



An Introduction to Energy Web X

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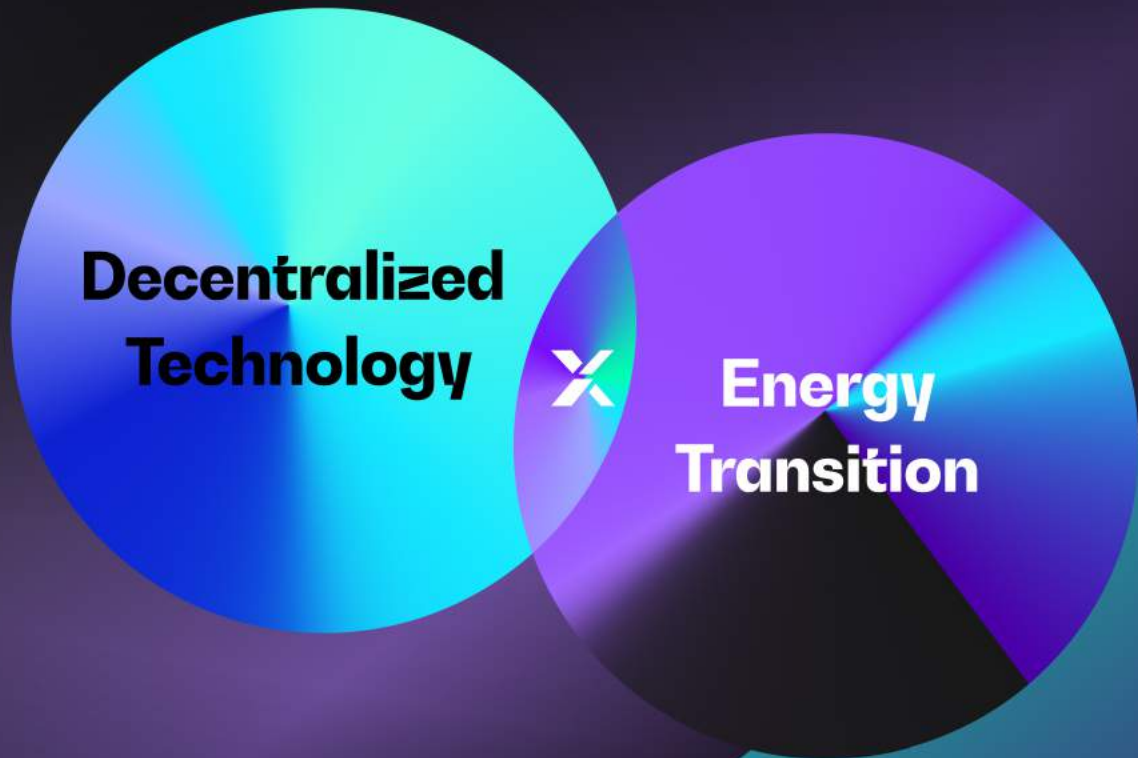
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Accelerating the energy transition

with open-source, decentralized technologies



The way we produce, use, and manage energy is changing - for the better. Every day new clean energy technologies are being adopted at an unprecedented rate, giving everyone from local communities to the world's largest companies access to abundant, affordable energy.

In aggregate, the global energy transition is the single most important climate solution and a multi trillion dollar business opportunity.

ENERGY WEB



But change is hard. Especially for an industry as old, large, and complicated as the energy sector. For over a century, energy companies have relied on centralized planning and control from the top-down. As energy systems become more diverse and dynamic than ever before, companies need to enable coordination and orchestration from the bottom up.

Unfortunately they lack the tools to undergo this paradigm shift; today decarbonization and innovation are hindered by fragmented, inefficient digital tools that were designed for a different era.

At Energy Web, our mission is to make the energy transition successful by developing open-source, decentralized software that helps energy companies speak a common language and work from a shared source of truth. **Energy Web X is a new technology that will enable us to do so at enterprise scale.**

Thanks to over five years of experience developing digital solutions with dozens of major energy companies from over 25 countries, Energy Web has a much clearer understanding of the problems decentralized technology can solve, how it creates real business value, and how to bring it to market.

Using “proof of good work” to accelerate the energy transition



Before diving into what Energy Web X is and how it works, it's important to understand how Energy Web's technology stack has evolved in order to solve emerging challenges in the global energy transition.

Today, Energy Web is narrowly focused on accelerating decarbonization in two specific areas where the Energy Web technology stack has the strongest business case.

