DE-SC005500
Innovation Ecosystem Development Initiative

# Energy Innovation Acceleration Program

FINAL REPORT
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Submitted by:

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# 1 Summary

## 1.1 Key Outcomes

The Energy Innovation Acceleration Program (IAP) – also called U-Launch – has had a significant impact on early-stage clean energy companies in the Northeast and on the clean energy economy in the Northeast, not only during program execution (2010-2014), but continuing into the future.

Key results include:

- Leverage ratio of 105:1
- $105M in follow-on funding (upon $1M investment by EERE)
- At least 19 commercial products launched
- At least 17 new industry partnerships formed
- At least $6.5M in revenue generated
- >140 jobs created
- 60% of assisted companies received follow-on funding within 1 year of program completion

In addition to the direct measureable program results summarized above, two primary lessons emerged from our work executing Energy IAP:

- Validation and demonstration awards have an outsized, 'tipping-point' effect for startups looking to secure investments and strategic partnerships (see Section 5.2).

- An ecosystem approach is valuable, but an approach that evaluates the needs of individual companies and then draws from diverse ecosystem resources to fill them, is most valuable of all (see Section 4.2).

## 1.2 Improving the Innovation Ecosystem

The Energy Innovation Acceleration Program (IAP), also called U-Launch, has blended a unique set of resources in the Northeast to help new ventures avoid typical start-up pitfalls and beat the odds to grow into mature companies.

This ecosystem has combined technology invention at regional universities, Fraunhofer technical expertise and R&D capabilities through the TechBridge Program, the New England Clean Energy Foundation's (NECEF) mentoring services, the Massachusetts Clean Energy Center's (MassCEC) sector development program and market incentive programs, and the ACTION Network's robust incubator services to provide a solid support and acceleration ecosystem for clean energy startup companies.

## 1.3 Technical Effectiveness and Economic Feasibility

We have shown the Fraunhofer-led ecosystem approach to be very effective. The U.S. Department of Energy Program Review termed our approach "surgical…[with an] exquisite choice of technical projects and value added," and "a tremendous accelerator."

Two elements of our program are important to touch upon with respect to technical effectiveness and scalability, and economic feasibility and impact.

*Technical effectiveness and scalability:* In Section 5, we show via program metrics, and by breakdown by award type, the effectiveness of our approach. While initially questions were asked about how feasible the approach would be in different areas of the country, program staff have made tremendous progress in laying the groundwork for scaling the approach. Since completion of the U-Launch program, we have effectively provided project awards to companies in other areas of the country. We have been able to make our lab's capabilities, facilities, and expert engineering staff available for the benefit of start-ups across the U.S. developing promising products. Further, we have developed the framework that would allow other similar organizations, such as National Labs, to provide the same type of services. (Ability to scale and execute the approach elsewhere were chief concerns cited in our Program Review).

*Economic feasibility and impact:* With a 105:1 leverage ratio of follow-on funding to initial government investment, the economic impact is clear. Our ecosystem has developed an impactful approach that stands to be considered for replication elsewhere. Additionally, we have shown that a higher investment per company served and 'high-touch' approach can have an equal or greater impact in the aggregate metrics, than many of the 'lighter-touch' approaches more typical of conventional ecosystem support organizations. (This has been an additional criticism of our approach cited in the Program Review, with the suggestion to reduce the funding allocated per venture so that a larger number of businesses can be supported.)

## 1.4 Benefit to the Public

IAP/U-Launch has brought significant public benefit via support from EERE, chiefly along three axes: (1) Bringing innovative, beneficial technologies to market for the benefit of society, (2) Creating economic impact through job creation and contributing to the growing clean energy economy, and (3) Yielding clear measurable impact and lessons learned, the processes for which could guide the evaluation of future government investments, should EERE or DOE so choose.

IAP/U-Launch has supported the commercialization of innovative technologies to transition to a clean energy future. A list of commercialized technologies supported through this program can be found in Table 4. Additionally, many more products are under development by companies that received critical support from IAP/U-Launch.

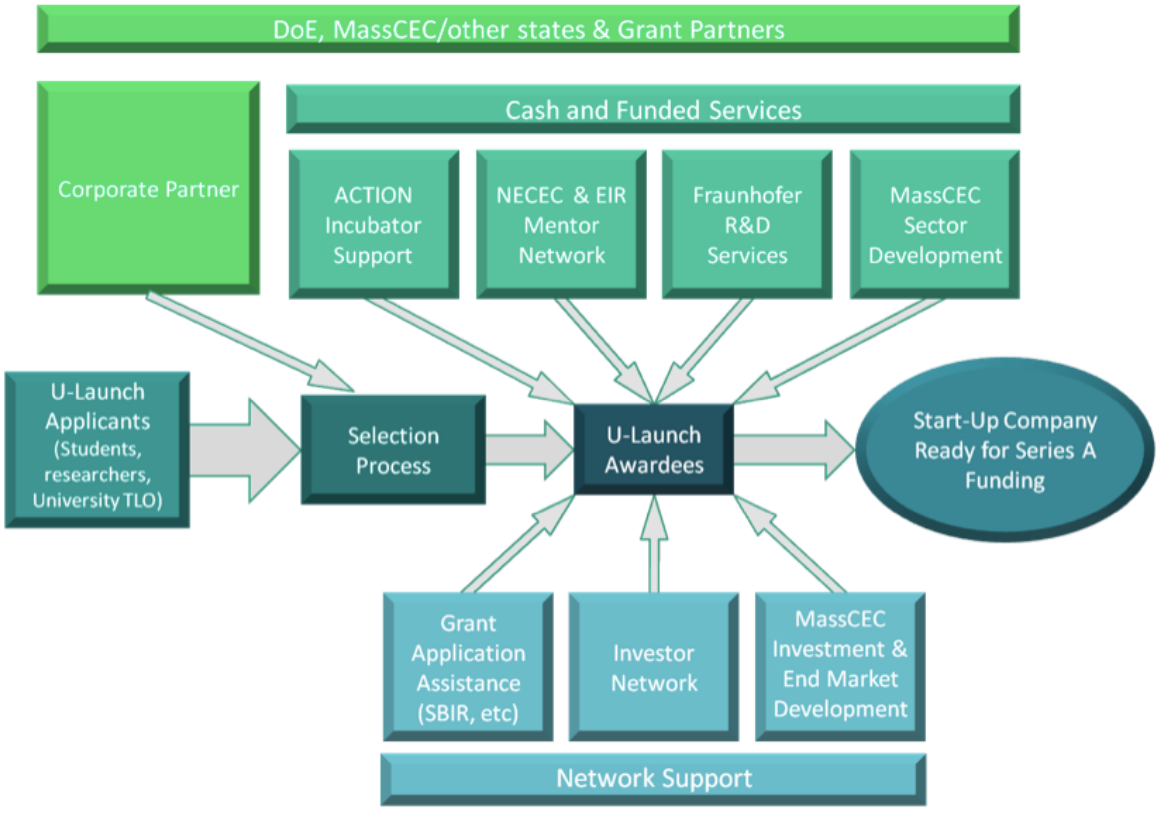
The program has also created significant economic impact through job creation (>140 jobs) and commercial revenues (>$6.5M), as well as through indirect measures. Additionally, our program has supported especially disruptive and capital-intensive companies, which are contributing to the growth of the clean energy economy and clean energy manufacturing, which will contribute to long-term economic growth outside the context of individual companies. IAP was also the genesis for the TechBridge program engaging with corporate partners. Through that work, we are now encouraging large corporate partners to engage in external innovation and disruptive growth, further driving the clean energy economy forward.

