

**NYSERDA Advanced Buildings Technology
Development Program:
Process Evaluation Final Report**

Final

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Executive Summary

The Advanced Buildings Technology Development (Tech Dev) Program, a NYSERDA Building Systems initiative, promotes targeted technology development activities that address the technical and economic barriers, and opportunities, for new or emerging building technologies and products. The most recent Tech Dev project solicitation (PON 2606) combined single technology specific solicitations into a broad, multi-round single solicitation (an “omnibus” solicitation) that includes all relevant technology areas of focus (i.e.,(1) construction materials, strategies and practices, (2) lighting, (3) heating and cooling, (4) demand response, smart buildings and demand-side resources, and (5) other technologies and other opportunities).

In the Technology and Market Development Program (T&MD) Operating Plan for 2012-2016, NYSERDA introduced a stage-gate process to the Tech Dev Program to support new product development from concept idea to commercialization. Stage-gating is a formalized phased R&D approach consisting of a series of distinct phases: discovery and concept development, including scoping/analysis; product development and testing; and commercial launch. The goals of this process evaluation were to assess the effectiveness of recently implemented changes to the Tech Dev Program, and to formatively assess potential changes to program offerings and administration.

Project Scope and Methods

The evaluation focuses on the following four evaluation topics:

- Evaluation Topic 1: How is stage-gating currently being implemented in the Tech Dev Program, and how can that implementation be improved moving forward?
- Evaluation Topic 2: What are the advantages and disadvantages associated with the current solicitation approach?
- Evaluation Topic 3: What is the potential value of a Technology Readiness Level (TRL) or Commercial Readiness Level (CRL) calculator to the Tech Dev Program, and if a calculator is developed, what are the design and feasibility issues program staff should consider?¹
- Evaluation Topic 4: Did the TRL/CRL calculator implemented in round six of the PON assist proposers in completing their applications?²
- Evaluation Topic 5: What are the potential advantages and disadvantages of changing the Tech Dev Program’s current approach to proposal scoring (categorizing as technically meritorious and not technically meritorious) to adopt a three “bin” system (must fund, may fund, do not fund)?

¹ TRLs and CRLs are used to assess the maturity level of a given technology (not necessarily the quality of the technology) as it moves from concept to final commercialization. A TRL or CRL calculator provides information about a technology generally in checklist form, and contains a scoring approach to determine the readiness level of the technology..

² This topic was added after all other evaluation topics had been analyzed.

This evaluation used an interview-based methodology, in which IEC conducted in-depth interviews with Tech Dev Program staff (six), TEP members (five), NYSERDA Legal staff (two), NYSERDA Contracts staff (one), program participants (27), and program proposers (17). To identify these individuals, the evaluation team employed the following methods:

- Tech Dev Program staff: All six Tech Dev Program staff were selected for interviews.
- TEP members: Tech Dev Program and evaluation staff identified five TEP members with experience in TEPs across the technology areas of PON 2606.
- Legal and Contracts staff: NYSERDA evaluation staff identified NYSERDA Legal and Contracts staff members with experience working with the Tech Dev Program.
- Program participants: The evaluation team conducted priority sampling, in which program staff identified participants that were most likely to have relevant experience and insights to inform the evaluation questions. However, the evaluation team ensured that an array of different technology types and project types were represented in the sample.
- Program proposers: The evaluation team attempted to sample evenly across technology types.

Recommendations

IEC's recommendations for improving program processes include:

1. Program staff should discuss the goals and meaning of **stage-gating**, ensure that it is consistent with any corporate definition of stage-gating, and create guidance clarifying how stage-gating works within the Tech Dev Program. This evaluation found significant inconsistency among and between program staff and participants regarding the definition and implementation of stage-gating. If implementing stage-gating is a priority for the Tech Dev Program, consistent understanding and clear guidelines for implementation are critical.
 - a. Program staff should create an outreach piece to accompany the next solicitation to clarify the agency's approach to stage-gating for the Tech Dev Program. Once there is an internal understanding of stage-gating in the Tech Dev Program, NYSERDA needs to ensure that current and future participants have a common understanding as well.
2. Continue to use an **ombibus solicitation approach** where possible and appropriate, with clear defined rounds. Participants appreciate the consolidated approach, and the multiple rounds (announced early on) allow them to better plan for and prepare their submissions. If possible, to reduce the burden on Legal and Contracts staff, move to a pooled approach rather than assigning these staff to particular programs, or implement templates and checklists for SOWs to ensure they have all of the required elements before review.
3. Include language within future solicitations clarifying that if a proposer declines to sign off on NYSERDA's **terms and conditions**, the proposal will not be disqualified, nor will its evaluation be affected. This evaluation found that some participants believed that negative consequences would result from not agreeing to the terms and conditions, when this is not the case, resulting in some proposers indicating agreement with the terms and conditions up front but later indicating that compliance would be difficult. Clarifying the language regarding terms and conditions up front may help to alleviate some of the delays in contracting after award, and may remove a barrier to participation in the Tech Dev Program.

4. The evaluation team found that the **TRL/CRL calculator** provided some help in assisting teams in completing the applications. However, proposers generally seemed to have a good sense of their technology's readiness without it. Moving forward, IEC suggests that NYSERDA address the minor functionality issues identified by proposers and discussed under key findings.
5. IEC does not recommend adding a **"may fund" category** to the TEP proposal scoring process for Tech Dev; NYSERDA should continue to rank projects with an indication as to whether or not the proposal is technically meritorious or not technically meritorious. The current system has the flexibility that a three tier system could potentially add, without the added effort and confusion that may be associated with a three tier system.

1 Introduction

1.1 Program Overview

The Advanced Buildings Technology Development (Tech Dev) Program, a NYSERDA Building Systems initiative, promotes targeted technology development activities that address the technical and economic barriers, and opportunities, for new or emerging building technologies and products. Program activities focus on advanced energy performance of new and existing buildings, and support research and development of the next generation of market-ready building technologies and systems, as well as demonstrations of commercial technologies and products to accelerate market adoption.

