Clean Coalition

Identifying optimal locations for Community Microgrids

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- Questions will be answered during the Q&A portion of the webinar.
- Contact Josh for webinar questions: josh@clean-coalition.org.

Presenter

Gregory Young
Program Associate

Gregory Young has worked with several nonprofits and community-based organizations in developing planning processes to help build resilience for disadvantaged populations. Universalizing local renewable energy resources has been an ongoing passion for Gregory, especially as more of the world's population transitions to urban environments. Gregory received a BA in Psychology at the University of Colorado Boulder and is currently pursuing an MA in Urban Sustainability at Antioch University in Los Angeles, with a focus on the world's dual challenges of climate change and inequality.

Webinar agenda

1. Clean Coalition's mission and the Goleta Load Pocket Community Microgrid (GLPCM)
2. Graduate studies in Urban Sustainability and Geographic Information Systems
3. Community Microgrid Suitability Model
4. The model's replicability
5. Data and ICA interactive maps

Mission

To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

Renewable energy end-game

100% renewable energy; 25% local, interconnected within the distribution grid and ensuring resilience without dependence on the transmission grid; 75% remote, fully dependent on the transmission grid for serving loads.

Community Microgrids are the grid of the future

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A Community Microgrid is a new approach for designing and operating the electric grid, stacked with local renewables and staged for resilience.

Key features:

- A targeted and coordinated distribution grid area served by one or more substations – ultimately including a transmission-distribution substation that sets the stage for Distribution System Operator (DSO) performance.
- Ability to utilize existing distribution grid infrastructure to serve the Community Microgrid during broader grid outages
- High penetrations of local renewables and other distributed energy resources (DER) such as energy storage and demand response.
- Staged capability for indefinite renewables-driven backup power for critical community facilities across the grid area – achieved by 25% local renewables mix.
- A solution that can be readily extended throughout a utility service territory – and replicated into any utility service territory around the world.

Goleta Load Pocket (GLP)

The GLP is the perfect opportunity for a comprehensive Community Microgrid

- GLP spans 70 miles of California coastline, from Point Conception to Lake Casitas, encompassing the cities of Goleta, Santa Barbara (including Montecito), and Carpinteria.
- GLP is highly transmission-vulnerable and disaster-prone (fire, landslide, earthquake).
- **200 megawatts (MW) of solar and 400 megawatt-hours (MWh) of energy storage** will provide 100% protection to GLP against a complete transmission outage ("N-2 event").
  - 200 MW of solar is equivalent to only about 5 times the amount of solar currently deployed in the GLP and represents about 25% of the energy mix.
  - Multi-GW of solar siting opportunity exists on commercial-scale built environments like parking lots, parking structures, and rooftops; 200 MW represents only about 7% of the technical siting potential.
  - Other resources like energy efficiency, demand response, and offshore wind can significantly reduce solar+storage requirements.

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Locating suitable Community Microgrid regions

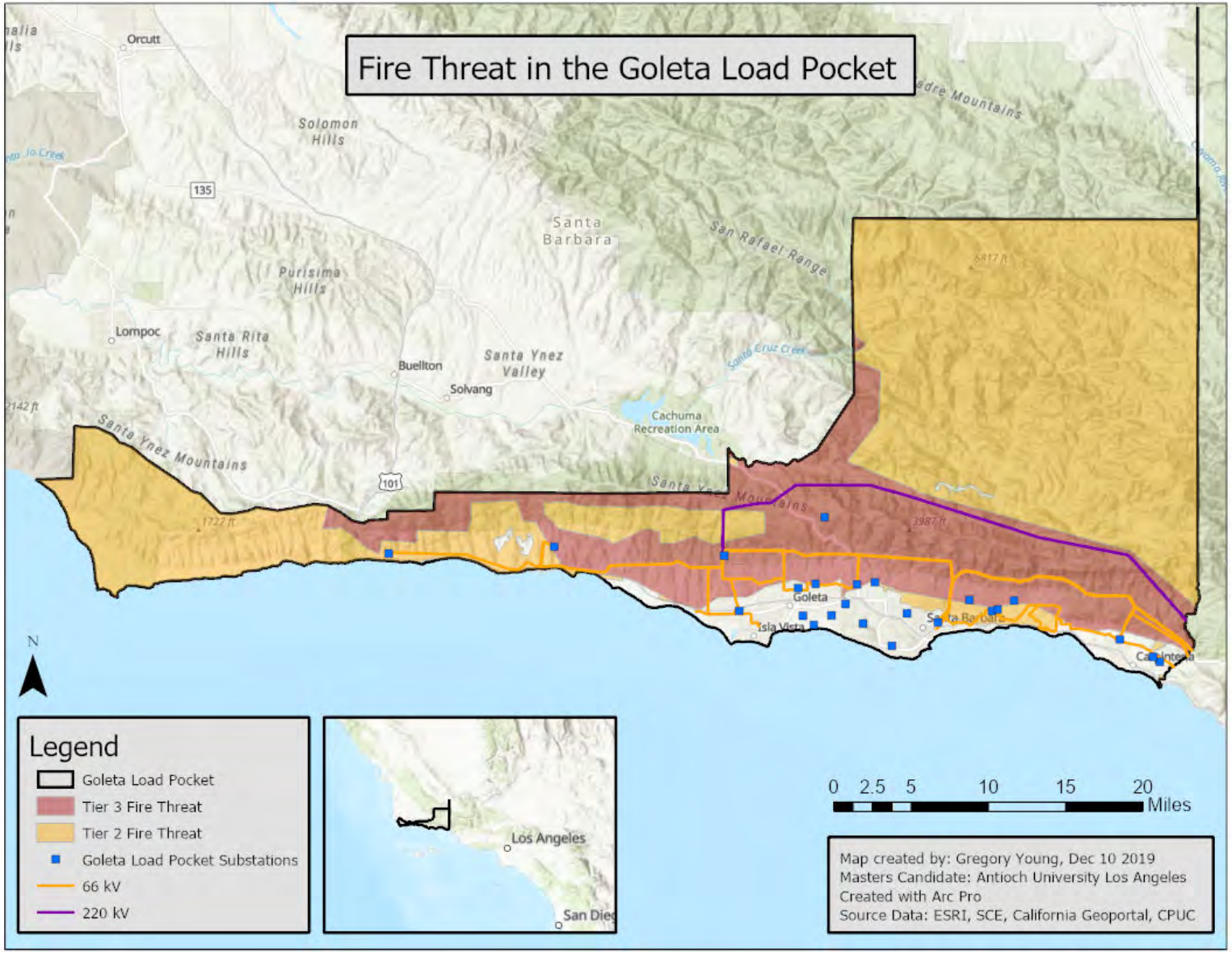
Gregory Young
Antioch University Los Angeles
Masters Candidate in Urban Sustainability
ES-6100
Final Project

