

SOFTWARE FOR RENEWABLES INTERCONNECTION

User Guide and Training Material

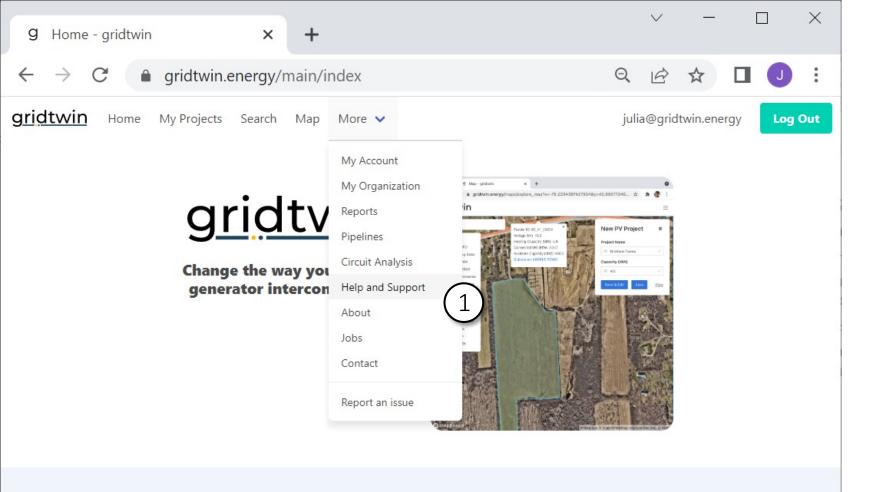
User Guide: Table of Contents

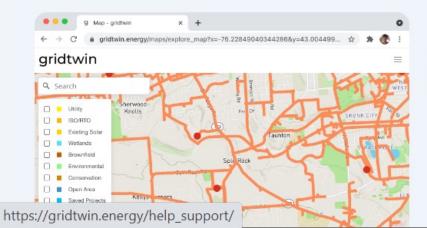
- 1. Gridtwin Software Overview
- 2. User Guide
 - 1. Account Creation
 - 2. Log in
 - 3. Project Home Page
 - 4. Mapping Tools for Interconnection
 - 5. Automated Interconnection Estimate
 - 6. Searchable Parcel Database
- 3. Additional Support



Additional Support and Help:

- To access additional help material, navigate to 'More' -> 'Help and Support' from the top menu bar
- 2. From this page, you can view additional documentation regarding Gridtwin software





Complex Models. Simple Software.

Simplify Interconnection

- · Search for ideal project sites
- Map out project details
- · Share results with your team
- Run automated interconnection analysis

Gridtwin software encompasses three types specific toolsets:



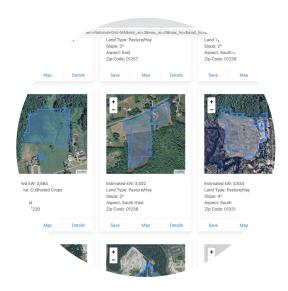
Map:

View feeders, substations, and other information on a maps interface



Interconnection:

Estimate the interconnection impact and cost for a solar project



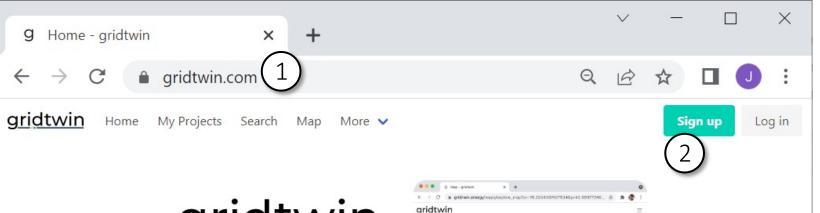
Search:

Search for parcels of land based on hosting capacity, project size, substation, or other characteristics



Account Creation:

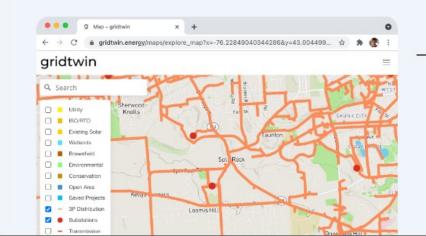
- 1. Navigate to: gridtwin.com
- 2. Select 'Sign Up' in the upper right corner





Change the way you manage generator interconnection.





Complex Models. Simple Software.

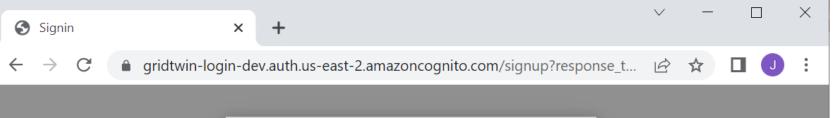
Simplify Interconnection

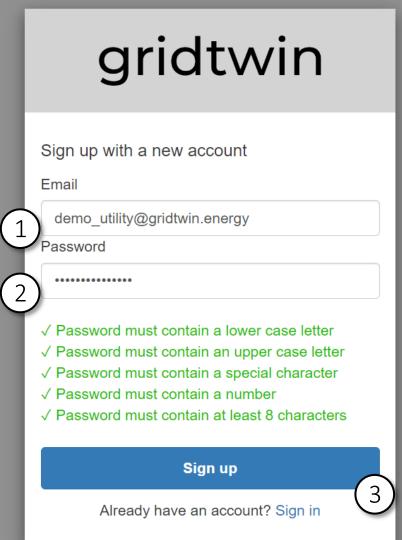
- Search for ideal project sites
- Map out project details
- Share results with your team



Account Creation:

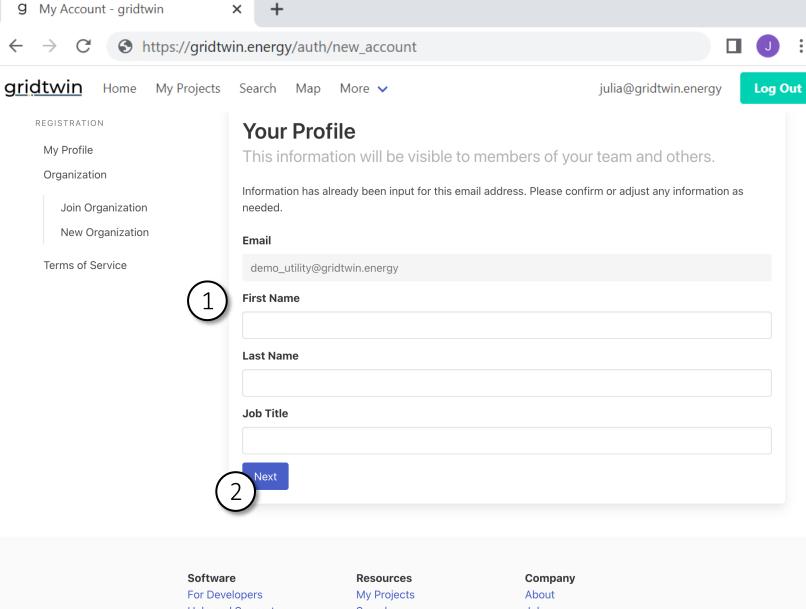
- 1. Sign-up with your email address
- 2. Choose a password
- 3. Select 'Sign up'
- 4. You will receive a verification code via email
- 5. This code must be used to verify your email address
- 6. After verifying your email address, you will proceed to additional account creation steps







- 1. Input your first name, last name, and job title
- 2. Click 'Next'