The Tech Dev Program funds projects that focus on: improvements to the building envelope with least cost and greatest performance; next generation heating, ventilation, and air conditioning; next generation lighting technologies with high efficiency and load flexibility; building automation and controls; demand response; application design guidelines; best practices for optimized performance of natural gas condensing boilers; high-efficiency natural gas-condensing hot water heaters; and integration of renewable energy.

The most recent Tech Dev project solicitation (PON 2606) combined single technology specific solicitations into a broad, multi-round single solicitation (an “omnibus” solicitation) that includes all relevant technology areas of focus. The program completed six rounds of project solicitations under PON 2606, starting in January 2013 and ending in September 2015. A total of \$25 million was available over all rounds of PON 2606, in the following five categories: (1) construction materials, strategies and practices, (2) lighting, (3) heating and cooling, (4) demand response, smart buildings and demand-side resources, and (5) other technologies and other opportunities.

In the Technology and Market Development Program (T&MD) Operating Plan for 2012-2016, NYSERDA introduced a stage-gate process to the Tech Dev Program to support new product development from concept idea to commercialization. Stage-gating is a formalized phased R&D approach consisting of a series of distinct phases: discovery and concept development, including scoping/analysis; product development and testing; and commercial launch. Under a stage-gate process, program staff evaluate a project’s progress to determine if the project should be eligible to advance to the next stage of support, with funding gradually increasing at each stage gate. The goal of stage-gating is to support projects from concept to commercialization by funding projects with the highest technical and business potential.

1.2 Purpose and Scope of the Evaluation

The goals of this process evaluation were to assess the effectiveness of recently implemented changes to the Tech Dev Program, and to formatively assess potential changes to program offerings and administration.

First, the evaluation addressed the program’s experience to-date with **stage-gating**. At the outset of the evaluation, program staff indicated that few Tech Dev projects had been stage-gated to date; therefore the evaluation addressed questions on program experience as well as formative questions about how the method will be used in the future. Secondly, the evaluation explored the advantages and disadvantages associated with the program’s **omnibus solicitation**, which took the place of separate solicitations for

each technology type (lighting, HVAC, etc.) used in the past, prior to the T&MD Operating Plan in 2012. The evaluation also probed proposers' experience with the new **form-fillable proposal** and understanding of **standard NYSERDA terms and conditions** in the proposal package.

The process evaluation also explored potential changes to Tech Dev Program offerings and administration. Program staff are considering the following changes:

- Development of **Technology Readiness Level (TRL) and Commercial Readiness Level (CRL) calculators**.³ TRLs and CRLs are used to assess the maturity level of a given technology (not necessarily the quality of the technology) as it moves from concept to final commercialization. A TRL or CRL calculator provides information about a technology generally in checklist form, and contains a scoring approach to determine the readiness level of the technology. This evaluation addressed the potential value and feasibility of developing TRL and CRL calculators for the Tech Dev Program. The program then implemented a TRL/CRL calculator in round six (the last round) of the PON, and the evaluation addressed the usability of and benefits associated with this calculator.
- Modification of the **proposal scoring method**. Currently, proposals are designated as technically meritorious or not technically meritorious by a technical evaluation panel (TEP).⁴ Program staff are considering switching to using three categories: Must Fund, May Fund, and Do Not Fund. The evaluation addressed the feasibility, advantages and disadvantages of modifying the program's current proposal scoring in this way.

1.3 Evaluation Questions

Working in conjunction with NYSERDA, IEC developed a targeted list of evaluation questions to guide this process evaluation. These evaluation questions differed from the questions outlined in the Comprehensive Evaluation Plan (CEP) due to subsequent changes in the program and staff priorities, and the desire to make this evaluation as actionable as possible to inform future program changes. The evaluation questions are listed below by evaluation topic.

³ The work plan for this evaluation listed the development of a Business Readiness Level (BRL) as one of the potential changes to the program. However, through discussions with program staff, it became clear that there was confusion between a BRL and CRL calculator. IEC determined that program staff were more interested in a CRL calculator, which is similar to a TRL calculator. When interviewing participants, IEC combined the questions on TRLs and CRLs due to their similarity, and did not inquire about a BRL calculator.

⁴ The work plan indicated that proposals are designated as Fund or Do Not Fund through a combined process between the TEP and program staff. Through interviews, IEC learned that the TEP develops a ranked list of proposals and draws a line between technically meritorious and not technically meritorious, and then program staff decide which proposals to fund.

Evaluation Topic 1: How is stage-gating currently being implemented in the Tech Dev Program, and how can that implementation be improved moving forward?

1. What has the Tech Dev Program's experience been with stage-gating to-date?
2. Which projects have been stage-gated and why?
3. What are the current barriers to stage-gating and how can they be overcome?
4. How can the Tech Dev Program ensure successful implementation of stage-gating moving forward?
5. What is the understanding and opinion of stage-gating among Tech Dev participants?
6. Are Tech Dev participants likely to take advantage of stage gating opportunities in the future?
7. Why do projects that appear to be good candidates for stage-gating not applying for subsequent rounds of funding?

Evaluation Topic 2: What are the advantages and disadvantages associated with the current solicitation approach?

1. Has the omnibus nature of the solicitation led to administrative efficiencies compared to the previous solicitation approach?
2. How does the form-fillable proposal format compare to the traditional open narrative format?
3. Do applicants understand their options with regard to the terms and conditions selection on their proposals?

Evaluation Topic 3: What is the potential value of a TRL or CRL calculator to the Tech Dev Program, and if a calculator is developed, what are the design and feasibility issues program staff should consider?⁵

1. What is the potential value of a TRL and/or CRL calculator to the Tech Dev Program?
2. How could a TRL and/or CRL calculator support stage-gating?
3. What are the feasibility issues to consider in developing a TRL and/or CRL calculator for the Tech Dev Program?
4. What is the potential value of a TRL and/or CRL calculator to participants?
5. What issues should program staff consider when designing and implementing a TRL and/or CRL calculator?

⁵ As noted above, the work plan included questions on TRL and BRL calculators, and during the evaluation IEC switched to asking about TRL and CRL calculators. Additionally, IEC merged the questions on TRL and CRL calculators due to their similarity.