We believe that startup support programs are generally lacking in the quality of their success metrics and their processes for measuring impact. We developed a set of processes and metrics (see Section 4.3 and Section 5) that could be adapted to other government-funded programs (e.g., through NIICE to multiple incubators). Such practices, adopted widely and adapted as needed, could ensure that government-funded incubator, accelerator, and innovation ecosystem programs are well-documented and that best practices can be identified in an impartial, objective manner.

# 2 Program Goals, Objectives, and Accomplishments

IAP/U-Launch was created to improve and combine the capabilities of Fraunhofer R&D, NECEF, MassCEC, and the ACTION Network for streamlining commercialization of university spin-outs (See Figure 1). IAP has connected high-impact university projects across New England with R&D services, experienced mentors, capital sources, and incubator services. Program activities have facilitated technology transfer and rapid prototyping, accelerated achievement of early-stage business, market, and technology validation milestones, and enabled new business formation and job growth.

**Figure 1: Relationship of Partners and Processes to IAP/U-Launch Program**




The main objective of IAP/U-Launch was to create and foster an ongoing ecosystem in which university technology commercialization is efficient and accelerates the creation of start-ups, in

order to contribute to economic growth and job creation. Table 1 summarizes the original Program Objectives, and compares them to the evaluated outcomes so far.

**Table 1: Program Objectives & Outcomes**

| Original Program Objective | Outcome |
|---|---|
| Acceleration of the licensing process at affiliated universities by engaging and encouraging universities to participate in the program | IAP/U-Launch program staff engaged university tech licensing heavily in identifying program applicants (example: Arctic Sand). These efforts continue beyond the grant period. |
| Acceleration of technology and market assessment activities by utilizing our network of entrepreneurs, consultants and hired staff and streamlining the process through the use of the Innovation Acceleration Program Task Force. | Program staff worked across organizations to evaluate markets, solidify technology development plans, and help develop business plans for all served companies. These efforts continue beyond the grant period. |
| Acceleration of the seed fund raising by engaging a group of venture capital and strategic investors | The program is believed to have accelerated seed and Series A round fundraising for >60% of the companies who participated. The progress of those companies continues to be tracked. |
| Acceleration of R&D and prototyping by utilizing Fraunhofer's numerous research labs and years of technical expertise | RD&D and prototyping services were provided to multiple companies, with outsized, 'tipping-point' impact. |
| Acceleration of the startup creation process by linking technologies with the appropriate entrepreneurs, CEOs, and other key members of management team as well as appropriate sources of capital | Program staff worked across organizations to identify mentors and resources for all served companies, and additionally have served (and continue to serve) as connectors for many more. |
| Providing ongoing support, training, and mentoring of selected companies by leveraging the NECEF Entrepreneurs-in-Residence (EIR) program and expanding relationships with organizations that provide training to entrepreneurs | IAP/U-Launch utilized NECEF's EIR program for multiple companies. Indirectly, the NECEF network also served to connect other companies to critical resources. |
| Facilitation of startup companies via ACTION Network of cleantech business incubators providing physical space and support services | Companies were placed within the ACTION network according to their specific needs. |

Over the course of the IAP/U-Launch program, program staff actively funded 43 startup companies with project, incubation, and mentorship awards. In addition, we assisted countless more in making meaningful connections, giving feedback and input in pitch development, business plans, and technology development and demonstration. We estimate that the program staff has reviewed at least 450 technologies over the 3-year period for serious consideration of startup awards. 10 of the 43 companies received technical RD&D project awards from Fraunhofer (and funding to support 5 more project awards was secured from other sources). 60% of the assisted companies received follow-on funding within 1 year of program completion, even though the majority of companies had received no funding prior to participation in the program. Table 2 summarizes these accomplishments relative to the initially defined goals.

