GOVERNMENT OF PUERTO RICO
PUERTO RICO PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE:

PROCESS FOR THE ADOPTION OF REGULATION FOR DISTRIBUTION RESOURCE PLANNING

CASE NO.: NEPR-MI-2019-0011

SUBJECT: Notice of Compliance with Interconnection Capacity Maps.

INFORMATIVE MOTION ON COMPLIANCE WITH ORDER ON INTERCONNECTION CAPACITY MAPS

TO THE PUERTO RICO ENERGY BUREAU:

COMES NOW, LUMA ENERGY SERVCO, LLC (LUMA), through the undersigned legal counsel and respectfully state and request the following:

1. In a Resolution and Order of December 31, 2020 ("December 31st Resolution and Order"), this honorable Puerto Rico Energy Bureau ("Energy Bureau") initiated procedures for LUMA and the Puerto Rico Electric Power Authority ("PREPA") to complete three tasks. *See* Resolution and Order of December 31, 2020, pages 8-10. The first task assigned to PREPA was to create voltage level maps by May 31, 2021. The second task involves the creation of preliminary maps of interconnection capacity, to be completed by September 30, 2021. Finally, the third task consists of updating and completing a power grid inventory, to be completed by December 31, 2021. *See id.*
2. The Energy Bureau has held three compliance hearings in this proceeding. The latest compliance hearing was held on July 14, 2021. The next compliance hearing is set for October 12, 2021.

3. On January 29, 2021, LUMA and PREPA filed a Plan for Distribution System Interconnection Capacity Map & Power System Inventory ("the Plan"), which was filed in revised format on February 1, 2021. The Plan provided details of the two approaches to estimate Preliminary Interconnection Capacity and the two interconnection capacity groups that would be evaluated and displayed: (i) Rudimentary Interconnection Capacity and (ii) Hosting Capacity. *See* Plan filed February 1, 2021 at page 8.
4. On February 5, 2021, LUMA and PREPA filed a Motion submitting the presentation to be offered in the compliance hearing of February 10, 2021 ("February 10th compliance hearing"). In slides 9 through 10 of the presentation, LUMA described the drop-down menu displays that would be displayed for feeders that do not have updated or validated data and the drop-down menu displays that would be displayed for feeders with updated and validated GIS and technical data. The presentation and LUMA's plan for compliance with the second order of the December 31st Resolution and Order were discussed with the Energy Bureau in the February 10th compliance hearing
5. On April 8, 2021, LUMA submitted the presentation to be offered during the compliance hearing that was scheduled and held on April 13, 2021, which provided an update on the status of the Plan.
6. On July 9, 2021, LUMA submitted the presentation to be offered during the compliance hearing that was scheduled and held on July 14, 2021, which provided a further update on the status of the Plan.

7. On July 21, 2021, PREPA filed *Informative Motion Regarding Voltage Level Maps*, providing explanations and visual representations of where the voltage level maps may be found accessing the DG Portal through PREPA's website.
8. On July 29, 2021, LUMA submitted to this Energy Bureau an illustrated step-by-step guide for accessing the DG Portal and voltage maps, using the lumapr.com website.
9. In compliance with the December 31st Resolution and Order, LUMA hereby provides notification that as of September 30, 2021, the interconnection capacity maps are accessible for use by any customers or DG developers on the lumapr.com website.
10. As Exhibit 1 to this Motion, LUMA is submitting both in the English and Spanish languages, a guide for users accessing and navigating the interconnection capacity maps. As explained in Exhibit 1, the interconnection capacity maps provide guidance to developers and customers to understand the impacts of connecting distributed generation to the system. *See* Exhibit 1 at page 1.
11. The interconnection capacity maps which are available for access by any user, contain a layer of information on DG Penetration that includes rudimentary interconnection capacity by distribution feeder with a dropdown menu that shows the following information:
    i. Substation ID;
    ii. Substation Name;
    iii. Feeder ID;
    iv. Feeder Peak Demand;
    v. Daytime Light Demand;
    vi. Existing DG Capacity;

vii. DG Penetration;

viii. DG Penetration Class;

ix. Primary Voltage; and

x. Whether Feeder Requires Supplemental Study

12. Furthermore, the interconnection capacity maps, which are also available for access by any user, include another layer of information entitled Power Flow-Feeder Segment Maximum PVMV that provides the following information:

a. Rudimentary interconnection capacity by distribution feeder; and

b. A dropdown menu in the interactive maps for those zones that have been studied that includes:

i. Substation ID;

ii. Substation Name

iii. Feeder ID;

iv. Feeder Peak demand;

v. Daytime light demand;

vi. Existing DG Capacity

vii. Limiting Factor;

viii. Maximum Circuit Segment Hosting Capacity; and

ix. Date of Study Performed.