Help and Support

Search Maps

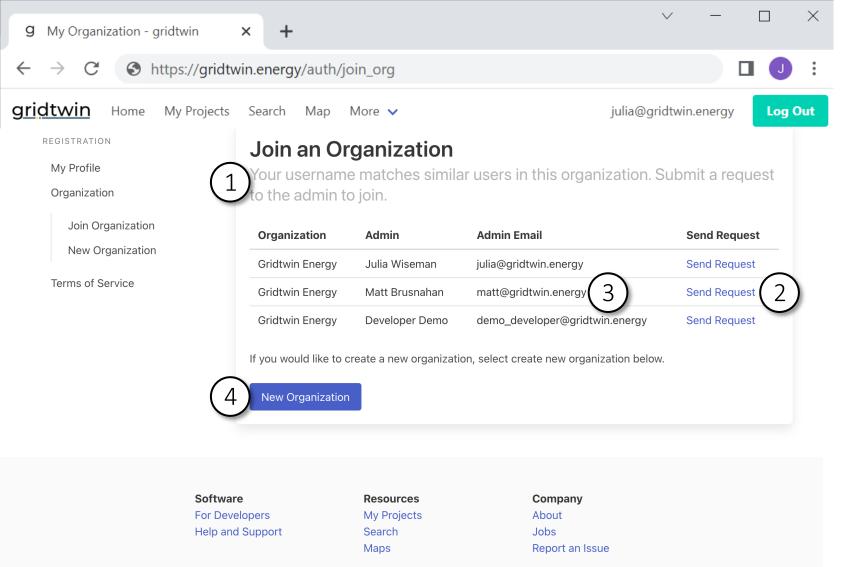
Jobs Report an Issue

Contact: info@gridtwin.energy

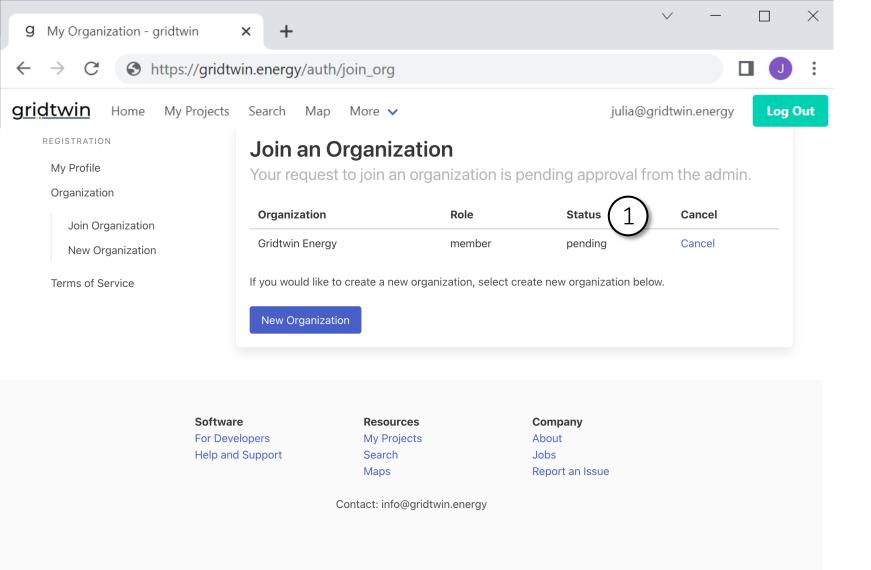


Account Creation:

- 1. If other members of your organization have already joined, you can request to join their organization: teammates within the same organization can access one another's projects
- 2. Click 'Send Request' to notify your team member via email that you would like to join the organization
- 3. Note that you can only join organizations which share your email address. For example, matt@gridtwin.energy can only join organizations which share the email domain 'gridtwin.energy'
- 4. If you do not want to join an existing organization, click 'New Organization'

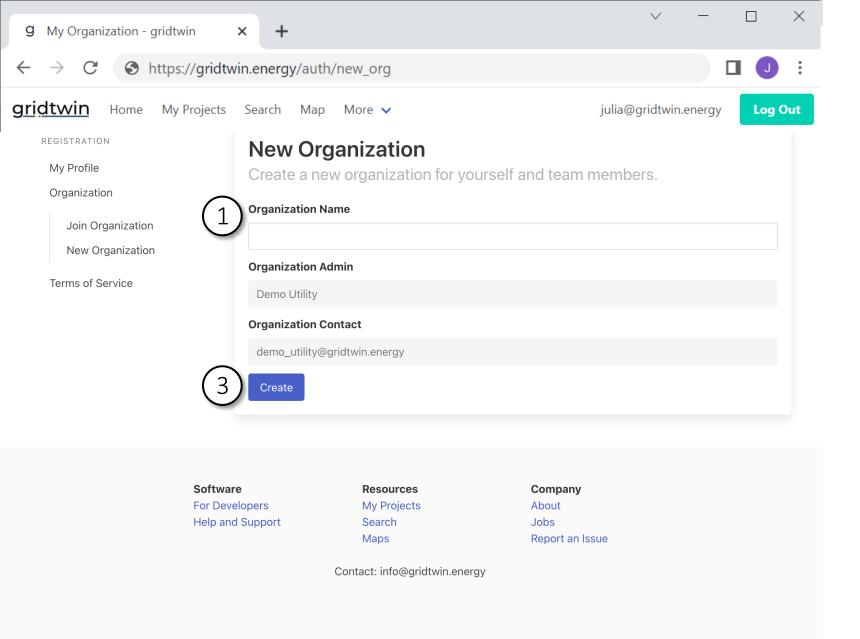


Contact: info@gridtwin.energy



Account Creation:

1. After submitting an invite request, your organization admin will need to confirm your invite



Account Creation:

- 1. If you choose to create a new organization, input your organization name
- 2. This is the name other users will see in the Gridtwin software
- 3. Select 'Create'
- 4. Note that only users with the same email address can join your organization. For example, matt@gridtwin.energy can only join organizations which share the email domain 'gridtwin.energy'

9 My Organization - gridtwin

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• https://gridtwin.energy/auth/terms_of_service





<u>gridtwin</u> Home My Projects Search Map More ✓

julia@gridtwin.energy

Log Out

REGISTRATION

My Profile

Organization

Join Organization

New Organization

Terms of Service

Gridtwin Energy Inc. Terms of Service

Please read and agree to the Gridtwin Energy Inc. Terms of Service.

This software-as-a-service Terms of Service Agreement (this "Agreement") is a binding contract between you ("Customer") and Gridtwin Energy Inc. ("Provider"). This Agreement governs your access to and use of the software-as-a-service.

THIS AGREEMENT TAKES EFFECT WHEN YOU CLICK THE ["I ACCEPT"] BUTTON BELOW OR BY ACCESSING OR USING THE SOFTWARE-AS-A-SERVICE ("the Effective Date"). BY CLICKING ON THE ["I ACCEPT"] BUTTON BELOW OR BY ACCESSING OR USING THE SOFTWARE-AS-A-SERVICE YOU (A) ACKNOWLEDGE THAT YOU HAVE READ AND UNDERSTAND THIS AGREEMENT; (B) REPRESENT AND WARRANT THAT YOU HAVE THE RIGHT, POWER, AND AUTHORITY TO ENTER INTO THIS AGREEMENT AND, IF ENTERING INTO THIS AGREEMENT FOR AN ORGANIZATION, THAT YOU HAVE THE LEGAL AUTHORITY TO BIND THAT ORGANIZATION; AND (C) ACCEPT THIS AGREEMENT AND AGREE THAT YOU ARE LEGALLY BOUND BY ITS TERMS.

IF YOU DO NOT AGREE TO THESE TERMS, PLEASE SELECT THE ["I DECLINE"] BUTTON BELOW. IF YOU DO NOT ACCEPT THESE TERMS, YOU MAY NOT ACCESS OR USE THE SOFTWARE-AS-A-SERVICE.

1. <u>Definitions</u>

- (a) "Aggregated Statistics" means data and information related to Customer's use of the Services that is used by Provider in an aggregate and anonymized manner, including to compile statistical and performance information related to the provision and operation of the Services.
- (b) "Authorized User" means Customer's employees, consultants, contractors, and agents (i) who are authorized by Customer to access and use the Services under the rights granted to Customer pursuant to this Agreement and (ii) for whom access to the Services has been purchased hereunder.
- (c) "Customer Data" means[, other than Aggregated Statistics,] information, data, and other content, in any form or medium, that is submitted, posted, or otherwise transmitted by or on behalf of Customer or an Authorized User through the Services.
- (d) "Documentation" means Provider's [user manuals, handbooks, and guides relating to the Services provided by Provider to Customer either electronically or in hard copy form][end user documentation relating to the Services available at {Invalid hyperlink URL}].
- (e) "Provider IP" means the Services, the Documentation, and any and all intellectual property provided to Customer or any Authorized User in connection with the foregoing. For the avoidance of doubt, Provider IP [includes Aggregated Statistics and any information, data, or other content derived from Provider's monitoring of Customer's access to or use of the Services, but]does not include Customer Data.
- (f) "Services" means the software-as-a-service offering provided by Provider under this Agreement that is described in Customer's service agreement.

Account Creation:

- 1. Please read and agree to the Gridtwin Energy Terms of Service
- 2. You must type your name exactly as it appears in your account profile
- 3. After accepting the Terms of Service your account is active and ready for use

9 My Organization - gridtwin

jurisdiction or country to which export, re-export, or release is prohibited by law, regulation, or rule. Customer shall comply with all applicable federal laws, regulations, and rules, and complete all required undertakings (including obtaining any necessary export license or other governmental approval), that prohibit or restrict the export or re-export of the Services or any Customer Data outside the US.]

- (k) <u>US Government Rights</u>. Each of the Documentation and the software components that constitute the Services is a "commercial item" as that term is defined at 48 C.F.R. § 2.101, consisting of "commercial computer software" and "commercial computer software documentation" as such terms are used in 48 C.F.R. § 12.212. Accordingly, if Customer is an agency of the US Government or any contractor therefor, Customer only receives those rights with respect to the Services and Documentation as are granted to all other end users, in accordance with (a) 48 C.F.R. § 227.7201 through 48 C.F.R. § 227.7204, with respect to the Department of Defense and their contractors, or (b) 48 C.F.R. § 12.212, with respect to all other US Government users and their contractors.
- (l) Equitable Relief. Each party acknowledges and agrees that a breach or threatened breach by such party of any of its obligations under Section 6 or, in the case of Customer, Section 2(d), would cause the other party irreparable harm for which monetary damages would not be an adequate remedy and agrees that, in the event of such breach or threatened breach, the other party will be entitled to equitable relief, including a restraining order, an injunction, specific performance, and any other relief that may be available from any court, without any requirement to post a bond or other security, or to prove actual damages or that monetary damages are not an adequate remedy. Such remedies are not exclusive and are in addition to all other remedies that may be available at law, in equity, or otherwise.