**Table 2: Program Goals & Accomplishments**

| Program Goal | Accomplishment |
|---|---|
| Review of 300 technologies. | Reviewed >450 technologies. |
| 40 of the reviewed technologies will be brought into the IAP program. | 43 of the reviewed technologies were brought into the program. |
| 10 companies will receive seed funding over the first 3 years to begin performing R&D work and be spun out of the universities. | 10 companies received in-kind RD&D work; in addition the program staff secured outside funding to support RD&D work for 5 additional companies. |
| Continuous mentoring and technical support will be provided until the companies reach the next level of funding enabling expansion of the management team and operations. | All of the 43 companies that participated have continued to receive business and technical mentoring from organizations that teamed for IAP/U-Launch. |
| Most of the 10 selected companies will then be expected to raise Series A funding within the next 2 years to expand its team and begin to work on the product. | 26 of the 43 total companies received seed or Series A funding. 8 of the 10 companies that received technical development project awards received seed or Series A funding. |
| Each Round A funded company will create 200-250 jobs over a 10 year period | Companies have cumulatively created a conservative estimate of 140 jobs; the majority of these are from the subset of 10 companies, as shown in Figure 8 in Section 5. |

# 3 Summary of Program Activities

## 3.1 Original Hypotheses and Changes to Proposed Approach

The Innovation Acceleration Program originally assumed the availability of seed capital prior to R&D projects and Entrepreneur matching. The granted approach also included very early stage technology pooling and team building. The executed U-Launch program was formed as a hybrid of these two approaches, as previously reported to and approved by EERE. Equity round seed investments and even convertible notes were seen as a source of delay rather than acceleration. Instead U- Launch focused on building toward a grant award program with support from external sponsors. U- Launch could then operate as a business acceleration process to prepare early stage companies for follow-on funding sources.

Program staff determined that it was much more expedient to partner with existing business plan competitions when possible, in order to minimize overhead devoted to recruiting and selection. While we still supplemented existing business plan competitions with open solicitations and outreach, this combined, partnered approach allowed us to focus more resources on the execution of support projects and the matching of entrepreneurs with mentors and other needs.

In the originally proposed approach, we hypothesized that venture capitalist groups would be suitable partners for seed funding select companies; however, we found in practice that individual financing partners could not be relied upon to provide seed funding to companies. Instead, we pivoted to an approach of incorporating market pull in designing support projects, and allowing startup companies to make the best use of results in pitching to prospective investors – including those outside our pre-identified channels.

The IAP was proposed to be a scalable self-sustaining program that could be replicated in other areas of the country. It was thought that the program could achieve full sustainability in 3 years; however, this approach was overly optimistic. In the third year, and subsequently, we have spent significant effort developing and executing on sustainability plans and preparing the program to be launched in other ecosystems outside Boston. We have not yet reached 100% sustainability; however, we are making significant progress both on external funding and implementing the program for startups nationwide.

## 3.2 Additional Funding Sources and Startup Clients

Throughout the course of the program, the Fraunhofer-led ecosystem secured additional outside funding to support, augment, or extend programmatic activities launched under the IAP, from sources including:

- Clean Energy Alliance (Fraunhofer)
- Small Business Administration (Fraunhofer)
- The Kauffman Foundation (Fraunhofer)
- Shell GameChanger (Fraunhofer)
- Massachusetts Clean Energy Center (NECEF)

- NYSERDA (NECEF)
- Economic Development Administration (NECEF and Fraunhofer)

Additional startup companies assisted via technical RD&D projects (other than those listed below in Table 3), via other funding sources, include:

- Cambrian Innovation
- Radiator Labs
- Simple Energy
- XTRLs International
- ThermoAura

While the funds to support these companies came from other sources, (including Clean Energy Alliance, Small Business Administration, The Kauffman Foundation, and Shell GameChanger), supporting them would not have been possible without the IAP/U-Launch program in place.

## 3.3 Program Activities

**Table 3: Summary of Program Activities by Year, including awardee companies.**

| Year | Main Activities | Awardee Companies (start of engagement) |
|---|---|---|
| 2010 | • Program initiation and kick-off<br>• Solidified advisory board and key personnel<br>• Opened U-Launch platform for applications | N/A |
| 2011 | • Announced collaboration with CTO Northeast<br>• Performed U-Launch awardee selections<br>• Teamed with CTO Northeast to augment awardee pipeline<br>• Worked with partners to provide targeted mentorship matching<br>• Worked with partners to provide multiple incubation awards<br>• Executed FirstFuel project | N12 Technologies<br>FirstFuel<br>Dynamo Micropower<br>Keystone Tower Systems<br>Thermeleon<br>Machflow<br>Logicoul<br>Altaeros Energy<br>ByteLight<br>Arctic Sand |
| | • Performed awardee selections<br>• ACTION incorporated as a 501c3<br>• Teamed with CTO Northeast and Utility Technology Challenge to augment pipeline<br>• Worked with partners to provide multiple | WegoWise<br>Retroficiency<br>Embue<br>Vecarius<br>SynAirCo<br>SolidEnergy<br>RenAir |

| | | |
|---|---|---|
| 2012 | incubation awards<br>• Worked with partners to provide targeted mentorship matching<br>• Global Cleantech Meetup (Ecosystem development)<br>• Executed ByteLight Project<br>• Executed Arctic Sand Project<br>• Executed N12 Technologies Project<br>• Initiated efforts to secure sustainability<br>• Presented at ARPA-E Summit with awardee<br>• Led Product Development workshop for Cleantech Open participants | Power Ally<br>Pika Energy<br>PelletCo<br>Jubilee Flooring<br>Hydrorecovery<br>FXQ<br>Energy Intelligence<br>Energy Compression<br>Divya<br>Cleansoft<br>Cerahelix<br>Callida Energy<br>BRASH<br>Advanced Products Company<br>Thinklight<br>… and previous |
| 2013 | • Global Cleantech Meetup (Ecosystem development)<br>• Executed WegoWise Project<br>• Executed Embue Project<br>• Executed Ubiquitous Project<br>• Executed Retroficiency Project<br>• Further developed avenues for long-term program sustainability | Ubiquitous Energy<br>Sistine Solar<br>NBD Nanotechnologies<br>… and previous |
| 2014 | • Executed NBD Nano Project<br>• Executed Sistine Solar Project<br>• Compiled final program metrics<br>• Developed a model for private-sector funding of projects | Continued serving previous companies |

# 4 Products and Methodologies Developed

## 4.1 Products launched by awardee companies

During IAP/U-Launch, we supported 43 companies who were largely pre-revenue and had not raised significant capital. Some of the 43 companies have already released commercial products and are generating revenue. Table 4 lists known product launches from companies supported by IAP/U-Launch. (Commercial product development was supported only indirectly via program

activities. Companies developed their products through self-generated fundraising efforts; IAP/U-Launch activities supported ongoing company efforts.)