13. Individuals who wish to access the interconnection capacity maps are not required to register as users of the DG Portal. However, registration is required to the DG Portal when users submit information about their project and account, while preventing them from accessing

sensitive information about other customers and projects. This also allows LUMA to keep a registry of user access to the DG Portal. The registry is meant to safeguard sensitive infrastructure information found on the DG Portal that includes details on feeders.

14. The Energy Bureau may likewise access the interconnection capacity maps, following the steps outlined in the guide.

WHEREFORE, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned and **deem** that LUMA complied with that portion of the December 31st Resolution and Order requiring the creation of maps on interconnection capacity.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 1st day of October 2021.

I certify that I filed this motion using the electronic filing system of the Puerto Rico Energy Bureau. A copy of this filing will be sent to counsels for the Puerto Rico Electric Power Authority, jmarrero@diazvaz.law and kbolanos@diazvaz.law.

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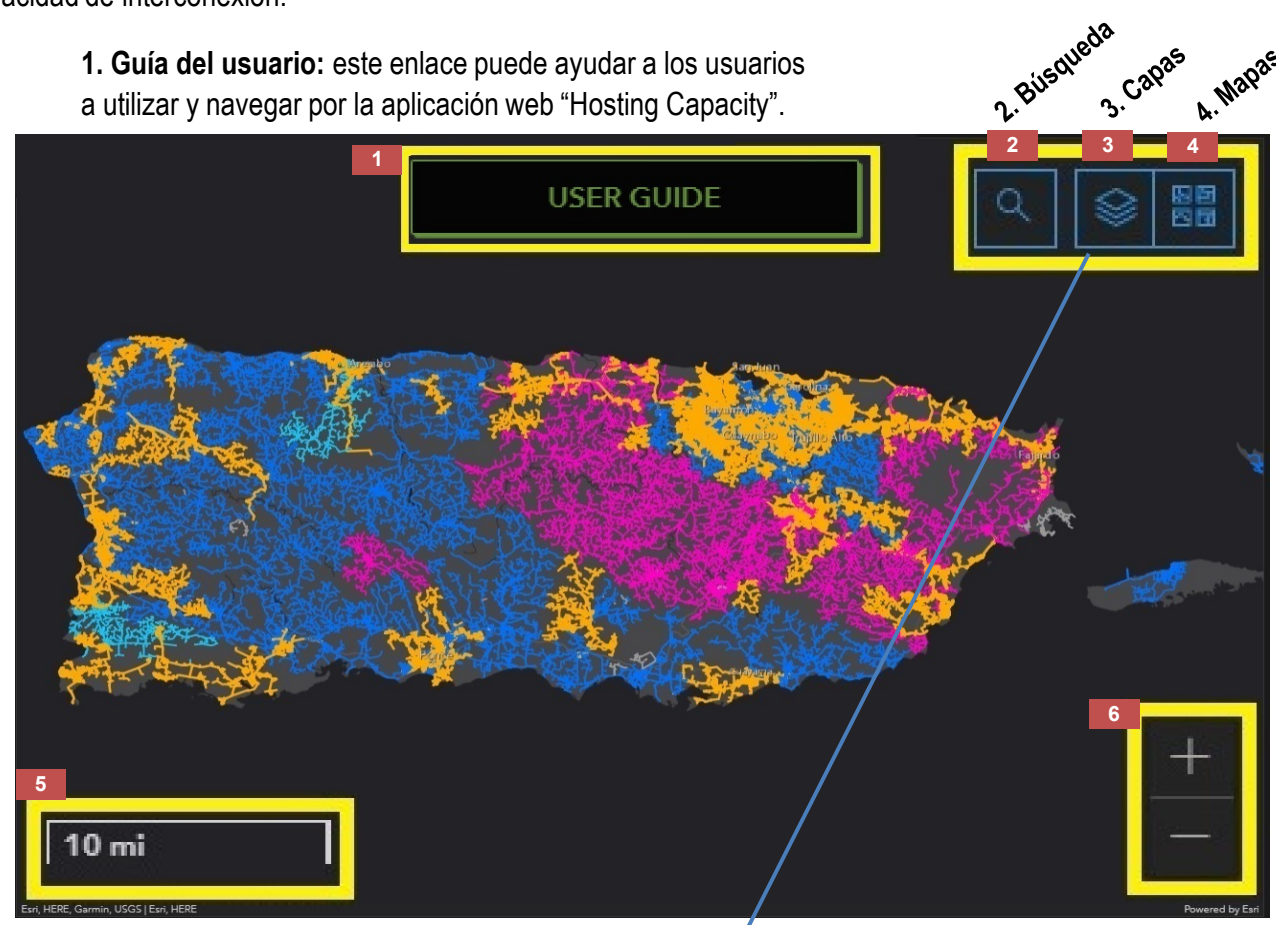
Exhibit 1