Evaluation Topic 4: Did the TRL/CRL calculator implemented in round six of the PON assist proposers in completing their applications?⁶

1. Did the TRL/CRL calculator help proposers choose which project category to apply under?
2. Were the options in the TRL/CRL calculator clear, and apply to different types of technologies?

Evaluation Topic 5: What are the potential advantages and disadvantages of changing the Tech Dev Program's current approach to proposal scoring (categorizing as technically meritorious and not technically meritorious) to adopt a three "bin" system (must fund, may fund, do not fund)?⁷

1.4 Report Organization

The remainder of this report is organized as follows. Chapter 2 provides an overview of the evaluation methodology. Chapter 3 presents analysis and results by evaluation topic. Conclusions and recommendations are provided in Chapter 4. Appendix A provides the interview guides.

⁶ This topic was added after the prior evaluation topics had been analyzed.

⁷ As noted above, the work plan indicated that the current approach involves a designation of Fund or Do Not Fund, which was later identified as a designation of technically meritorious or not technically meritorious.

2 Methodology

This evaluation used an interview-based methodology. To evaluate the research questions described in Section 1.3, IEC conducted in-depth interviews with Tech Dev Program staff (six), TEP members (five), NYSERDA Legal staff (two), NYSERDA Contracts staff (one), program participants (27), and program proposers (17). To identify these individuals, the evaluation team employed the following methods:

- Tech Dev Program staff: All six Tech Dev Program staff were selected for interviews.
- TEP members: Tech Dev Program and evaluation staff identified five TEP members with experience in TEPs across the technology areas of PON 2606.
- Legal and Contracts staff: NYSERDA evaluation staff identified NYSERDA Legal and Contracts staff members with experience working with the Tech Dev Program.

To select program participants for interviews, the evaluation team had three methodological options:

- 1) *Sample proportionately*, so that the proportion of projects from each technology area in the sample would match their overall proportion of projects (i.e., if 10 percent of the total Tech Dev projects are lighting projects, 10 percent of the projects in the sample would be selected from the lighting category);
- 2) *Sample evenly*, so that the same number of projects from each technology type would be included in the sample; or
- 3) *Conduct priority sampling*, in which program staff would determine the high priority participants to include in the sample.

Program and evaluation staff preferred the third option, to select participants based on staff priorities. By employing this method, the evaluation team ensured that participants with relevant experience and valuable insights were included. In addition, program staff selected an array of projects from different technology types and project phases that roughly matches the distribution of projects in the population. Table 2-1 summarizes the participant interviewees' projects by technology type. The potential universe included 51 projects funded by the Tech Dev Program, from 39 program participants (some participants have multiple projects funded).⁸ The final sample included 34 projects and 27 participants.

Although priority sampling was the best sampling approach for this evaluation, because participants were not randomly selected, the evaluation team cannot extrapolate its findings to the entire population of participants. In other words, the findings discussed in this report only apply to the 27 interviewed participants; the reader should not make inferences about the opinions of the population based on the opinions of the participants in the sample.⁹ This is a key limitation of priority sampling discussed with NYSERDA evaluation and program staff at the outset of the evaluation.

⁸ The work plan for this evaluation contained an initial universe of 63 Tech Dev projects pulled from the NYSERDA's R&D Metrics Database. However, in working with program staff, 12 projects were removed because they are not actual projects, but instead represent program spending on sponsorships, memberships, or consortiums.

⁹ This methodology does not meet NYSERDA's 90/10 confidence/precision standard. The 90/10 standard dictates the level of confidence needed to make inferences about the population in the study. The 90/10 standard requires a sampling approach that

Table 2-1. Evaluation final participant sample by technology type

	Research Study	Product Development	Product Demonstration	Total (%)
Construction Materials	4	5	3	12 (35%)
Heating and Cooling	0	4	0	4 (12%)
Lighting	2	4	1	7 (21%)
Demand Response	3	2	2	7 (21%)
Other Technologies	3	1	0	4 (12%)
Total	12	16	6	34

To select program proposers from the round six of the solicitation, to conduct interviews specific to utility of the TRL/CRL calculator, the evaluation team attempted to sample evenly across technology types. There were 63 proposers, some of whom applied more than once, within the same technology type or for a different technology type. The evaluation team aimed to include three proposers from each category, but because of the quick turnaround time required for conducting these interviews, the evaluation team contacted most of the proposers and received responses from more than the planned number per category, as shown in Table 2-2.

Table 2-2. Evaluation final proposer sample by technology type

Technology Type	Proposers interviewed^a
Construction Materials	5
Heating and Cooling	4
Lighting	3
Demand Response	4
Other Technologies	1
Total	17
^a Proposers may have applied more than once, within the same category or among different categories	

Table 2-2 aligns the evaluation topics, research questions, and interviewee groups. Appendix A contains the specific questions asked in interview guides for each of the interviewee groups.¹⁰ Most interviews were conducted over the phone, although eight participants and nine proposers elected to provide a written response. The program staff interviews lasted about an hour, the proposer interviews lasted about 15 minutes, while all other interviews lasted about 30 minutes on average. All interview subjects were provided the opportunity to review interview questions in advance of the interview. Following the completion of the interviews, IEC conducted a formal coding analysis of the participant and proposer

would lead to 90 percent confidence that the true value (for the entire population) for a given metric is within +/- 10 percent of observed values. Since participants were not randomly selected, the evaluation team cannot calculate a confidence or precision standard for its findings.

¹⁰ Throughout the interviews, some small adjustments were made to the interview guides; therefore, some questions were not asked of all participants.

interview responses to identify the most common responses to each question. For the other interviewee groups, IEC conducted a qualitative analysis of responses.