Southern California Edison (SCE) statement

"Due to the rugged mountainous terrain, any required repair and replacement of transmission lines and transmission towers could take up to several weeks if a natural disaster, such as a landslide or earthquake, occurs."

— A. Hernandez, 2019

GLP fire threat map



GIS, ArcGIS Pro, and Suitability Modeling

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1. GIS is the framework.
2. ArcGIS Pro is the software.
3. ModelBuilder is the visual programming language.
4. Suitability Modeling is the technique/toolset.

Final Community Microgrid Suitability Model

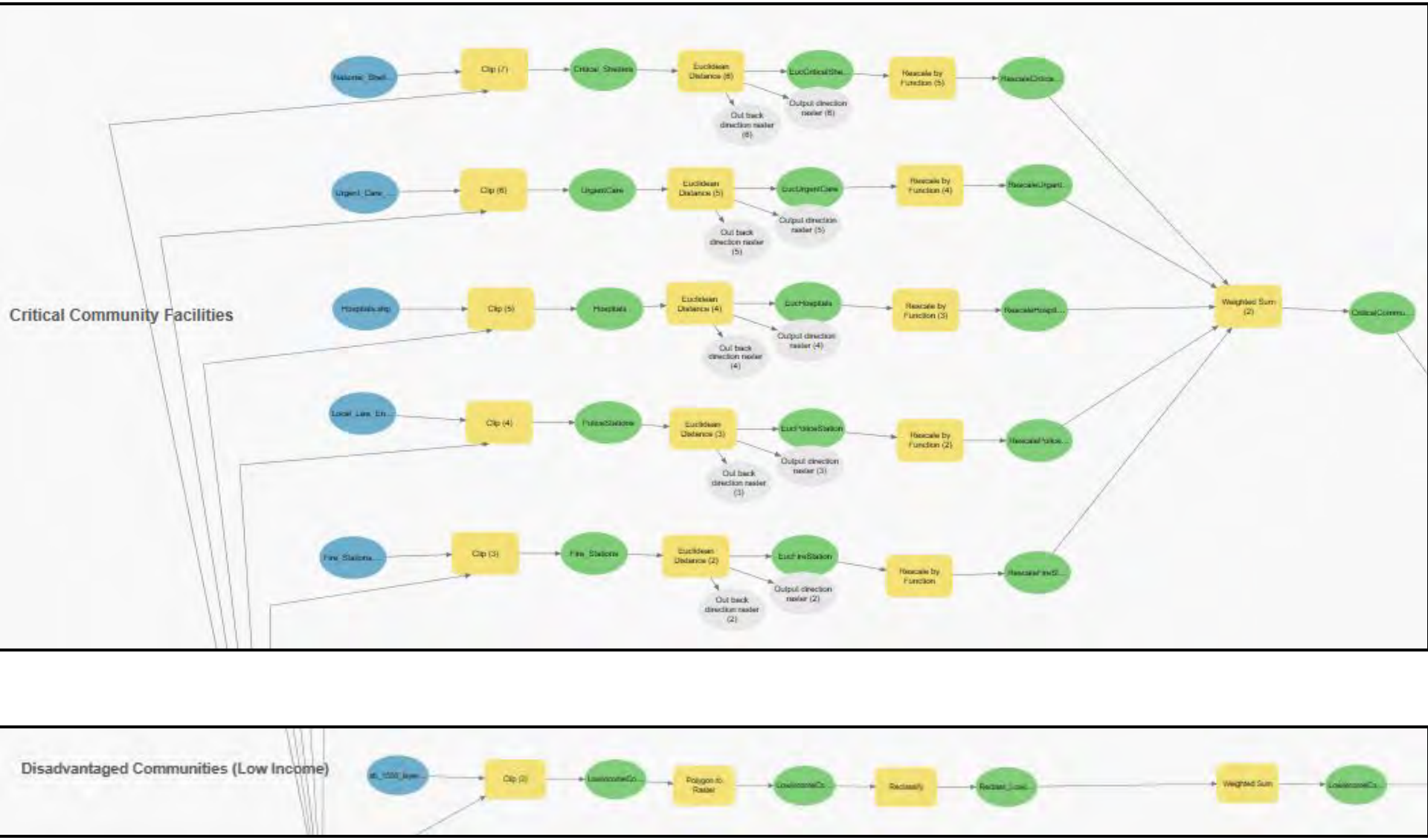
Datasets used

Dataset	Acquisition date	Application
Fire stations	11/10/19	Deriving suitability raster layer
Hospitals	11/10/19	Deriving suitability raster layer
Urgent care centers	11/10/19	Deriving suitability raster layer
Police stations	11/10/19	Deriving suitability raster layer
Critical sheltering sites	11/10/19	Deriving suitability raster layer
Priority population areas	11/10/19	Deriving low-income communities for suitability raster layer
SCE service layers (SCE Boundary, ICA segments, transmission and distribution lines, substations)	11/10/19	Defining study boundaries, important map elements, and suitability raster layer
Southern California Association of Governments - Counties	11/10/19	Defining study boundaries
CPUC Fire Threat areas	11/10/19	Defining study area
Solar Siting Survey points	11/10/19	Adding value to results

