BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

In the Matter of the Application of
THE STATE OF HAWAII
DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT,
AND TOURISM

Docket No. 2014-0135

For an Order Approving the Green
Infrastructure Loan Program.

PROGRAM NOTIFICATION FOR
THE GREEN INFRASTRUCTURE LOAN PROGRAM
AND
CERTIFICATE OF SERVICE

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For an Order Approving the Green Infrastructure Loan Program.

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PROGRAM NOTIFICATION FOR
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TO THE HONORABLE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII:

The Hawaii Green Infrastructure Authority ("Applicant", "HGIA", or "Authority") of the State of Hawaii,\(^1\) submits this Program Notification through its Deputy Attorney General.

I. Background

Decision and Order No. 32318, filed on September 30, 2014 in Docket No. 2014-0135 (the "Program Order") approved the "Application of the Department of Business, Economic Development, and Tourism for an Order Approving the Green Infrastructure Loan Program," filed on June 6, 2014 ("Application"). The Program Order allowed for the use of funds deposited in the Green Infrastructure Special Fund to establish and institute the Green Infrastructure Loan Program ("GEMS Program"), subject to the modifications described within

\(^1\) HRS §196-63 provides that until the Authority is duly constituted, the Department of Business, Economic Development, and Tourism of the State of Hawaii (DBEDT) may exercise all powers reserved to the Authority pursuant to HRS §196-64, and shall perform all responsibilities of the Authority. As the Authority has now been duly constituted, the Authority assumes in its own right, pursuant to statute, all of the functions, powers, and obligations, including responsive or informational submissions in this Docket, which had heretofore been assigned to DBEDT.
the Program Order.² Within the Application, a governance process was proposed for the GEMS Program that used mechanisms for updates to or modifications from the approved GEMS Program guidelines. In this process, Program Notifications are used to provide additional details on GEMS Program components including project, program, financing, or other arrangements (clean energy technology, parties intended to benefit, loan program or other arrangements, and credit sources and funding); minimum lending, credit or investing criteria; and repayment mechanisms and processes.³ The Application stated that DBEDT or the Authority⁴ will use Program Notifications to report and certify information on implementation of key GEMS Program components that are within the scope of the Program Order parameters and exhibits issued by the Commission.⁵

The Program Order approved the Program Notification process with a modification requiring that the Authority file any GEMS Program Notification with the Commission no less than fifteen (15) business days prior to implementation instead of the proposed ten (10) days stated in the Application.⁶

The Division of Consumer Advocacy ("Consumer Advocate" or "CA") recommended that DBEDT submit market assessments and cost-benefit analyses for the financing of technologies related to solar photovoltaic ("PV") systems that will mitigate grid saturation prior to DBEDT's

³ Paraphrased from HRS §269-170 and 269-171, as referenced in “Application of Department of Business, Economic Development, and Tourism; Verification; Exhibits; and Certificate of Service," filed in Docket No. 2014-0135 on June 6, 2014 at p. 15. Emphasis added.
⁴ Prior to the Authority’s establishment, DBEDT is authorized to exercise the Authority’s powers and is required to effectuate the Authority’s responsibilities (see HRS §196-63). Accordingly, references to the “Authority” and “HGI/A” in this Program Notification include DBEDT acting on behalf of the Authority, as explained in footnote 1 above.
⁵ See “Application of Department of Business, Economic Development, and Tourism; Verification; Exhibits; and Certificate of Service,” filed in Docket No. 2014-0135 on June 6, 2014 at p. 15.
⁶ See “Decision and Order No. 32318,” filed in Docket No. 2014-0135 on September 30, 2014, at p. 84.
submission of a Program Notification, specifically requesting market assessments and cost-benefit analyses be provided by DBEDT to the Commission that “support a switch from [distributed generation photovoltaic systems] to (or addition of) the proposed technology”. The Commission then directed the Authority in the Program Order “to provide the information identified by the Consumer Advocate concerning market assessments and cost-benefit analyses for approved non-Solar PV clean energy technology with any Program Notification that is submitted to finance those technologies.”