Table 2-3. Process evaluation questions and data sources

Evaluation Topic	Research Areas	Interviews					
		Partici- pants	Program Staff	TEP Members	Legal Staff	Contracts Staff	Proposers
Stage-Gate Process	What has the Tech Dev Program's experience been with stage-gating to-date? Which projects have been stage-gated and why?	✓	✓				
	What are the current barriers to stage-gating and how can they be overcome?	✓	✓				
	How can the Tech Dev Program ensure successful implementation of stage-gating moving forward?	✓	✓				
	What is the understanding and opinion of stage-gating among Tech Dev participants?	✓	✓				
	Are Tech Dev participants likely to take advantage of stage gating opportunities in the future?	✓					
	Why do projects that appear to be good candidates for stage-gating not applying for subsequent rounds of funding?	✓					
Solicitation Approach	Has the omnibus nature of the solicitation led to administrative efficiencies compared to the previous solicitation approach?		✓		✓	✓	
	How does the form-fillable proposal format compare to the traditional open narrative format?	✓					
	Do applicants understand their options with regard to the terms and conditions selection on their proposals?	✓					
Technology Readiness Level and Commercial Readiness Level Calculators	What is the potential value of a TRL and/or calculator to the Tech Dev Program? How could a TRL and/or CRL calculator support stage-gating?		✓				
	What are the feasibility issues to consider in developing a TRL and/or CRL calculator for the Tech Dev Program?	✓	✓				
	What is the potential value of a TRL and/or CRL calculator to participants?	✓	✓				
	What issues should program staff consider when designing and implementing a TRL and/or CRL calculator?	✓	✓				
	Did the round six TRL/CRL calculator help proposers choose which project category to apply under?						✓
	Were the options in the round six TRL/CRL calculator clear, and apply to different types of technologies?						✓

Evaluation Topic	Research Areas	Interviews					
		Partici- pants	Program Staff	TEP Members	Legal Staff	Contracts Staff	Proposers
Proposal Scoring Method	What are the potential advantages and disadvantages of changing the Tech Dev Program's current approach to proposal scoring (categorizing as technically meritorious and not technically meritorious) to adopt a three "bin" system (must fund, may fund, do not fund)?		✓	✓	✓		

3 Results

3.1 Evaluation Topic 1: How is stage-gating currently being implemented in the Tech Dev Program, and how can that implementation be improved moving forward?

As noted above, NYSERDA introduced a stage-gate process to the Tech Dev Program beginning with PON 2606; however, currently few projects have actually been stage-gated. Some participants plan to take advantage of stage-gating opportunities in the future, but at the time of this evaluation, their projects were not far enough along to have had the opportunity to apply for multiple rounds of funding (i.e., multiple stages).

While this timing problem accounts for some of the lagging participation in stage-gating under the Tech Dev Program, more importantly, **the evaluation team found that participants and program staff do not share a consistent definition of stage-gating in the context of the Tech Dev Program.** The number of participants reporting their project had been stage-gated was seven; the number of projects that program staff reported as being stage-gated was only three. While participants and program staff were aware of the stage-gating approach in general, some, particularly program staff, think stage-gating refers to providing funding for the next stage of development without needing to reapply; some think stage-gating refers to allowing participants to apply for stage two before finishing stage one; and others think stage-gating refers to providing funding at different stages of development through the current PON. In addition, both program staff and participants conflate stage-gating with setting milestones within a single contract. In other words, some reported that a project had been “stage-gated,” when the project was really in one stage of development, but had measurable milestones attached to funding stages within the current contract. Overall, it is difficult to assess the implementation experience with stage-gating due to the disparate definitions used by program staff and participants.

Most participants think that stage-gating can be an effective tool for the Tech Dev Program, assuming it is implemented clearly and thoughtfully. They suggested that NYSERDA consider that stage-gating may be more effective when it is applied to product development projects, as opposed to research, product demonstration, or projects aimed at behavioral changes. In addition, stage-gating is not applicable to most university-based projects, as they are focused on the research phase only. Finally, most participants indicated that they plan to take advantage of stage-gating opportunities in the future.

3.2 Evaluation Topic 2: What are the advantages and disadvantages associated with the current solicitation approach?

For the current solicitation (PON 2606), NYSERDA consolidated its approach into an omnibus solicitation, covering all technology areas. This was a change from previous Tech Dev solicitations, where each technology area distributed its own PON. **Overall, the evaluation team found that program staff and participants appreciate the new omnibus solicitation approach. In particular, participants appreciate the multiple, defined rounds, which allow them to better plan and prepare their applications.** For example, instead of rushing to put together a proposal for fear that there may not be another funding opportunity, proposers know the schedule of proposal rounds in advance.

The evaluation team also found that:

- While the multiple, defined rounds in the new solicitation were designed to facilitate stage-gating, **the two and a half year solicitation was not long enough to realize multiple stages for most projects**, especially for product development projects, which take about three years on average to move from one stage to another.
- **It is unclear whether the omnibus solicitation has led to overall administrative efficiencies.** While creating one solicitation that covers multiple rounds may save staff effort in the long run, it required significant effort up-front. In addition, the omnibus solicitation did not appear to reduce the amount of effort required to review proposals submitted, either from the program staff or the Legal and Contracts staff. Notably, the omnibus solicitation resulted in a significant burden for Legal and Contracts staff due to concurrent proposal review, TEP meetings, and contracting for all technology categories.
- **Participants were divided on their preference for a form-fillable format versus an open format for applications.**¹¹ Some preferred the form-fillable because it is easier to understand the specific requirements of the solicitation; others find the form-fillable format limiting, particularly when they have previously drafted a narrative and/or have diagrams/tables to include.
- Some participants thought that checking “No” to the terms and conditions of the application would delay or invalidate their application.

3.2.1 Administrative efficiencies: program staff findings

One of the potential benefits of the omnibus solicitation was administrative efficiency. Program staff time for solicitation administration includes solicitation development, meetings about the solicitation, proposal review, and other administrative tasks. Three program staff indicated that time was saved in solicitation development, as it only needed to be done once over the course of four years rather than every year. Program staff were divided on whether they spent less time in meetings due to the omnibus solicitation. Two staff members indicated they spent more time in meetings; one staff member indicated meeting time did not seem to change; and one staff member indicated that meeting time was significantly reduced. One of the staff members thought that meeting time may have increased due to other reasons than the omnibus solicitation, such as changes in the organization overall and changes in staff. It is likely that there were more meetings associated with the upfront development of the solicitation due to the new format, but potentially fewer meetings over time.

