**TECHNOLOGY TO MARKET PLAN**

**Template and Instructions**

*Rev. 4/30/14*

**TECHNOLOGY TO MARKET PLAN INSTRUCTIONS**

# I. PURPOSE

During award negotiations, selected awardees negotiate and submit an initial Technology to Market (T2M) Plan to the ARPA-E Technology to Market advisor and the Program Director, and obtain approval prior to the execution of the award. The T2M Plan is intended to serve as a roadmap for advancing the proposed technology toward commercial viability, and provides an opportunity to set goals and identify issues and opportunities related to technology transfer and commercialization of your ARPA-E funded technology.

**II. T2M PROJECT LEAD**

A single member of your project team should be designated as the T2M lead, and will maintain responsibility for coordinating and leading T2M activities for the project, including completion of the initial T2M Plan, subsequent T2M Plan updates, and T2M milestones throughout the award lifecycle. The T2M Lead must be an integral team member with intimate knowledge of the project technology and must participate in all project reviews. The lead technical PI with strong interest in the commercial applicability of the technology is an appropriate T2M Lead.

**III. T2M PLAN UPDATES**

You are required to provide updates on your initial T2M Plan to the ARPA-E Technology to Market Advisor and report on implementation of T2M Plan activities per the T2M milestones in Attachment 3 to the Award (usually every three months); these updates should include key learnings from previous and concurrent T2M milestones and the impact on the project’s commercialization approach. This may also include a description of what is unknown and the proposed path to a better understanding of what is unknown.

**IV. T2M PLAN TEMPLATE**

A template T2M Plan is attached as Appendix A. Please use this template when preparing your initial T2M Plan. Your initial T2M plan should include a cover page and footers that have the appropriate markings to protect confidential information and data. Full instructions on marking are included in Appendix C.

**V. ADDITIONAL NOTES**

**Budget Justification:** Awarded Project Teams are expected to spend at least 5% of the Federal funding provided by ARPA-E on Technology Transfer and Outreach (TT&O). The project’s TT&O budget should relate to furthering elements of the plan presented here. Note that development of the initial T2M Plan is not eligible for reimbursement as a pre-award cost and does not qualify as an allowable in-kind cost share contribution, unless approved in writing by the DOE Contracting Officer with the concurrence of the ARPA-E Deputy Director for Commercialization.

# APPENDIX A: TECHNOLOGY TO MARKET PLAN TEMPLATE

**Technology to Market (T2M) Plan**

|  |
| --- |
| Project Title |
| Prime Awardee Entity |
| Project Control Number |
| Principal Investigator Name |
| Date |

***NOTICE OF RESTRICTION ON DISCLOSURE AND USE OF DATA***

*Pages [\_\_] of this document may contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.*

1. ***T2M Team***

Please provide full contact information for the project’s T2M Lead. Please include name, primary affiliation, email address, and telephone contact information for this individual.

Please describe team strengths and any gaps in the capability, knowledge, and availability of current team resources necessary to advance the various development areas. Furthermore, please describe how and when the team plans to address each gap (new partnerships, advisors, consultants, conferences, etc.).

1. ***Overall Transition Plan***
   1. ***Technology transition***

Describe how the proposed technology is expected to transition from its current stage of development to ultimate market deployment. Please note that while some ARPA-E technologies will be ready to transition from ARPA-E funding to a commercial or deployment-focused effort, this is not by any means a requirement.

*Examples of questions to be answered in this section:*

* + 1. *What is the product, process, or technology the team intends to develop and commercialize?*
    2. *What specifics can be provided regarding your concept of the product features and benefits, and what information was used to develop this concept?*
    3. *How do you expect this technology to transition from lab to market? Do you expect to form a company, license the technology, sell the technology, etc.? How will this be done?*
    4. *What experiences do the team members have with moving technology from lab to market, and can examples of prior successes be described?*
    5. *What factors will influence your approach to moving this technology from lab towards market and why?*
    6. *What partners are currently involved in, or expected to be involved in, the transition of the technology from lab to market, including name, position title, company, description of relationship and value provided?*
    7. *What characteristics will you look for in partnering organizations and why?*
    8. *What do you expect your first markets to be? What do you expect your longer term markets to be, what factors lead you to this conclusion, and why have you chosen these markets, or market segments, over others?*
    9. *What is your expected time to commercialization, including major steps and timing for each major step?*
  1. ***Commercial Readiness Level***

Using the Commercial Readiness Level (CRL) scale (see Appendix B) to serve as a framework for defining the spectrum of commercial maturity, from basic market research to full deployment, please describe and explain the current level of commercial readiness of the proposed technology. Note: Commercial Readiness Level (CRL) is not equivalent to TRL.