Guía del usuario: Acceso a los mapas de capacidad de interconexión

1. Navegación

Propósito: El mapa de capacidad de interconexión provee orientación a los desarrolladores y clientes para entender el impacto de conectar la generación distribuida al sistema. Este guía se utilizará para navegar por el panel de mapas de capacidad de interconexión.

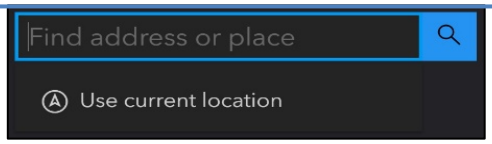
1. Guía del usuario: este enlace puede ayudar a los usuarios a utilizar y navegar por la aplicación web "Hosting Capacity".



5. Barra de escala: es una línea que contiene la altura en millas. La barra de escala está asociada con el mapa. Si la escala del mapa cambia, la barra de escala se actualiza para permanecer correcta.

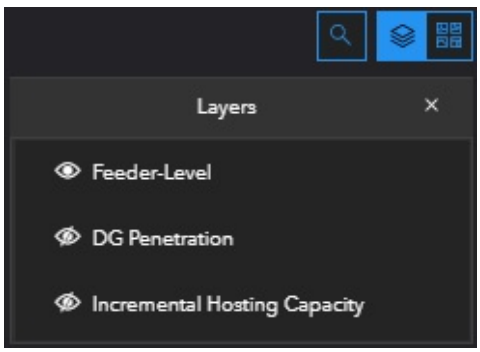
6. Acercar / Alejar: permite al usuario acercar o alejar el mapa. *Nota: el usuario puede usar su "mouse" para acercar o alejar mientras el puntero está en el marco del mapa.*

2. Búsqueda de direcciones: el usuario puede utilizar direcciones de correo específicas y el mapa se acercará a esa área del mapa.



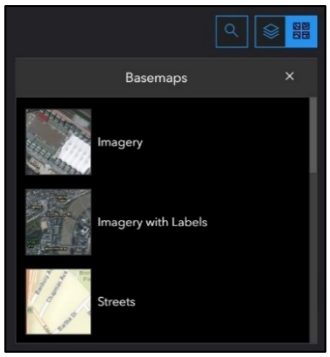
3. Capas: el usuario puede activar / desactivar las capas utilizando el menú de capas.

- **Feeder-Level:** Circuitos de clase de voltaje simbolizados por nivel de voltaje.
- **DG Penetration:** Circuitos simbolizados por porcentaje de penetración.
- **Flujo de energía:** mínimo del segmento del alimentador (PV)