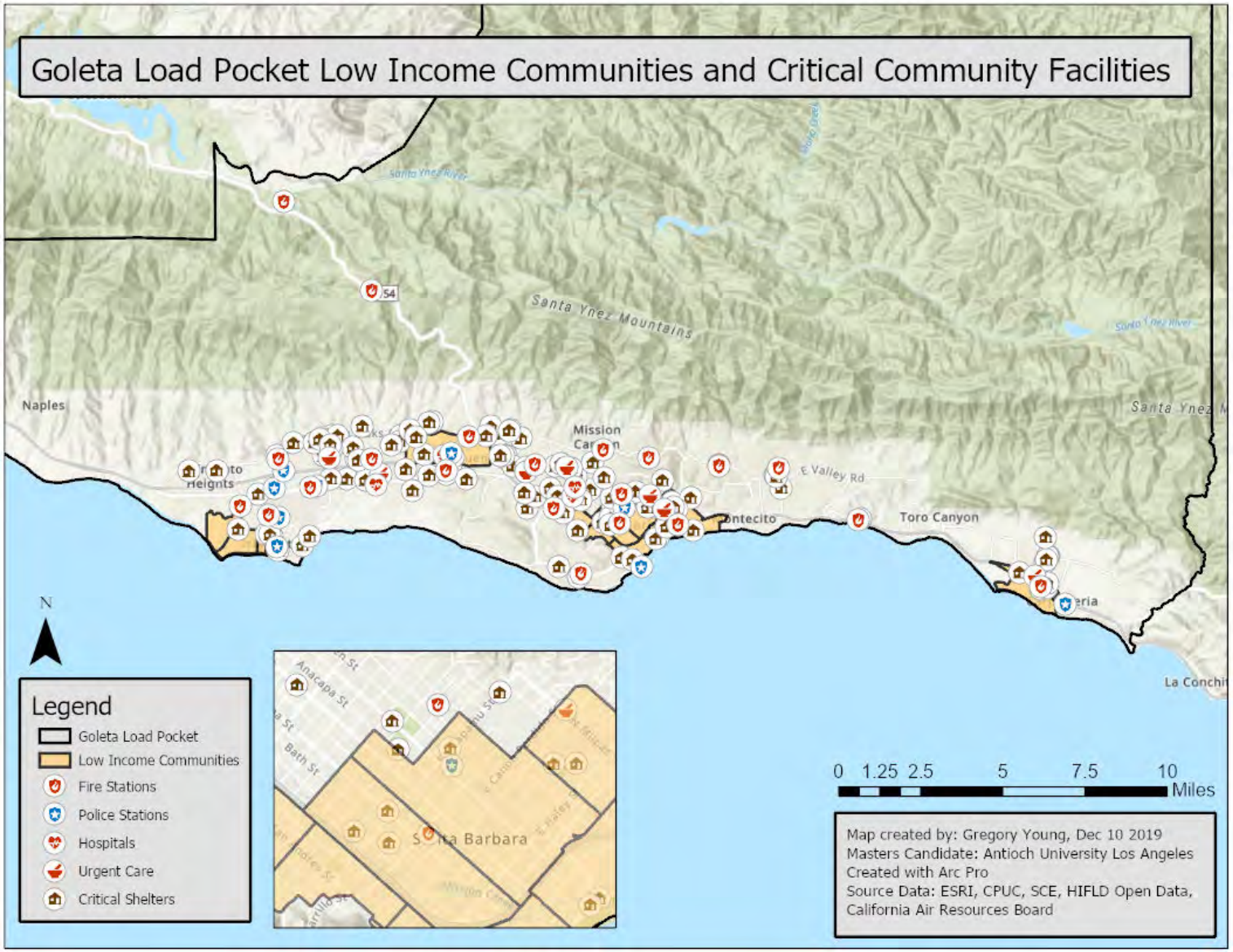
Critical community facilities

- Data derived from Homeland Infrastructure Foundation-Level Data (HIFLD)
  - **Fire stations**: Any location where firefighters are stationed or based out of, or where equipment that such personnel use in carrying out their jobs is stored for ready use. Fire departments not having a permanent location are included, in which case their location has been depicted at the city/town hall or at the center of their service area if a city/town hall does not exist.
  - **Hospitals**: Hospital facilities included based only on data acquired from various state departments or federal sources.
  - **Urgent care centers**: Any location that is capable of providing emergency medical care and must provide emergency medical treatment beyond what can normally be provided by an EMS unit, must be able to perform surgery, or must be able to provide recuperative care beyond what is normally provided by a doctor's office.
  - **Police stations**: Sheriff departments, police departments, patrol stations, highway patrol stations, and jails.
  - **Critical sheltering sites**: Facilities designated a shelter by either the Federal Emergency Management Agency (FEMA) or the American Red Cross (ARC).

