

Launching the Renewable Energy Data Explorer: Data and Analysis to Enable Renewable Energy Decisions

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Webinar Panelists

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S. Hernandez

Hello everyone, I'm Stephanie Hernandez with the Clean Energy Solutions Center and welcome to today's webinar which is hosted by the Solutions Center in partnership with the US Agency for International Development, USAID, and the National Renewable Energy Lab. Today's webinar is focused on launching the Renewable Energy Data Explorer: Data Analysis to Enable Renewable Energy Decisions.

Before we begin I'll quickly go over some of the webinar's features. For audio you have two options; you may either listen through your computer or over the telephone. If you choose to listen through your computer, please select the "mic and speakers" option in the audio pane. If you choose to dial in by phone, please select the "telephone" option and a box on the right-hand side will display the telephone number and audio pin you can use to dial in. If anyone's having technical difficulties with the webinar, you can contact the GoToWebinar's help desk at (888) 259-3826 for assistance.

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Also, the audio recording and presentations will be posted to the Solutions Center's training page within a few days of the broadcast and will be added to the [Solutions Center YouTube channel](#) where you will find other informative webinars as well as video interviews with thought-leaders on clean energy policy topics.

Finally, one important note of mention before we begin our presentation is that the Clean Energy Solutions Center does not endorse or recommend specific products or services. Information provided in this webinar is featured in the Solutions Center's resource library as one of many best practices, resources reviewed, and selected by technical experts.

Today's webinar agenda is centered around our presentation from the guest panelist, July Tran, who has joined us to discuss the RE Data Explorer and RE Geospatial Data Science. Before we jump into the presentation, I'm going to provide a quick overview of the Clean Energy Solutions Center and following the presentation we will have a Question and Answer session where July will address questions submitted by the audience. At the end of the webinar you will automatically be prompted to fill out a brief survey as well. Thank you in advance for taking a moment to respond.

The Solutions Center was launched in 2011 under the Clean Energy Ministerial. The Clean Energy Ministerial is a high-level global forum to promote policies and programs that advance clean energy technology to share lessons learned and best practices and to encourage the transition to a global clean energy economy. Twenty-four countries and the European Commission are members covering 90 percent of clean energy investment and 75 percent of global greenhouse gas emissions.

This webinar is provided by the Clean Energy Solutions Center which focuses on helping government policy-makers design and adopt policies and programs that support the deployment of clean energy technologies. This is accomplished through support in crafting and implementing policies relating to energy access, no-cost expert policy assistance, peer-to-peer learning and training tools such as this webinar. The Clean Energy Solutions Center is co-sponsored by the governments of Australia, Sweden, and the United States, as well as in-kind support from the government of Mexico.

The Solutions Center provides several clean energy policy programs and services including a team of over 60 global experts that provide remote and in-person technical assistance to governments and government-supported institutions. No-cost virtual webinar trainings on the variety of clean energy topics. Partnership building with development agencies and regional and global organizations to deliver support. An online library containing over 5,500 clean energy related publications, tools, videos, and other resources. Our primary audience is made up of energy policy-makers and analysts from government and technical organizations in all countries. But we also strive to engage with the private sector, NGOs, and civil society.

The Solutions Center is an international initiative that works with more than 35 international partners across its suite of different programs. Several of these partners are listed above and include research organizations like IRENA, the IEA, programs like SE4ALL, and regionally-focused entities such as the ECOWAS Center for Renewable Energy and Energy Efficiency.

A marquee feature that the Solutions Center provides is no-cost expert policy assistance known as "Ask an Expert." The Ask an Expert service matches

policy-makers with one of more than 50 global experts selected as authoritative leaders on specific clean energy finance and policy topics. For example, in the area of energy forecasting, we are very pleased to have Ciril Casesa serving as one of our experts. If you have a need for policy assistance in energy forecasting or any other clean energy sector, we encourage you to use this valuable service.

Again, the assistance is provided free of charge. If you have a question for one of our experts, please submit it through our simple online form. You can see the link on the screen. It is cleanenergysolutions.org/expert. We invite you to spread the word about this service to those in your networks and organizations.