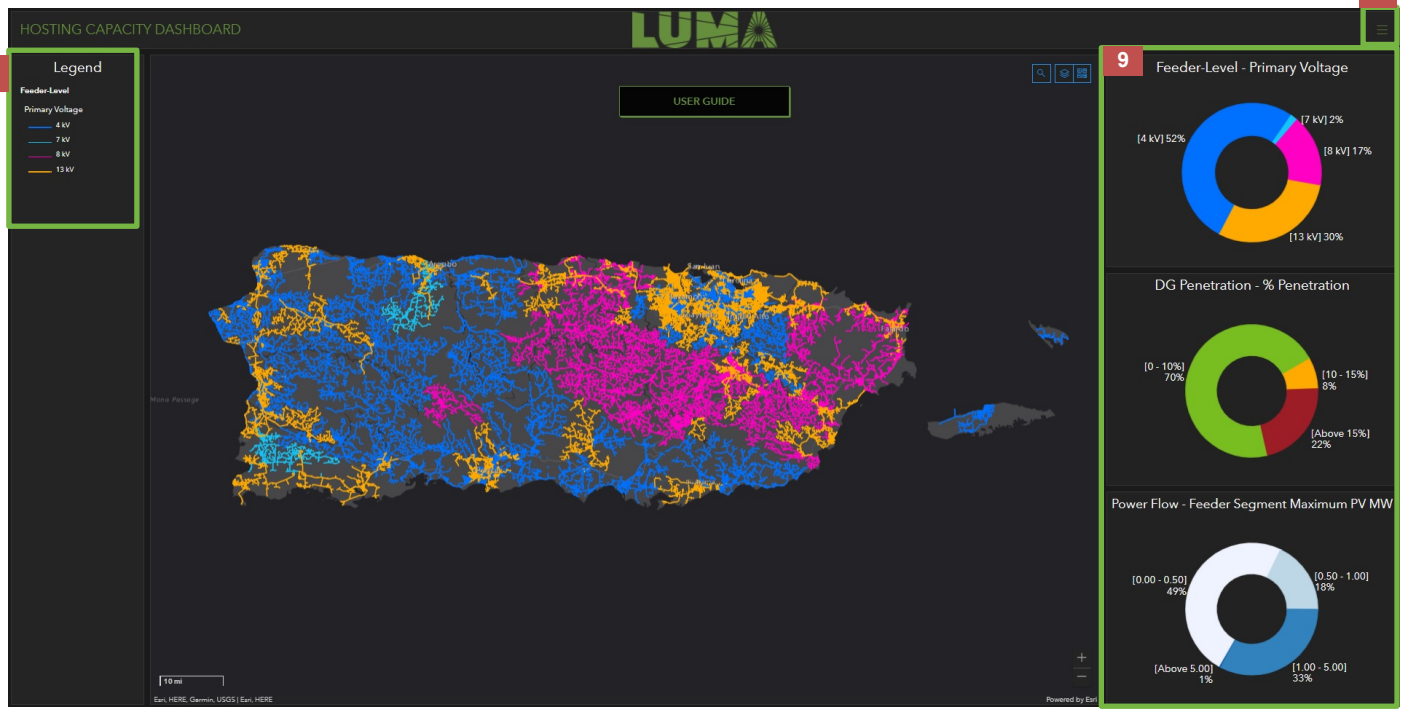
Navegación (continuado)

4. Mapas base: los usuarios pueden alternar entre los mapas base, que son capas mapas geográficos estándar. Los dos mapas base más útiles son “Imagery” (imágenes satelitales de baja resolución) y “Streets” (redes de carreteras a nivel de calle).



7. Leyenda: la leyenda está acoplada a la izquierda del mapa de la interfaz. Es dinámico, por lo que solo mostrará las capas que están actualmente activadas y visibles dentro del mapa.

8. Enlace de menú: enlace al inicio de la página web de LUMA.



9. Filtro de contenido de capa

Las tres gráficas de anillos a la derecha del mapa de la interfaz permiten a los usuarios seleccionar solo elementos específicos para cada capa. Los resultados de la selección solo son visibles cuando la capa de interés se hace visible en la ventana desplegable Lista de capas.

2. Cómo encontrar información

Pasos	Proceso
1	Haga clic en el anteojo  para expandir la búsqueda de direcciones y haga clic en el campo de dirección en blanco. Cuando empiece a escribir la dirección postal que le interese, aparecerán recomendaciones debajo del cuadro de dirección. Si ve la dirección que le interesa, mueva el puntero sobre esa dirección y haga clic en ella. De lo contrario, termine de escribir su dirección postal completa y seleccione entrar. El marco del mapa se acercará automáticamente a la dirección deseada.
2	Haga clic en el segmento del circuito más cercano a su dirección. Si no está seguro de qué segmento es, haga clic en el selector  de mapa base para activar el menú desplegable. Haga clic en el mapa base de la parte superior llamado "Imagery" para cambiar el mapa base a imágenes de satélite. Esto debería ayudar a identificar mejor la premisa deseada y el segmento de circuito más cercano a ella.
3	Para ver la capa de penetración de la generación distribuida (DG), haga clic en el icono lista de capas  para expandir el selector de lista de capas. Desactive la capa “Feeder-Level” haciendo clic en el icono de ojo abierto a la izquierda del nombre de la capa. Para habilitar la capa de penetración de DG, haga clic en el icono de ojo cerrado a la izquierda del nombre de la capa para establecer la visibilidad en activado. Nuevamente, haga clic en el segmento de circuito más cercano a la premisa deseada. Esto activará una ventana emergente con toda la información subyacente para ese segmento de circuito.
4	Para ver la capa “Incremental Hosting Capacity”, repita el proceso realizado en el Paso 3. Haga clic en el icono Lista de capas, desactive la capa “DG Penetration” haciendo clic en el icono de ojo abierto, haga clic en el icono de ojo cerrado de la capa “Incremental Hosting Capacity” para establecer la visibilidad a Activado y haga clic en el segmento de circuito más cercano a la premisa deseada para activar la ventana emergente.
5	Para cualquier capa que esté configurada como visible en la lista de capas, los gráficos circulares de anillos acoplados a la derecha del tablero se pueden usar para filtrar datos específicos. Por ejemplo, con la capa “Feeder-Level” configurada como visible, haga clic en el segmento circular azul oscuro etiquetado como “4 kV”. Esto apagará todas las demás clases de voltaje, dejando solo visibles los alimentadores de 4 kV. Se pueden seleccionar varias clases simplemente haciendo clic en segmentos de pastel adicionales. Para desactivar los filtros de datos, simplemente haga clic en el medio de la dona para que todas las clases vuelvan a estar visibles. Los filtros de anillos solo funcionarán en las capas que están visibles en la lista de capas.

