Driving profitability

HOW SOLAR SOFTWARE DELIVERS ROI

Transforming archaic workflows
and accelerating returns

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The solar PV market in the context of an evolving energy mix

Strong tailwinds continue to drive a growing demand for utility-scale solar PV in an evolving energy market; however, competition to shorten project lifecycles and get MWs to commercial operations as quickly as possible continues to intensify.

The deployment of **global solar PV projects remained strong in 2022**, with countries like China, India, and Germany reporting massive year-over-year increases in PV installations. However, despite a sizeable growth in installation figures, countries like the **United States and Australia recorded small reductions** due to supply chain disruptions and consequent cost increases.

Throughout 2022 though, **tailwinds did continue to drive the market towards a bright 2023** and beyond.

Across the globe, several forces have continued to drive the Energy Evolution forward. These can be simplified into four points: **investor, microeconomic, consumer, and political (Figure 1).**

Learn more about the four forces of The Energy Evolution in this 35-minute talk.

Watch it now

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Investors have been taking cues from policy and consumers to push businesses by providing capital to those they deem good stewards of the climate. The share of corporate debt issued for green-themed initiatives continues to grow. As such, **a wealth of capital is flowing into the Energy Evolution and competing for the best opportunities in the space.** Many technological advances, paired with incentives, have also made clean technologies increasingly competitive with current supply levels.

In addition, **consumers continue to shift towards using electrons as their energy source** rather than heat. The electrification of household appliances and cars underlines this rapidly changing preference.
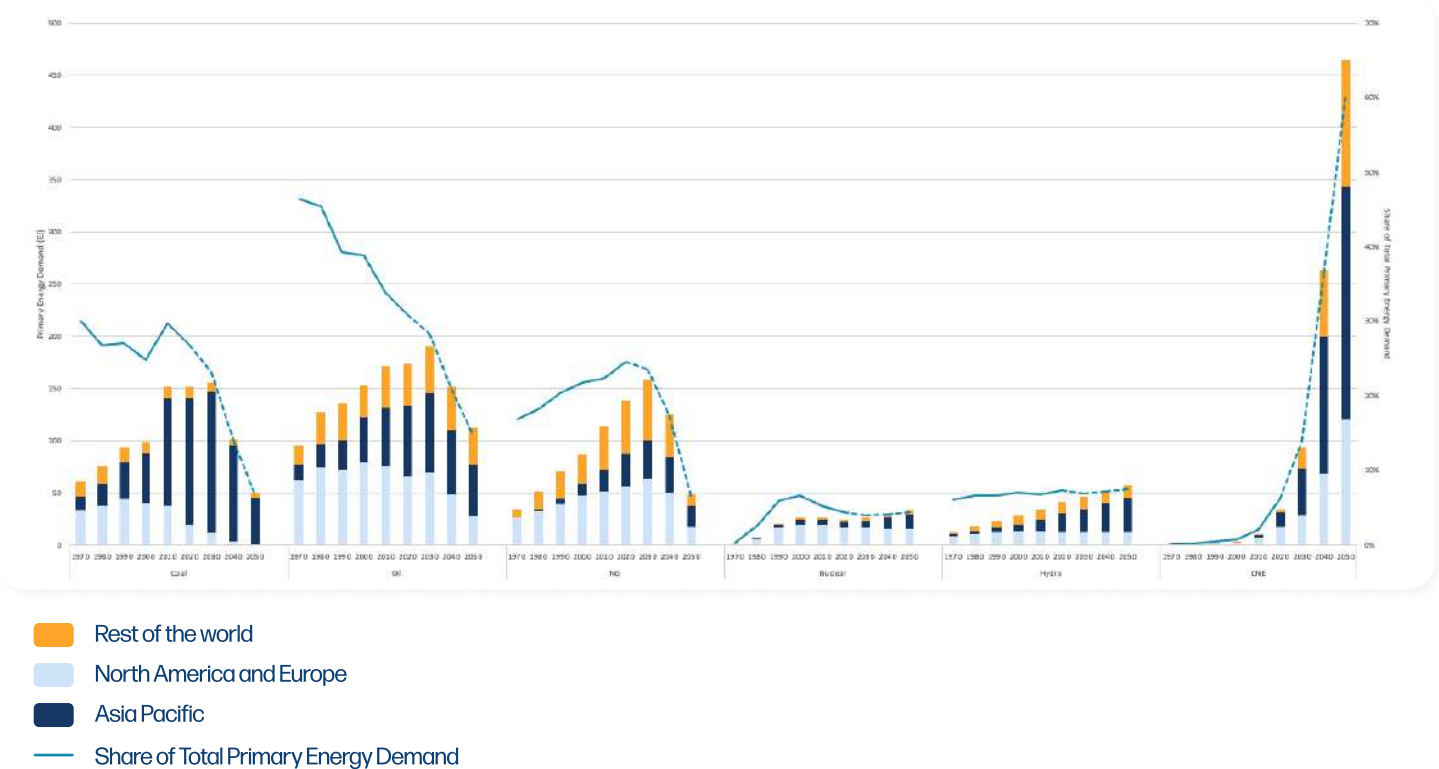