Now I'd like to introduce you to today's panelist, July Tran. She's a software developer in the Geospatial Data Science section here at NREL. She specializes in technical product management, user experience, and front-end development. With that introduction, I would like to welcome July to the webinar.

July Tran

Hi, thanks so much for having me.

S. Hernandez

Great.

July Tran

Great. Like Stephanie mentioned, I'm a software developer on Geospatial Data Science team and I've mainly been working on developing the applications for RED-E, the Renewable Energy Data Explorer, which is what I am going to talk to you about today.

First, I want to back up and have some context for policy-making. One of the reasons why RED-E was created — or the Explorer Platform was created was to help make good data accessible to decision-makers. In the RED-E platform, we have accurate, up-to-date renewable energy resource data, GIS data, and we make this data accessible so policy-makers can use it to facilitate smart decision making and make data-driven decisions. These decisions will enable ambitious, cost-effective, and achievable outcomes for renewable energy deployment.

So the RE Explorer can help you with these decisions giving data, analytical tools, and technical assistance to developers, policy-makers, and decision-makers in developing countries. It lets users make meaningful decisions that support low-emissions development and ultimately reduce greenhouse gasses.

To learn more you can visit re-explorer.org.

As part of RE Explorer we have the RE Data Explorer, or RED-E, which was developed by National Renewable Energy Laboratory. It's a web-based analysis tool that uses geospatial and spatiotemporal renewable energy data to visualize, execute, and support analysis of renewable energy potential under various user-defined scenarios.

The kind of questions that the RE Data Explorer can help answer are things like; high-level prospecting and integrating resource-planning questions, and questions like where the most appropriate areas to site utilities scale solar and wind facilities based on resource quality, proximity to the load centers, transmission lines and roads, and site sustainability like terrain, protection status, and current land use.

It could also help you to answer how resource potential varies at the province level and help you identify which sites might offer the best possibilities for investment in long-term measurement stations.

We use geospatial analysis to help policy-makers answer these questions. For anyone who's unfamiliar, geospatial analysis is the domain on the surface of the earth, extending into the _____ topography, the atmosphere, and down into ground water geology as well. Any data that has a geospatial reference on it or has a geo-identification about where that data is on the earth constitutes geospatial data and we use that data in our geospatial analysis. So this data can scale from being local to regional and to global-level data and analysis. It also scales in time. It could be current data, historical data, or predictive data in the future. It can also vary in duration of time. The data can be collected from timeframes such as annually, monthly, hourly, and even down to the minute and to the second.

The data that we have in RED-E constitutes renewable energy resource data and some base data. For renewable data, we have gridded solar and wind resource data. We have the ability to add other resource data like biomass, geothermal, hydro, and conventional resources when the data is available to us.

For base data we have elevation and slope, land use, land cover, protected areas, political boundaries, cities, towns, rivers, lakes, and other administrative boundaries. The RE Data Explorer is available for several countries including Mexico, Ghana, Kenya, Kazakhstan, Afghanistan, Pakistan, India, Nepal, Bangladesh, the Lower Mekong region, Indonesia, and the Philippines.

I'm going to move on to talk a little more about the current capabilities of the RED-E applications. First, there's core GIS functionality. If you've ever used a tool like ARCHIE IS or QGIS, this is a version of that tool on the web. It is designed to be more user-friendly and accessible to anyone who may not have a geospatial background. The functionality includes things like navigating the map, you can zoom, pan, things like that. You can use a layer tree to organize and display the layers. You can use the legend to view what the data corresponds to and also style the layers to make them more opaque or transparent and move them above and below each other.

You can also do queries on the data you have turned on. You can do this at the point and region level. You can also do it via attribute and place filters on the data that you'd want to query. You can also download spatial data that's available on there and get metadata that comes with it. You can print out the maps and various reports that are in the tools. If you were to turn on a certain

selection of layers and wanted to share them with others, you can just send the URL to them and they'll see the same layers that you had turned on. There's also interactive tutorials in the app on how to use GIS functionality if you're new to the application.