3. Definiciones clave

Los términos y definiciones clave utilizados en todo el tablero del mapa de capacidad de interconexión se describen a continuación:

Term	Definition
DG Penetration *Penetración de generación distribuida*	Método utilizado para aproximar la cantidad de generación distribuida existente y en cola de espera en cada circuito, en comparación con la carga máxima del circuito. Actualmente se utiliza un umbral del 15% como uno de los criterios para el requisito de estudios detallados de interconexión.
Existing DG *Generación distribuida existente*	Suma total de los valores nominales de toda la generación distribuida declarada ya en servicio en el circuito de distribución.
Hosting Capacity *Capacidad de hospedaje*	Cantidad estimada de generación distribuida que, si se instala en un punto dado del sistema de distribución, se espera que no cause efectos perjudiciales en el rendimiento del sistema y la calidad del servicio.
Incremental Hosting Capacity *Capacidad de alojamiento incremental*	Método utilizado para calcular la capacidad de hospedaje con mayor resolución, que aumenta gradualmente la cantidad de GD en cada sección del modelo, hasta que se detecta una infracción de criterio.
Voltage Class *Clase de voltaje*	Magnitud nominal del voltaje de línea a línea en kV para el circuito primario.

4. Metodología de capacidad de alojamiento

El tablero del mapa muestra la capacidad de hospedaje estimada para el sistema de distribución de LUMA, basada en dos métodos: 1. Penetración de generación distribuida y 2. Capacidad de hospedaje incremental. Ambos métodos se describen a continuación.

Penetración GD

Este método se utiliza para aquellos circuitos del sistema LUMA que están en proceso de desarrollo de modelo digital y, por lo tanto, no son adecuados para simulación y análisis con herramientas de software de análisis de sistemas de potencia. Los resultados de penetración de GD para un circuito dado representan el porcentaje de generación distribuida existente, en comparación con la carga máxima del mismo circuito. El valor resultante se asocia al circuito completo y se calcula como:

$$DG\% = \frac{DG_{existing+queued}[MW]}{Feeder\ Peak\ Load[MW]}$$

donde,

$DG_{existing}$ Suma total de los valores nominales de toda la generación distribuida que existe en el mismo circuito de distribución.

Feeder Peak Load Carga bruta máxima del circuito en consideración.

Según lo establecido en el Reglamento 8915, el umbral del 15% se utiliza como referencia para alta penetración. De acuerdo con esto, se muestran los siguientes niveles de penetración de DG.

- $0\% \leq DG\% < 10\%$
- $10\% \leq DG\% < 15\%$
- $DG\% \geq 15\%$

Capacidad de alojamiento incremental

Este método se utiliza para aquellos circuitos del sistema LUMA que tienen modelos validados adecuados para simulación y análisis con herramientas de software de análisis de sistemas de potencia. En este caso, Synergi Electric se ha utilizado para calcular la capacidad de alojamiento estimada en cada sección del circuito, utilizando el método incremental.

El método de capacidad incremental de la sección de Synergi aumenta gradualmente la cantidad de GD en cada sección del modelo, hasta que se detecta una infracción de los criterios. Los criterios utilizados para este análisis son:

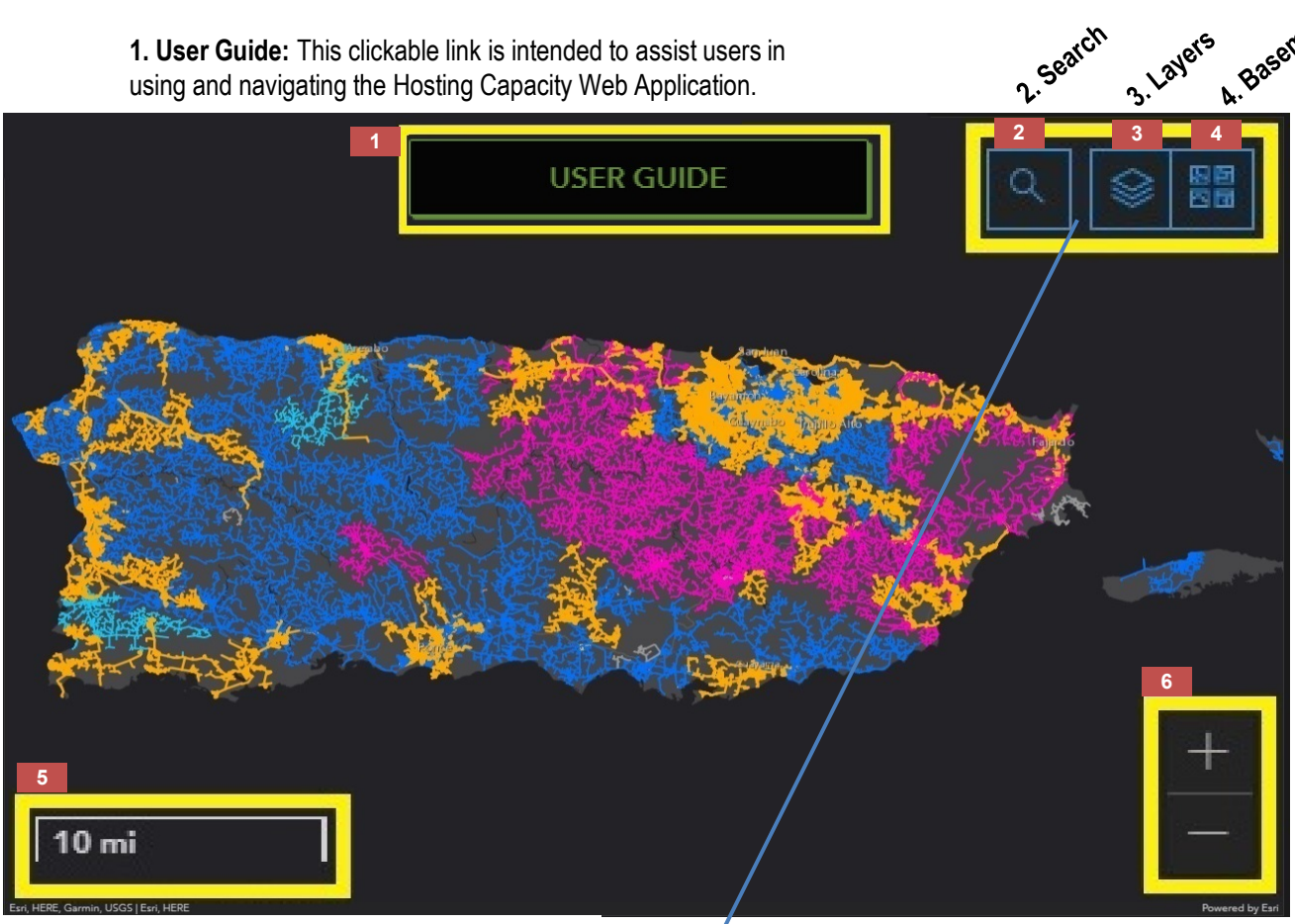
- Límite de carga de línea o equipo: 100%
- Límite de alto voltaje: 1.05 pu
- Límite de voltaje bajo: 0.95 pu
- Variación máxima de voltaje: 2%
- Flujo de potencia inverso del alimentador: 0 kW

User Guide: Accessing the Interconnection Capacity Maps

1. Navigation

Purpose: The interconnection capacity map provides guidance to developers and customers to understand the impacts of connecting distributed generation to the system. This guide will be used to navigate the Interconnection Capacity Maps Dashboard.

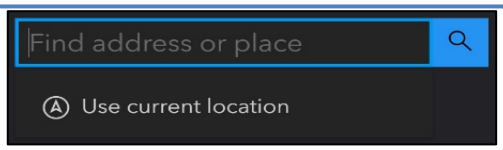
1. User Guide: This clickable link is intended to assist users in using and navigating the Hosting Capacity Web Application.



5. Scale Bar: Is a line labeled with its ground length in miles. Scale bars are associated with the map frame in the layout. If the map scale for that map frame changes, the scale bar updates to remain correct.

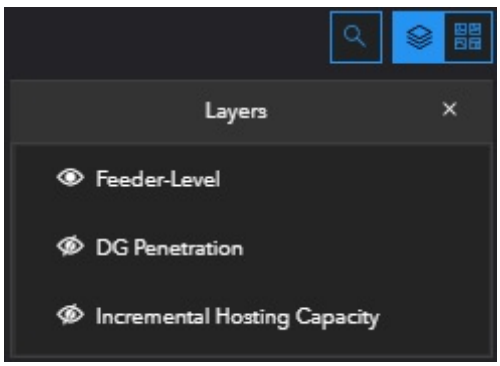
6. Zoom In/Out: Allows the user to zoom in or out of the map. *Note: the user can use their mouse to zoom in or out while the pointer is in the map frame.*

2. Address Search: The user can search for specific mailing address locations and the map will zoom to that area of the map.