Critical community facilities and disadvantaged communities (low-income) sub-model



Critical community facilities and low-income communities within the GLP

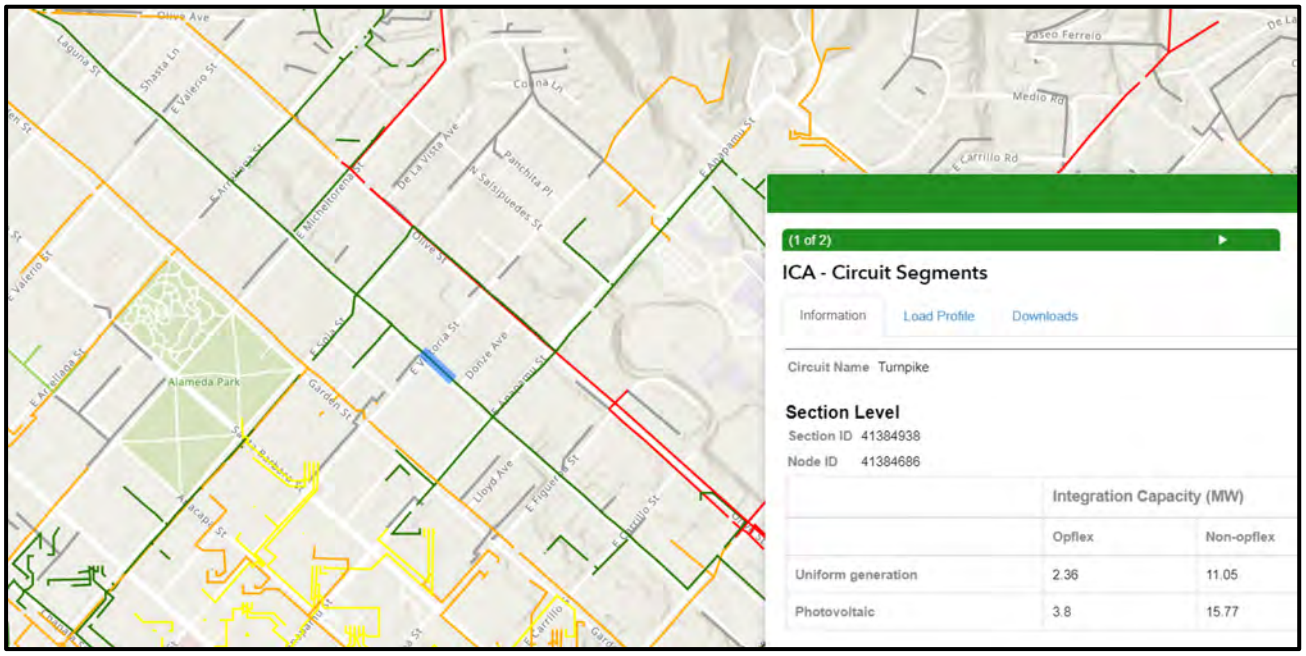


Southern California Edison integration capacity analysis (ICA) maps

The ICA maps offer four values for generation interconnection:

1. Uniform generation operational flexibility
2. Uniform generation non-operational flexibility
3. Photovoltaic operational flexibility
4. Photovoltaic non-operational flexibility

Uniform generation: Covers storage, PV, and other resources so that Community Microgrids can continue to operate at night.
Operational flexibility: A constraint that lowers the value of PV integration to take into account the possibility that an integration may need to be reviewed by a utility engineer.