We also have several analysis tools. One of which is a Data Download tool. This lets users download pixel or region of hourly solar or five-minute wind resource data including ancillary meteorological data. This gives access to tens of terabytes of wind and solar resource data. The wind data happens where it's available. The solar resource data comes from NREL's and this RED-E database.

The uses that we've seen from the Data Download tool is for site-based generator energy estimates that generate exceedance probabilities, financial modeling, and be used as base data for grid integration analysis. We've seen this data used by various kinds of people like electric utility consultants, utility plans, academics, engineers, analysts, developers.

Another tool that we have in the RED-E platform is a Technical Potential Analysis tool. Here in our progression of potential on the left you have the most potential and on the right you have the least potential. Each step along the way provides more filters to reduce — to refine your analysis to see what the potential for a certain area is. So for Technical Potential, you can apply exclusions based on land-use and systemic and topographic constraints.

The Technical Potential tool in the RED-E application lets you dynamically run a technical potential analysis based on your own inputs. Below, you can see the screen where you can input different values as exclusion layers and also input different ways you want to limit the results like "Were made by solar resource," "Eliminate by distance to roads." You can perform this analysis for multiple regions as well. After this presentation, I'll do a demo of this tool.

We've seen various people use Technical Potential tool including transmission developers, regional organizations, NGOs, developers, data offices, and engineering analysts. They often use it to inform policy analysis, use as base data for grid integration analysis, provide land use and environmental impact analysis, and to identify utility-scale sites for renewable energy development.

Now I'm going to move on and talk about some of the upcoming capabilities we have in the RED-E platform. Like I just showed with Technical Potential, another step further along in the progression of potentials is Economic Potential. The Economic Potential tool will allow users to assess the economic viability of different renewable energy technologies in a high geospatial resolution. You can specify the scenarios to analyze impact of incentive schemes or barriers to renewable energy deployment.

Technical potential represents the subset of the available — sorry, economic potential represents the subset of the available technical potential where the cost required to generate the electricity is below the revenue available in

terms of displaced energy and displaced capacity. So, similar to the Technical Potential tool, you can run the Economic Potential tool put in your own inputs to be used in the analysis like capital cost, own-in cost, the discount rate, in the lifetime, and others. You run the tool to get your tabular results and a layer in the map and the layer tree.

Another tool we have upcoming is the Metadata Repository. This is collection of data and metadata data sets and metadata that makes it easier to find this data to perform renewable energy analysis and develop tools and determine what data is available. Currently, we have this data for Lower Mekong, but we are going to be adding more data for the other countries in RED-E to this data as well.

We also have upcoming the climate change resiliency tool that we'll be adding to the Lower Mekong application and may be adding to other application as well. This allows users to view trends in temperature and precipitation under different climate change scenarios.

We'll also be adding data layers for dams and various other geo-hazard risks like cyclone, earthquake, flood, and landslide. This tool will help answer questions like, "How can seasonal changes impact power generation? What our current anticipated system reliability challenges? Where are they most significant? What are the near and long term implications of precipitation change for hydropower generation? What types of geo hazards could impact power sector planning in the region?"

Also coming soon we'll have a new RED-E application for the Central Asia region. We're working on a publication called "From Data to Decisions: An Introductory Guide to Linked Data, Analysis, and Renewable Energy Decisions." This decision guide will walk through key data and analysis that can support different types of decisions related to target-setting, policy-making, investment and power sector planning. Of course, we're always happy to explore development of other RED-E applications.

Some resources available to you, like Stephanie mentioned earlier, is the Ask an Expert feature. You can find that at re-explorer.org. There's also interactive tutorials in the app to learn how to use the RED-E applications. We also have a fact sheet about geospatial _____ [inaudible due to audio glitch] analysis and how it's used in RED-E. Like I just mentioned, we'll have a decision guide coming out soon as well.

I wanted to acknowledge the USAID. They've been a big partner in doing the RED-E work. Also the World Bank ESMAP program for providing us with some high-quality solar data.

Thanks. I going to move on to do a demo of the application now. Afterwards, we will take questions.