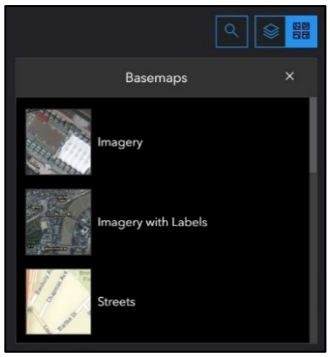
3. Layers: The user can turn on/off the layers using the Layer List dropdown.

- **Feeder-Level:** Voltage Class Circuits symbolized by voltage-level
- **DG Penetration**: Circuits symbolized by percentage of penetration
- **Power Flow:** Feeder segment minimum PV



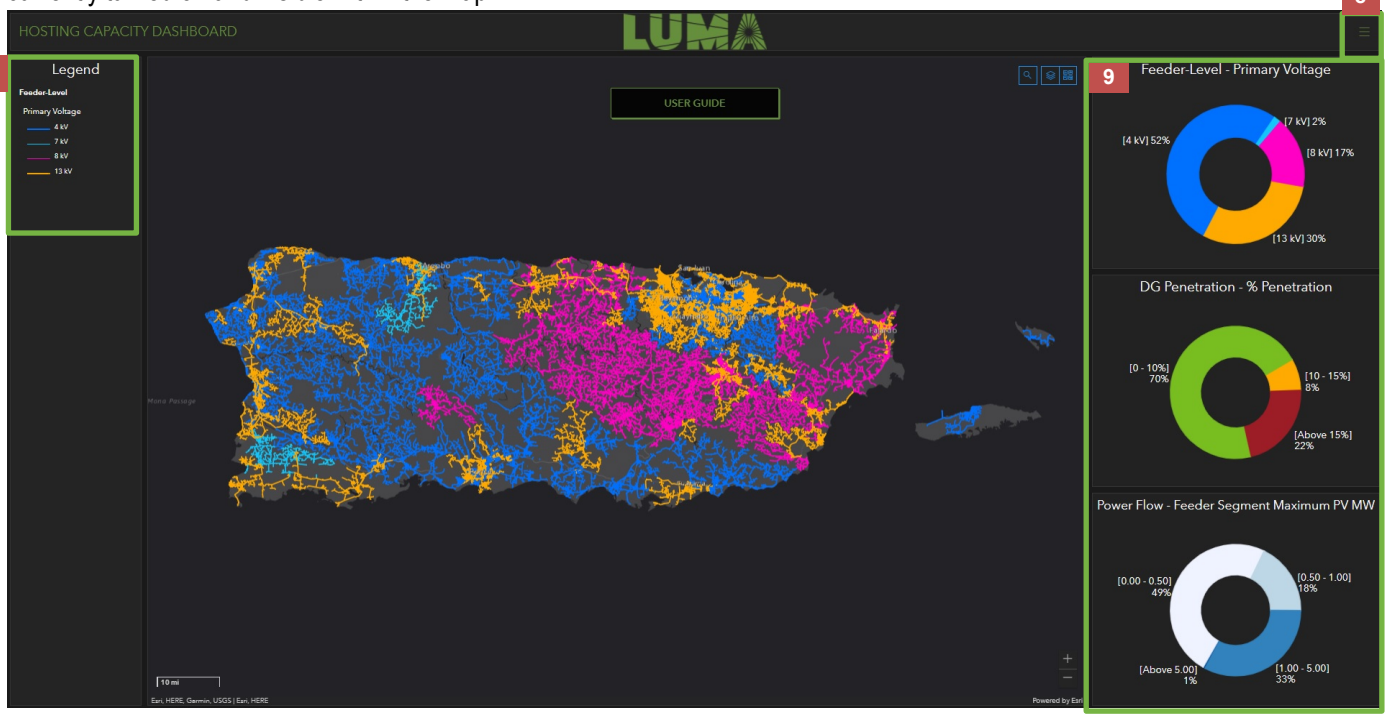
Navigation (continued)

4. Basemaps: Users can toggle between the basemaps, which are reference layers that are standard geographic maps. The two most useful basemaps are Imagery (low-resolution satellite imagery) and Streets (street-level road networks).



7. Legend: The legend is docked to the left of the interface map. It is dynamic, so it will only show the layers that are currently turned on and visible within the map.