Rest of the world

North America and Europe

Asia Pacific

Share of Total Primary Energy Demand

Figure 2 - Primary Energy Source and Share of Total Primary Energy Demand for a 2.5 deg C Warming Pathway (Source: Enverus Intelligence – Energy Transition Research)

Additionally, **government and regulatory policy continue to target climate objectives by incentivizing clean technologies.** The Inflation Reduction Act (IRA) in the United States and the REPowerEU in Europe are just some examples of policies that aim to accelerate the Energy Evolution.

The Energy Evolution is an enormous task. **To meet a 2.5°C warming pathway, carbon neutral energies (CNE) would need to make up 60% of the primary energy mix by 2050, requiring 14x growth (Figure 2).** Even this massive change to the energy mix would imply that we will miss our 1.5°C targets from the Paris Agreement by 2050.

The technologies that could help us get there are currently not mature enough or close to becoming economically viable. However, we can't just wait for them to come around. **The success of the Energy Evolution depends on the deployment, at scale, of mature and economical solutions that exist today.** Thanks to its global viability and access, utility-scale solar will play a key role now and well into the future.

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The good news is that project queues are considerable. In the United States, the passage of **the IRA has removed the ambiguity around economic incentives** for clean energy.
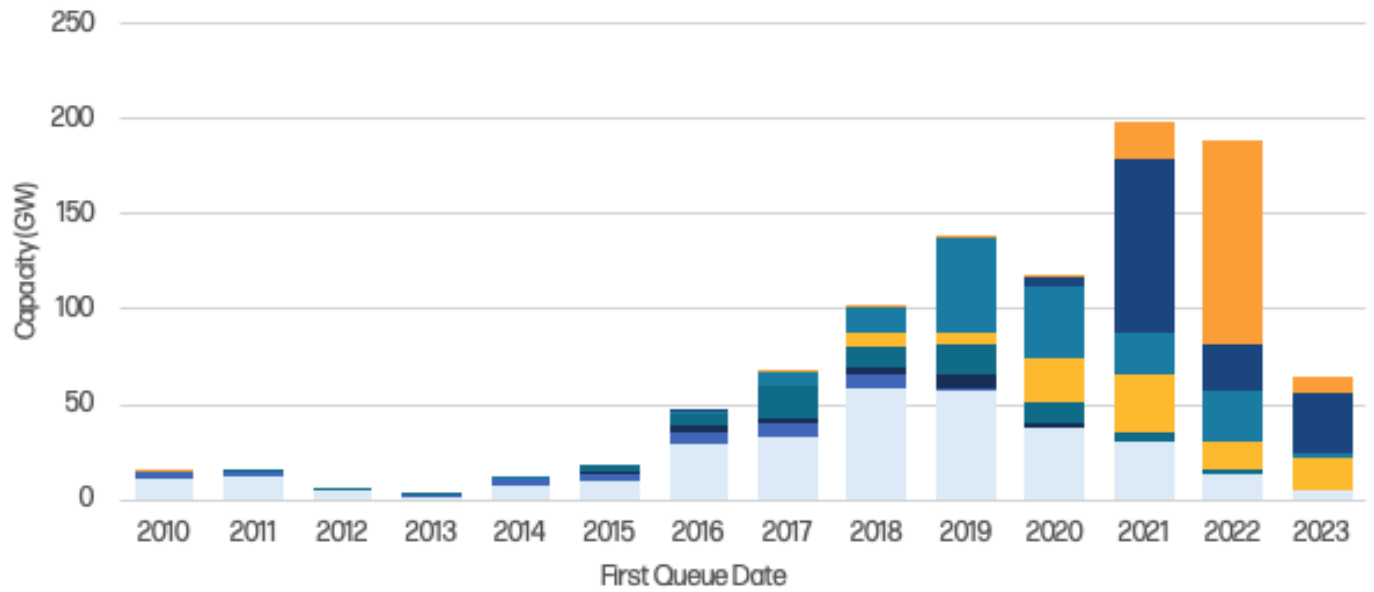
It has also **lifted the suspension of tariffs on solar panels** from select countries in Southeast Asia, easing supply chain and cost-related concerns for the time being. This means **the market is set to rebound from its single-year contraction to a record 2023** for utility-scale installations. Furthermore, hundreds of GWs of projects have been announced for future years (Figure 3).
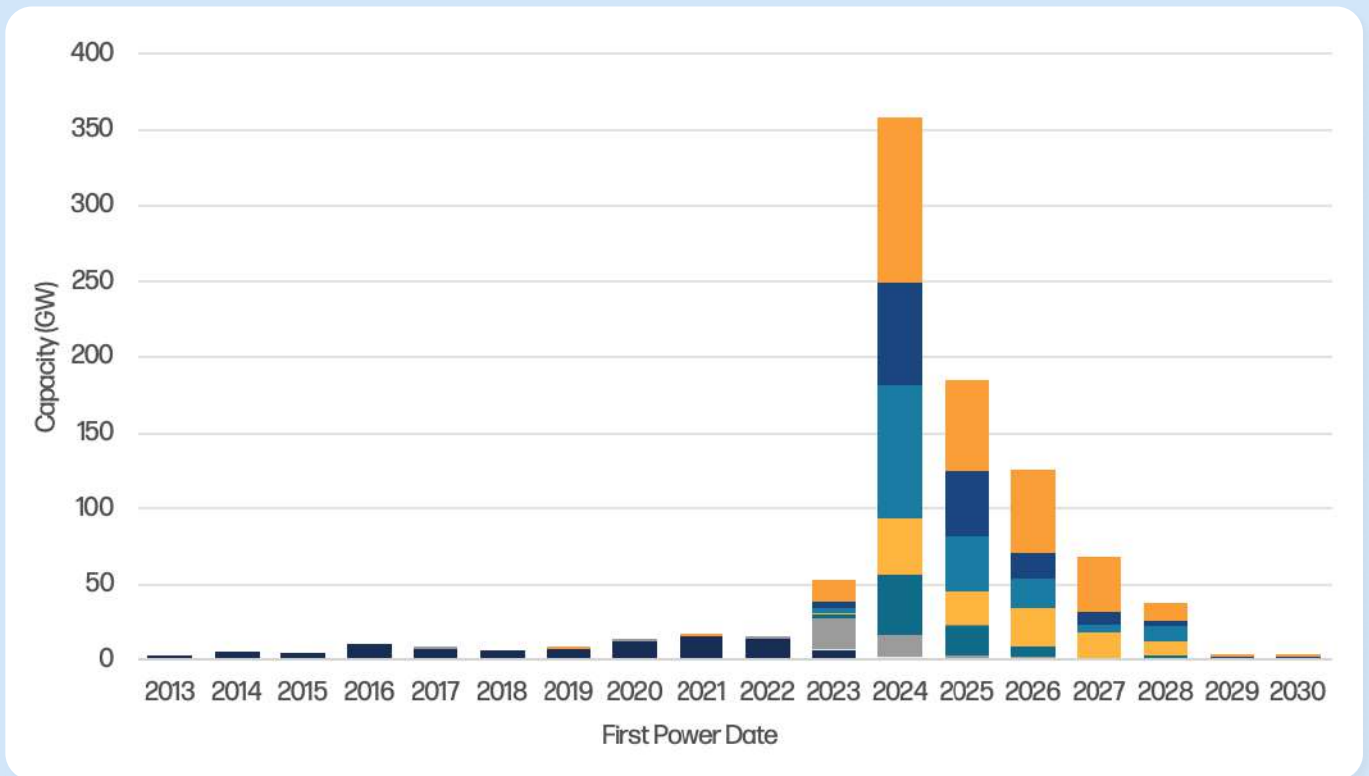
Legend:
- Built - Not in operation
- Feasability Study
- Interconnection Agreement
- Pre-Construction
- System Impact Study
- Operating
- Facility Study
- Under Construction