Software

For Developers Help and Support Resources

My Projects Search Maps Company

About Jobs

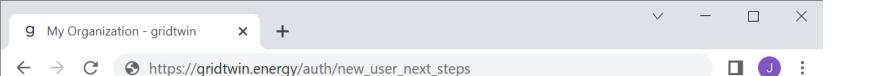
Report an Issue

Contact: info@gridtwin.energy

Account Creation:

X

- 1. Please read and agree to the Gridtwin Energy Terms of Service
- 2. You must type your name exactly as it appears in your account profile
- 3. After accepting the Terms of Service your account is active and ready for use



My Projects Search Map More V

julia@gridtwin.energy

Log Out

GENERAL

My Account

ADMINISTRATION

Organization Settings

Manage Your Team

Members

Invite a Member

Pending Invites

New Account Active

Thanks for signing up! We suggest the following next steps to get the most of Gridtwin:

Invite your team.

Invite team members to join your organization and collaborate on new projects.

Learn how to use Gridtwin.

Review the help materials and videos to become an expert user.

Create new projects.

Use the map to search for new projects and simulate interconnection.

Software

For Developers

Help and Support

Resources

My Projects Search

Maps

Company

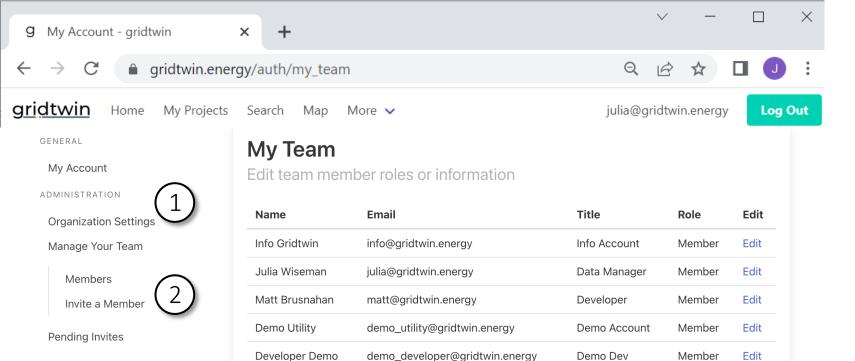
About Jobs

Report an Issue

Contact: info@gridtwin.energy

Account Creation:

- 1. After your account is active, get started with Gridtwin
- 2. Invite team members to join your organization
- 3. Read the help material
- 4. Create new projects



Software For Developers Help and Support

Developer Demo

Resources My Projects

Search

Maps

Company About Jobs

Report an Issue

Demo Dev

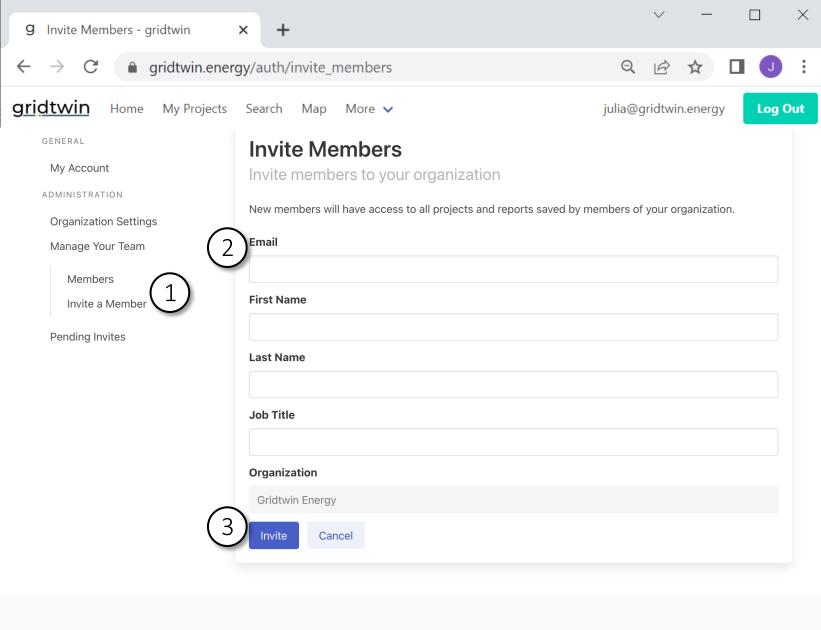
Member

Edit

Contact: info@gridtwin.energy

Organization Management:

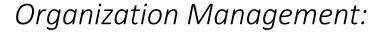
- 1. You can manage your team under the administration settings
- 2. To send an email invite to someone on your team select 'Invite a Member'



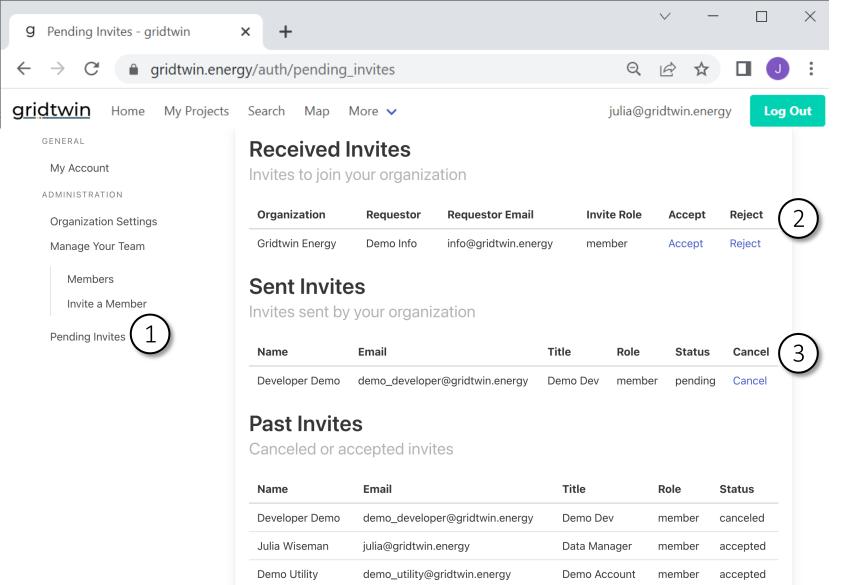
Organization Management:

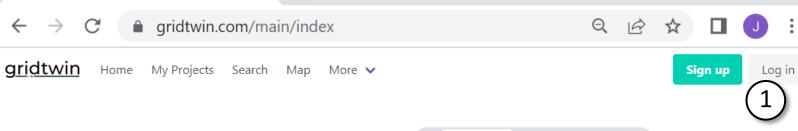
- 1. Invite a member to join your organization
- 2. Note that only users with the same email domain can join your organization. For example, matt@gridtwin.energy can only join organizations which share the email domain 'gridtwin.energy'
- 3. Select 'Invite'
- 4. After inviting a new member, that member will receive an email inviting them to join your organization

Company
About
Jobs
Report an Issue



- 1. If you have received requests to join your organization, you can view them under 'Pending Invites'
- 2. Here you can accept or reject requests to join your organization
- 3. You can also view invites you have sent to potential members





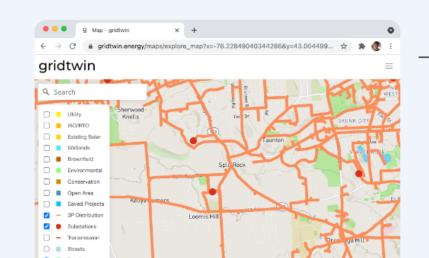
9 Home - gridtwin

Change the way you manage generator interconnection.



Home Page

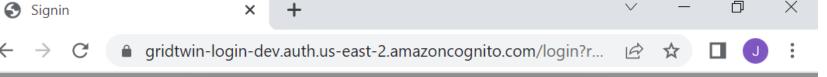
1. When using the software anytime after account creation, log in from the home page or any other page on the site



Complex Models. Simple Software.

Simplify Interconnection

- Search for ideal project sites
- Map out project details
- Share results with your team
- Run automated interconnection analysis



gridtwin
Sign in with your email and password Email
name@host.com Password Password
Forgot your password? Sign in
Need an account? Sign up

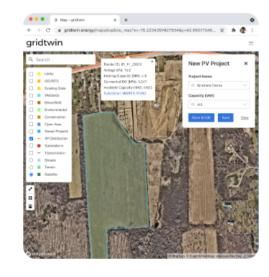
Login Page

From this page, login, reset your password, or create a new account



9 Home - gridtwin

Change the way you manage generator interconnection.



Gridtwin

Search

Search

Sherwood

Kinelis

Fix Or & Skunk City

Shunk City

Spl. Rock

Spl. Rock

Conservation

Saved Projects

Saved Projects

Saved Projects

Saved Projects

Substations

Substations

Loomis Hill

Substations

Complex Models. Simple Software.