The first is helping electric utilities digitize and integrate distributed energy resources (e.g., rooftop solar systems, batteries, electric vehicles, electric vehicle charging stations, heat pumps) to the grid.

The second is bringing deep levels of transparency and verifiability to emerging green product supply chains—including but not limited to 24/7 matched renewable electricity, sustainable aviation fuel, and sustainably produced bitcoin.



The solutions applied to these areas, dubbed Data Exchange, Green Proofs, and Asset Management, are powered by a new technology that can unlock significant business value for energy enterprises: worker node networks.

Each worker node network is a decentralized group of computers that jointly execute sensitive business processes that involve or impact multiple companies. Worker nodes establish consensus about the results of a business process, but they are not blockchains.

Whereas the “work” performed by traditional blockchain miners or validators—validating and sealing blocks—has limited value for energy enterprises, worker node networks are fine-tuned to execute custom logic that is specific to an actual business problem.

Based on the Energy Web experience, worker node networks are only useful in cases where multiple businesses need the capability to transmit complex datasets amongst three or more parties in a way that does not reveal all data to all parties, and/or the capability to provide public verification of outputs while maintaining privacy and integrity of inputs.

The global energy system has many situations where these needs exist. To date, Energy Web has deployed worker nodes for several use cases, and the list grows by the day:

Powering solutions for 24/7 matched renewables and green electric vehicle charging by ingesting and matching granular electricity load and generation data, ensuring that matching rules and preferences are enforced correctly, and that there's no double-counting of renewable generation.

Launching registries for clean commodities like sustainable aviation fuel and sustainably produced bitcoin by ingesting granular production data, validating credentials of authorized producers, issuing digital certificates based on verified production, and ensuring the rules governing certificate transfer and retirement are followed correctly.

Coordinating dispatch of distributed energy resources by enabling distribution utilities, market operators, transmission actors, and distributed energy resources to exchange and process critical operational data while anonymizing identity and commercial data.

Supporting decentralized registries for distributed energy resources by enabling multiple independent companies involved in the DER lifecycle—including transmission actors, distribution utilities, aggregators, installers, and manufacturers –to create, read, and/or update DER records within a shared database based on their role within the market and the relationship to the DER without revealing sensitive customer information.

The Energy Web team is currently building solutions that rely on the [open-source worker node toolkit](#) that map to each of these use cases. Upcoming releases throughout 2023 and 2024 will enable any energy enterprise to configure worker nodes to perform specific work and deploy those nodes in a production environment.

Today, worker nodes are deployed and operated directly by Energy Web. But to realize their full potential we need a way to deploy thousands of independent worker nodes and coordinate them in cohesive networks so the results of their work can be publicly verified. This is where Energy Web X plays a key role.

Energy Web X is a critical enabling technology for worker node networks

Introducing Energy Web X



Today worker nodes are implemented as independent off-chain computing nodes that communicate with a smart contract deployed on the Energy Web Chain. This approach is effective, but it is complex and labor-intensive to configure custom business logic, synchronize nodes, and apply appropriate governance such as defining eligibility requirements and service level agreements that worker nodes must adhere to.




A more efficient solution is to implement worker nodes within a common environment where they can run independently but follow a unified set of rules. And that's where Energy Web X comes in.