Figure 3 - United States Lower 48 Solar Project Queue by Status (Source: Enverus P&R – Project Tracking)

Although solar PV is crucial to global energy evolution and climate goals, and capital is abundant, the competition is also fierce. **Roughly 80% of the projects that are in the queue never make it to commercial operations (Figure 4).**

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Figure 4 – United States Lower 48 Solar Project Status by First Queue Date (Source: Enverus P&R – Project Tracking)

Utilizing next-generation software has become crucial for every stage of the project lifecycle to speed up the process of completing project milestones, grow the pipeline of opportunities, and increase the probability of projects reaching commercial operations. In other words, software enables the necessary efficiencies to maximize returns and minimize risk. **Within the utility-scale solar PV project lifecycle, arguably the most crucial step that software can help optimize is design and engineering.**

The evolution is fueled by utility-scale solar software

The adoption of next-generation utility-scale PV design and engineering software is developing at a rapid pace as efficiency becomes an existential risk for developers. **The RatedPower product leads the way, and its rapid adoption is the leading indicator of its value.**

RatedPower provides the next-generation cloud-based software to automate and optimize the study, analysis, design, and engineering of ground-mounted PV plants. It helps speed up the design and engineering of utility-scale solar PV projects to boost efficiency, increase accuracy, and reduce costs. It transforms the traditional engineering process through the optimization and automation of processes, accelerating the time to design.