**Table 4: Awardee Company Product Launches**

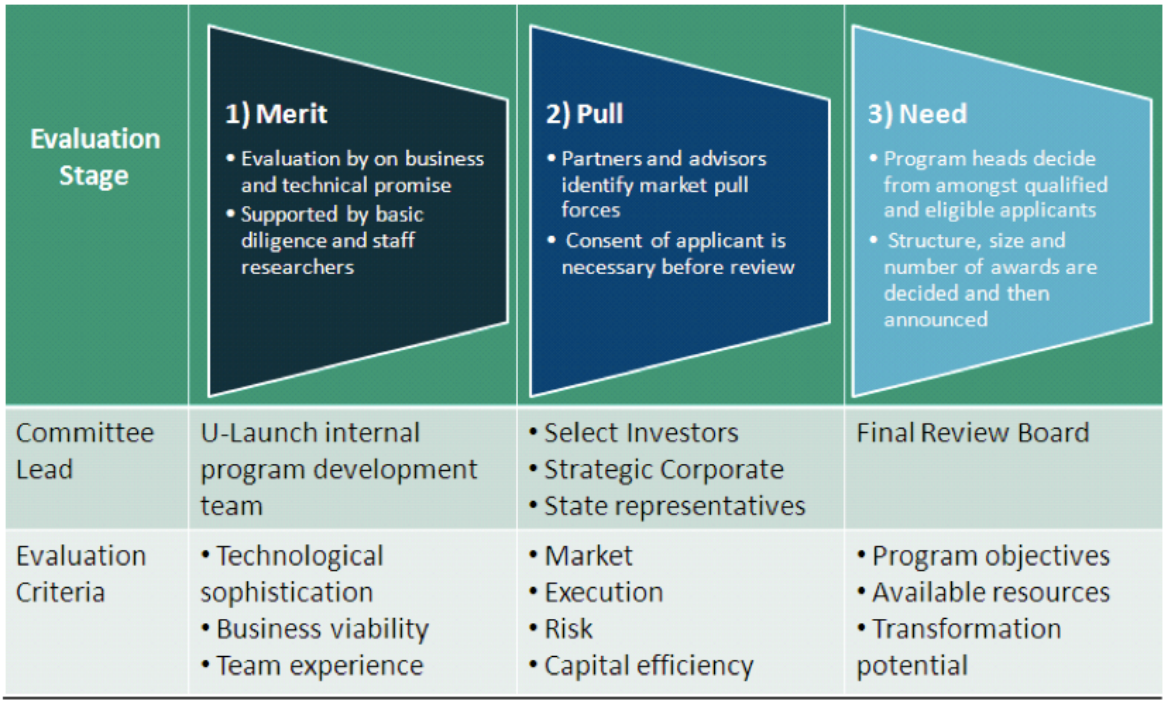
| Awardee Company | Product Name | Product Description (if available) |
|---|---|---|
| BRASH Engines Inc. | Prototype | 1.2 kW CHP |
| Callida Energy | Calida Energy Solution | Energy optimization software for commercial buildings |
| Cambrian Innovation | EcoVolt | Energy positive wastewater system |
| Embue (Coincident) | Embue Core | |
| Embue (Coincident) | Embue Module | |
| Embue (Coincident) | Embue Sensor | |
| Embue (Coincident) | Embue Switchboard | |
| FirstFuel Software (Iblogix) | FirstAudit | Building-specific remote audits that deliver customized, actionable energy savings recommendations. |
| FirstFuel Software (Iblogix) | FirstMonitor | Advanced predictive analytics for efficiency savings monitoring, measuring, and alerting. |
| FirstFuel Software (Iblogix) | FirstScreen | Portfolio screening analytics to rapidly determine which buildings hide deep savings potential. |
| FirstFuel Software (Iblogix) | FirstEngage | Engagement portal that transforms energy consumption information into intelligent action. |
| N12 Technologies | Nanostitch Surface Layer System | Multifunctional Coating |
| N12 Technologies | Nanostitch | CNT interlaminar composite reinforcement |
| PelletCo | HeatPod | PPA for thermal energy |
| Pika Energy | T701 | Wind turbine |
| Pika Energy | X3001 | Inverter |
| Pika Energy | S2001 | Solar charger |
| Radiator Labs | Cozy | Thermostatic control of radiator heat |
| Retroficiency | Automated Energy Audit | Building portfolio analysis tool |
| Retroficiency | Virtual Energy Assessment | Building portfolio analysis tool |
| Retroficiency | Efficiency Track | Building efficiency M &V tool |
| Retroficiency | Building Efficiency Intelligence (BEI) | Mines utility meter data and building information, combining them with industry's energy analytics to create energy models to improve efficiency upgrades. |
| Sealed | Sealed Efficiency Sales Software | Software used in the field to offer Sealed's energy savings guarantee |
| Simple Energy | Energy Insights | Presents Energy Usage data |

| | | |
|---|---|---|
| Simple Energy | Energy Challenge | Allows users to compete to save energy |
| Simple Energy | Energy Rewards | Allows users to redeem points for energy efficient products and services |
| Simple Energy | Marketplace | E-commerce platform connecting utilities, consumers |
| Sistine Solar | Solar Tiles | Handheld LEGO-like solar tiles that come in different colors and designs and which can be mixed and matched to create different patterns |
| Thermoaura | Thermoelectric nanopowder | Bismuth telluride alloy nanopowders |
| WegoWise | WegoScore | An efficiency rating for apartments |

## 4.2 Award Process

IAP/U-Launch program staff developed a methodology for evaluating as outlined below in Figure 2. Companies were first evaluated on technical and business merits. Promising startups were then reviewed in the context of market pull, as defined by investor and industry partners. Finally, awardees were selected based on best program fit given the availability of resources made available from the program partners. Eligibility criteria and scoring rubrics can be made available upon request.