In terms of reviewing proposals, program staff indicated that the time they spent reviewing proposals did not change with the new solicitation. However, program staff found that consolidating other administrative tasks did save time. With the omnibus solicitation, one program staff member covered the administrative tasks for each round, whereas with the prior, technology-specific solicitations, every program staff member would be responsible for all administrative tasks for their solicitation.

¹¹ It is IEC’s impression that there may have been two form-fillable versions (Microsoft Word and PDF) and that the problems cited were with the PDF version.

NYSERDA Legal and Contracts staff are also involved in solicitation administration. IEC asked program staff whether more awards were made concurrently under the omnibus solicitation than under prior solicitations and if so, whether this imposed additional burden on Legal and Contracts staff. Program staff were divided on this question. Two program staff members indicated that there is no additional burden on Legal and Contracts staff, as NYSERDA always has a high level of activity across many different solicitations, and having one due date instead of multiple due dates doesn't mean that the awards are all distributed at the same time. However, two other staff members thought there may be a burden on Legal and Contracts staff, as the Tech Dev Program only has one Legal and one Contracts staff member assigned to assist it. One program staff member noted that Legal and Contracts staff may be pooled in the future rather than assigned to particular programs, which may rebalance the workload.

IEC also asked program staff about whether the omnibus solicitation streamlined outreach activities. Two program staff members thought that it did, as they only had to release one press release instead of five, send one email out to their contact list, and proposers only had to read one solicitation rather than having to read multiple solicitations to determine which was appropriate for their project. However, two program staff thought that outreach activities were not streamlined, as they used the same distribution lists and word of mouth at conferences as they did before. One program staff member thought that there was no change in the program's outreach activities, and noted that outreach activities were "still poor."

3.2.2 Administrative efficiencies: Legal and Contracts staff findings

IEC interviewed NYSERDA Legal and Contracts staff about whether the omnibus solicitation led to administrative efficiencies. The Tech Dev program has one Legal and one Contracts person assigned to assist it, and all of the contracts for this program flow through them. These staff members indicated that there were some efficiencies due to the omnibus solicitation, but overall it has led to more burden for them.

Legal and Contracts staff indicated NYSERDA saved time up front in the solicitation process, in creating the Project Planning Request (PPR) and the PON, since there was only one to review rather than one per technology category. However, these staff were overburdened throughout the rest of the solicitation process, particularly for TEP meetings, proposal reviews, and statement of work (SOW) reviews. The Legal and Contracts staff members are required to attend at least the first and last hour of each TEP meeting. During the first hour, the TEP discusses scoring, requirements, and conflicts of interest; during the last hour, they examine "where to draw the line," identify projects to recommend and any requirements that need to be met, and ensure group consensus. With the omnibus solicitation, the TEP meetings (one per technology category) often happened during the same week, and sometimes on the same day, which was difficult for Legal and Contracts staff to manage. The Legal and Contracts staff members also review the one (or two) page summary of each proposal prior to the team meeting, for which they often only have a few days to conduct a detailed review of a document around 100 pages in length.

Once awards are made, the project managers develop SOWs of 15 to 20 pages each that the Legal and Contracts staff need to review. This is a time intensive process for them because the SOWs are often missing required pieces of information, and the Legal and Contracts staff conduct extensive editing.¹² Legal and Contracts staff also work through negotiations for all of the contracts, and debrief proposers who did not win. Due to the omnibus solicitation, much of this later work also occurs simultaneously and creates a heavy burden for them.

3.2.3 Form-fillable proposal

IEc found that about half (10 of 21) of participants prefer a form-fillable proposal and the other half (11 of 21) prefer an open narrative format. A few of the participants were strongly opposed to the form-fillable format and noted significant difficulties copying and pasting text in and out of the document and inserting graphics. Some participants noted that they prepared their submissions ahead of time, with input from several members of their team, and that translating these prepared documents into a form-fillable format was difficult. Other participants found that the form-fillable proposal helped them to know exactly what information NYSERDA wanted and how much information to provide in each area, though some participants found that they needed more space to complete sections of the proposal. It is IEC's impression that there may have been two form-fillable versions (Microsoft Word and PDF) used for PON 2606, and that the problems cited were with the PDF version.

3.2.4 Terms and conditions

IEc asked participants about their understanding of their options with regard to the terms and conditions selection on their proposals. Most (15 of 20) respondents indicated that they were aware that they could negotiate the terms and conditions, but some (7 of 20) believed that selecting "No" or attempting to negotiate would result in their application either not being reviewed or would hinder an award. One respondent stated that even if he/she had wanted to negotiate the terms and conditions, he/she would not risk the time it would take, since the contracting process already takes such a significant amount of time (nine months in this case). Two of the respondents noted that the application did not make it clear that the terms and conditions were negotiable.

¹² NYSERDA participated in a LEAN process that found that the contracts review could happen more quickly if the contracts contain all of the required elements before review. NYSERDA has worked on creating templates and checklists to facilitate this process but at the time of developing this report, many project managers are not using them.

3.3 Evaluation Topic 3: What is the potential value of a TRL or CRL calculator to the Tech Dev Program, and if a calculator is developed, what are the design and feasibility issues program staff should consider?

While a TRL and/or CRL calculator may be useful for evaluating whether projects are ready to move to the next stage, there are a number of significant feasibility issues to developing a calculator for the Tech Dev Program. Some interviewees thought that a TRL calculator could have value for the Tech Dev Program. For example, a TRL calculator could be a valuable companion to the stage-gating process – to help determine whether a project is ready to move to the next stage of funding. However, despite its potential value, half of participants saw significant feasibility issues with its development. A primary concern with the development of a TRL and/or CRL calculator (for both participants and program staff) is its applicability across technologies. It is unlikely that a single calculator could accurately and effectively track important items across several different technology types (e. g., several items would need to be scored “N/A”). However, a significant investment of time and resources would be required to create individual calculators for each technology type.