Distribution Resources External Portal integration capacity analysis (ICA) maps

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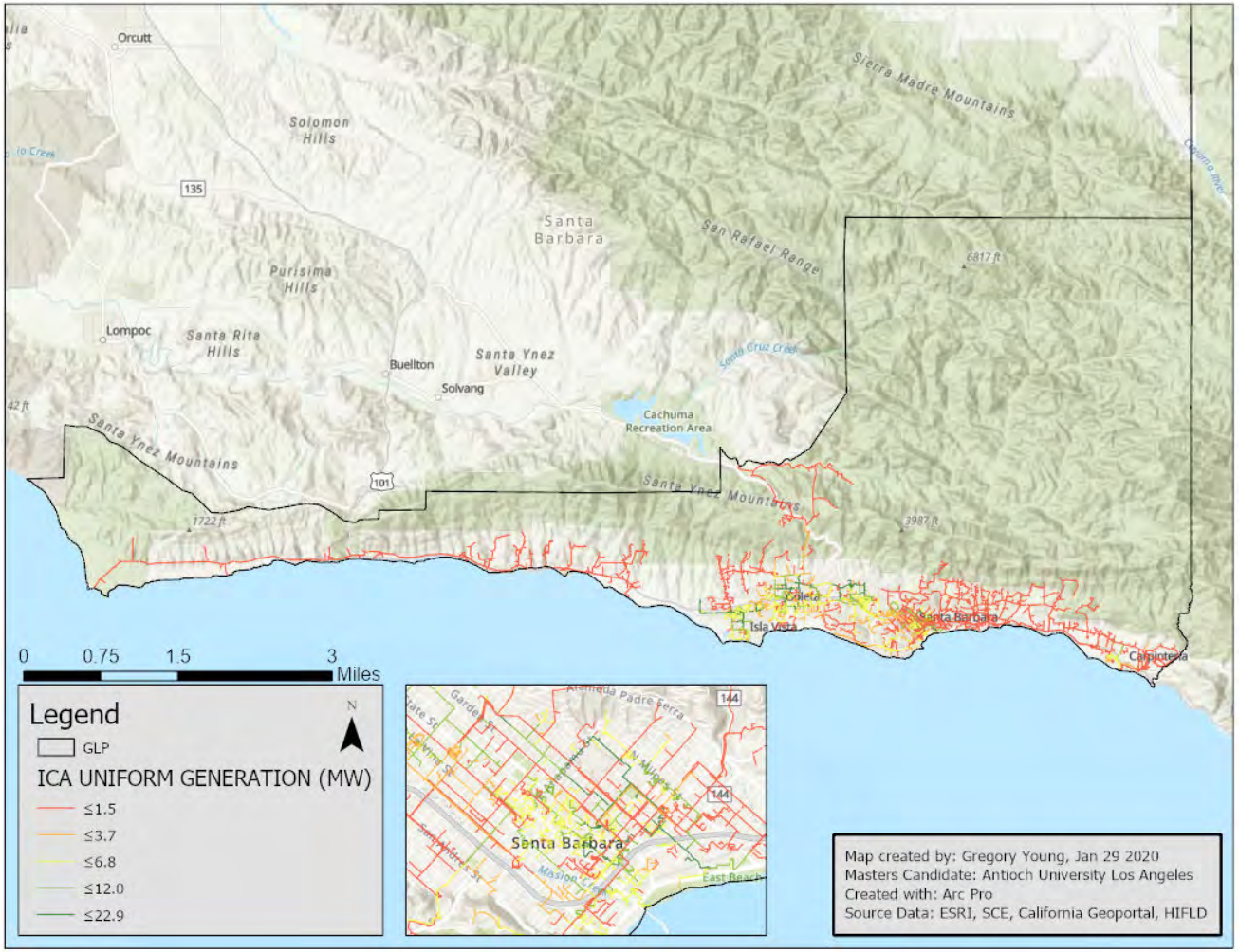
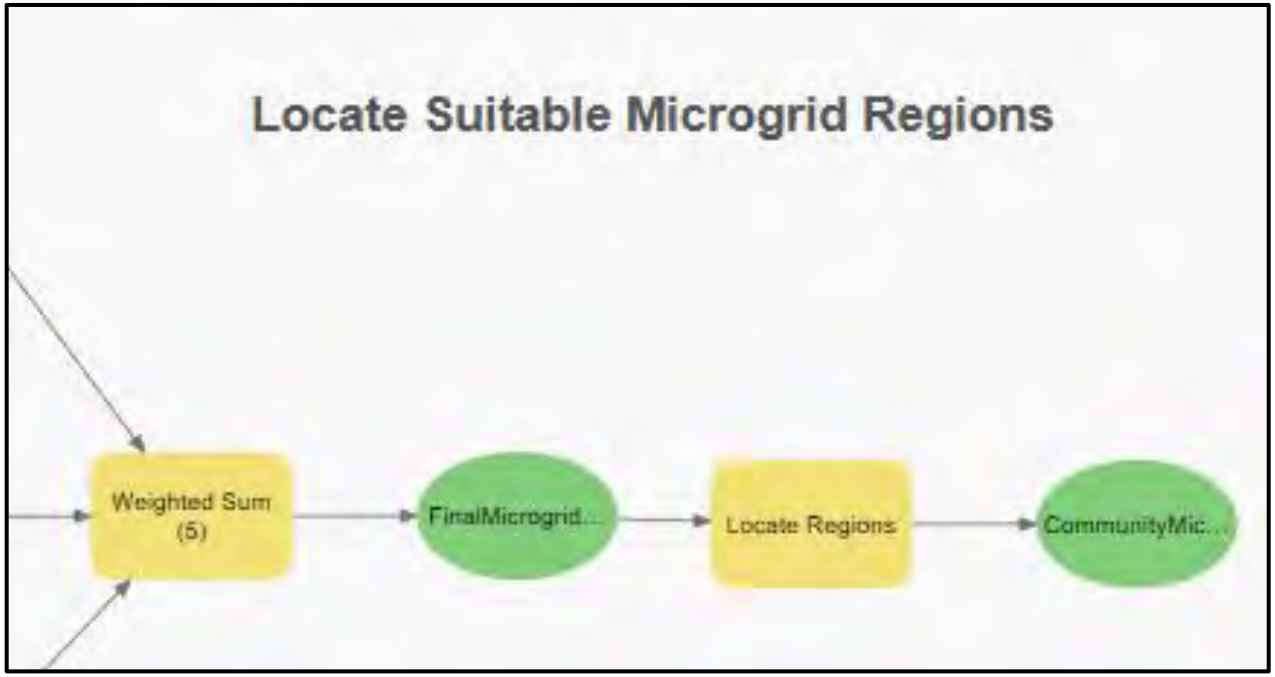