**Figure 2: Selection Process**



Once awardees were selected, program staff evaluated each company's needs separately, and designed and allocated awards based on company needs. The types of awards made available to companies could include incubation, entrepreneur-in-residence, and technical services awards.

Program staff made awards in a 'surgical' manner, evaluating in each case what would make a unique value to a company. We believe that avoiding a one-size-fits-all approach was key to achieving the strong program results, which is supported by our follow-on metrics as well as from anecdotal feedback from awardee companies and investors:

> *"We were able to show potential investors that our [technology] had been technically validated and that the results showed the promise of the technology. [TechBridge] helped us receive the venture funding that will take our technology to the next stage of commercialization."*
> - Swapnil Shah, CEO and Founder, FirstFuel Software

> *"The work of Fraunhofer CSE and the TechBridge program provided us with valuable technical insight before making our investment decision in a new energy efficiency startup."*
> - Daniel Hullah, Rockport Capital Partner

A key lesson learned was that while an ecosystem approach is invaluable because many types of resources can be deployed, a different set of resources represents the optimal award for each company. We developed an approach that evaluated the needs of individual companies, and then drew from diverse ecosystem resources to fill those needs.

## 4.3 Survey & Metrics Process for tracking success

During the course of the program, we examined several options for success metrics and evaluating impact; however, we were unsatisfied with existing approaches. Instead, we devised our own method and developed a configurable database of company profiles and data to track the success of the many companies that we have worked with via IAP/U-Launch.

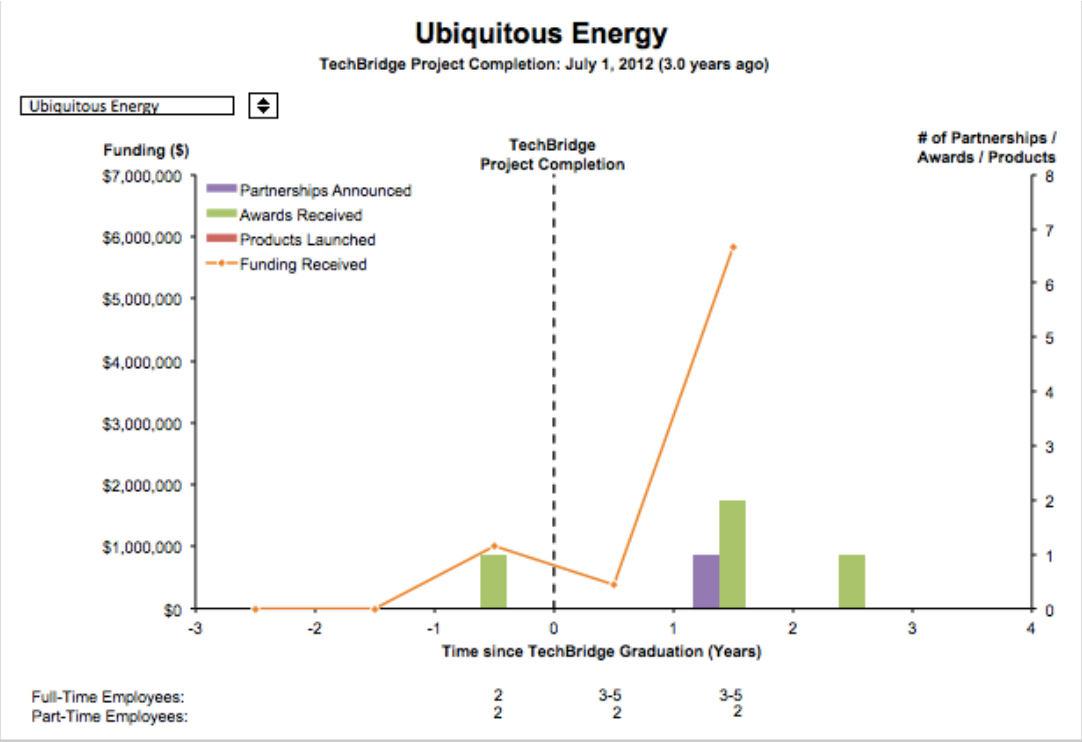
Before we provide services, we request each company to provide baseline metrics (funding, revenue, products, partnerships, and jobs). Subsequently, we survey each company once a year to request an annual update on the numbers. We also corroborate the survey data with that which is publicly available (most commonly private-sector funding events, commercial product launches, and strategic partnerships).

The data is then incorporated into our database, where it can be used to display the results of an individual company's journey (as shown in Figure 3), or displayed in aggregate with other companies (as shown in multiple figures in Section 5).

We believe that rigorous quantitative data practices are sorely lacking in the incubator, accelerator, and ecosystem development space, and that government and private sector investment could be put to increasingly greater use if stakeholders had uniform ways to measure impact and success.

Final program metrics are provided in Section 5.