*Examples of questions to be answered in this section:*

* + 1. *What factors were used to arrive at the conclusion of your state CRL?*
    2. *What CRL level do you expect to achieve at the end of the program, what technical and commercial targets are needed to achieve the expected CRL, and how long is each expected to take?*
    3. *Who are the key players across the value chain, what are their characteristics, and what roles do they play?*
  1. ***Value Proposition***

Describe the product concept and value proposition of your technology against competing technologies.

*Examples of questions to be answered in this section:*

* + 1. *What information have you learned from talking directly with potential customers?*
       1. *What is the existing problem(s) they have that your technology will solve?*
       2. *What is their willingness to pay for a potential solution?*
       3. *What specific characteristics or features do they want in a product?*
       4. *What is their decision-making process for purchasing a new solution and what is their process for adopting a new technology?*
       5. *What was their reaction when you mentioned your hypothesis on your product’s value proposition?*
    2. *What specific activities do you have planned to advance the technology toward market viability during the ARPA-E project, including validation of the technology value proposition in the market.*

1. ***Intellectual Property, Competitive Analysis, and Risks Analysis***

Please describe the status of intellectual property, competition, and risks associated with technology development and commercialization.

*Examples of questions to be answered in this section:*

* 1. *Intellectual property: What is your evaluation of the IP landscape surrounding your technology?*
     1. *What intellectual property do you currently own, how do you protect it (trade secret, patenting, etc.), and what is your process for decision making regarding IP protection?*
     2. *What is the team’s understanding of intellectual property protected by competitors and how could competitors’ IP limit the parameter space you could be interested in exploring?*
     3. *What new intellectual property you expect to create (designs, processes, etc.), what are your plans for protecting it?*
     4. *What plans for disposition/ownership of the intellectual property, including intellectual property agreements or memorandums of understanding, are in place between members of the project team?*
  2. *Competition: what does the competitive landscape look like?*
     1. *What is the status of the competitors making products or using technology similar to yours and what is the status of technologies taking a very different approach to solve the same problem?*
     2. *How do you intend to differentiate from the competitors within this technology?*
     3. *Why will this technology solution will be better than an alternative technology solution?*
  3. *Risks: what are the risks involved in developing, scaling, and commercializing this technology?*
     1. *What are the current risk levels and mitigation methods for each of the following as they relate to commercialization: materials and supply chain risks (price stability, raw materials availability, etc.), process scaling, equipment (commercial availability or requiring design and build), and people/ talent?*
     2. *What are the drivers which could influence the risks and pace of commercialization?*
        1. *External: e.g., regulations, costs of production materials, costs of other resources (oil, natural gas), geo-political factors, mass adoption of technology, etc.*
        2. *Internal: financing, target applications, relationship building with upstream and downstream partners, etc.*
     3. *How will the funding from ARPA-E help to minimize these risks? That is, how will this project help to reduce or eliminate these risks?*

1. ***Manufacturing and Scalability***

How much is known about the manufacturing or assembly approaches/options at full commercial scale for the proposed technology?

Describe plans to complete quantitative cost/benefit analysis for the proposed technology. This could include a cost/performance model, manufacturing cost model, or other quantitative analysis geared toward validating the value proposition for the proposed technology.

1. ***Next Stage Funding***

Please describe how this technology will continue to be funded.

*Examples of questions to be answered in this section:*

* 1. *What resources are needed for the next phase of development that follows the end of the ARPA-E project?*
  2. *Who is expected to serve as the next source(s) of private or public funding, what is your plan to engage these entities during the ARPA-E project, and why will you choose this funding source?*
  3. *What characteristics will you look for in a funding partner?*

1. ***ARPA-E Resources***:

Several resources are available from ARPA-E to assist with Tech to Market activities. Some examples are provided below

* 1. **Regional Resource Map**: This online tool was developed to help ARPA-E awardees identify regional and national resources that can help them evaluate the market viability of their technologies. The database highlights resources that were suggested by a diverse set of practitioners; you can visit the online tool here: [ARPA-E Technology-to-Market Regional Resource Map](http://arpa-e.energy.gov/?q=arpa-e-site-page/regional-resource-map).
  2. **I-Corps @ ARPA-E**: ARPA-E has an inter-agency agreement with the National Science Foundation (NSF) for ARPA-E project teams to participate in NSF’s “Innovation Corps” (I-Corps) program. I-Corps is an intensive, structured, and curriculum-based program designed to educate early stage technology developers on business model development and the value of customer discovery. Please answer if you are interested in learning more or potentially participating in a future I-Corps cohort, please write **YES** or **NO** here: \_\_\_\_\_\_.