II. Program Notification

The purpose of this Program Notification is to provide additional information on the GEMS Program as approved in the Program Order for financing of “PV-Related Technologies” which can consist of “Advanced Inverters”, “Smart Modules”, “Monitoring Devices”, “Other Technologies that Support PV Interconnection”, and/or “Physical Infrastructure to Support PV Installations”. PV-Related Technologies may be included as part of any financing/loan product approved for the GEMS Program that provides financing for customer-sited PV systems, including the Non-Profit Loan Product, the Consumer Loan Product and any future financing/loan product for PV systems approved for the GEMS Program.

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8 See “Division of Consumer Advocacy’s Statement of Position,” filed in Docket No. 2014-0135 on August 7, 2014, at p. 13 for quote. “Proposed technology” refers to the “other related technologies identified in Exhibit 9” (See “Division of Consumer Advocacy’s Statement of Position,” filed in Docket No. 2014-0135 on August 7, 2014, at p. 12), which at the time referred to the Application’s list of “Solar Photovoltaic Systems”, “Energy Storage”, “Advanced Inverters”, “Smart Modules”, “Monitoring Devices”, “Other Technologies that Support Solar Photovoltaic System Interconnection”, and “Physical Infrastructure to Support Solar Photovoltaic Installations.” According to the CA, the “proposed technology” for which market assessments and cost-benefit analyses are requested includes all items on the list except for “Solar Photovoltaic Systems”. The CA is concerned that projects based on technologies which have not been subject to market assessment of cost-benefit analysis, could be implemented without sufficient review.
The PV-Related Technologies that are part of the Eligible Clean Energy Technologies list (Exhibit 9) of the Application are defined as follows:

- "Advanced Inverters" refers to commercially-available, market-ready, utility-accepted inverters capable of any and all of the features described in any of the three phases described in Section 4.2.4 of the HECO Companies' Distributed Generation Interconnection Plan ("DGIP"), including microinverters, if capable of the features described.

- "Smart Modules" refers to PV panels that contain an optimizer as part of the panel and optimizes the power created by the solar cells for enhanced functionality and performance of the individual solar panel. The module may also have a microinverter and/or monitoring device embedded.

- "Monitoring Devices" refers to any device that tracks the output of a PV system and is capable of transmitting or otherwise sharing that data remotely, including devices that serve other purposes within a PV system in addition to monitoring, but excluding devices that serve in an energy storage capacity.

- "Other Technologies that Support PV Interconnection" refers to other technologies that, when included with the installation of a PV system, still allow the PV system to meet the requirements of Exhibit 13 of the Application and do not provide a service or benefit to the property or its occupants, owners, or managers without the PV system.

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• "Physical Infrastructure to Support PV Installations" refers to other physical infrastructure requirements that are required to enable PV installation, without which PV cannot be installed and customers cannot receive the benefit of PV.

The Authority considers these PV-Related Technologies to be necessary components of PV systems in the current and future PV equipment market and requests the flexibility to finance systems that contain various components of a basic or more grid-integrated PV system as requested by consumers or the utility to create a complete and functional PV system. Therefore, a PV system installed through the GEMS Program can consist of component parts that can be basic or advanced, including panels, inverter(s), components that monitor the output of the PV system, and physical installation infrastructure and wiring. The PV system (and all PV-Related Technologies included with the PV system) must still meet the requirements of Exhibit 13 of the Application as approved by the Commission. Because these PV-Related Technologies are considered to be “non-Solar PV” in the Program Order, and CA has requested market benefits and cost-benefit analyses of the technologies, the Authority is providing market assessments and cost benefit analyses with this Program Notification. The Authority does not intend to finance PV-Related Technologies independently of the financing of a PV system.

Market Assessments

The Authority does not have any expertise on the technical interconnection requirements for distributed energy resources ("DER") and believes the proposal and approval of these requirements are the purview of the utilities and the Commission. Ultimately, the GEMS

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13 The Commission recognized that DBEDT proposed a list of clean energy technologies that focus on "Solar PV systems and an array of non-Solar PV technologies that may be used to support the installation and interconnection of Solar PV", referring to the Application’s Exhibit 9 (See "Decision and Order No. 32318," filed in Docket No. 2014-0135 on September 30, 2014, at p. 43).