Here, I can find all the applications at re-explorer.org. There's a list of all the Data Explorer tools found here. Once I click that tool, I'll end up on a page like this. First, it will ask me if I wanna take a five-minute tutorial of RED-E's

GIS functionality. If I say "Yes" I can take this tutorial and learn about how to use the different features in the application. I don't wanna do that right now, so I can "X" it out. If I ever wanna come back to it, I can click the tutorial link in the nav bar in the upper right-hand corner.

Now that I've clicked out of that, I can see the map and the layer tree to the left. First, in the upper right-hand corner of the map I'll see some map tools. Here, I can change the base map to various other options like satellite, terrain, open-street map, others. I'll go back to Google Road map. I can also use these map controls to zoom in and out, I can use the "Zoom to Extend" tool to draw a box and zoom to that box. Or I can use the "Zoom to Location" tool to in the far right to type in a location and be zoomed there as well.

In the layer tree, I see a lot of different categorizations for data. I see some layers that are checked on right now. I can turn layers on and off by checking them — clicking them — either on the check box or on the words. Let's say I wanna focus my analysis on Laos right now. I can turn off the layers for the other countries here in the lower Mekong area. I can turn on more layers for Laos. Let's say I want to turn on power plants. I can zoom in to view this data better. If I wanna know more about the source for this data and where it comes from, I can click this question mark that comes on for every data layer that's turned on. Here, I can see the source for this data. The solar layer came from the World Bank.

I can hit this down arrow to download the layers that's on. Some layers are restricted to download based on rules from the source where we get the data. So this one is unavailable, but if I hit "Power Plant" then I can see I can download this data in various geospatial data formats. I have different options to download them in.

Now, if I go to the "Legend" tab, I can see the categorizations for the colors and what they mean. I can see the units. I can make these layers more transparent, or I can make them more opaque. I can also move these layers on top or below each other.

Under the "Query" tab, I can perform queries via point, region, custom shape, or an attribute. For a point query I can click and the results that are found within a few pixels of where I clicked will be given to me. For region query I can click and then hold and drag to draw a rectangle. The query will return data for the area that I drew. I can see the two layers that I have on here with the data that was in them.

I can also do the same for a custom shape. I can drop points on the map and draw my own shape for where I wanna do my query. For attribute queries, I can choose whether I want to filter by attributes for the data sets — for the layers that are on. So I can select whether I wanna pick from all the layers or from visible layers that are currently turned on. So if I want to query the solar layer, then I can select which attribute I wanna filter on. I can select the operator that compares the attribute to the value that I want to query on. So say if I want data PVOUT to be greater than zero, I would put in the greater-than symbol and put in zero as my value. For condition, if I wanted to add

another filter on a different attribute and have my data be returned where it meets both conditions, I can choose "And" and add another condition here. Or I can choose "Or" and add another condition here and get data that matches at least one of the two conditions, but not necessarily both of them. Or I can hit "End" and just end my query right there and hit "Execute." Here I'll see my data returned again. If I want to download the results from the queries, I can find this "Download Query Results" button in the top right-hand corner of the results pane.

Under "Run Analysis" tab up here, you can find the Dynamic Technical Potential tool. When I launch that, I'll see the various inputs that I can put in to run my own technical potential analysis. If I say I wanna run it for Laos, I can select my technology — I'm gonna keep CSP. I can select the different regions that I want to run the analysis for. I can limit by solar resource. I can enter my own power density. I can limit by distance to roads or change that to one kilometer. I can choose whether to exclude protected areas or not. I can exclude certain land use types, also. I'll exclude water wetlands Laos. I can also limit my results by a certain slope percentage. If you wanna learn more about what these factors mean, you can hover over the question marks and get information on what these inputs are.

I can also name my layer. I'll call this "Laos CSP." If I wanna run multiple analyses, naming them can help me distinguish between them. Now I'll hit "Run Analysis." Depending on what I entered in the last screen, running the analysis may be very quick or it might take up to a few minutes. Now that my run has completed, I can see my results in the table here. On the left I have cumulative results for all the regions that I selected. On the right I can see my results broken down by region.