**Figure 3: Example of company profile from our developed Metrics Database**




# 5 Final Metrics and Best Practices

## 5.1 Final Metrics

Collected event-based final program metrics are displayed in Table 5. Notable funding results from these numbers include:

- Total follow-on funding is $105M
- Program graduates are most likely to raise their first $1M within 12 months of program completion
- In first 12 months, the average seed funding secured by program graduates is $1.5M

**Table 5.** Final Funding, Product, and Partnership Statistics

## Summary Statistics for Program Graduates
## Event Data

| | Calendar Year | | | | | Years Since TB Graduation [3] | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **2011** | **2012** | **2013** | **2014** | **2015** | **1** | **2** | **3** | 4 |
| # of TB Graduate [2] | 5 | 29 | 32 | 34 | 34 | 34 | 31 | 8 | 1 |
| # of Funding Events | 4 | 11 | 29 | 16 | 2 | 41 | 56 | 61 | 62 |
| # of TB Graduates Receiving Funding | 2 | 8 | 19 | 10 | 2 | 22 | 22 | 22 | 22 |
| % of TB Graduates Receiving Funding | 40% | 28% | 59% | 29% | 6% | | | | |
| Min Funding Size (Thousand $) [4] | $25 | $20 | $5 | $15 | $750 | $5 | $5 | $5 | $5 |
| Median Funding Size (Thousand $) [4] | $100 | $450 | $150 | $0 | $11,875 | $150 | $175 | $225 | $263 |
| Average Funding Size (Thousand $) [4] | $81 | $1,256 | $1,250 | $1,873 | $11,875 | $1,093 | $1,127 | $1,329 | $1,679 |
| Max Funding Size (Thousand $) [4] | $100 | $9,600 | $9,600 | $7,000 | $23,000 | $9,600 | $9,600 | $9,600 | $23,000 |
| Total Funding (Thousand $) [4] | $325 | $13,820 | $36,243 | $29,960 | $23,750 | $44,825 | $63,098 | $81,098 | $104,098 |
| Min Funding (Multiple of Total Award) [5] | | | | | | 0x | 0x | 0x | |
| Median Funding (Multiple of Total Award) [5] | | | | | | 27x | 63x | 402x | |
| Average Funding (Multiple of Total Award) [5] | | | | | | 264x | 367x | 514x | |
| Max Funding (Multiple of Total Award) [5] | | | | | | 3,000x | 3,000x | 1,513x | |
| # of Products Launches | 0 | 2 | 6 | 11 | 0 | 14 | 18 | 19 | 19 |
| # of TB Graduates Launching Products | 0 | 2 | 4 | 7 | 0 | 8 | 10 | 10 | 10 |
| % of TB Graduates Launching Products | 0% | 7% | 13% | 21% | 0% | | | | |
| # of Accelerator/Incubator Participations | 2 | 6 | 15 | 6 | 0 | 24 | 27 | 29 | 29 |
| # of TB Graduates Participating | 2 | 4 | 13 | 6 | 0 | 17 | 18 | 18 | 18 |
| % of TB Graduates Participating | 40% | 14% | 41% | 18% | 0% | | | | |
| # of Partnerships Announced | 0 | 4 | 4 | 7 | 2 | 6 | 13 | 17 | 17 |
| # of TB Graduates Announcing Partnerships | 0 | 4 | 4 | 7 | 2 | 6 | 10 | 12 | 12 |
| % of TB Graduates Announcing Partnerships | 0% | 14% | 13% | 21% | 6% | | | | |
| Awards Announced | 5 | 14 | 12 | 11 | 2 | 34 | 40 | 43 | 44 |
| # of TB Graduates Announcing Awards | 3 | 10 | 6 | 6 | 2 | 16 | 17 | 18 | 18 |
| % of TB Graduates Announcing Awards | 60% | 34% | 19% | 18% | 6% | | | | |

[2] **Calendar Year**: Cumulative # of TB Graduates as of December 31 that calendar year; **Years since TB Graduation**: # of TB graduates that have graduated for at least that many years (as of today).

[3] Figures in this part of the table are cumulative. E.g., "# of Funding Events" within two years of TB graduation includes funding events that occurred within one year of graduation.

[4] Summary statistics for funding sizes are based on all available funding events during the specified time period. Note that companies without funding events are therefore not reflected in any way in these figures. In other words, the minimum funding size will always be positive.

[5] Summary statistics for funding multiples exclude companies that have not yet completed TB for the specified number of years (e.g., the funding multiple in the 2-year column is only based on companies that have graduated from TB more than 2 years ago as of today). Companies that did not receive any funding during the specified time period are included. Note that this calculation differs from the calculation of the funding size summary statistics above.

While event-based data such as fundraising, product launches, and commercial partnerships are public and can thus be tracked reliably (and corroborated with survey data), proprietary information such as employee count and revenues are difficult to track. While every effort has been made to gather additional information from awardees through the survey method, the response rate to date has been somewhat low at 30%, due to limited resources available for data collection and followup. Thus, aggregate revenue and jobs numbers are estimates based on responses obtained from 30% of companies. It is likely that the employment numbers are significantly more accurate than the revenue numbers, because they have been corroborated by performing a correlation with follow-on funding data, which is publicly available. (We have found that the number of employees is closely correlated with follow-on funding, while revenue numbers are not closely correlated with follow-on funding. This is logical, as early-stage startups use funds chiefly to employ staff, and revenue from commercial sales is a downstream effect of employing engineering staff over many months, or even a few years.)

## 5.2 Best Practices

In an effort to identify best practices, we sought to identify if certain awards or ways of interacting with startup companies were more impactful than others. We used our developed Metrics Database to look at the results of portfolio companies in various ways.