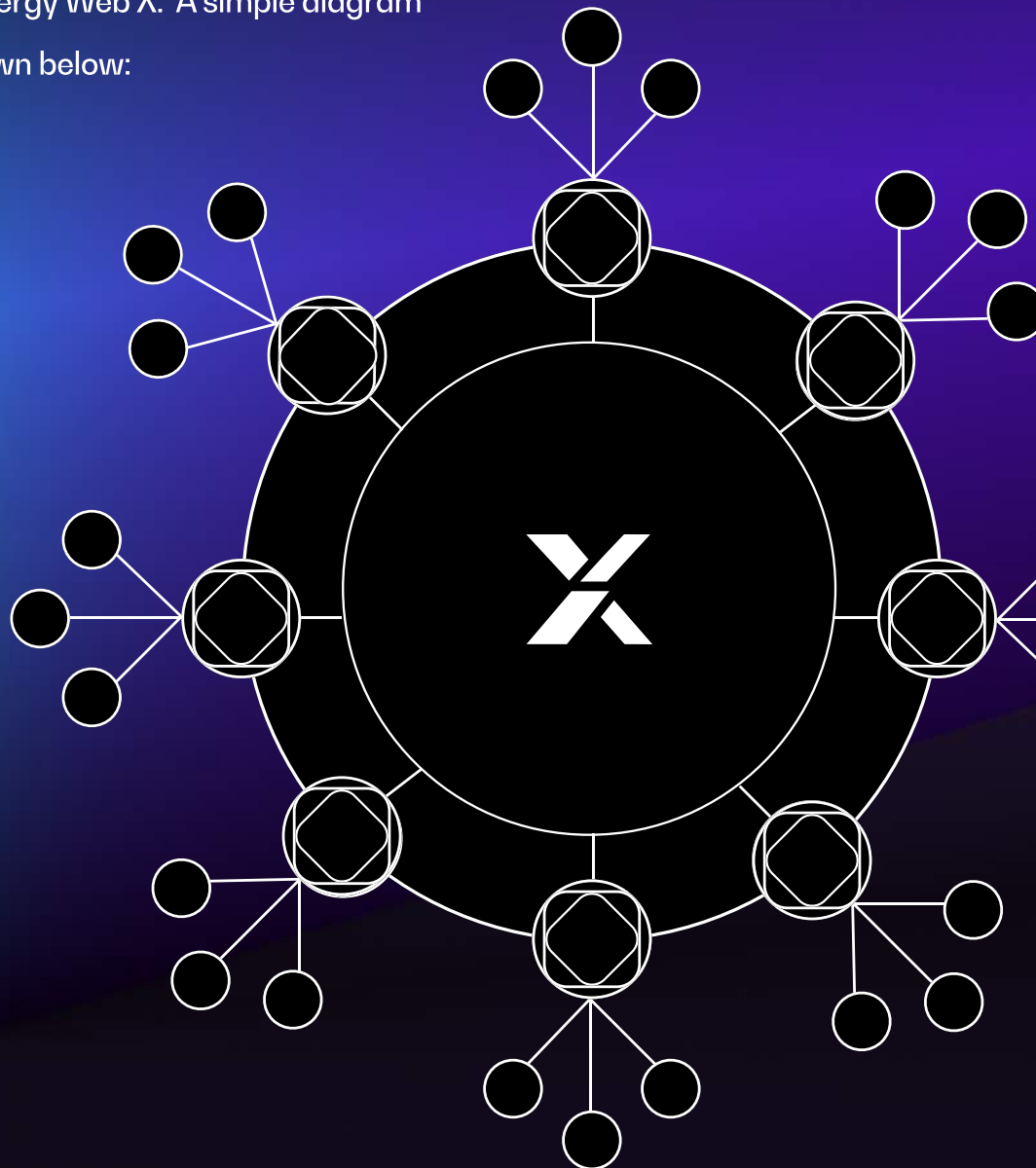
In contrast to the Energy Web Chain, which is Ethereum-based, Energy Web X is built with substrate technology. Its sole purpose is to coordinate, secure, and make public the results of work performed by worker node networks.



Each set of worker nodes deployed by Energy Web, Energy Web customers, or—over time— any energy enterprise, will be governed and anchored to unique “pallets” on Energy Web X (in traditional Web 3 language, a “pallet” on a substrate-based blockchain is similar to a smart contract on an ethereum virtual machine but more powerful and flexible).

With this architecture in place, Energy Web will have a scalable way to launch worker nodes—each with their own decentralized identifier—that are anchored to Energy Web X. A simple diagram of this architecture is shown below:

-  **Worker Nodes**
Software that performs useful work for energy companies
-  **Solution**
A solution developed by a company, EWF, or a consortium of companies
-  **Energy Web X**
A parachain designed to secure, govern, and coordinate worker nodes via a decentralized network