Creating the final suitability layer and locating regions



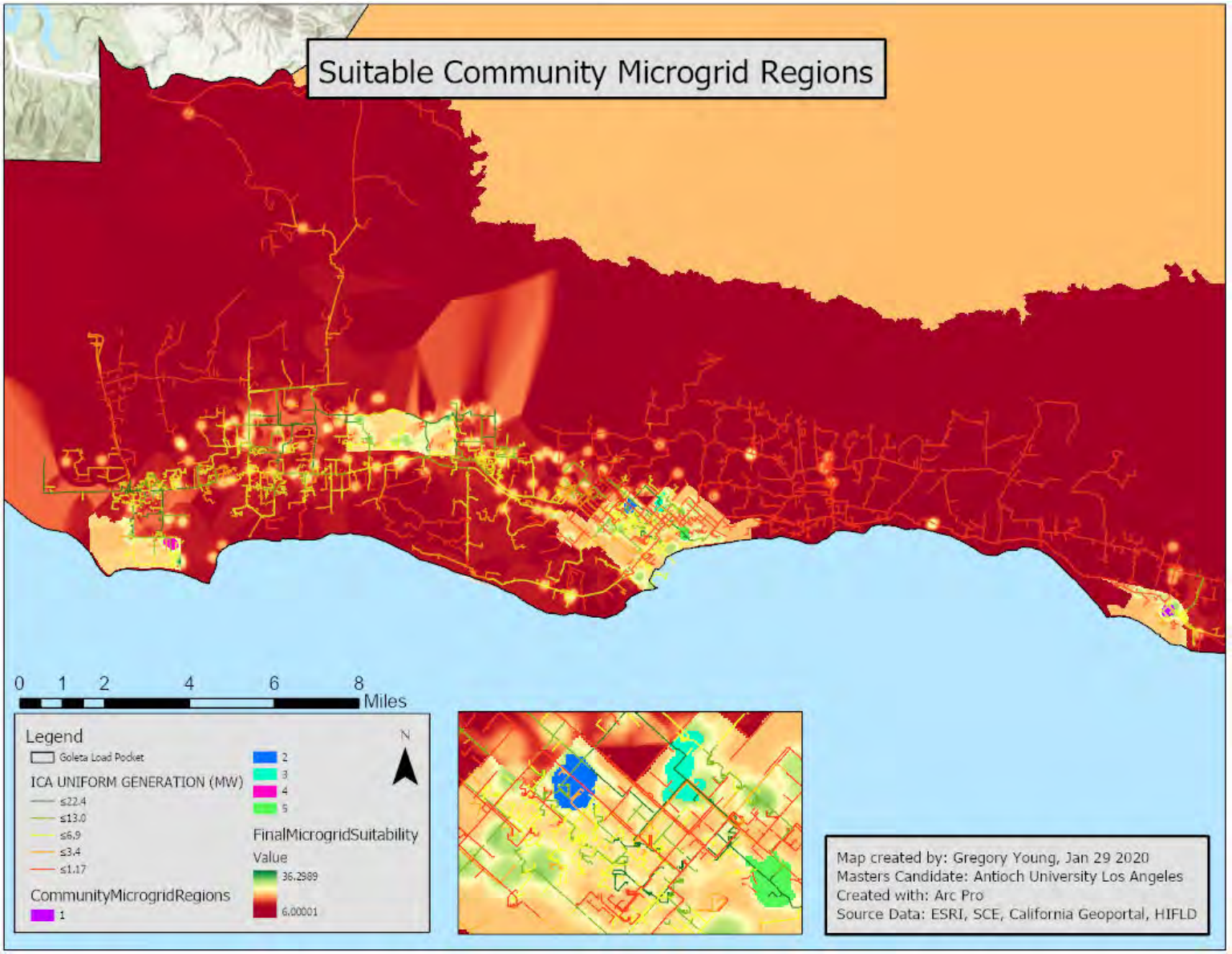
Weighted sum tool:

- Gave all criteria the same weighted values, but these values could be changed based on what criteria a community deems to be more desirable (e.g., critical community facilities more important than low-income communities).

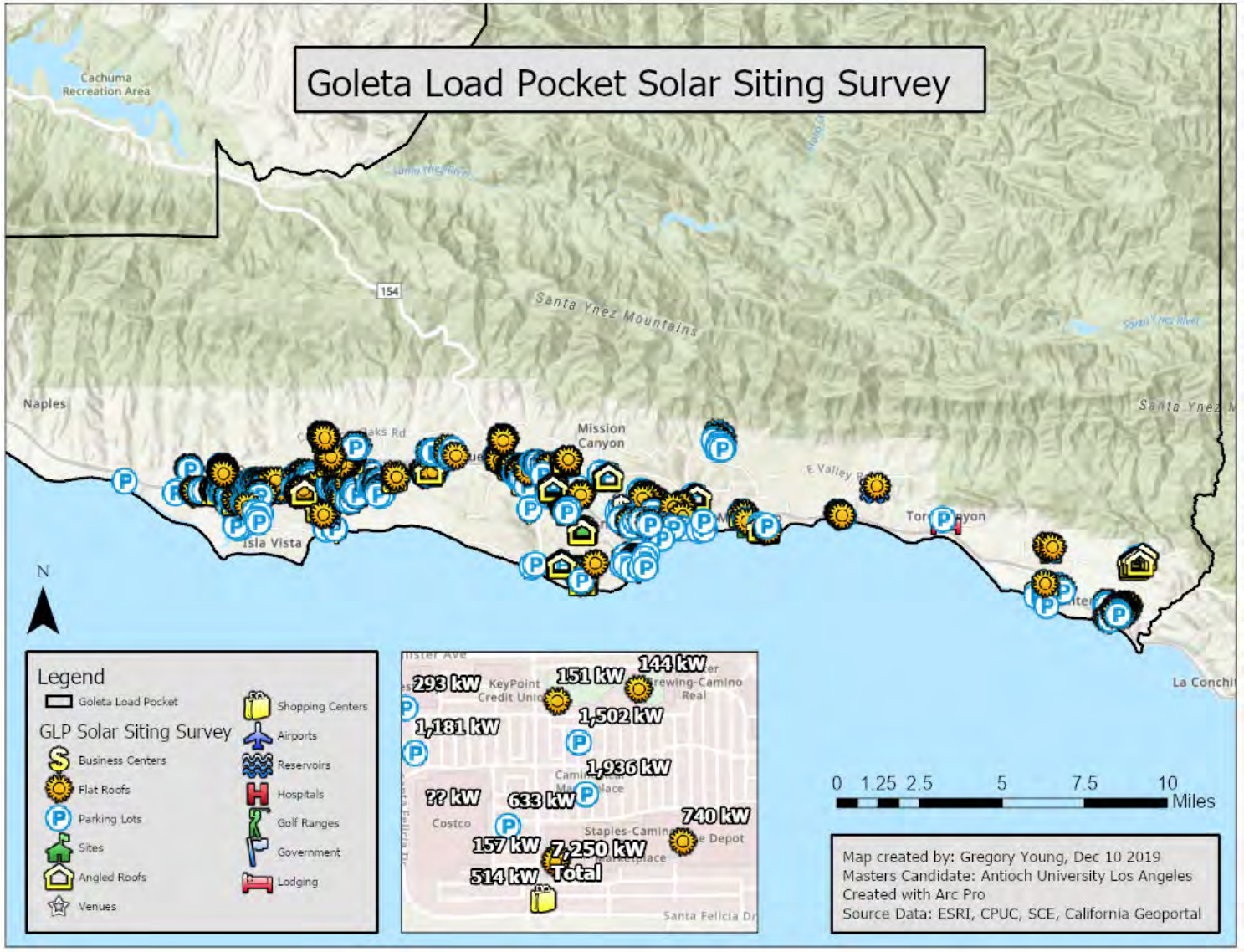
Locate regions tool:

- Identifies the best regions that meet specified size requirements and spatial constraints.
- Chose to locate five regions across the GLP

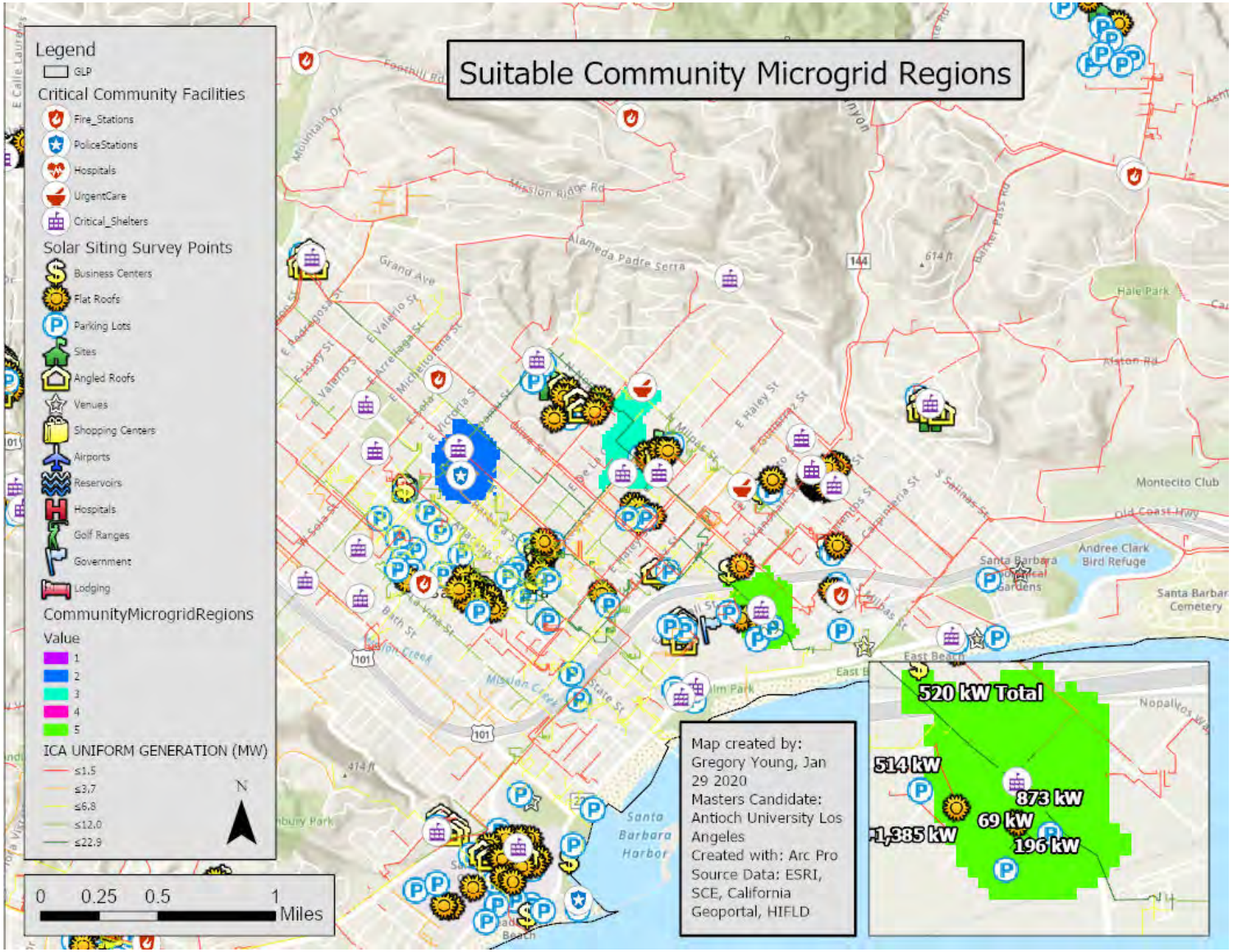
Optimal locations for Community Microgrids



Solar Siting Survey across the GLP



Community Microgrid regions with Solar Siting Survey



Final Community Microgrid Suitability Model

Replicability

- This model was designed so that very few pieces need to be changed when conducting the analysis on a different study area:
  - Swap out study area boundaries.
  - Adjust disadvantaged/low-income community layers as needed.
  - Swap out ICA data depending on which investor-owned utility (IOU) serves the study area.
  - Consider if other critical community facilities should be included.
  - If a Solar Siting Survey is desirable, then the Clean Coalition can provide this service.
  - Consider if the criteria in the model should receive different weighted values

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Data and information sources

- Critical community facilities data (Homeland Infrastructure Foundation-Level Data)
- Disadvantaged and low-income data (Priority Populations) maps and data
- SCE ICA maps
  - No registration required.
  - Has limited viewing capabilities. Can't toggle off opflex but shows values for non-opflex when you click on a feeder segment.
  - Spatial data can be found using the ArcGIS webmap or in the ArcGIS Pro software Geospatial Portal.
- PG&E ICA maps
  - Must create a login for access.
  - Poor user interface.
  - Map toggles itself between Feeder level (RAM) and Line level (ICA) based on the visibility range.
  - Spatial data can be downloaded straight from the interactive map's front page (top right corner) but not directly available via the ArcGIS webmap.
- SDG&E ICA maps:
  - Must register with SDG&E; once registered, SDG&E will send an email that contains a web link, username, password, and instructions to access and use the map.
  - Spatial data not directly available via the ArcGIS webmap but can be downloaded once SDG&E has provided you access to their interactive ICA map.
- Clean Coalition Solar Siting Surveys

Questions?

