute testbed, prior to demonstrations that may take place outside the United States.

Exceptions to the above may be made for a specific REMADE Project where a Member cannot agree to the above provisions as written. Part of the process for finalizing the Project Agreement (and related project specific appendices, as applicable) (i.e. Subaward) for said REMADE project(s) will include developing legally-binding language, based on a Net Benefit Statement, that is acceptable to DOE and commits Member to provide some other benefit to the U.S. economy, which will then be made a part of the Project Agreement in lieu of the standard clause.

The following questions will assist a REMADE subrecipient in developing an acceptable Net Benefit Statement that will be reviewed and approved by DOE.

### **Net Benefits Statement Worksheet**

**Project Title:**

**Contact Person (e.g., Patent Counsel), phone number, and e-mail address:**

**Briefly describe your business model.**

The description may include plans for manufacturing domestically and offshore. Briefly explain why you need to manufacture in the locations you discuss.

**Future Benefits to the U.S. economy when creating and implementing Intellectual Property developed under the Subaward:****What work under Subaward do you plan to do in the U.S.?**

Work may include manufacturing, R&D, administration. If you have built or will build a plant or R&D facility, what are the capacity and approximate number and type of employees? What is the timeframe of the U.S.-based work? Will you begin work in the U.S. right away, with later global diversification, or will the work be spread over several locations for the entire period of the Subaward? Will your efforts result in the creation of new U.S. jobs? If so, describe them.

**Participant makes the following specific commitments to U.S. investment:**

(You may list these in bullet or numbered form, or in paragraph form. Be aware that DOE will require specific commitments. You may include existing or planned facilities in the U.S. (if so, please describe what they'll be and how many and what type of employees they may have)). In addition, what is the projected timeline for building and operating the facilities?

**How will your work under the Subaward further the U.S. development of the technology?**

What commitments do you make to significantly reinvest profits from the Commercialization of the intellectual property resulting from the work under this Subaward in the U.S. economy?

**What other benefits will your work have on the U.S. economy?**

Such benefits may include one or more of the following:

- Direct or indirect investment in U.S.-based plant and equipment.
- Creation of new and/or higher-quality U.S.-based jobs.
- Enhancement of the domestic skills base.
- Further domestic development of the technology.
- Significant reinvestment of profits in the domestic economy.
- Positive impact on the U.S. balance of payments in terms of product and service exports as well as foreign licensing royalties and receipts.
- Appropriate recognition of U.S. taxpayer support for the technology; e.g., a quid-pro-quo commensurate with the economic benefit that would be domestically derived by the U.S. taxpayer from U.S.-based manufacture.
- Cross-licensing, sublicensing, and reassignment provisions in licenses which seek to maximize the benefits to the U.S. taxpayer.