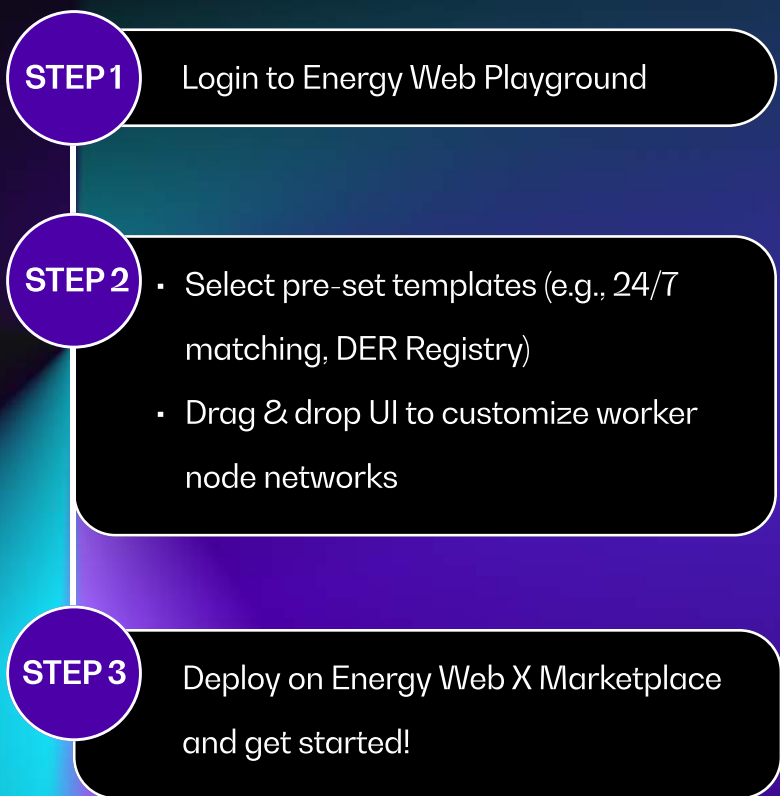




The following visuals illustrate how worker node networks on Energy Web X will work. First, energy enterprises will use a web-based application, **Energy Web Playground**, to easily configure and deploy custom worker logic. This tool will enable enterprises to configure business logic, set requirements that must be met for worker nodes to be run (staking thresholds and know-your-customer requirements, for example) and specify award schedules for running worker nodes.

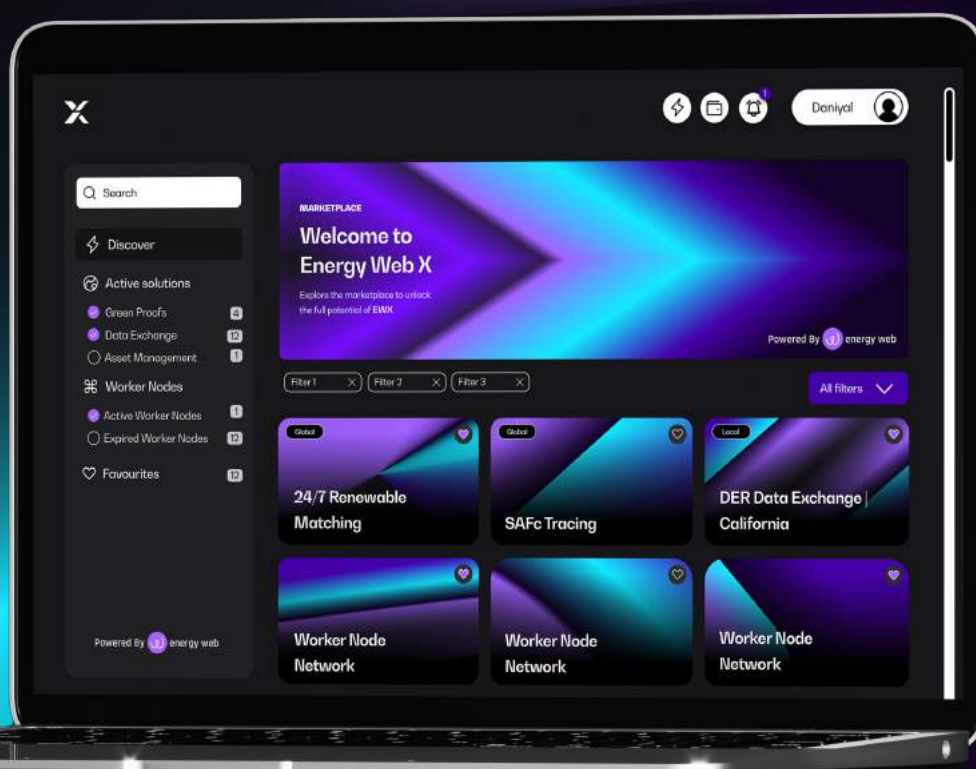
Some worker node networks may support a “global” use case that can be used by enterprises in multiple geographies and have thousands of worker nodes. Other worker node networks may support a specific use case for a single company in a single geography with a smaller number of worker nodes. Enterprise users will be able to adjust these parameters at their discretion.

Enterprise User Experience for Launching Worker Node Networks



Once configured, enterprises will be able to deploy their worker node network onto the Energy Web Marketplace. The marketplace is a simple web-based user interface where individuals and/or businesses can browse different applications, their associated worker node networks, select networks to participate in, and ultimately be allowed to download, deploy, and operate one or multiple worker nodes. In the event all requirements are fulfilled for a given worker node network, individuals and/or businesses will be permissioned to download and run a worker node in support of a specific application.