14 See footnotes 8 and 9.
Program should provide financing for equipment that meets interconnection requirements or equipment that is anticipated to be needed to meet future interconnection requirements, so long as they make financial sense and provide savings to customers. The GEMS Program achieves this purpose by setting restrictions on the total system cost and pricing its financing products competitively while accounting for lending risk.\textsuperscript{15}

The GEMS Program is a financing initiative that increases access to clean energy through market-driven public-private partnerships. The GEMS Program for PV is designed to integrate with the existing PV market in Hawaii by creating an additional method of financing for customers that previously may have found it difficult to access financing for PV. As part of its original Application, the Authority submitted a market assessment for the Solar PV market.\textsuperscript{16} This market assessment was agnostic to specific technology types within the Solar PV market and instead assessed access to Solar PV financing. The market assessment showed that access to financing is a barrier to entry in the PV market in both the residential and commercial markets.

In the residential market, those households with higher incomes traditionally are more likely to have installed a PV system, and almost half of single family households in Hawaii are not likely to be able to access traditional financing for PV.\textsuperscript{17} On the commercial side, the market assessment noted that the commercial market as a whole was short of installed capacity compared to expectations, and non-profits were identified as lacking the revenue streams to secure financing.\textsuperscript{18}

\textsuperscript{15} See “Application of Department of Business, Economic Development, and Tourism; Verification; Exhibits; and Certificate of Service,” filed in Docket No. 2014-0135 on June 6, 2014 at Exhibit 13.
\textsuperscript{16} See “Application of Department of Business, Economic Development, and Tourism; Verification; Exhibits; and Certificate of Service,” filed in Docket No. 2014-0135 on June 6, 2014 at Exhibit 6.
\textsuperscript{17} See “Application of Department of Business, Economic Development, and Tourism; Verification; Exhibits; and Certificate of Service,” filed in Docket No. 2014-0135 on June 6, 2014, Section IV A.
\textsuperscript{18} See “Application of Department of Business, Economic Development, and Tourism; Verification; Exhibits; and Certificate of Service,” filed in Docket No. 2014-0135 on June 6, 2014, Section IV B.
Since the market for financing PV systems is not dependent upon any single component of a PV system, and more likely dependent on the total price of the system and whether customers will receive adequate savings to warrant the installation of the system, the financing market assessment filed with the Application still applies to all PV systems funded by GEMS, regardless of whether the system may or may not have more advanced components and functions. Specifically, with respect to Other Technologies that Support PV Interconnection and Physical Infrastructure to Support PV Installations, the definition of these PV-Related Technologies restricts them to be used with a PV system, without which they serve no benefit to the customer or the PV system cannot be installed. Therefore, the market assessment filed with the Application includes Other Technologies that Support PV Interconnection and Physical Infrastructure to Support PV Installations, assuming the total system price still generates adequate savings for customers.

In a market-based scenario, where consumers must pay for their choices, PV systems and PV-Related Technologies are selected based on function and cost, with industry standards and utility requirements serving as the driving force behind the adoption of advanced technologies. In regards to the deployment of PV-Related Technologies for the GEMS Program, it is the understanding of the Authority that the motivation behind current and future interconnection requirements, which the PV-Related Technologies are designed to meet, is to reduce negative impacts to the distribution system that occur as a result of integrating distributed generation. So while the perception is that PV systems may cost more as a result of more advanced PV-Related Technologies, such costs may be necessary to expand the number of customers approved for interconnection, especially on circuits that are over-saturated. Additionally, such costs also likely reflect costs that should be borne by the PV customer but are currently being borne by all ratepayers.
The Authority needs flexibility to provide financing for PV-Related Technologies as long as savings and other requirements in the Program Order are met, because the purpose of these technologies, as needed by consumers and the utilities, is to maximize system efficiency, reduce the cost shifting that occurs as a result of PV interconnection, and ultimately improve the operation of the grid. Therefore, the Authority offers the following comments to summarize its anticipation of the future PV equipment market for PV-Related Technologies.