The value of solar PV software can be seen clearly in the massive adoption of RatedPower, as **the number of PV plant design simulations performed in the software in March 2023 was 26x higher than at the beginning of January 2019 (Figure 5).**
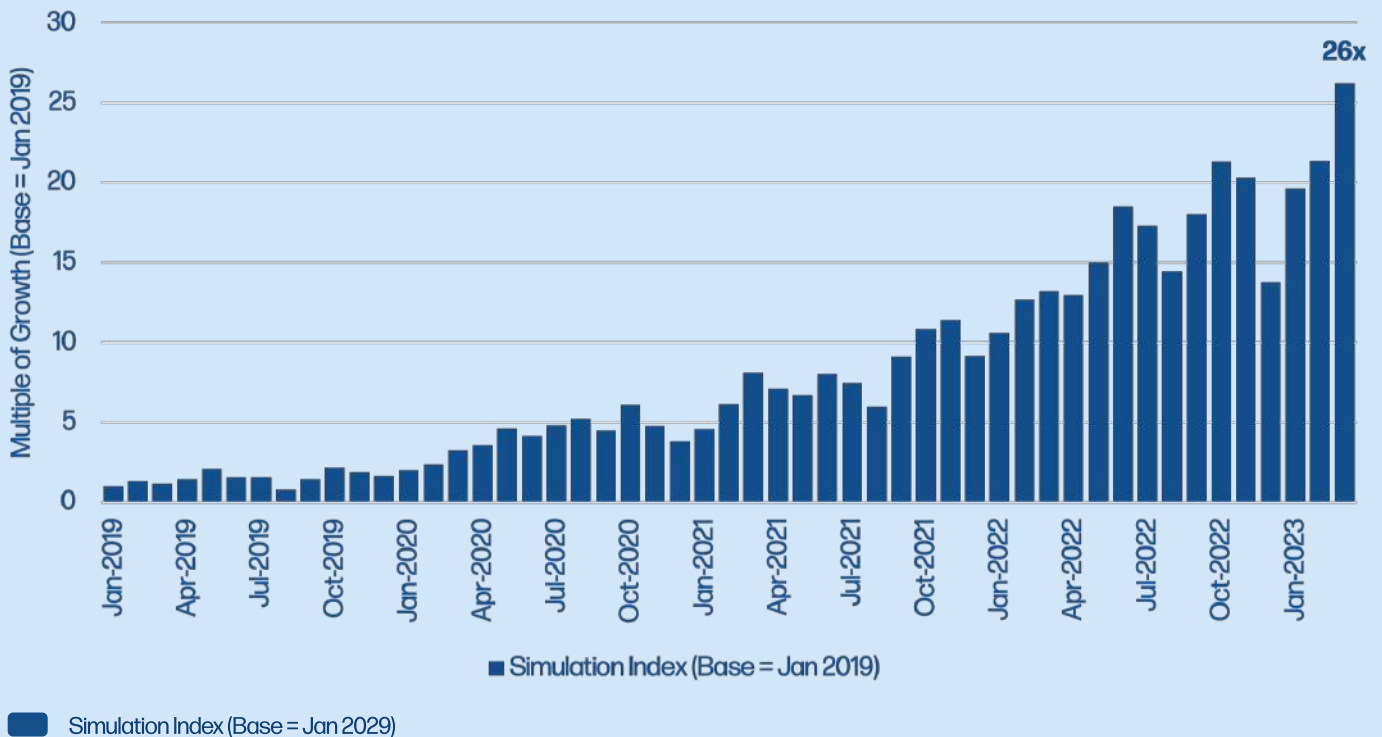

Figure 5 - Growth in Simulations in RatedPower software (Base = Jan 2019) (Source: RatedPower)

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✓ **Speed up project lifecycles:** accelerating the time to design.

✓ **Analyze more design and engineering scenarios:** achieving optimal design by comparing alternate designs in just a few clicks.

✓ **Respond quickly to changing orders:** reacting quickly to changing equipment or other design parameters.

✓ **Standardize workflows and documentation:** obtaining 400+ pages of standardized documentation with every simulation.

✓ **Enable collaboration across teams:** sharing your work and collaborating in the cloud.

✓ **Widen their funnel of opportunities:** use the time you saved to do even more!

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Customers across the globe were interviewed about how their workflows have been transformed.

Mirko Schieszl
Head of Engineering EMEA,
BayWa r.e.

BayWa r.e.

What were your team's challenges and goals when designing and developing PV projects?

"You can imagine with 30 engineers helping 200 developers... that's quite a big thing! They are not just dealing with one project but with several projects daily. So, our big problem is to support them. The standard way of doing detailed engineering for each project was not working. That's why we introduced pvDesign, where we can do many more designs and layouts in the early stages."

What were your top 3 requirements for your team when evaluating the solar software stack?

"One of the major points is that it has to be easy to handle, even for non-technicians. That was one of our key reasons for using the tool at a very early stage of development. So, all developers that are not engineers are already using the tool. It has to be quick and fast but also detailed. When we do a design now with pvDesign, if they have had a bit of training, they can create a design in half an hour. If our engineers were to do that with AutoCAD or other tools, it would take a day or two."

How does pvDesign help your competitive advantage?

"If I want to change the model, if I want to change the inverter or the racking system, it takes 2 to 3 minutes to change that with pvDesign. And that means we can generate layouts much faster. So, that helps us and the developers to deliver results much faster to the customers or the investors."