Simplify Interconnection

- Search for ideal project sites
- Map out project details
- Share results with your team
- Run automated interconnection analysis

Menu Bar

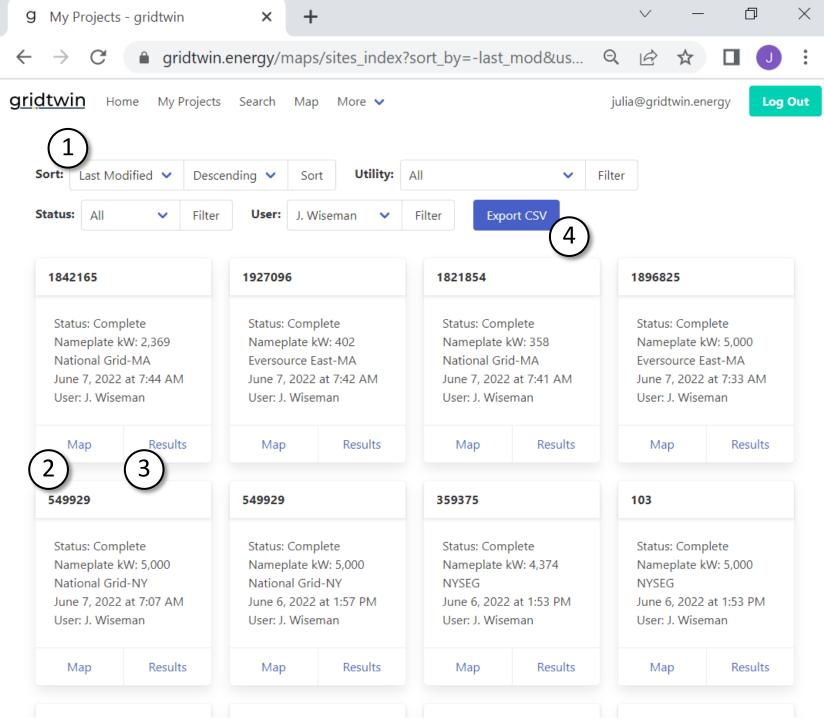
After logging in, the menu bar allows you to navigate to any feature of the software:

- 1. My Projects Page
- 2. Search for New Projects
- 3. Explore the Map
- 4. More:

Help, Support, Other Information

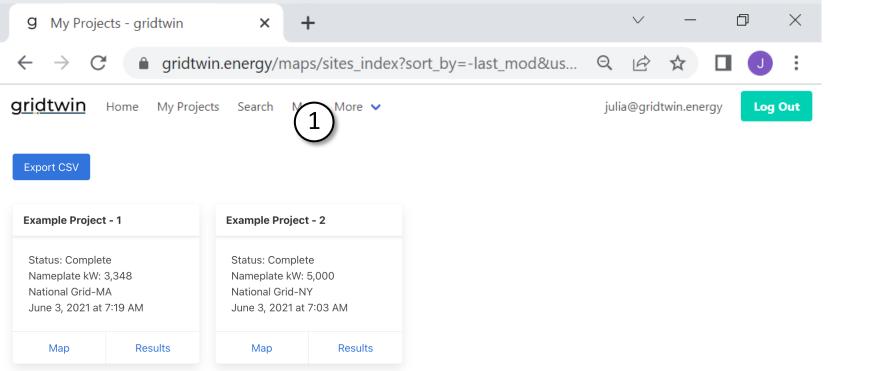
- 5. Back to the Home Page
- 6. Log Out

After reviewing the menu bar, navigate to 'My Projects' (1).



My Projects

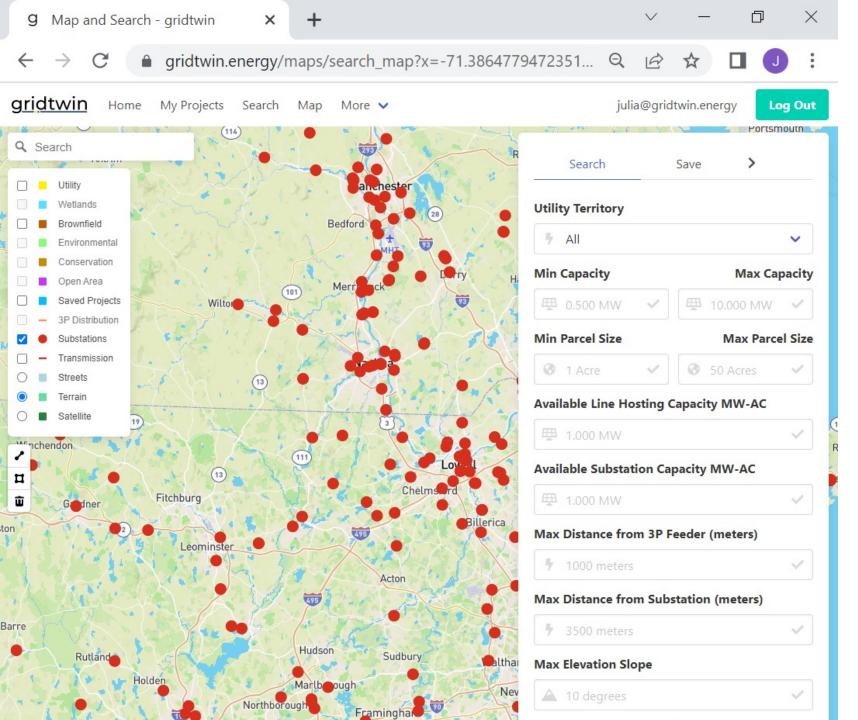
- 1. Sort and Filter projects by utility, status, or other characteristics
- 2. View a saved project on the map
- 3. View results of interconnection analysis
- 4. Export project results, geometries, and other characteristics to csv



My Projects

New Users typically have a 'My Projects' Page with two example projects

1. Navigate to the Map as the next step of the training

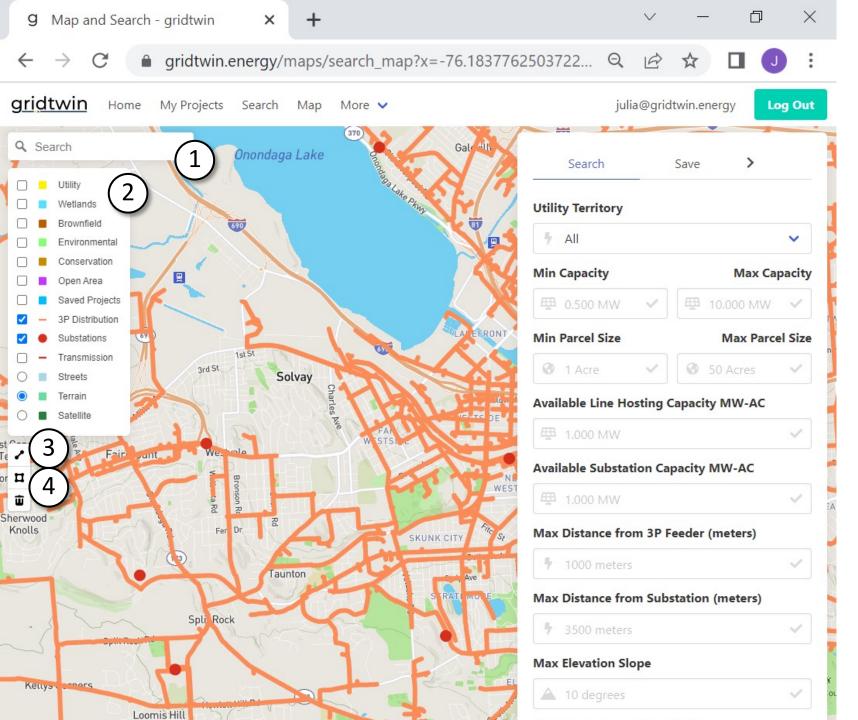


Map:

The map contains information related to interconnection across multiple utilities in the United States.

Data is aggregated from multiple public data sources to provide comprehensive information layers:

- Transmission Lines
- Substations
- Hosting Capacity
- Parcel Boundaries
- Utility Boundaries
- Wetlands
- Environmental Conservation

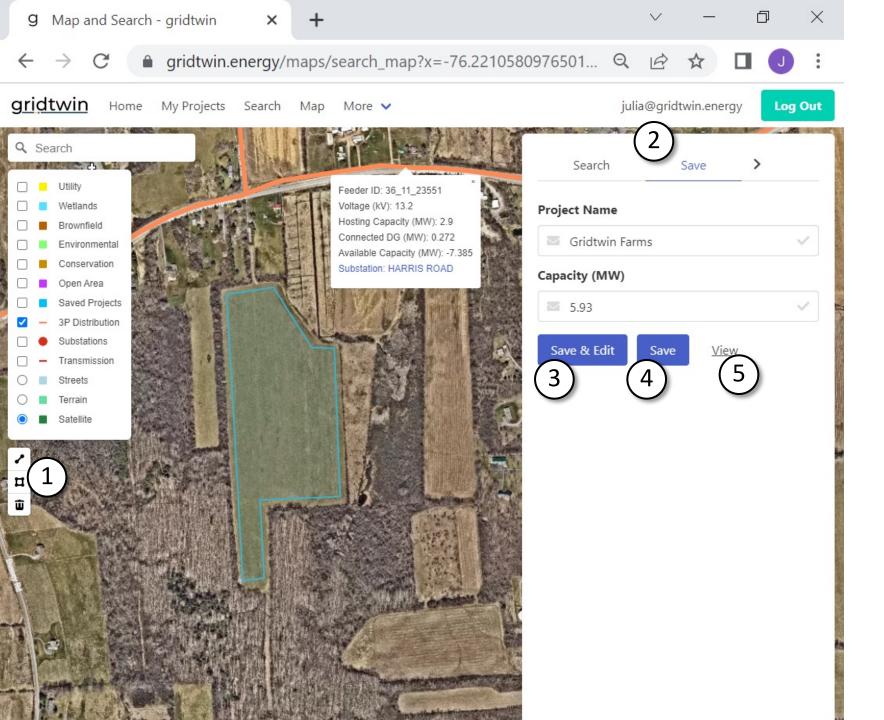


Map: Using Layers

Layers can be enabled and disabled in the map view.

