



Learnings from a BT Imaging Pty Ltd ARENA Funded Project

22 March 2023

Contents:

- 1. Introduction**
 - 2. Project Overview**
 - 3. Anticipated Project Risks and Potential Impediments**
 - 4. Overview of Unforeseen Risks and Impediments**
 - 5. Industry Developments and Impacts on Project**
 - 6. Learnings on How to Better Prepare for Unforeseen Events and Work with Funding Bodies**
-

DISCLAIMER AND ACKNOWLEDGEMENT

The views expressed herein are not necessarily the views of the Australian Government. The Australian Government does not accept responsibility for any information or advice contained within this document.

This project received funding from the Australian Renewable Energy Agency (ARENA) as part of ARENA's Advancing Renewables Program.

1. Introduction

In late 2019, BT Imaging executed a Funding Agreement with The Australian Renewable Energy Agency (**ARENA**) to undertake an important Deployment project under ARENA's **Advancing Renewables Program**. The project, **BT Imaging LIS-M1 Solar Module Inspection System Project**, which was to be completed in just under two years, involved two domestic and one international industry partners, and would cost a total of near \$3.0 million, with ARENA contributing \$1.0 million of grant funding.

BT Imaging commenced the project as planned and submitted the first Milestone report to ARENA in March 2020. In that report, BT Imaging indicated the good progress that was being made, but also that a number of developments were emerging which might delay completion of various project activities. One of these developments was the then growing global Coronavirus emergency. Another development was the possibility of delays in the contributions from project partners who were critical to the project, due to the impacts of the Coronavirus emergency and also due to factors specific to their own business operations, factors totally outside of BT Imaging's control.

In mid-2020, BT Imaging advised ARENA of the inevitability of significant project delays and in December 2020 BT Imaging again wrote to ARENA, this time seeking project changes. BT Imaging explained the reasons for the project delays and also highlighted the significant industry changes that had occurred over the two years or more that had elapsed since BT Imaging first scoped and then agreed the project with ARENA. Over that time at least one project partner had been impacted by changes in their operations which jeopardised their ability to contribute to the project as planned. More importantly, the PV manufacturing industry as a whole had undergone major changes in manufacturing that consequently rendered the original project less compelling than originally determined, particularly given the new and very promising research and development opportunities that had emerged since BT Imaging and ARENA had agreed on the project. Consequently, BT Imaging sought ARENA's approval to change to one of two projects, the first being essentially an extension of the original, and the second, BT Imaging's preferred alternative, being a totally new R&D project that sought to address new and pressing industry needs that had emerged as a result of the changes in PV manufacturing.

In mid-2021 BT Imaging advised ARENA that some of the company's shareholders were negotiating for a sale of the business to Aurora Solar Technologies Inc. (**Aurora**), a publicly listed Canadian company and that consequently a change in control was a possibility. ARENA at this point agreed to hold off varying the project and Funding Agreement to allow time for BT Imaging to clarify the change of control situation.

For various reasons, the acquisition of BT Imaging by Aurora took longer to resolve than any of the parties anticipated and the matter was not clarified until early August 2022, at which point BT Imaging sought ARENA's approval of the change in control, so that the modifications to the project and to the Funding Agreement could be progressed.

After Aurora's acquisition of BT Imaging, BT Imaging (with Aurora) and ARENA had the opportunity to fully consider BT Imaging's ongoing project proposals and the combined group's resources and R&D priorities. On the basis of these considerations, BT Imaging and ARENA decided by mutual agreement to terminate the existing Funding Agreement as the Project could no longer be delivered as originally agreed and so that BT Imaging could return to ARENA with a new project application soonest practical, once Aurora's acquisition of BT Imaging was properly bedded down and the group's R&D priorities could be reconfirmed and aligned with the industry situation at that time.

As this background indicates, despite BT Imaging's and ARENA's best intentions and efforts, factors outside the parties' control prevented the delivery of a successful project. Significant lessons were learnt by BT imaging from the experience, lessons that may be of use to current and future ARENA grant applicants as well as the broader industry.

2. Project Overview

BT Imaging developed its prototype LIS-M1 inspection tool as a solar module inspection unit based on BT Imaging's proprietary photoluminescence (PL) imaging technology, for use in R&D laboratories, at module manufacturing facilities, distribution centres, and at large installation sites for the inspection of solar modules, to identify defects that may be present and reduce module performance, or that may result in a decline of performance over time. The LIS-M1 combines electroluminescence (EL) imaging, a widely used technology, with BT Imaging's proprietary PL imaging technology to facilitate the acquisition of information about the nature and distribution of specific defects and device imperfections, which in turn facilitate the process of automated image analysis - without the need for human interpretation.