Megan Parsons
Chief Engineer,
Blue Ridge Energy

What were your top 3 requirements for your team when evaluating the solar software stack?

"I think the first requirement is accuracy. Of course, if you cannot rely on the outputs of the software, there's no value at any point; secondly, probably transparency. So, we need to know what the design basis is, what we can change and do, and how that affects the outputs of performance and cost. I'd say the third most important element is speed. So, there has to be value for us to utilize software versus going for the more traditional design methods to get our projects developed."

How does pvDesign help your competitive advantage?

"Definitely, in the U.S. market, speed is a competitive advantage. Especially with the market being as busy as it has been recently, resources are very constrained. pvDesign has allowed us not to have that constraint. So, we've been able to, within hours and minutes, not days and weeks, turn around design documents to stakeholders, landowners, partners, and engineers to get through our regulatory interconnect process and move projects further, faster."

What else comes to mind when you think about the benefits of solar software?

"We pretty much solely use pvDesign clear through the project development phase until we get to the guarantee phase. So, until we go to an EPC contractor, we need EPC performance guarantees."

"Being a SaaS platform, I didn't have anything to download or install, passwords, tokens, or any startup there, so I was up and running day one, minute one. It is a very intuitive software, so it didn't take very long; I would say an hour to get a feel of how it worked, and then I was able to rely on the tutorials."

Hugo Navarro
Senior Photovoltaic Design Engineer, PNE AG

What were your team's challenges and goals when designing and developing PV projects?

"

The biggest challenge is to help or support each country with the best design or best way to construct the power plant. It takes a lot of time and a lot of resources to know the requirements and parameters each power plant should have for every project. It is usually a huge amount of time and resources that we have to spend."

How does pvDesign help your competitive advantage?

"

pvDesign has made it easy and cut the time for the design process by probably more than 50%. Not only that but since it's very user-friendly, what I can define the parameters the power plant should have if it's in South Africa or Romania, or the U.S., and any person on our team in those countries, even if they have no experience in engineering, can develop a draft proposal for the profitability analysis in a couple of minutes."

What else comes to mind when you think about the benefits of solar software?

"

Since it's a cloud-based system, the engineers in the headquarters in Germany can enter and manipulate the projects in real-time if they see that something needs to be changed. Since the tool can be used by any person without a technical background, just with a few guidelines, we step in when we need corrections or adjustments so that the design is as detailed as possible."

It really does the job of two or three different software packages."

For me, it's not just that pvDesign cuts the time for making a project design by 50%. It is impossible to quantify how much time it will save us in the future when opening backup projects and re-running calculations. So, it is wonderful to have all of the information needed from the first moment in just a single program."

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What were your team's challenges and goals when designing and developing PV projects?

" The main goal that we have is to compare our different equipment. Our customers ask us: ok, we have this location; what should I use? String-inverter? What type? Or maybe it's central? It is tough to say something about it without taking into account some measurements you usually have to get from engineers. So we use pvDesign to compare these cases. We don't have a team that can develop these studies, and we need software that can provide us some versatility to fulfill the requirements of our customers."

How does pvDesign help your competitive advantage?

" pvDesign fits with us very well because it allows us to prepare calculations and comparisons without needing a larger amount of resources from our side. We need software that provides us the simplicity or flexibility to do what we want but with fewer resources. Let's say some other software packages need more resources to develop these calculations. For example, it allows us to compare a string inverter vs. a central inverter in a certain PV plant. I imagine that you have shading in a PV plant, or if you are between mountains, the customer might ask if it is better to use a string inverter rather than a central inverter. It's pretty tricky to say yes. You have to calculate it case by case because it will depend. So, it helped us a lot to prepare those comparisons for our customers."

Nicolás Fernández-Velilla
System Solution Engineer,
Sungrow

SUNGROW

All our interviewees agreed that solar **PV software increases their efficiency, returns, and probability of project success.** As capital continues to flow into clean energies and solar penetration into the global energy mix grows ever larger, **those that adopt software in their workflows will emerge as the leaders of the solar evolution.**

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How does pvDesign help your competitive advantage?