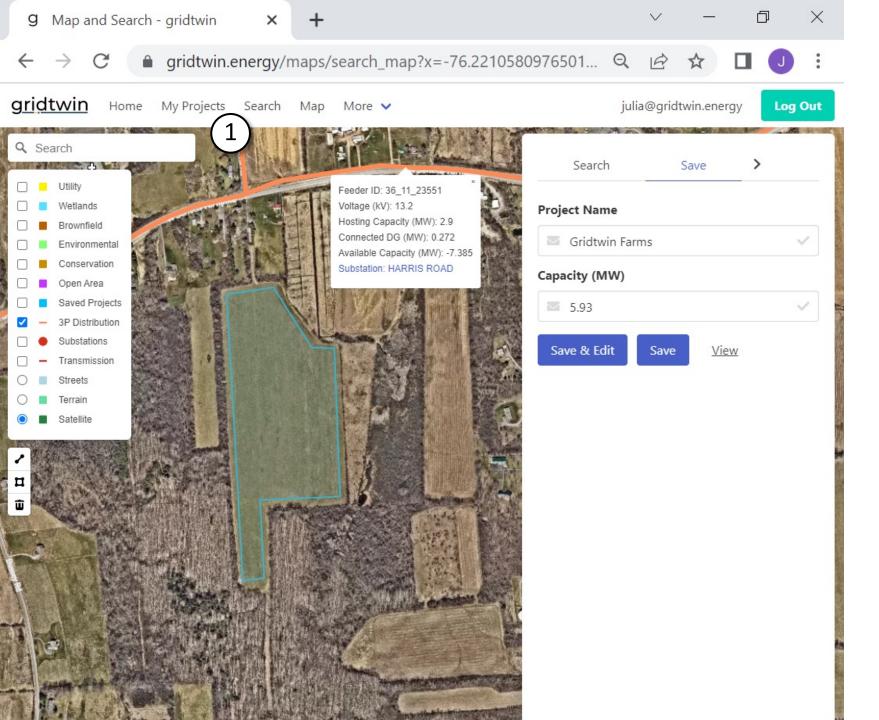
Some layers are only available when at high zoom levels. Zoom in further to enable all layers

- 1. Search for an address
- 2. Enabled Layers
- 3. Measure Distance: Click the last point to complete the line
- 4. Draw Project Boundary



Map: Save a Project Site

- 1. Draw a Project Boundary:
 Draw a shape and complete
 the shape by clicking the first
 point.
- 2. Save Tab: The new project's information will auto-populate here. Give it an appropriate name before saving
- 3. Save & Edit: Save the project and go to the edit page to define further details
- 4. Save: Save the project and remain on the map page
- 5. View: View the last saved project



Map: Save a Project Site

1. Return to the 'My Projects' page to see the newly saved site

359375

NYSEG

Map

Status: Complete

User: J. Wiseman

Nameplate kW: 4,374

June 6, 2022 at 1:53 PM

Results

549929

Status: Complete

National Grid-NY

User: J. Wiseman

Map

Nameplate kW: 5,000

June 6, 2022 at 1:57 PM

Results

1896825

Status: Complete

User: J. Wiseman

Мар

Nameplate kW: 5,000

Eversource East-MA

June 7, 2022 at 7:33 AM

Results

549929

Status: Complete

National Grid-NY

User: J. Wiseman

Map

Nameplate kW: 5,000

June 7, 2022 at 7:07 AM

Results

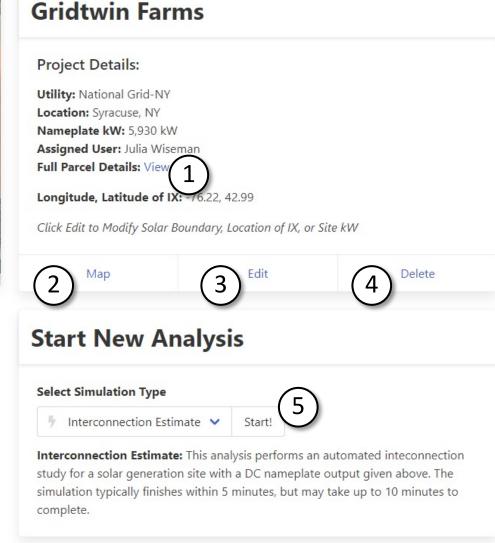
gridtwin

My Projects: View the

- 1. The saved project is now
- 2. Click 'Results' to see details





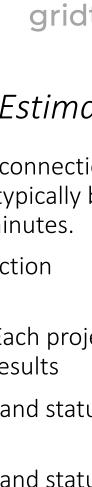


Project Detail:Overview

From this page, start a new interconnection estimate, edit the site details, or view the results.

If the site is new, the results will be empty until an interconnection analysis is completed.

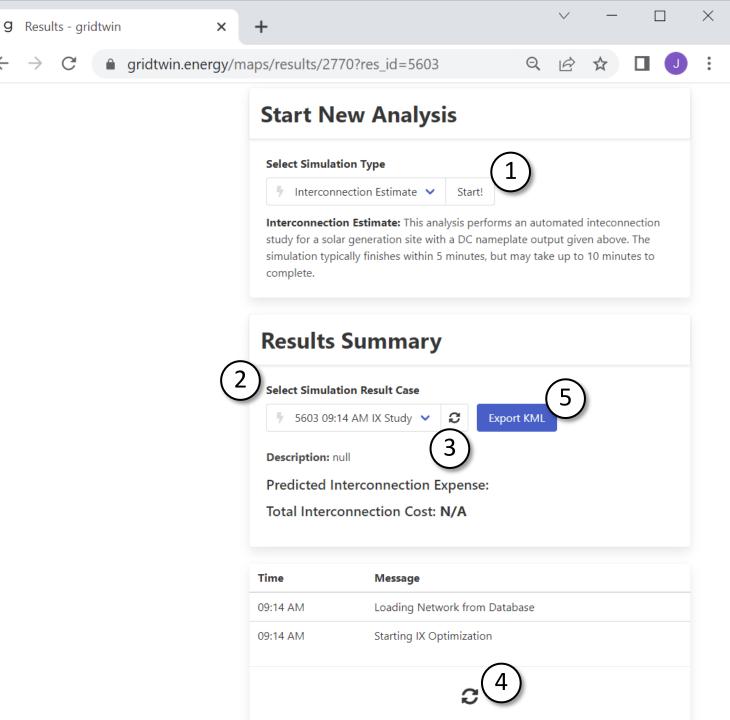
- 1. View parcel details
- 2. View project on the map
- 3. Edit the project details
- 4. Delete the project
- 5. Start an interconnection analysis





After starting an interconnection estimate, results will typically be ready in less than 5 minutes.

- 1. Start an interconnection estimate
- 2. Select the results: Each project can have multiple results
- 3. Refresh the results and status updates
- 4. Refresh the results and status updates
- 5. Export this project as a KML file for use elsewhere







After the analysis is completed, view the results summary, cost breakdown and status updates.

- 1. Select or refresh results
- 2. Summary of cost breakdown
- 3. Status updates of interconnection analysis. These status updates also include information on hosting capacity and required upgrades.



Results Summary

Select Simulation Result Case 1

5603 09:14 AM IX Study
Export KML

Description: This analysis includes an interconnection simulation for a site with a nameplate DC rating of 5.930 MW. For this analysis, line loading limits and voltage conditions were checked for all lines effected by the project. Required upgrades are summarized in the Cost Breakdown Table below. This analysis includes 0.272 MW of DG already connected to the network. Locations for these projects were determined using our satellite imagery. For an estimated analysis which includes a range of cost based on projects in the DG queue, perform a congestion simulation listed above.

Predicted Interconnection Expense:

2 Line: \$206,000 Metering: \$14,200 Protection: \$800,000

Results - gridtwin

Total Interconnection Cost: \$1,020,000

Time	Message
09:14 AM	Loading Network from Database
09:14 AM	Starting IX Optimization
09:14 AM	IX Optimization Complete
09:14 AM	Available Line Hosting Capacity: -7.38453
09:14 AM	Saving Bill of Materials to DB
09:14 AM	Adding SCADA Recloser for Project > 1 MW
09:14 AM	Project Exceeds Published Hosting Capacity
09:14 AM	Adding Voltage Regulator for Possible Overvoltage
09:14 AM	Project Exceeds 3V0 Threshold Limit
09:14 AM	Adding 3V0 Protection to Substation



Project Detail: Interconnection Estimate

The cost breakdown includes each line item for the interconnection estimate.