Now when I "X" out of here, I can go to the layer tree and I can see that my results were added to the layer tree here. I can move them higher to see the results of my analysis. Here, in these three regions, I can see this new layer that I've generated based on the exclusions that I put into the Technical Potential Analysis tool.

Soon we will have an in-application tutorial for how to use Technical Potential Analysis tool as well. We're also working on some updated usability features to make it more clear how to use the tool.

So that's it for the demo. Thanks for listening. I can take questions if people would like to ask them, so go ahead and put them in the "Question" box.

S. Hernandez

Great. Thank you so much. That was interesting. We received some comments really complimenting the tool. It looks really great. We only have a couple questions so just a reminder to everybody, if you have a question you would like into the "Questions" pane on the right-hand side. The first question is, "You showed a list of countries where this is available. Do you have a timeline for adding other countries or areas to the tool?"

July Tran

Yes, like I mentioned, we're adding country — we're adding an application for the whole Central Asia region. That's in progress right now. That's

probably be done over the course of the next few months. We're also in talks with several other countries on getting RED-E applications for them, but those are less concrete. The way we come up with which countries get an application is that we work with people from USCID, we work with local stakeholders in that country, and it's really a partnership with them for us to work together to come up with an application for them. So it's all dependent on how our relationships with local stakeholders go.

S. Hernandez Okay. If someone wanted to work with you all to try to get their country on the list, who would be the best folks to contact about that?

July Tran You can contact me and I can connect you with more people based on what region of the world — the country you're interested in. You can reach out to me and I'll connect you with the people. You can also reach out to Sadie Cox. She is the program manager for this program at NREL.

S. Hernandez Great. July, is your contact information on your presentation on the last slide?

July Tran Yes, it is.

S. Hernandez Perfect. So that will be posted to the Solutions Center's website. We only have one more question right now, so if there's anything else that folks would like to ask, please go ahead and enter it. You mentioned that solar and wind are always included, but there's other resource data like hydro or biomass is included "when available." Does that mean that when it's available in a particular area, or when you have the data? So, is it possible for someone to run a search of an area and not include one of those other sources?

July Tran Yeah, so it's included whenever we have it available for that region. For example, in the Lower Mekong, we do have hydro data so we've added that to that application. If we have trouble or don't have a clear, high-quality source of data for the other resource in the applications, we won't add them but we'll work on continuing to find them. Again, when we work with our local stakeholders, it's more likely that they'll be the ones who have some of the other resource data. We'll work with them to see what data is available for that country. Whatever is available we'll add initially. As we keep working through it, we'll keep trying to find other data sets that we can add.

S. Hernandez Great. The final question that's come through: "Is there any data that would be added for the United States?" They're specifically asking about Hawaii.

July Tran That's a great question. The United States doesn't have a RED-E application on its own, but we do have a suite of domestic apps for — RED-E shows all the various resource data. Domestically, we have apps that are separate and more targeted towards a certain resource. If you go to [maps.NREL.gov](https://maps.nrel.gov) you can see all of our domestic applications. We have, for example, the geothermal prospector that shows geothermal in the U.S. We have biomass applications that shows bio fields, bio power in the U.S., and we have the wind prospector showing wind in the U.S. So for the U.S., we have more applications and they're all more targeted. And that's [maps.NREL.gov](https://maps.nrel.gov).

S. Hernandez

Excellent. Thank you so much so that is all we have for questions today. On behalf of the Solutions Center, I'd like to thank July for that wonderful presentation and I'd also like to thank our attendees for participating in today's webinar. We really appreciate your time and hope, in return, that you receive some valuable insights that you can take back with you. We invite you to inform you colleagues and those in your networks about the Solutions Center's resources and services. I invite you to check the Solutions Center's website if you would like to view the slides and listen to a recording of today's presentation as well as any previously-held webinars.

Additionally, you'll find information on upcoming webinars and other training events. Finally, I would like to ask you to please take a moment to complete a short survey that will appear when we conclude the webinar. Please enjoy the rest of your day. We hope to see you again soon at future Clean Energy Solutions Center events. This concludes our webinar.

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