BT Imaging's *LIS-M1 Solar Module Inspection System Project* aimed to take the LIS-M1 prototype through a large-scale trial, to demonstrate the prospects for broad commercial deployment of the technology. An important aspect of the project was the correlation of specific defects, uniquely detectable using the LIS-M1, with module degradation in the field. The project involved deploying three LIS-M1 systems at the sites of three very different Project Participants who were uniquely positioned in the industry to provide the quality of participation and the breadth of data needed to prove BT Imaging's core propositions around the value of deploying the tool in the field.

Module reliability and long-term power performance are extremely important factors for the further adoption of Photovoltaics. A successful demonstration of significant correlations between defects detected by the LIS-M1 and module degradation would enhance the commercial value of the system for the whole of the PV industry. BT Imaging sought to achieve the following project outcomes:

- (a) Improved understanding of how the LIS-M1 unit could be integrated at commercial sites
- (b) Improved understanding of the relationship between defects uniquely detectable by LIS-M1 and their impact on module performance and module degradation
- (c) Increased industry knowledge about solar module degradation and failure rates
- (d) Improved commercial value proposition for the LIS-M1, and
- (e) Improved understanding and specifications for a commercial tool that would enable the qualitative and quantitative prediction of module performance degradation, and how the tool might deliver substantial commercial value for BT Imaging and the PV industry more generally.

3. Anticipated Project Risks and Potential Impediments

The risks of not achieving the project outcomes and fulfilling the key project objectives, even if the project was completed successfully, were well understood by both BT Imaging and ARENA. BT Imaging also understood and planned for the possibility that one or more of the industry partners in the project might, for their own reasons, pull out from the project before or after commencing it, slow their participation in the project, divert resources to other projects that might be more important from their perspective, or prove difficult to work with for some other reason. BT imaging was sufficiently prepared, including to ARENA's satisfaction, for all the "normally foreseeable" risks in the project, including the:

- Risk that the R&D might not deliver the expected results
- Financial risks and the risk of diverting scarce resources to a speculative project
- The risks that one or more project partners might not deliver their contributions, underperform in their tasks, or decide to back out of the project altogether.

4. Overview of Unforeseen Risks and Impediments

BT Imaging was not, however, prepared for the risks associated with the unforeseeable consequences of a rare global event like the Coronavirus pandemic. Specifically, BT imaging was not prepared for the flow on effects that the global emergency would have, including on the ultimate value of undertaking the intended R&D, as a result of

the substantial delays caused by the global disruptions the event caused. ARENA likely was similarly unprepared for the broader and new context for BT Imaging's project. In addition, neither BT Imaging nor ARENA were prepared for the risks posed to the project by a change of control situation that continued, due to reasons totally outside of the company's control, unresolved for an inordinate amount of time.

The Covid-19 global pandemic made its presence felt in Australia around February 2020 and deteriorated through the months into the first half of 2021, when conditions stabilised as a result of various community health measures and the availability of vaccinations. BT Imaging's business and operations, along with those of domestic and international project partners, were severely impacted in numerous ways during this period, which necessitated BT Imaging pausing project activities.

As already indicated, another major unforeseen risk was the prospect of a protracted change of control situation. In embarking on the project BT Imaging did consider a change of control event as a possibility, as did ARENA. The possibility was provisioned for in the Funding Agreement. BT Imaging, however, never countenanced the possibility that a change of control event would take as long to resolve as it did.

Finally, BT Imaging was also not prepared for the consequences the industry developments that occurred over the period from around mid-2019 to the point at which BT Imaging was again in a position to continue the project (a total time elapsed of around three years) would have on the project's viability and value.

5. Industry Developments and Impacts on Project

Over the three years elapsed between the original project being scoped, confirmed, and commenced and then paused after various disruptions, and BT Imaging again being able to continue the project, the Photovoltaics industry continued to grow and develop at a very impressive rate and in unexpected ways, presenting new challenges and opportunities to suppliers like BT Imaging. Key and relevant industry developments included:

- Manufacturing line and process speeds in production increased dramatically, right across the industry
- Cell forms, along with module configurations and sizes, all changed, with continually increasing dimensions and performance being the common theme.

At the same time a number of totally new options emerged as promising complimentary techniques for assessing module quality – especially useful for detecting defects that are not able to be revealed by existing means such as EL and PL.