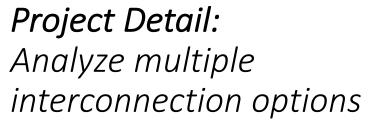
- 1. Status updates of interconnection analysis: These status updates also include information on hosting capacity and required upgrades.
- 2. Cost Breakdown: Line items which are included in the total interconnection cost.

g	Results - grid	dtwin ×	+		~	_	×
\leftarrow	→ G		maps/results/2770?res_id=5603	Q	B	☆	:

Message Loading Network from Database 09:14 AM Starting IX Optimization 09:14 AM IX Optimization Complete 09:14 AM Available Line Hosting Capacity: -7.38453 09:14 AM Saving Bill of Materials to DB 09:14 AM Adding SCADA Recloser for Project > 1 MW 09:14 AM Project Exceeds Published Hosting Capacity 09:14 AM Adding Voltage Regulator for Possible Overvoltage 09:14 AM Project Exceeds 3V0 Threshold Limit 09:14 AM Adding 3V0 Protection to Substation \mathbb{C}

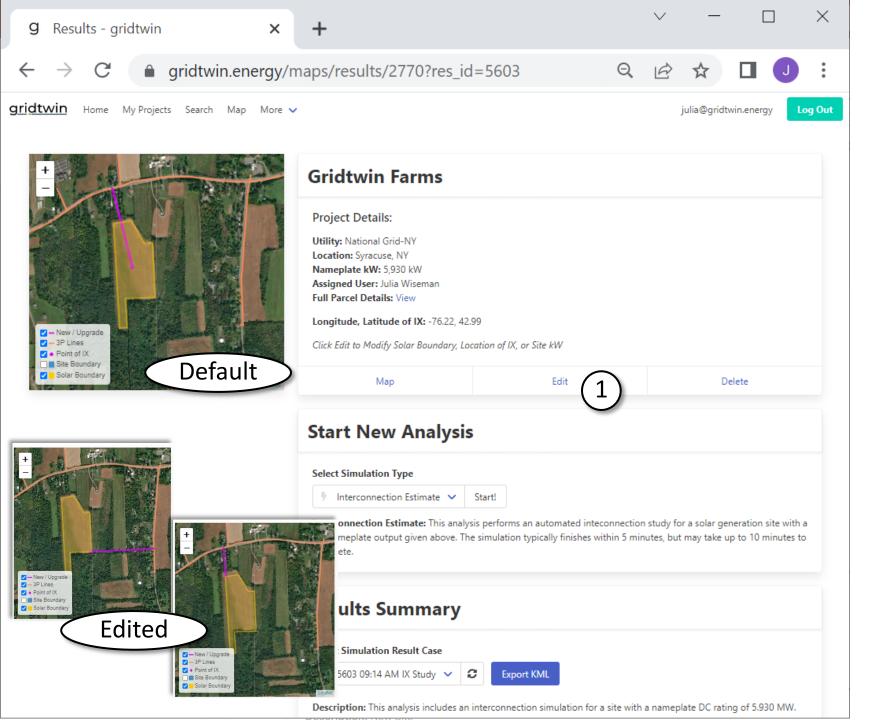
Cost Breakdown - Base Case

Units	Expense
1,583 ft	\$206,000
2 units	\$14,200
1 units	\$120,000
1 units	\$180,000
1 units	\$500,000
	\$1,020,000
	1,583 ft 2 units 1 units 1 units



Edit a project to modify line routing and analyze multiple scenarios:

1. Select Edit to modify the point of interconnection or three-phase line routing
Edit also allows users to modify the local hosting capacity or network parameters



Edit Project:

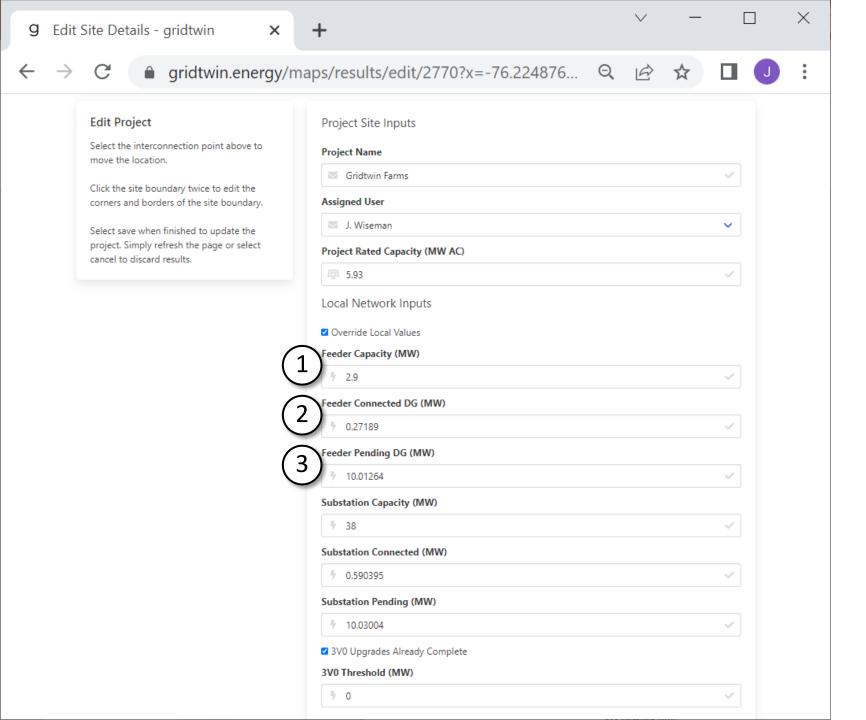
From this page, change the site boundary, move the point of interconnection, or manually create a line extension

- 1. Select the point of interconnection and drag to the appropriate location
- 2. Select the boundary to redraw the border
- 3. Manually draw a three phase extension to the project site
- 4. Redraw the project boundary
- 5. Edit Site Name, Capacity, or other characteristics

Edit Project: Manually add a three phase extension

For this site, the point of interconnection has been moved, and a three phase line extension has been drawn

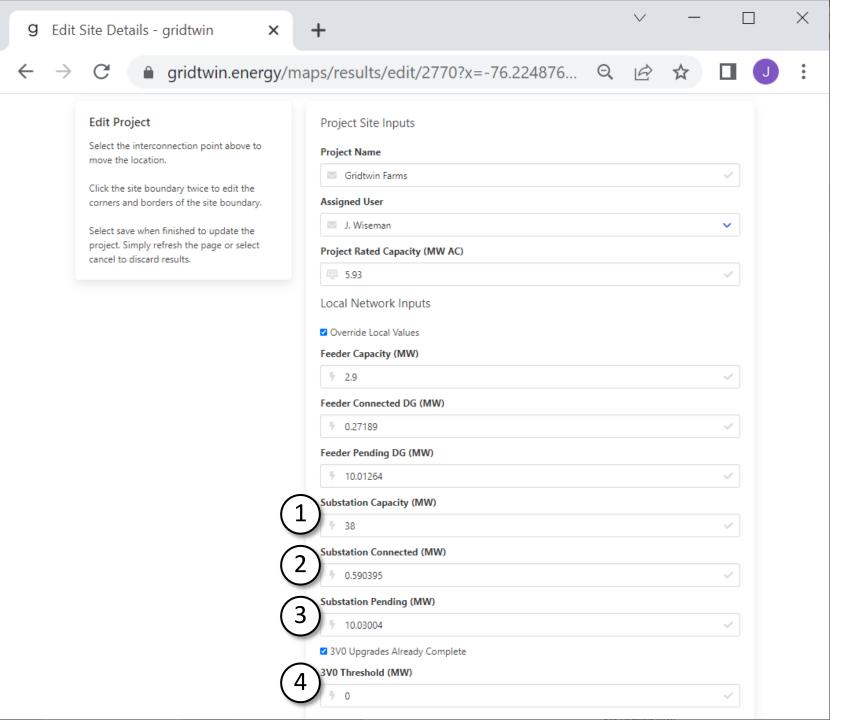
- 1. Point of interconnection was moved to the south-east corner of the site
- 2. A three-phase line extension was drawn by the user
- 3. Line Extension Tool: The threephase extension is not required. Gridtwin will automatically generate a three-phase extension if this is not used.



Edit Site: Override local values

Local hosting capacity values can be edited by the user if required. These values will affect required substation upgrades or line upgrades.

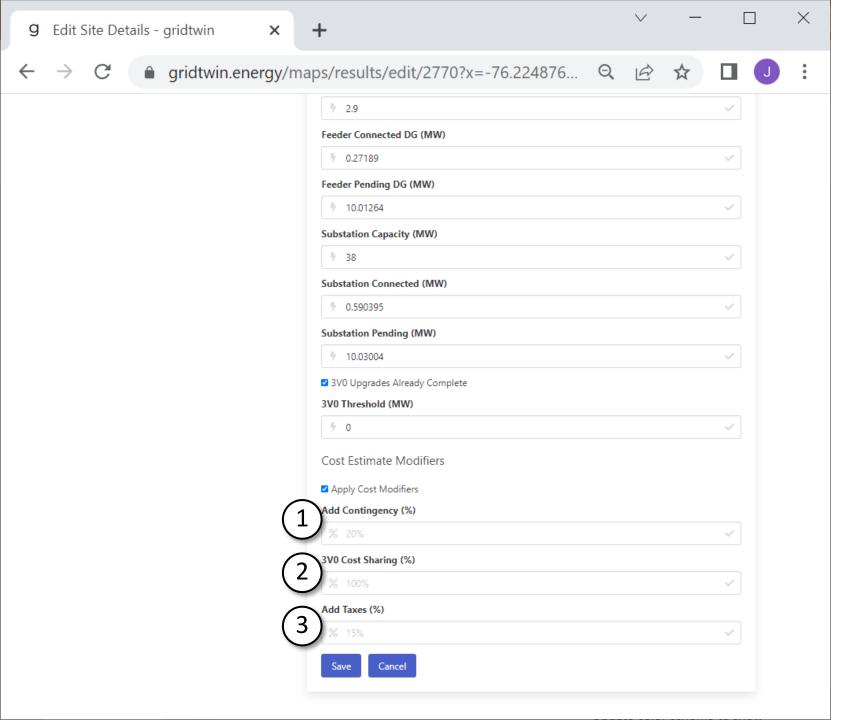
- 1. Feeder Capacity: Override the published hosting capacity value for the feeder
- 2. Feeder Connected DG: The amount of DG connected to the feeder
- 3. Feeder Pending DG: For the purposes of analysis, pending projects are assumed to be connected



Edit Project: Override local values

Overrides to substation capacity or 3V0 protection are also available.