8. Menu Link: Clickable link to LUMA's Home website.



9. Layer Content Filter

The three donut charts docked to the right of the interface map allow users to select only specific elements for each layer. Selection results are only visible when the layer of interest is made visible in the Layer List dropdown window.

2. How to Find Information

Steps	Process
1	Click the spyglass  to expand the Address Search and click in the blank address field. As you begin typing in your mailing address of interest, recommendations will appear below the address box. If you see the address you are interested in, move pointer over that address and click it. Otherwise, finish typing your full mailing address and select Enter. The map frame will automatically zoom to the desired address.
2	Click the circuit segment that is closest to your address. If you're unsure which segment that is, click the basemap selector  to engage the dropdown. Click the top-most basemap named 'Imagery' to change the basemap to satellite imagery. This should help better identify the desired premise and the closest circuit segment to it.
3	To view the Distributed Generation (DG) Penetration layer, click the Layer List icon  to expand the Layer List selector. Turn-off the Feeder-Level layer by clicking the open eye icon to the left of the layer name. To enable the DG Penetration layer, click the closed eye icon to the left of the layer name to set the visibility to On. Again, click the circuit segment closest to the desired premise. This will engage a pop-up window with all the underlying information for that circuit segment.
4	To view the Incremental Hosting Capacity layer, repeat the process performed in Step 3. Click the Layer List icon, turn Off the DG Penetration layer by clicking the open eye icon, click the closed eye icon for the Incremental Hosting Capacity layer to set the visibility to On, and click the closest circuit segment to the desired premise to engage the pop-up window.
5	For any layer that is set to Visible in the Layer List, the donut pie charts docked to the right of the dashboard can be used to filter specific data. As an example, with the Feeder-Level layer set to visible, click the dark blue pie segment labeled "4 kV". This will turn-off all other voltage classes, leaving only the 4 kV feeders visible. Multiple classes can be selected just by clicking on additional pie segments. To turn off data filters, simply click in the middle of the donut to make all classes visible again. The donut filters will only work on layers that are visible in the Layer List.

3. Key Definitions

Key terms and definitions used throughout the Interconnection Capacity Map Dashboard are outlined below:

Term	Definition
DG Penetration	Method used to approximate the amount of existing and queued-ahead distributed generation in each circuit, as compared to the peak load of the circuit. A threshold of 15% is currently used as one of the criteria for detailed interconnection studies requirement.
Existing DG	Total sum of nominal ratings of all distributed generation declared to be already in service in the distribution circuit.
Hosting Capacity	Estimated amount of distributed generation that if installed at a given point of the distribution system, it is expected not to cause detrimental effects on the system's performance and quality of service.
Incremental Hosting Capacity	Method used to calculate hosting capacity with greater resolution, which gradually increases the amount of DG in each section of the model, until a criteria violation is detected.
Voltage Class	Nominal line to line voltage magnitude in kV for the primary circuit.

4. Hosting Capacity Methodology

The map dashboard displays the estimated hosting capacity for the LUMA Distribution System, based on two methods: 1. DG Penetration, and 2. Incremental Hosting Capacity. Both methods are described below.

DG Penetration

This method is used for those circuits in the LUMA System that are in process of digital model development, and therefore are not suitable for simulation and analysis with power systems analysis software tools. The DG Penetration results for a given circuit represent the percent of existing distributed generation, as compared to the peak load of the same circuit. The resulting value is associated to the complete circuit, and it is computed as:

$$DG\% = \frac{DG_{existing+queued}[MW]}{Feeder\ Peak\ Load[MW]}$$

where,

$DG_{existing}$ Total sum of nominal ratings of all distributed generation that is existing in the same distribution circuit.

Feeder Peak Load Peak gross load of the circuit in consideration.

As established in Regulation 8915, the threshold of 15% is used as reference for high penetration. According to this, the following levels of DG penetration are displayed.

- $0\% \leq DG\% < 10\%$
- $10\% \leq DG\% < 15\%$
- $DG\% \geq 15\%$

Incremental Hosting Capacity

This method is used for those circuits in the LUMA System that have validated models suitable for simulation and analysis with power systems analysis software tools. In this case, Synergi Electric has been used to compute the estimated hosting capacity at each section of the circuit, using the Incremental method.

Synergi's section incremental capacity method gradually increases the amount of DG in each section of the model, until a criteria violation is detected. The criteria used for this analysis is:

- Line or equipment loading limit: 100%
- High voltage limit: 1.05 pu
- Low voltage limit: 0.95 pu
- Maximum voltage variation: 2%
- Feeder reverse power flow: 0 kW