TRL and/or CRL calculators may also not be as effective at gauging a project’s progress as program staff, who have a wealth of knowledge about the technologies and applicable markets. Additionally, there are some tradeoffs with asking participants to complete a self-assessment through a TRL and/or CRL calculator. On the one hand, participants are likely to have a deep knowledge of their projects, and asking them to complete a TRL and/or CRL calculator can help them think critically about their technology and to understand what is needed to advance to the next level. On the other hand, participants have an incentive to overstate their project’s readiness level.

As noted in Section 1.2, the work plan for this evaluation included questions on TRL and BRL calculators. Through subsequent conversations with program staff, it became clear that there was confusion between CRLs and BRLs, and IEc determined that program staff were more interested in a CRL calculator than a BRL calculator. In addition, staff often either conflated TRL and CRL calculators or reported the same strengths and concerns about the two. Therefore, when interviewing participants, IEc combined questions on TRL and CRL calculators due to their similarity.

3.3.5 Program staff findings

Program staff identified two primary ways that a TRL calculator could provide value to the Tech Dev Program. First, a TRL calculator could provide a finer scale for categorizing projects/activities, and assessing a whole portfolio for readiness. Second, it could provide a guide for project managers and contractors to determine necessary accomplishments for projects to move to the next level or stage, and a common understanding of where a project is in the development cycle. However, some program staff noted that they do not need a calculator to accomplish these objectives, due to their expertise in their technology areas. Program staff noted that they conducted a test run with an existing TRL calculator, and found that the calculator was generally slightly more conservative (by one to two levels) than program staff determinations without a calculator. They also found that many of the calculator questions were irrelevant, and there was no option of “N/A.”

Program staff were divided on whether a TRL calculator would be valuable to participants. Some program staff thought that a TRL calculator would help proposers to understand: what they need to do to advance to the next technology level, to apply for the appropriate phase of funding, and/or to help them think critically about their technology. Others thought that proposers may just see a TRL calculator as something they have to do as part of their application but not have any other value, and most proposers generally already correctly identify what category they are in.

Finally, program staff foresee additional feasibility issues with developing a TRL calculator for the Tech Dev Program. Specifically:

- Program staff do not have a high degree of confidence in the calculator’s ability to determine if projects cleared a stage gate.
- Program staff would need training to properly use a TRL calculator.
- A TRL calculator would need the capability to indicate if an item is not applicable, without affecting the overall score.
- A TRL calculator would not be relevant to the non-product development projects.

If NYSERDA develops a TRL calculator, program staff had the following suggestions:

- Get assistance from industry and contractors with whom they have worked successfully in the past.
- Make the tool user-friendly and define terminology in the questions.
- Have the project manager do calculations in addition to proposers, as proposers have an incentive to overstate their project’s readiness level.

3.3.6 Participant findings

As shown in Table 3-1 below, a number of participants were not familiar with TRLs and/or CRLs as concepts (7 of 26), but most of those who were familiar with them thought that they are valuable and/or useful tools in general (11 of remaining 19).

Table 3-1. Participant responses on general view of TRLs and CRLs as concepts

	Useful /valuable	Not helpful	Not familiar with	Useful in specific areas	Other	Total
What is your general view of TRLs and CRLs as concepts?	11	1	7	1 (for a widget)	6	26

Table 3-2 summarizes the participants’ responses on the value of a TRL and/or CRL calculator. Many participants (12 of 26) thought that a TRL and/or CRL calculator developed by NYSERDA could be valuable to them, mostly to understand NYSERDA’s criteria for each level, especially when moving to the next stage.

Table 3-2. Participant responses on value of TRL and/or CRL calculator

	Yes	No	Maybe	Total
Do you think that a TRL and/or CRL calculator developed by NYSERDA could be valuable to you?	12	8	6	26

Most participants and proposers¹³ (35 of 43) indicated that their organizations do not use TRL or CRL concepts for internal planning purposes, but 10 of these participants and proposers noted that their organization uses something similar. About half of the participants and proposers¹⁴ (19 of 43) reported that other funders outside of NYSERDA have asked their organization for information related to TRL and/or CRL. These other funders include Bonneville Power Administration, DOD, DOE, SBIR, NASA, private investment firms, and USDA. Some of the proposers noted that other funders sometimes ask for other relevant information on readiness, but not TRLs and/or CRLs.

Though many participants thought TRLs and/or CRLs are valuable and/or useful tools, many participants (13 of 21) also thought there would be feasibility issues in NYSERDA developing a TRL and/or CRL calculator. Similar to concerns raised by program staff, these include:

- Need for customization for different businesses and technologies (and option of “N/A”)
- Potential for gaming
- Oversimplification
- Subjectivity

Participants also had a number of suggestions for NYSERDA if they design a TRL and/or CRL calculator:

- External expertise
 - Use industry standard and/or industry experts to develop the calculator
 - Mimic NASA or DOD TRLs
- Design considerations
 - Have an explanation field for each selection
 - Include ability to represent if a technology is in-between levels

¹³ This question was asked of both program participants and proposers to round six of the PON.

¹⁴ This question was asked of both program participants and proposers to round six of the PON.

- Interaction between NYSERDA and contractors
 - Keep centralized at NYSERDA so companies who have multiple contracts can update their level over time
 - Don't rely heavily on the number, also be familiar with the company
 - Be transparent with contractors and work together (NYSERDA and contractors) to do the assessment.
- Other considerations
 - Conduct a beta test before full implementation
 - Keep it simple and transparent
 - Consider university perspective
 - Include business development component

3.4 Evaluation Topic 4: Did the TRL/CRL calculator implemented in round six of the PON assist proposers in completing their applications?

After the evaluation team conducted interviews to answer the previous evaluation question about a potential TRL and/or CRL calculator, the program implemented a new TRL/CRL calculator in round six of PON 2606. As discussed above, the evaluation team found that a TRL and/or CRL calculator that covered all technology categories would be difficult to design and likely have a number of feasibility issues. However, **the TRL/CRL calculator developed by NYSERDA was simple and general enough that it applied across technology categories and proposers did not report any significant issues in using it. Additionally, it assisted some proposers in determining which project category (research, development, demonstration) to apply under.** With that being said, proposers generally seemed to have a good sense of their technology's readiness without the calculator.