Given the industry developments in production and given also the emergence of the promising new imaging techniques that were not included in the project as originally developed, BT Imaging's project was rendered incompatible with the new industry requirements, and also incompatible with the requirement for state-of-the-art equipment incorporating the latest techniques for assessing module quality. The project needed to be rethought and modified, or even possibly replaced with a more promising alternative, to deliver the required value to BT Imaging and for ARENA.

Although the new industry landscape did not invalidate the project nor the value of proving the LIS-M1 as a high-quality field deployable metrology tool for determining module quality, it did cause BT Imaging to reassess the projects priority and relative value against other options that BT Imaging could pursue successfully, ideally with ARENA's continuing assistance. Under the circumstances, a significantly modified or entirely new project potentially represented a better and very significant business opportunity for BT Imaging, as well as for ARENA who would be able to leverage work completed within current and previous ARENA funded projects, to benefit the PV industry in Australia and globally. ARENA agreed with this analysis.

After considering all of the circumstances, BT Imaging and Aurora Solar Technologies agreed with ARENA to terminate the existing project and Funding Agreement by mutual consent, with a view to lodging a new funding proposal with ARENA soonest practical for BT Imaging's preferred new project.

6. Learnings on How to Better Prepare for Unforeseen Events and Work with Funding Bodies

BT Imaging's experience and learnings from this ARENA funded project may be of value to other applicants for project funding from ARENA or other R&D funding bodies, as well as possibly to funding bodies themselves. BT Imaging's leanings are summarised below.

Learning	Recommendation	Comments
Unexpected events are bound to occur over the life of any project, especially long projects.	Ensure, to the extent that is realistic, that the Funding Agreement has sufficient flexibility built into it to accommodate significant project changes.	
Normal "foreseeable" risks to a project undertaken in a "business as usual" environment can pale into relative insignificance when extraordinary events occur.	<p>Consider the potential consequences of major, black swan, events for the business/operation and project.</p> <p>To the extent that it is practical, ensure the Funding Agreement addresses what should occur if and when a major disruption(s) eventuate.</p>	BT Imaging was not adequately prepared first for the consequences of the Covid-19 emergency and later the impact that a protracted change of control situation would have on the viability of its project.
<p>More Project Partners is not always best for a project.</p> <p>Be proactive early in lining up potential replacements for primary contributors.</p> <p>Negotiate comprehensive and effective agreements with Project Partners, including appropriate break and termination conditions.</p>	<p>Consider the role of Project Partners very carefully, along with the terms on which they will contribute.</p> <p>Take early account of how proposed Project Partners' own businesses and organisations may change over the life of the project, along with how changes can impact their contribution and the project overall.</p> <p>Avoid engaging project contributors if their absence from the project could irreversibly compromise the viability of the project.</p> <p>Develop and put in place detailed agreements with Project Partners, recognizing that this can sometimes be difficult, particularly when they may have little to gain directly from participation in a project.</p>	In the excitement of scoping and confirming projects, a temptation can develop to expand the pool of contributors, and also to collaborate with the most obvious candidates without considering how their own organisations may change over the life of a project.
Recognise that new knowledge can emerge during the life of a project and that industry developments can occur which put the very viability of a project into question.	<p>Take the consequences of this possibility seriously and ensure the Funding Agreement is appropriately flexible and adaptive.</p> <p>Consider how such a situation could be resolved without undue or unfair risk or penalty to either the grant recipient or the grantor.</p>	Although ARENA were very accommodating and flexible in this regard, neither BT Imaging nor ARENA possibly gave the implications of new knowledge sufficient consideration in framing the original project and funding agreement.
Ensure that project timelines are well defined and constrained.	ARENA and the Grant Recipient should ensure they are each aligned with the other's expectations. Establish clarity around these issues and reflect it in the Funding Agreement.	BT Imaging's project was plagued by unanticipated events. ARENA and BT Imaging might both have expended less effort and resources if the project had been terminated when the completion date receded into the future. Both parties persevered,

		however, to give the project every chance of success.
Communicate early and communicate openly and effectively.	<p>Treat ARENA as another “Project Partner” as opposed to simply a source of funding.</p> <p>BT Imaging’s project turned out to be a problematic one for a variety of reasons outside of any parties’ control. Maintaining open and affective communication with ARENA at all times, however, enabled BT Imaging and ARENA to terminate the project without undue stress or significant loss and wasted investment, on a basis that was acceptable and beneficial for all concerned.</p>	

BT Imaging remains grateful and is pleased to acknowledge that ARENA and its staff were extremely cooperative, accommodating, and helpful throughout every stage of the company’s efforts to first complete the project as agreed and then to pivot the original project to one better suited to the changed environment and the company’s and the PV industry’s emerging needs.