Hawaii is on the leading edge of solar penetration on its electrical grid, due to ample solar resource availability, accessibility of PV, generous financial incentives for the installation of PV, and high electricity costs. Since Hawaii has grid saturation issues with small, isolated grids, advanced, commercially-available, industry-tested equipment is needed to allow for interconnection of additional DER. To accommodate additional DER, the utilities have been seeking changes to their net energy metering programs, including changes in price signals and interconnection requirements, which require or encourage use of DER technologies that reduce impacts to the grids and circuits. The Commission stated in the Program Order that “Hawaii’s electric utilities have been challenged to accommodate demand for DER and to enable adoption of these technologies for the benefit of their customers”\textsuperscript{19} and observed that “continued advances in DER technology and applications provide Hawaii’s electric utilities and their customers with a number of solutions to address the present impediments in the area of DER integration.”\textsuperscript{20}

The Commission has stated its perspective on, among other things, a future utilities’ distribution system that enables DER-equipped customers to become “prosumers”, customers


who consume energy or use utility services, as well as also providing services to the utility. In the “Commission’s Inclinations on the Future of Hawaii’s Electric Utilities; Aligning the Utility Business Model with Customer Interests and Public Policy Goals,” the Commission provided guidance that the future distribution system should harness DER to benefit the system and customers, and stated that “the utilities will need to plan proactively for future additions of DER.” The Commission ordered the utilities to file a Distributed Generation Interconnection Plan (“DGIP”) that includes an Advanced DER Technology Utilization Plan setting forth near, medium, and long-term plans identifying how customers will install, and the utilities will utilize, advanced inverters, among other things. The Advanced DER Technology Utilization Plan is also required to include proposed requirements for inverters that allow DER to provide autonomous grid support functions, enable active utility control of DER, and provide ancillary services as grid conditions require. Based on the Advanced DER Technology Utilization Plan the HECO Companies submitted, it is clear the HECO Companies believe more advanced DER technologies are necessary to increase grid stability and control, and successive interconnection requirements will include additional DER control capabilities to allow for an increase in the amount of distributed generation that may be placed into service.

The Commission opened Docket No. 2014-0192 to investigate various DER technical, economic, and policy issues, and filed the HECO Companies’ DGIPs in that docket. The Authority anticipates, given the Commission’s Inclinations document and HECO’s DGIP, that the use of technologies that allow for additional DER functions through better management of distributed energy will continue to be the preferred path for DER interconnection, and therefore that PV systems will require more advanced components for interconnection approval.

**Market Assessment: Advanced Inverters**

The HECO Companies’ DGIP discusses advanced inverter requirements and provides a roadmap for the planned commercial deployment of various stages of advanced inverters. Given the Commission’s statements encouraging the advancement of grid and distributed energy and the utilities willingness to require distributed generation systems to include continually more advanced inverters as soon as the technology is tested and commercial-ready, the Authority assumes that the functions of inverters for PV systems must be advanced, commercial-ready technology in order to meet utility needs. Additionally, the Authority believes that in circuits with very high penetration where customers are otherwise not allowed to interconnect, using advanced inverters will address a number of the utilities’ concerns, making interconnection possible for customers who want to install distributed generation systems.

Based on the current inverter market trajectory, features being created and placed in Advanced Inverters are a result of utility requirements and market demand. Advanced Inverters with a host of new features are being manufactured to address requirements that are being implemented today and in the near future. Additionally, Advanced Inverters available in the

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market today are already being installed as both proactive and remediation measures where interconnection requires advanced features beyond current minimum requirements. The use of Advanced Inverters has value in that it enables more distributed generation systems to be interconnected on saturated circuits, and can also alleviate issues on other circuits, thus allowing more systems to interconnect than would otherwise be possible. Flexibility to deploy Advanced Inverters is needed when it is practical, effective, efficient, and/or required to do so, therefore the market for Advanced Inverters consists of the entire market of PV sales.