Among the most striking results: validation and demonstration awards (in the form of RD&D projects) seem have an outsized, 'tipping-point' effect for startups looking to secure investments and strategic partnerships. **In every metric we examined, companies that received these technical development services outperformed those that did not—*not only on average, but even in aggregate, even though there were far fewer of these companies than the others.***

**Figure 4**

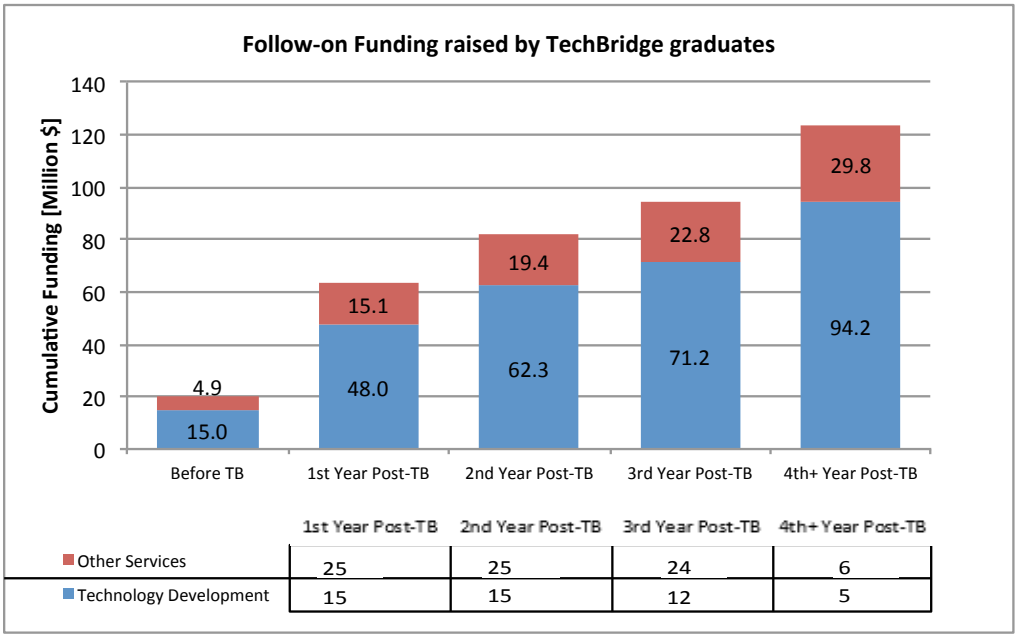
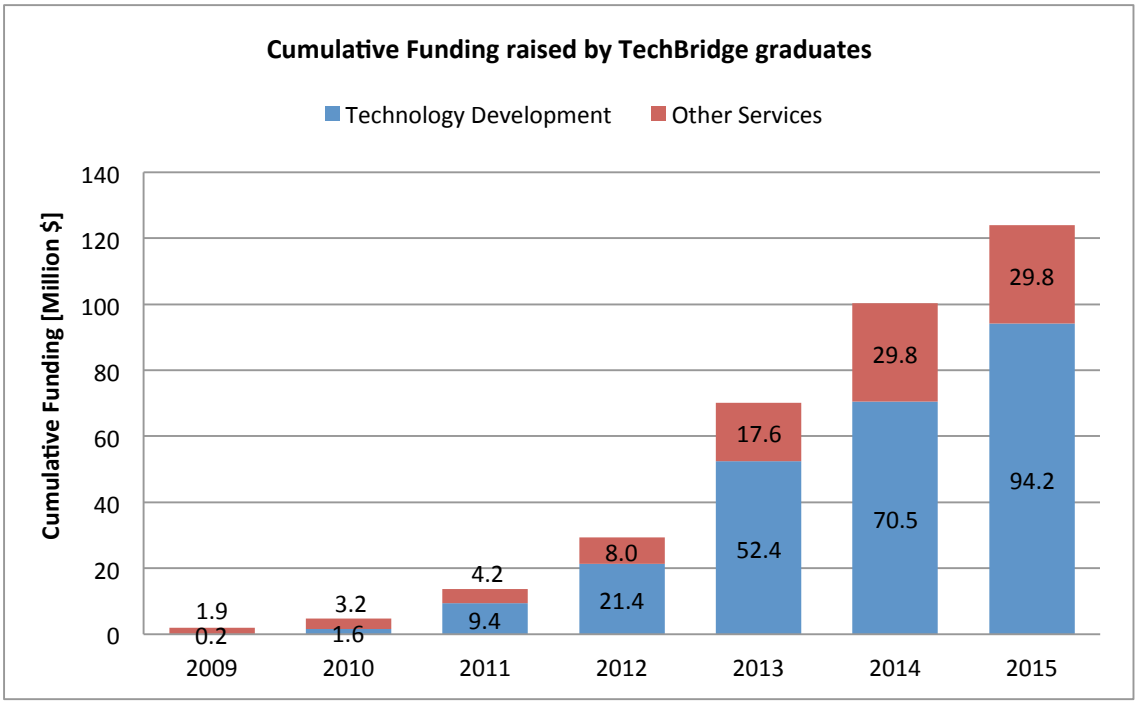


Figure 4 shows the follow-on funding secured by companies when they were one, two, three, and four years out of the program. Below the bar chart, the number of companies contributing to the bar heights are listed. (Note that all companies have been out of the program for at least one year; while only the first companies with whom we engaged have been out of the program for four years.)

Figure 5 shows the same data, but in a year-on-year format. In Figure 5, only companies that were program graduates by end of year are factored into that year's bar heights.

In both modes of data presentation, companies that received technical development services are shown to have raised more outside follow-on funds than those who did not, both on average and in aggregate. This trend is also evident in the additional metrics as shown below, which leads us to the conclusion that technology development RD&D awards have an outsized, tipping-point effect for awardee companies.

**Figure 5**




Figures 6 and 7 show the revenue generation numbers for all program awardees, again split by those that received technology development services (Figure 6) versus those that did not (Figure 7). A greater fraction of those in the first category have revenues in the higher ranges of $100K-$1M and $1M-$5M. The vast majority of those in the second category continue to be pre-revenue. While it is likely that the other companies will generate revenue in the future (since all companies were at a similar stage when they engaged with U-Launch), we surmise that the technical development

awards accelerated the first commercial revenue for the companies who received technical development work, since that work typically focused on product development.