- 1. Substation Capacity: Override the published substation capacity. This is based on the transformer ratings at the substation
- 2. Substation Connected DG: The amount of DG connected to the substation
- 3. Substation Pending DG: For the purposes of analysis, pending projects are assumed to be connected
- 4. 3V0 Protection: Have the required 3V0 upgrades been completed? If not completed, the megawatt threshold to trigger upgrades



Edit Project: Add Contingency or Taxes

Contingency and Taxes can be added to any project analysis.

3V0 Cost sharing can also be included to reduce the cost of 3v0 upgrades.

- 1. Contingency: Increase interconnection cost by a flat percentage
- 2.3V0 Cost Sharing: Decrease the cost of 3V0 if upgrades are shared between multiple developers
- 3. Add Taxes: Increase total cost by a flat percentage to account for taxes

Project Detail: View alternative interconnection option

After saving the new options, start a new interconnection analysis.

- 1. A new analysis is required each time options or geometry are changed
- 2. The alternative results are displayed whenever a new results case is selected
- 3. The upgrades on the map will refresh
- 4. Scroll down to see the additional results

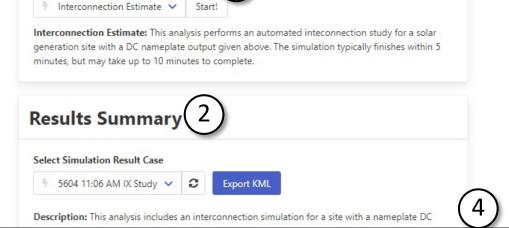


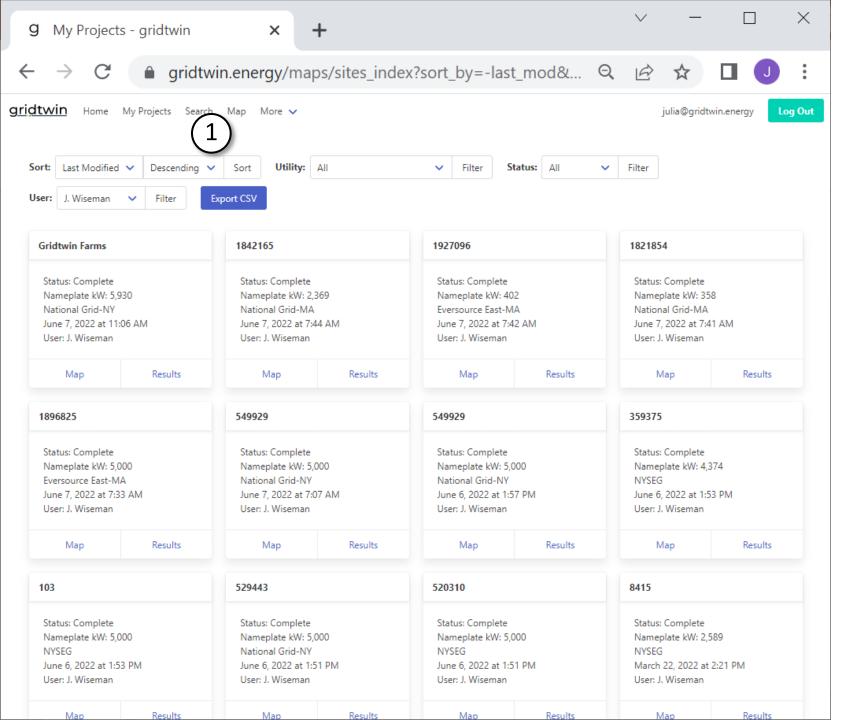
Start New Analysis

Select Simulation Type



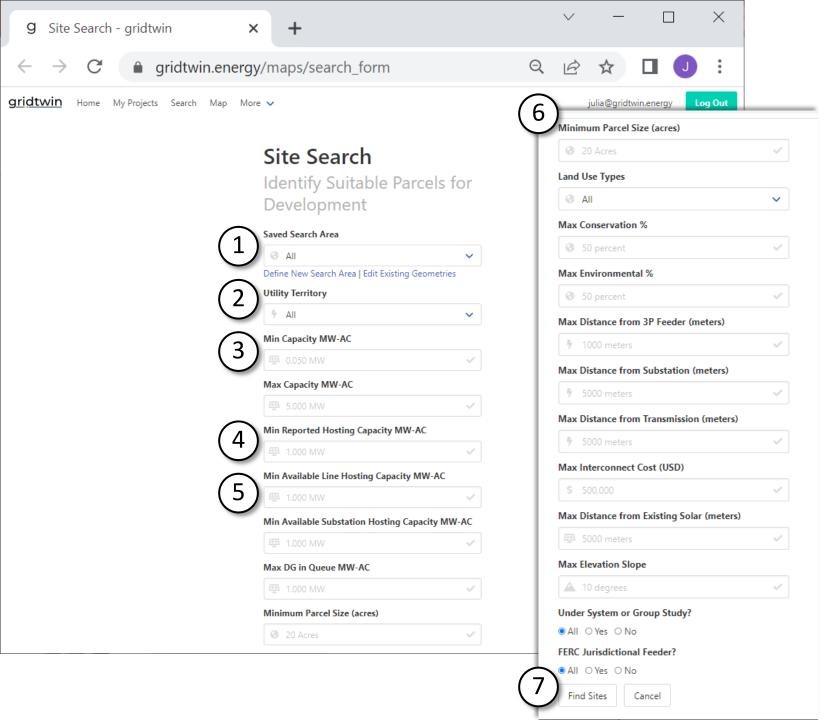






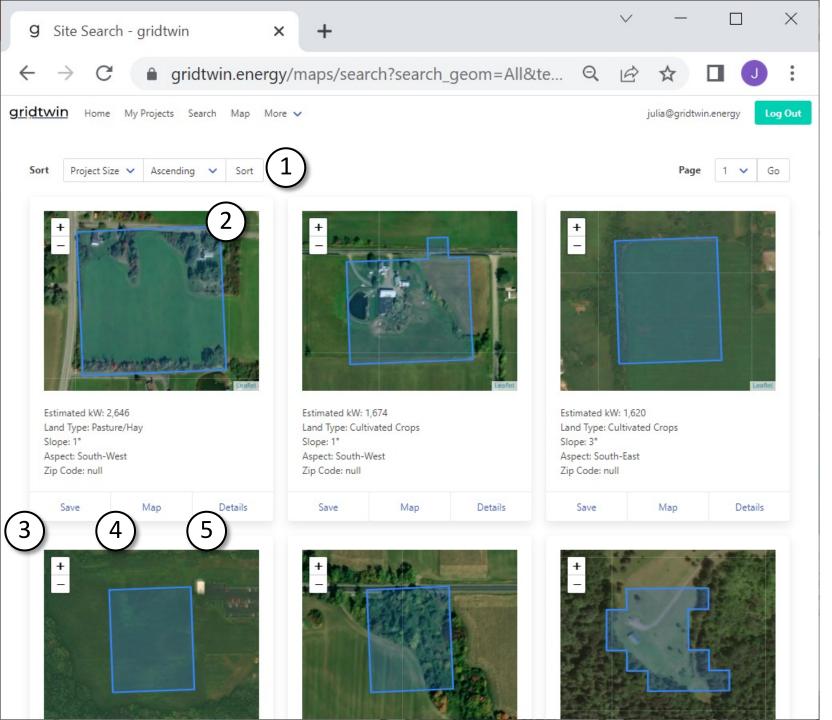
Search: Find New Parcels

1. Navigate to Search to find new projects



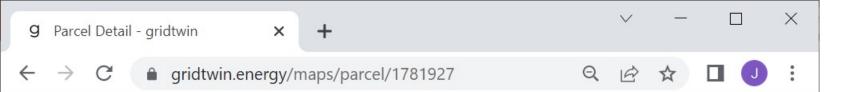
Search: Define search criteria for new project sites