The GEMS Program intends to finance inverters that meet the requirements of the HECO Companies for interconnection and therefore assumes the need to finance Advanced Inverters in the near future. Additionally, the GEMS Program may fund PV Systems with Advanced Inverters where benefits will be provided to customers by ensuring system interconnection, expanding available capacity for PV Systems on individual circuits, etc.

**Market Assessment: Smart Modules**

The GEMS Program is a market-based program that allows for consumers to access financing products for equipment. Therefore, GEMS participants will be able to make decisions about what equipment is installed, as long as the products meet the requirements and restrictions of the GEMS Program. Smart Modules allow for the optimization of PV panel output in certain situations (e.g., frequent partial shading of the system), and can increase the efficiency of the system and minimize the size of the output fluctuations of the system as a whole. Given this, the GEMS Program intends on financing Smart Modules when selected by the consumer because of its financial benefit over modules that do not have the ability to optimize power generation for each panel. Because the features of Smart Modules increase efficiency in PV systems that have variable amounts of shading, the determination of the use of Smart Modules will likely be on a case-by-case basis as determined by installers and customers, unless the technology of PV panels
advances to the point where the majority of panels are also Smart Modules, in which case the GEMS Program will finance these panels, as they are the market standard.

Market Assessment: Monitoring Devices

Monitoring Devices can serve both the utilities and the consumer. For the consumer, monitoring a PV system’s output enables more efficient use of a PV system’s generated electricity and ensures panels are performing optimally. When PV system monitoring data is used in conjunction with additional usage monitoring and equipment control on site, a consumer can also have real-time or close to real-time awareness of his/her energy bill, providing a means to control or modify behavior and also prevent electricity bill shock in cases where usage inadvertently caused a bill that is considered too expensive. For the utilities, monitoring a PV system’s output and being able to control that output as it applies to power being fed into the distribution system allows for greater awareness and predictability, which would result in a more stable distribution system, more cognizance of interconnection limitations, and the ability to utilize more intermittent power.

In addition to providing these services, the installation of monitoring devices can assist the Authority in providing metrics to the Commission as required by the Program Order on energy produced by GEMS Program projects and the cost impacts of PV Systems to the grid. Though the data on energy production can also be obtained through a formulaic calculation based on installed capacity and efficiency factors, data that is generated from monitoring of the systems is likely to be more accurate.

Cost-Benefit Analyses

The Authority is required to meet a specific savings target for each project installed under the GEMS Program for PV systems and PV-Related Technologies according to Exhibit 13 of the Application. The bill savings will be reported with the GEMS Program metrics.
For each of the PV-Related Technologies listed herein, the costs associated with their use or installation is at best incremental compared to a base-case PV system. This base-case PV system, though undefined by the Application or Program Order, has functionally been determined by the Authority and the CA to be the basic equipment (panels, installation infrastructure, wiring, and inverters) that was the market standard for the past few years. The PV-Related Technologies identified in the Program Order are then viewed as technologically advanced versions of the base-case PV system. Since PV-Related Technologies are only installed in cases where they are either (1) required for the installation or interconnection of a GEMS-financed PV system, without which the project could not be installed; or (2) selected by consumers as part of a GEMS-financed PV system because they provide more benefits than their additional incremental cost or is the best available option to the consumer, the required project savings approved by the Program Order is still the best metric for ensuring that customers receive benefit from the GEMS Program rather than attempting to monitor the benefits of each component of a PV System to ensure its individual value to customers.

III. Subsequent Authority Action

Unless informed otherwise by the Commission, upon completion of the 15 day review period for this Program Notification, the Authority may finance the PV-Related Technologies as a part of any current or future financing/loan product for PV systems approved for the GEMS Program.

Submitted this 2nd day of April, 2015, in Honolulu, Hawaii.

Gregg J. Rinkley
Deputy Attorney General for the Authority
CERTIFICATE OF SERVICE

I hereby certify that I have this date, in addition to filing an original and three copies with the Commission, served one (1) or two (2) copies of the foregoing GEMS Program Notification, together with this Certificate of Service, by making personal service (P) or service by electronic mail (M), to the following and at the following addresses:

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