> The main benefit of pvDesign is that it gives you the ability to run dozens of configurations for the same project in only a few minutes and compare them... A reduction of time and effort translates into a decrease of costs and increase of the benefits."

What else comes to mind when you think about the benefits of solar software?

> pvDesign is very collaborative, and it is great how I can do a project in Australia, and the team from Spain can pick the design up and continue working."
>
> "pvDesign combines the functionality of multiple software that most solar engineers use to provide ready-to-export information. The fact that you can access yield analysis, BOM, terrain analysis, and layout from a single tool simplifies our workflow."

Thomas Gerstch
Head of Engineering
Iberdrola

IBERDROLA

How does pvDesign help your competitive advantage?

> We used independent contracting for the first two designs, but from then on, after acquiring pvDesign, the rest (8 projects) have been designed by pvDesign. Even taking into account the new higher power outputs, Celsia has gone from using one and a half hectares for each MW to a 1 to 1 ratio."

Lennin Pineiro Rivera –
Development Engineer,
Celsia

CELSIA

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Antonio Verdugo
Technical Engineer, ABEI Energy

How does pvDesign help your competitive advantage?

pvDesign helps to perform preliminary and advanced layouts to know the possibilities of the terrain in a very accurate way in the initial stages, being able to perform site analysis in a very fast and approximate way."

Smart flow for energy: bringing intelligent connections across your renewable asset lifecycle

Next-generation software like RatedPower is revolutionizing utility-scale PV design and engineering. Integrated solutions can also help achieve further efficiencies in competitive and market intelligence, siting, operational optimization, and risk management.

Using **a comprehensive solution set that addresses the whole lifecycle of a project helps you make those intelligent connections** and eliminate the gaps in your analyses (Figure 6).

All your workflows in one place
Intelligent Connections: from start to finish

Enverus Power & Renewables helps at every stage of the project lifecycle.
Final ideal development sites, design & build projects, manage & optimize assets and maket the most profitable trading decisions.
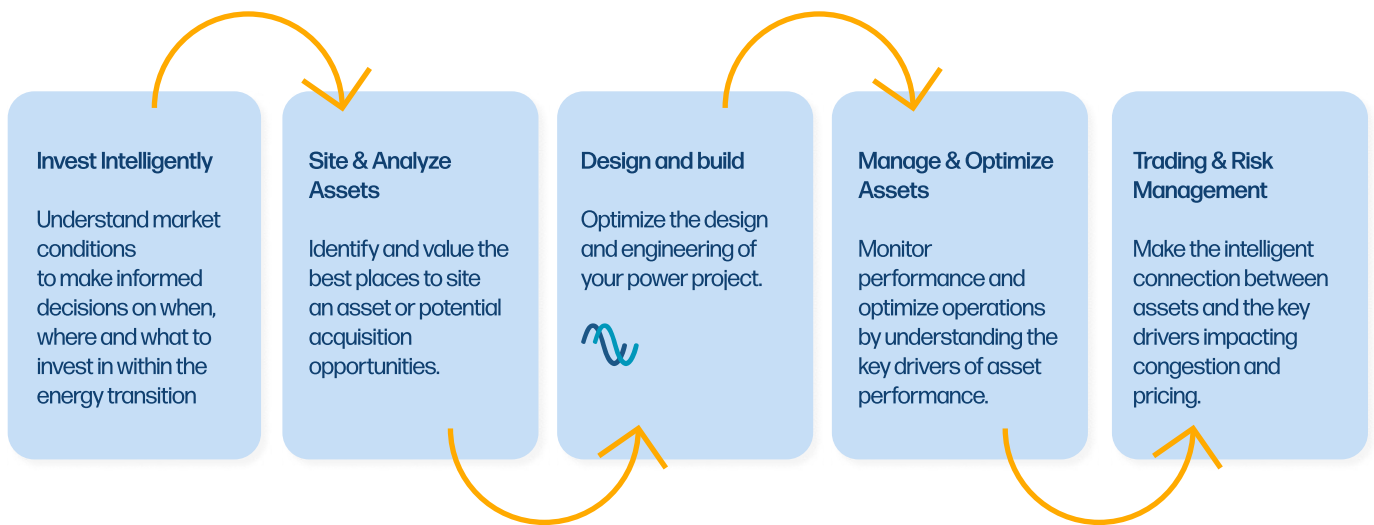
Invest Intelligently