More information on the program can be found here: [I-Corps @ ARPA-E](http://arpa-e.energy.gov/?q=arpa-e-site-page/i-corps-arpa-e).

* 1. **Areas of Need**: ARPA-E may provide assistance to funding recipients in order to help prepare for market adoption and deployment of technologies developed with ARPA-E funds. Please indicate from the list below any specific areas or activities with which ARPA-E can provide help. Your responses will allow us to tailor our assistance programs to address areas of greatest need.

|  |  |
| --- | --- |
|  |  |
|  | Specific Need (Describe below) |
| Market and Industry Knowledge |  |
| Intellectual Property Management |  |
| Cost-Performance Modeling |  |
| Regulatory Issues |  |
| Business Model / Plan |  |
| Manufacturing / Scalability / Supply Chain |  |
| Next Stage Funding |  |
| Team Development |  |
| Other (please explain) |  |

**Connections / Introductions**: Additionally, ARPA-E can help facilitate connections with companies, organizations, and individuals who may be valuable to the project’s future success where and when appropriate (subject matter experts, potential advisors, next stage funding partners, etc.). Please list the top five connections we could help facilitate in the table below. You can name specific people/companies or list categories of people/companies.

|  |  |  |
| --- | --- | --- |
| Rank | Company/Organization/Individual | Role/Function/Title |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |

# APPENDIX B - COMMERCIAL READINESS LEVEL SCALE

Please note that proposed technologies are not expected to be commercially mature at the start of the project period, nor must any specific CRL be reached by the project’s end.

|  |  |
| --- | --- |
| **CRL** | **Description** |
| 1 | Knowledge of applications, use-cases, & market constraints is limited and incidental, or has yet to be obtained at all. |
| 2 | A cursory familiarity with potential applications, markets, and existing competitive technologies/products exists. Market research is derived primarily from secondary sources. Product ideas based on the new technology may exist, but are speculative and unvalidated. |
| 3 | A more developed understanding of potential applications, technology use-cases, market requirements/constraints, and a familiarity with competitive technologies and products allows for initial consideration of the technology as product. One or more “strawman” product hypotheses are created, and may be iteratively refined based on data from further technology and market analysis. Commercialization analysis incorporates a stronger dependence on primary research and considers not only current market realities but also expected future requirements. |
| 4 | A primary product hypothesis is identified and refined through additional technology-product-market analysis and discussions with potential customers and/or users. Mapping technology/product attributes against market needs highlights a clear value proposition. A basic cost-performance model is created to support the value proposition and provide initial insight into design trade-offs. Basic competitive analysis is carried out to illustrate unique features and advantages of technology. Potential suppliers, partners, and customers are identified and mapped in an initial value-chain analysis. Any certification or regulatory requirements for product or process are identified. |
| 5 | A deep understanding of the target application and market is achieved, and the product is defined. A comprehensive cost-performance model is created to further validate the value proposition and provide a detailed understanding of product design trade-offs. Relationships are established with potential suppliers, partners, and customers, all of whom are now engaged in providing input on market requirements and product definition. A comprehensive competitive analysis is carried out. A basic financial model is built with initial projections for near- and long-term sales, costs, revenue, margins, etc. |
| 6 | Market/customer needs and how those translate to product needs are defined and documented (e.g. in market and product requirements documents). Product design optimization is carried out considering detailed market and product requirements, cost/performance trade-offs, manufacturing trade-offs, etc. Partnerships are formed with key stakeholders across the value chain (e.g. suppliers, partners, customers). All certification and regulatory requirements for the product are well understood and appropriate steps for compliance are underway. Financial models continue to be refined. |
| 7 | Product design is complete. Supply and customer agreements are in place, and all stakeholders are engaged in product/process qualifications. All necessary certifications and/or regulatory compliance for product and production operations are accommodated. Comprehensive financial models and projections have been built and validated for early stage and late stage production. |
| 8 | Customer qualifications are complete, and initial products are manufactured and sold. Commercialization readiness continues to mature to support larger scale production and sales. Assumptions are continually and iteratively validated to accommodate market dynamics. |
| 9 | Widespread deployment is achieved. |

# APPENDIX C – MARKING INSTRUCTIONS

1. Please include the following marking on the cover page of the **initial** T2M Plan.

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1. Please include the following markings on the cover page of allT2M Plan **updates** presented and/or submitted to ARPA-E.

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1. Please include the following footer at the bottom of every page of the **initial** T2M Plan and all T2M Plan **updates**.

*May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure.*

1. Please include page numbers on each page, and please remove the text from the Tech to Market Plan Template when submitting your Tech to Market plan (this last part may be up to each individual T2M advisor’s preference?).