Gregory Young
Program Associate

Email Gregory with questions at
gregory@clean-coalition.org

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Backup slides

Percentage of time online for Tier 1, 2, and 3 loads for net zero solar + 2 hours storage microgrid at UCSB

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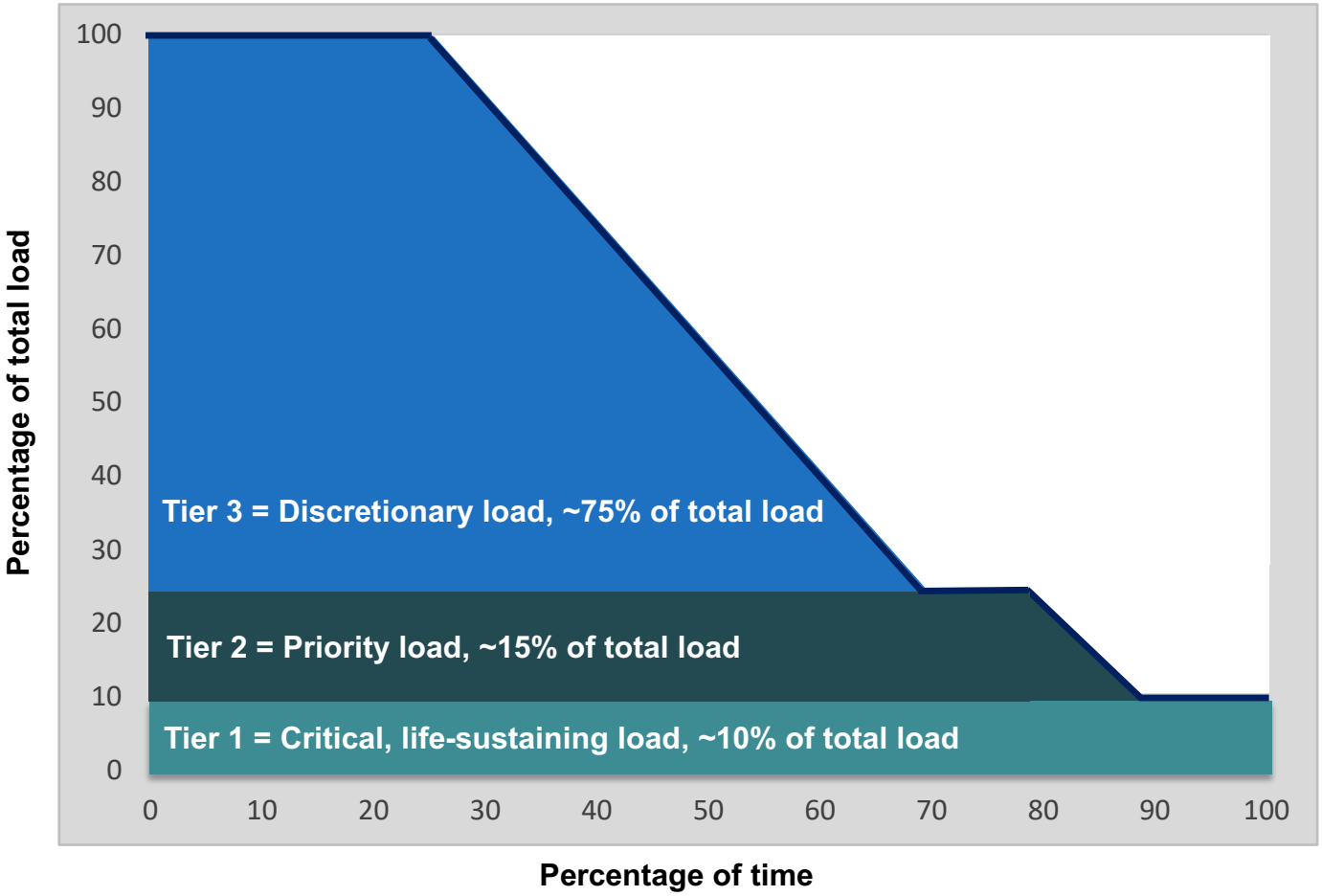

Value of Resilience (VOR) depends on tier of load

- Everyone understands there is significant value to resilience provided by indefinite renewables-driven backup power
  - But no one has yet quantified the value of this unparalleled resilience.
  - Hence, there is an economic gap for innovative Community Microgrid projects while learning is still is the early stages.
- The Clean Coalition aims to establish a standardized Value of Resilience (VOR) for critical, priority, and discretionary loads that will help everyone understand that premiums are appropriate for indefinite renewables-driven backup power for critical loads and almost constant backup power for priority loads, which yields a configuration that delivers backup power to all loads a lot of the time
- The Clean Coalition's VOR approach will establish standardized values for resilience of three tiers of loads:
  - Tier 1 loads, usually about 10% of the total load, are mission-critical and life-sustaining loads, crucial to keep operational at all times, including during grid outages.
  - Tier 2 loads, usually about 15% of the total load, are priority loads that should be maintained as long as long as doing so does not threaten the ability to maintain Tier 1 loads.
  - Tier 3 loads, usually about 75% of the total load, are the remaining, discretionary loads and are maintained when doing so does not threaten the ability to maintain Tier 1 & 2 loads.