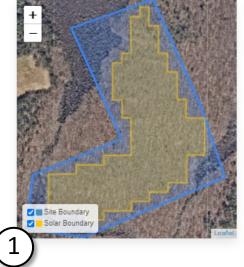
- All search criteria are optional
- Multiple criteria can be combined to refine the search results
- 1. Saved Search Area: define a geographic area to search within
- 2. Utility Territory: Only one utility can be selected
- 3. Filter by Project Size (MW-AC): Based on an approximation of available land
- 4. Reported Hosting Capacity: Utility reported values for hosting capacity
- 5. Available hosting Capacity: Based on reported hosting capacity, but accounting for projects connected or in-queue
- 6. Scroll to view all possible search criteria
- 7. Search

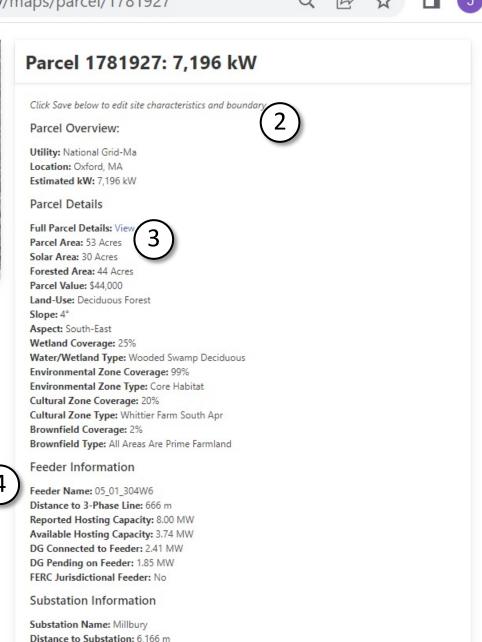


Search: View Results of Parcel Search

- 1. Sort the results of the search
- 2. View the identified area for potential ground-mount solar
- 3. Save the project to your 'My Projects' Page
- 4. View the Parcel on the Map
- 5. See the details of the Parcel

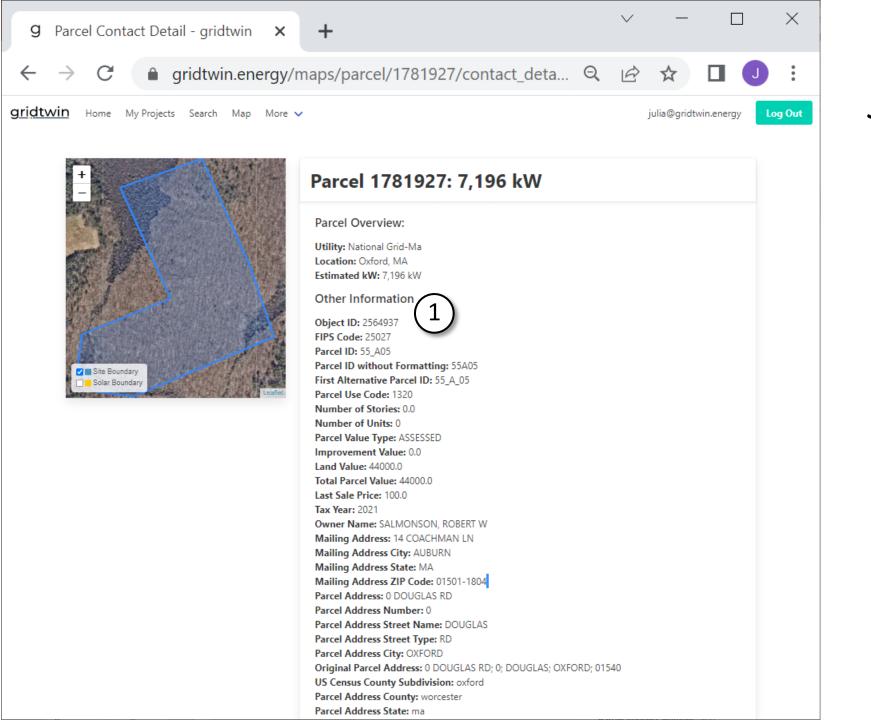






Search: View Parcel Details

- 1. View the Site Boundary as well as the Identified Area for ground-mount solar
- 2. Save the site to 'My Projects' at the bottom of the page
- 3. View the full parcel details such as owner name, contact information, zoning, etc.
- 4. View other information related to interconnection



Search: View Parcel Details

1. View all available characteristics for the parcel such as Owner Name, Contact Information, Address, Property ID, and Zoning Information

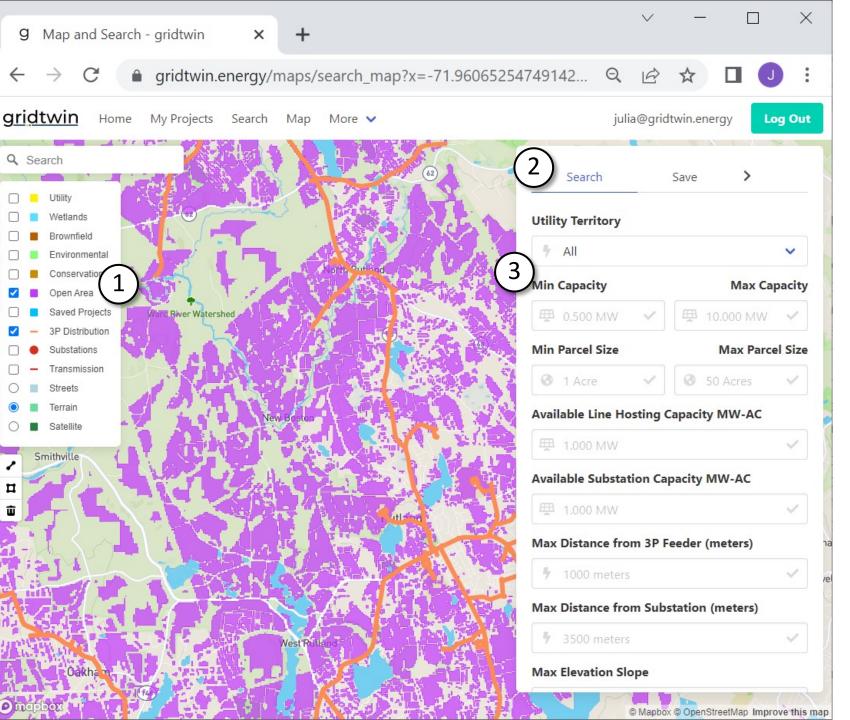
Search: Saved Parcel

After saving, the parcel is available in your 'My Projects' Page

- 1. Saved Parcel from search
- 2. View Project and start an interconnection analysis
- 3. To explore an alternate search method, return to the Map

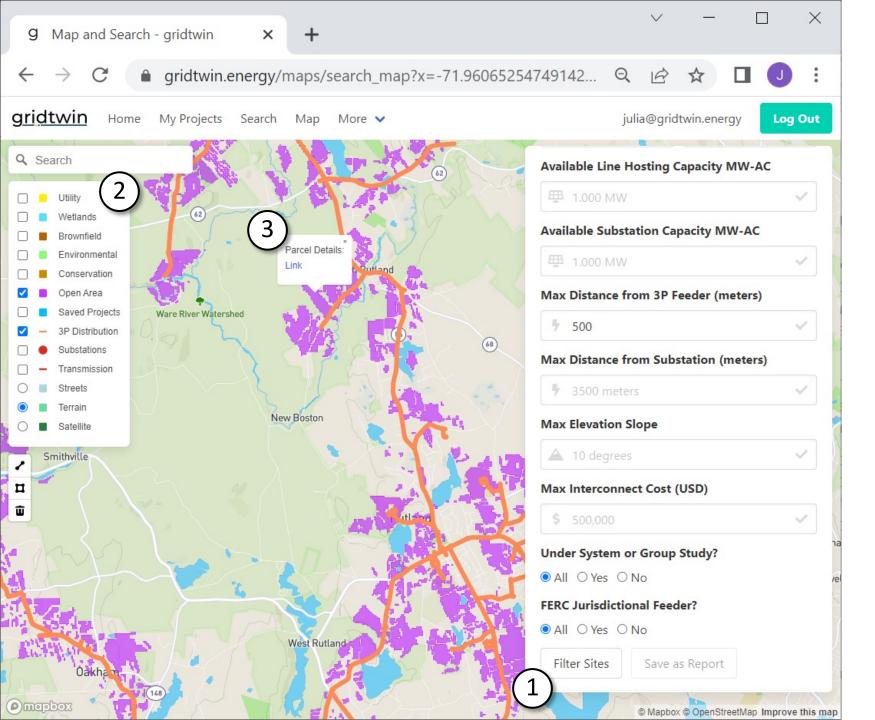
Search: Map-based Filtering

- After panning and zooming to your area of interest on the map, display the Open Area layer to see available parcels
- 2. The Search tab allows you to filter out all parcels that don't meet your needs
- 3. The map-based search function utilizes many of the same helpful criteria as your previous search method



Search: View Sites

- 1. After inputting your desired criteria, scroll down in the search tab and select 'Filter Sites' to only view relevant parcels
- 2. Other map layers can be selected to help narrow your search as you see fit
- 3. Click on any parcel of interest and select its 'Link' to view further parcel details, save it, and proceed in any analyses



Additional Support

- 1. Additional help material will always be available on our website; to find this, navigate to 'More' -> 'Help and Support' from the top menu bar.
- 2. Please reach out via email with any questions or concerns
- 3. This .ppt will be sent out via email for reference



SOFTWARE FOR RENEWABLES INTERCONNECTION

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