A summary of proposer responses to select questions about the TRL/CRL calculator is included in Table 3-3. The evaluation team interviewed 17 proposers, two of whom reported they did not use the calculator as they were not aware of it at the time of their application, and therefore these proposers are not included in the total number of respondents for many of the questions.

Table 3-3. Summary of select proposer responses on the TRL/CRL calculator

Question	Yes	No	Total
Did the TRL/CRL calculator help you decide which project category (research, development, demonstration) to apply under?	7	8	15
Did you have any difficulty filling in the options in the calculator? Were the descriptions of each option clear?^a	14	1	15
Do you think the options in the calculator applied to your technology?	13	2	15
Do you think the options in the calculator adequately described your technology's readiness level?	12	3	15
Do you think the calculator provided an accurate score for your technology?	12	2	14^b
Do you think you could have scored the TRL and CRL levels for your technology without the calculator?	6	9	15^c
Do you find NYSERDA's TRL/CRL calculator to be valuable to you?	8	4	12^d
^a A "yes" response to this question indicates that the proposer did not have difficulty and the descriptions were clear. ^b One proposer responded "not sure." ^c The proposers who did not use the calculator are included for this question. Two proposers did not respond to this question. ^d Two proposers were neutral, and one proposer did not answer the question.			

About half (7 of 15) of the proposers reported that the TRL/CRL calculator helped them decide which project category to apply under. Some of the proposers indicated that the calculator provided a check of their determination without the calculator. Most of the proposers found the calculator to be easy to use and the descriptions of each option to be clear (14 of 15), the options in the calculator applied to their technology (13 of 15), the calculator adequately described their technology's readiness level (12 of 15) and provided an accurate score for their technology (12 of 14). Overall, proposers found the calculator to be easy to use, and generic enough to apply to most technologies. Most (9 of 15) proposers indicated they could not have scored the TRL and CRL levels for their technology without the calculator, and most (8 of 12) found the calculator to be valuable to them.

Proposers provided the following additional feedback on the TRL/CRL calculator:

- Issues for NYSERDA to address:
 - There was some confusion in the calculator between laboratory environment and laboratory scale.
 - The calculator was difficult to use for a project developing specifications for housing design, rather than a technology product and for capturing the reapplication and reuse of commercial products in new ways.
 - The order of the options in the calculator is not consistent, which can cause the user to make mistakes in scoring. In particular, the options in the Technology section are out of order from lowest to highest readiness.

- Additional suggestions for improvement:
 - Incorporate the application form with responses from the calculator, so they can be reviewed in the same format.
 - Provide an example of the calculator filled in, for each type of project, and include a brief discussion of the company (examples can be fictional).
 - Provide greater clarity on how to define a project as research, as the calculator is more focused on product development and delivery.
- Other comments:
 - It can be a judgment call on whether a particular technology falls in one category or the next, but finer granularity of the options would not help and would likely muddy the decision process.
 - One proposer noted that they were rated lower than they would have been if a laboratory demonstration had counted.
 - Fully understanding a technology's readiness involves dialogue, which is captured in other sections of the proposal.

3.5 Evaluation Topic 5: What are the potential advantages and disadvantages of changing the Tech Dev Program's current approach to proposal scoring (categorizing as technically meritorious and not technically meritorious) to adopt a three "bin" system (must fund, may fund, do not fund)?

The evaluation team discussed this topic with program staff and the Legal representative only; it was not discussed with program participants. **While some staff thought that a three tier system would provide more flexibility, most thought this third tier (a "may fund category") would add unnecessary ambiguity and require an additional layer of agreement between TEP members that may cause delays.** Several staff thought that the contracting process provides them with sufficient existing flexibility. For example, staff can include contingencies in the contracts for projects with potential issues. Program staff submit a team memo and a one page summary on each proposal to NYSERDA management summarizing the proposals that they wish to fund; in these team memos, they can make an argument to fund a project deemed not technically meritorious by the TEP or to not fund a project deemed technically meritorious by the TEP. Additionally, the "may fund" category may be more applicable when a program has more technically meritorious proposals than it has funding for, which has not been the case for the Tech Dev Program to-date.

3.5.7 TEP process

During evaluation implementation, IEc learned that the original framing of this evaluation question was incorrect. TEPs do not score projects as “fund” or “do not fund.” Instead, they rank projects and indicate a line above which projects are “technically meritorious” and below which projects are “not technically meritorious,” and are instructed not to consider available project funds in their decision making process. Program staff are given this ranked list, and make the final decision as to which projects will receive funding.

IEc also learned many other pertinent details of the TEP process during this evaluation. For Tech Dev, each technology category has a separate TEP for each round of the PON. Each TEP has external and internal members, with more external than internal members. The members include one of the program staff (in the case of Tech Dev, the project manager for the particular technology category) who guides the TEP process to make sure the TEP members understand the scoring criteria and program goals. The TEP members review the proposals prior to the TEP meeting and give preliminary scores. During the meeting, the TEP members discuss each proposal, and they can change their opinion based on these conversations. After the discussions, each TEP member finalizes their scores for each proposal, and has a best to worst rank. The ranks are summed to determine an overall rank across the TEP members. After determining the ranking, the TEP must draw a line between proposals that are technically meritorious and those that are not technically meritorious. The program staff member determines whether the TEP will work from top to bottom or bottom to top to determine which proposals are technically meritorious, and this may influence where the line is drawn. The TEP may designate proposals as technically meritorious that need contingencies when they go to the contracting phase with NYSERDA. These contingencies are communicated to NYSERDA management in the team memo and one-page summary for each project.

3.5.8 Program staff findings

Program staff identified a number of ways that changing to a three tier system would be advantageous, the primary way being that program staff would have more flexibility to fund proposals below the TEP’s technically meritorious line, and to not fund proposals above the line. Currently, program staff have the ability to do this by providing a justification to NYSERDA management, but it can be difficult. One staff member noted that the flexibility of a three-tier system could be useful as the quality of the TEP review is not always high. Another staff member indicated that NYSERDA management has already begun to allow more flexibility in funding decisions, without a change in the current scoring system. An additional advantage program staff identified is that the three tier system would convey an additional level of information from the TEP, separating proposals that are highly fundable from those that are potentially fundable.