Similar trends are observed for employment figures (shown in Figures 8 and 9), which is likely a direct result of the funding trends observed and displayed in Figures 4 and 5.

**Figure 6**

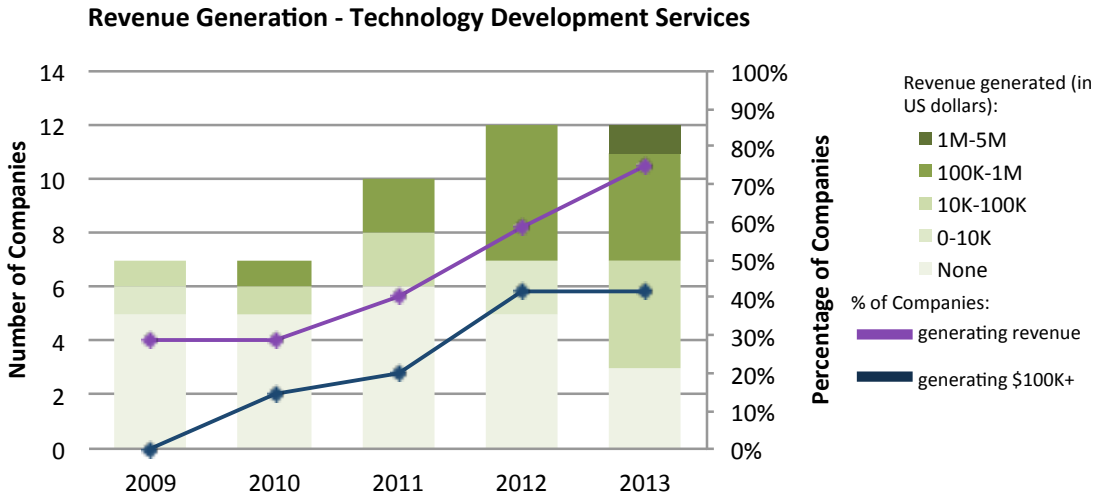



**Figure 7**

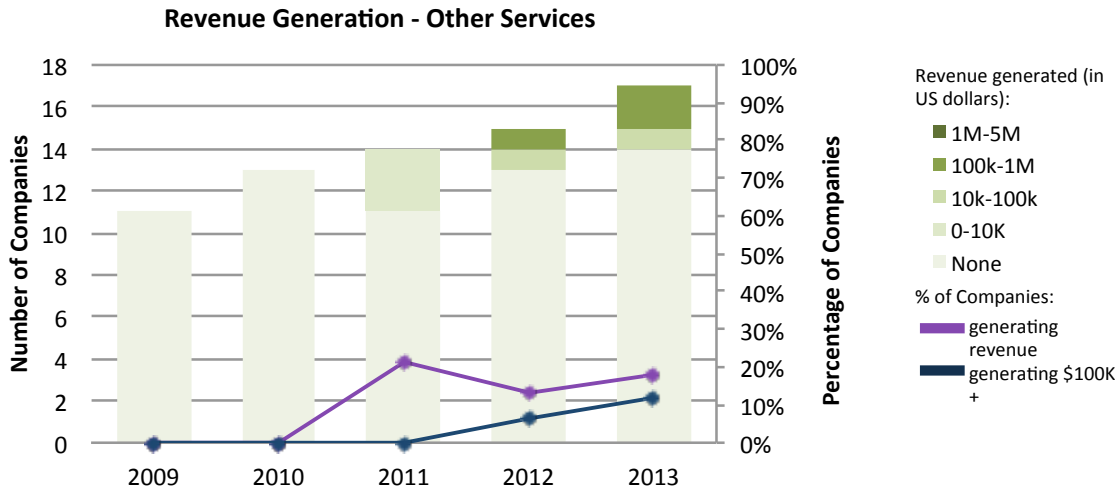


**Figure 8**

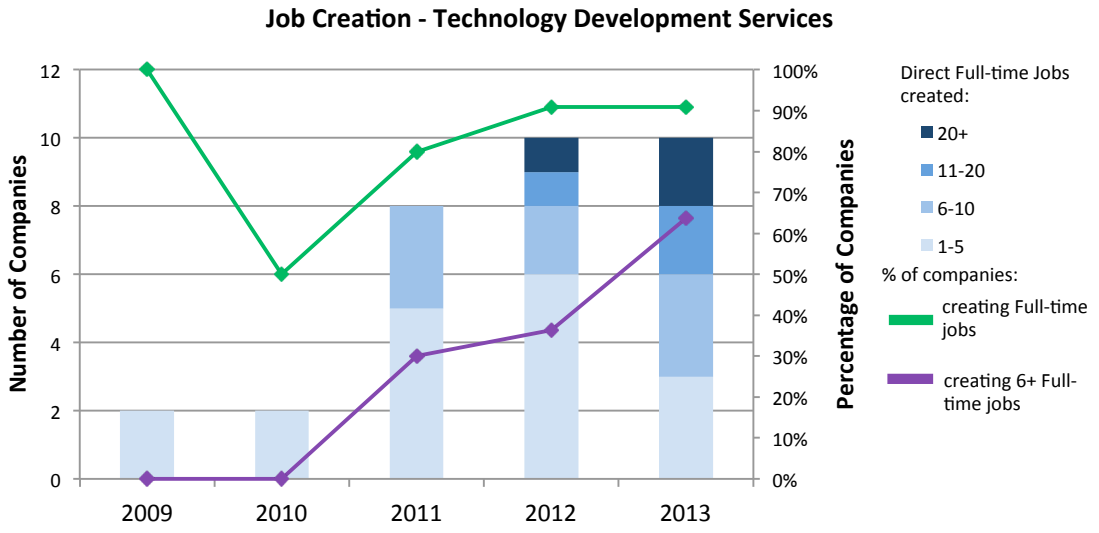



**Figure 9**