Understand market conditions
to make informed decisions on when, where and what to invest in within the energy transition

Site & Analyze Assets

Identify and value the best places to site an asset or potential acquisition opportunities.

Design and build

Optimize the design and engineering of your power project.

Manage & Optimize Assets

Monitor performance and optimize operations by understanding the key drivers of asset performance.

Trading & Risk Management

Make the intelligent connection between assets and the key drivers impacting congestion and pricing.

Figure 6 - Integrated Software Solutions for All Stages of the Utility-Scale Solar PV Project Lifecycle (Source: Enverus)
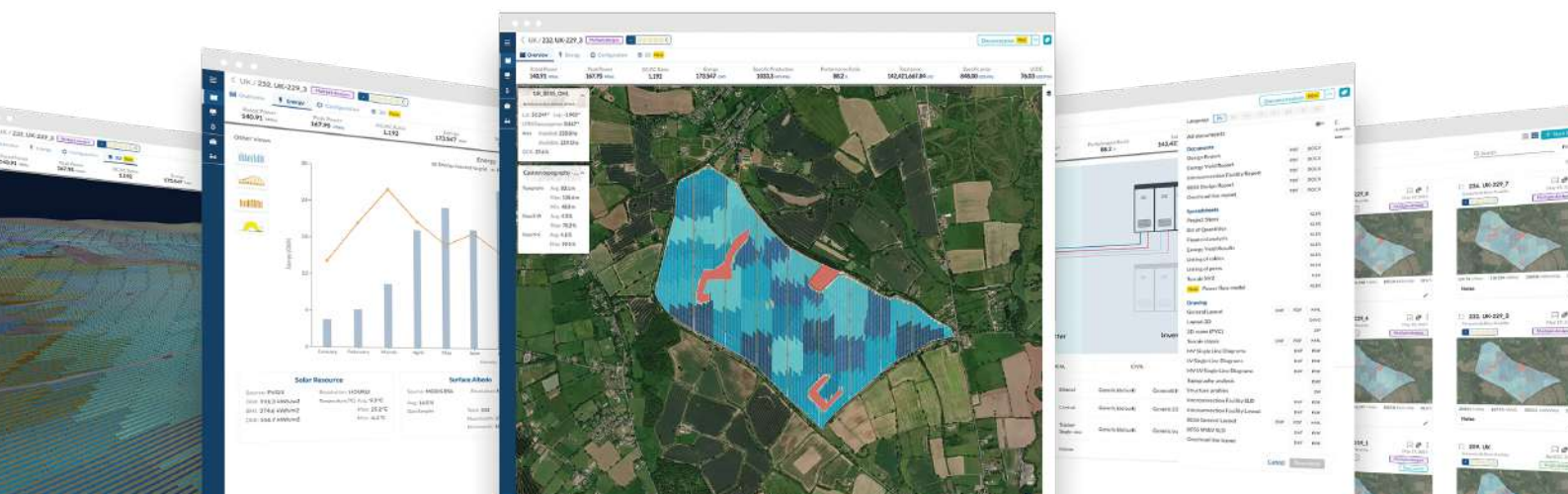
Want to learn more?

A buyer's guide to utility-scale solar software

Thinking about adding another tool to your solar engineering and design stack? Here's how to pick the ideal solar software to expedite time-to-layout and slash LCOE. Discover the must-haves and deal breakers.

Check the guide

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Learn more at ratedpower.com