Despite these advantages, program staff identified more disadvantages than advantages in switching to a three tier system. One staff member thought a three tier system could cause the TEP to be “wishy washy” and put a proposal above the line that does not qualify. Another staff member thought a three tier system could make the TEP meetings more difficult and lengthy because they would have to draw two lines instead of one; however, this staff member also indicated that the three tier system might also cause the TEP members to think more critically about the proposals, which could be an advantage. Furthermore, one staff member thought it would be more difficult for program staff to disagree with the TEP categories in a three tier system.

IEc also learned from program staff that the Tech Dev Program does not have more technically meritorious proposals than it has money to fund. A three tier system may be more applicable in a case where a program has more technically meritorious proposals than it has the ability to fund.

3.5.9 TEP member findings

The TEP members varied on whether or not they see advantages to a three tier system. Two of the six TEP members interviewed didn't see any advantage to a "may fund" category as they think there already is one. In their view, the current "may fund" projects are the ones that the TEP deems technically meritorious but that require contingencies.¹⁵ Other TEP members identified potential advantages of a "may fund" category. One TEP member indicated that the additional category could be helpful if available funding becomes limited, in order to prioritize particular proposals. Another TEP member thought that a "may fund" category could give value to proposals that sound promising but aren't technically meritorious.

TEP members also identified potential disadvantages associated with a three tier system. One TEP member thought that a three tier system may cause delay, as the TEP would have to come to an additional agreement, and that this additional level may not provide added value. Another TEP member noted that under a three tier system, the TEP would have to be careful about fairness, as it could be unfair if they designate some projects as needing more information. A third TEP member indicated that there are few perfect proposals, and the "may fund" category may become a default.

3.5.10 Legal staff findings

The Legal staff member interviewed confirmed that program staff have the flexibility to fund proposals below the technically meritorious line and to not fund proposals above the line. Because of this, the Legal staff member interviewed did not see any advantage to a three tier system, as all proposals are "may fund" (i.e. NYSERDA doesn't have to fund any or could fund all). However, the Legal staff member indicated that a three tier system would not have legal barriers, as long as it could be deemed competitive.

¹⁵ IEc learned from TEP members that the TEP may deem proposals technically meritorious but require contingencies when they go to the contracting phase with NYSERDA.

3.6 Other Findings

During the interviews with participants, the evaluation team identified two additional findings worth noting here:

1. Although IEC did not ask directly about implementation issues, many participants reported concerns with sometimes substantial delays in contracting at NYSERDA. These contracting delays can be problematic, especially for smaller companies, as they need to have staff ready to implement the project but cannot effectively plan the timing of their staffing needs with unknown turnaround times from NYSERDA. The contracting delays also often come with significant back and forth with NYSERDA, which increases participants' administrative costs; some participants noted not budgeting enough administrative time to account for these additional tasks.
2. Some participants noted that NYSERDA should consider offering a business development component to their Tech Dev awards. This additional support could be valuable as companies research, demonstrate, and learn to market their products.

4 Recommendations

Based on the findings of this evaluation, IEC offers the following recommendations for improving program processes:

Evaluation Topic 1: How is stage-gating currently being implemented in the Tech Dev Program, and how can that implementation be improved moving forward?

3. Program staff should discuss the goals and meaning of **stage-gating**, ensure that it is consistent with any corporate definition of stage-gating, and create guidance clarifying how stage-gating works within the Tech Dev Program. This evaluation found significant inconsistency among and between program staff and participants regarding the definition and implementation of stage-gating. If implementing stage-gating is a priority for the Tech Dev Program, consistent understanding and clear guidelines for implementation are critical.
 - a. Program staff should create an outreach piece to accompany the next solicitation to clarify the agency's approach to stage-gating for the Tech Dev Program. Once there is an internal understanding of stage-gating in the Tech Dev Program, NYSERDA needs to ensure that current and future participants have a common understanding as well.

Evaluation Topic 2: What are the advantages and disadvantages associated with the current solicitation approach?

4. Continue to use an **ombibus solicitation approach** where possible and appropriate, with clear defined rounds. Participants appreciate the consolidated approach, and the multiple rounds (announced early on) allow them to better plan for and prepare their submissions. If possible, to reduce the burden on Legal and Contracts staff, move to a pooled approach rather than assigning these staff to particular programs, or implement templates and checklists for SOWs to ensure they have all of the required elements before review.
5. Include language within future solicitations clarifying that if a proposer declines to sign off on NYSERDA's **terms and conditions**, the proposal will not be disqualified, nor will its evaluation be affected. This evaluation found that some participants believed that negative consequences would result from not agreeing to the terms and conditions, when this is not the case, resulting in some proposers indicating agreement with the terms and conditions up front but later indicating that compliance would be difficult. Clarifying the language regarding terms and conditions up front may help to alleviate some of the delays in contracting after award, and may remove a barrier to participation in the Tech Dev Program.

Evaluation Topic 3: What is the potential value of a TRL or CRL calculator to the Tech Dev Program, and if a calculator is developed, what are the design and feasibility issues program staff should consider?

(No recommendation given that NYSERDA subsequently developed a calculator; see below).

Evaluation Topic 4: Did the TRL/CRL calculator implemented in round six of the PON assist proposers in completing their applications?

6. The evaluation team found that the **TRL/CRL calculator** provided some help in assisting teams in completing the applications. However, proposers generally seemed to have a good sense of their technology's readiness without it. Moving forward, IEC suggests that NYSERDA address the minor functionality issues identified by proposers and discussed under key findings.

Evaluation Topic 5: What are the potential advantages and disadvantages of changing the Tech Dev Program's current approach to proposal scoring (categorizing as technically meritorious and not technical meritorious) to adopt a three "bin" system (must fund, may fund, do not fund)?

7. IEC does not recommend adding a **"may fund" category** to the TEP proposal scoring process for Tech Dev; NYSERDA should continue to rank projects with an indication as to whether or not the proposal is technically meritorious or not technically meritorious. The current system has the flexibility that a three tier system could potentially add, without the added effort and confusion that may be associated with a three tier system.