

ARPA-E Technology-to-Market Milestones

Examples of appropriate activities	Considerations that may be relevant	Examples of appropriate milestones
Intellectual property		
Secure IP on inventions	<ul style="list-style-type: none"> ▪ Are you working with a qualified lawyer, patent agent, or other IP expert? ▪ Have you reviewed the IP landscape and prior art in the field? ▪ What is novel about your innovation, and how are your inventions best protected? ▪ Do you have a plan in place to secure IP before disclosing new discoveries? 	<ul style="list-style-type: none"> ▪ Plan for securing intellectual property presented to program director ▪ Invention disclosure(s) documented ▪ Patent application(s) submitted
Commercialization Readiness		
Learning about markets & applications	<p>For each market of interest:</p> <ul style="list-style-type: none"> ▪ What does the value chain look like? ▪ Who are the key customers and users? ▪ What technology and product solutions exist to serve the market? ▪ What value do customers get from buying them? ▪ What are the requirements for the various applications and use cases? ▪ Why and in what context are some solutions chosen over others? ▪ Through what channels, when, and how often do customers purchase? ▪ What is the size of the market? ▪ How is the market evolving? ▪ Is your knowledge of the market based on assumptions, secondary research, or primary research? 	<ul style="list-style-type: none"> ▪ Potential market research sources identified and presented to program director ▪ Market knowledge compiled and presented to program director
Product definition, refinement, and validation	<ul style="list-style-type: none"> ▪ What does the product do and how will it be used? ▪ What are the key features and attributes? ▪ How much and what parts of the market will your product serve? ▪ Does the product offer a clear and compelling value proposition? ▪ Is the value proposition consistent with the product's expected cost-performance characteristics? ▪ Have you considered how the product compares to competitive products and solutions? 	<ul style="list-style-type: none"> ▪ Product hypotheses presented to program director ▪ Product hypotheses tested through direct conversations with potential customers ▪ Leading product hypothesis selected for focused refinement ▪ Product requirements and needs documented and presented to program director

	<ul style="list-style-type: none"> To what extent has your product definition been tested and refined through direct conversations with potential customers? 	
Cost-performance model	<ul style="list-style-type: none"> Does your model account for the full bill of materials of your product? Have costs of materials been estimated for the appropriate scale of production? What assumptions have been made to create the model? Does your model provide insight into the trade-offs and interactions between product design, product cost, and product performance? Are your performance estimates relevant to the use case of interest? What is the model's margin of error? 	<ul style="list-style-type: none"> Bill of materials estimated and presented to program director Bill of materials validated by potential suppliers Cost-performance model presented to program director
Competitive analysis	<ul style="list-style-type: none"> Are you considering all competitive solutions including not just other products, but also substitutes which obviate the need for a product altogether? Have you assessed and weighted all of the relevant cost-performance attributes in your analysis? How reliable is your information on competitive approaches? How can it be validated? 	<ul style="list-style-type: none"> List of competitive products/approaches identified and presented to program director Attributes of competitive products/approaches compiled and presented to program director Competitive landscape and analysis presented to program director
Identify & engage with potential customers / partners	<ul style="list-style-type: none"> What specifically would you like to get out of the interaction? What does a successful engagement look like? Are the targeted engagements well-aligned with these goals? Is now the appropriate time to engage? Have you evaluated risks that the interaction may pose? 	<ul style="list-style-type: none"> Engagement plan including list of potential engagements, rationale, and timeline presented to program director Update on outcome of engagements presented to program director
Knowledge of regulatory issues	<ul style="list-style-type: none"> What are the key regulatory issues to consider? Who is responsible for making the regulations? How are the regulations enforced? What steps must be taken to comply with the regulations? How much money and time will it take to comply with the regulations? How do the regulations affect the viability of your technology/product? Do workarounds exist to alleviate the burden of the regulations? 	<ul style="list-style-type: none"> Regulatory landscape/risk analysis presented to program director Summary of engagement with relevant regulatory bodies presented to program director Plan to address/mitigate regulatory issues presented to program director

Manufacturing and Scalability		
Knowledge of production processes	<ul style="list-style-type: none"> ▪ Are there opportunities to leverage existing production processes, or are entirely new processes required? ▪ For products made by comparable processes, what are the key cost drivers? ▪ What type of production equipment will likely be required? ▪ For comparable products, how does manufacturing cost depend on scale? 	<ul style="list-style-type: none"> ▪ Overview and analysis of expected production processes presented to program director
Identify scalability risks	<ul style="list-style-type: none"> ▪ What steps of the production process pose the highest risks to rate and yield? ▪ Does your production process require any inputs that are highly constrained in scale or geography? ▪ Are there multiple suppliers for the primary materials on which your solution depends? 	<ul style="list-style-type: none"> ▪ Production and scalability risk analysis presented to program director
Identify / engage suppliers	<ul style="list-style-type: none"> ▪ Who are the leading vendors for the production equipment likely to be needed? ▪ Who are the leading suppliers of materials and components ▪ Have you engaged with suppliers in direct conversations about process and materials specifications, costs, and availability? 	<ul style="list-style-type: none"> ▪ Engagement plan including list of potential engagements, rationale, and timeline presented to program director ▪ Update on outcome of engagements presented to program director
Next Stage Funding		
Map out next stage goals and resource needs	<ul style="list-style-type: none"> ▪ At the conclusion of the project, what will be the largest remaining risks to demonstrating a viable solution? ▪ What facilities, expertise, and funds will be required to accomplish the next stage of development? ▪ How much time will be required? 	<ul style="list-style-type: none"> ▪ Analysis of next stage goals and resource needs presented to program director
Identify appropriate next stage funding sources	<ul style="list-style-type: none"> ▪ Will funding be needed for further research, demonstration, or commercialization? ▪ Which types of public and private funding sources are aligned with the stage and goals of the project? ▪ Have similar or analogous projects received funding recently, and if so by whom? 	<ul style="list-style-type: none"> ▪ Analysis of potential next stage funding sources presented to program director
Engage with next stage funding sources	<ul style="list-style-type: none"> ▪ Do you have a presentation describing your work and next-stage resource needs? 	<ul style="list-style-type: none"> ▪ Engagement plan including list of potential engagements,

	<ul style="list-style-type: none"> ▪ Is the presentation appropriate for the specific funding source that you are targeting ▪ Have you researched the motivations and preferences of the funding source before meeting? 	<p>rationale, and timeline presented to program director</p> <ul style="list-style-type: none"> ▪ Update on outcome of engagements presented to program director
Team Development		
Identify / engage resources for tech to market work	<ul style="list-style-type: none"> ▪ Does your team currently include a person who is well-suited and available to take the lead on technology-to-market activities? ▪ Can project partners help with certain technology-to-market activities? ▪ Will the planned technology-to-market activities require you to hire someone full-time or part-time? ▪ Are there other resources in your region that you can leverage? ▪ How will the PI be involved in technology-to-market activities? 	<ul style="list-style-type: none"> ▪ Primary responsibility assigned for coordinating and completing technology-to-market activities