On the enterprise side, the ultimate aim with this design is to make it simple and easy for enterprises to launch worker node networks. On the Energy Web community side, this design will make it straightforward for qualifying individuals and businesses to spin up and manage worker nodes.



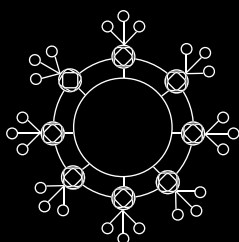
Two blockchains, one token

Securing Worker Nodes with the Energy Web Token (EWT)



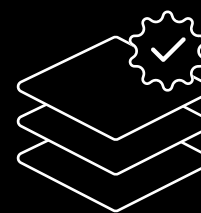
Energy Web X's purpose is to introduce new technical capabilities, not replace what already works in the Energy Web ecosystem or create unnecessary complexity. Accordingly, Energy Web X will leverage and complement the existing Energy Web Chain.

To maximize the security of every Energy Web solution using worker nodes in the architecture described above, Energy Web Tokens (EWT) will be required to interact with worker nodes and Energy Web X. Most notably, Energy Web Tokens will be required to:



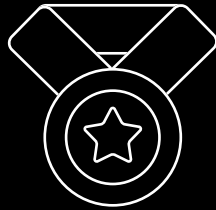
Deploy worker node networks

Enterprises wishing to configure and launch worker node networks on Energy Web X will be required to stake EWT to perform this action.



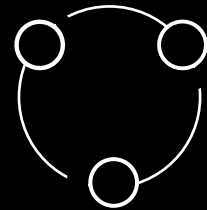
Validate Energy Web X

Energy Web X validators will need to stake a significant number of Energy Web Tokens in order to become validators on Energy Web X.



Reward worker node networks

Worker nodes are software packages that need to be run by individuals and/or businesses. In order to attract entities to run worker nodes, enterprises will need to include rewards that pay worker node operators for their work. All worker node rewards must be paid out in EWT. Worker node logic will be able to be run on a mix of personal computers, cloud and local servers, mobile phones, and specialized hardware for computationally demanding use cases.



Operate worker nodes

In order to become a trusted party and run worker nodes, individuals and/or businesses will be required to stake EWT. Staking requirements and reward schedules are mass customizable—enterprises launching worker node networks can configure different thresholds and award schedules at their discretion.



Instead of launching a new token with the Energy Web X blockchain, Energy Web X will be powered by the native token of the existing Energy Web Chain, Energy Web Token, or EWT. In partnership with Aventus, Energy Web is deploying the ability to “lift” Energy Web Tokens from the existing Energy Web Chain onto Energy Web X. Lifted Energy Web Tokens can then be used for the functions described here.

With this mechanism in place, EWT holders will be able to “lower” Energy Web Tokens back to the main Energy Web Chain at their discretion. Over time, token holders will be able to lower EWT to other layer one blockchains (for example, main net Ethereum) making Energy Web solutions interoperable with any blockchain ecosystem.

Governing Energy Web X



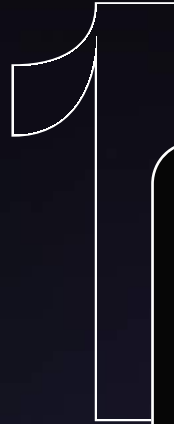
Energy Web solutions are enterprise applications. This means one of the most important governance topics in the Energy Web ecosystem is governance of solutions themselves. In some cases, individual companies govern their solutions, such as Engie's traceability -focused TEO application.

In other cases, consortia of companies abide by different governance requirements for specific solutions. Examples include Project EDGE in Australia, Shell's aviation-focused Avelia solution, and Green Proofs for Bitcoin.

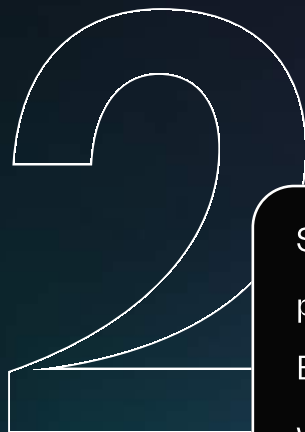
Energy enterprises will take a similar approach to governing worker node networks connected to Energy Web X. Enterprise users will be the entities responsible for governing worker node networks, specifying different requirements for individuals and/or businesses to run worker nodes, and setting award schedules for running them.



Over time, the vision is to decentralize Energy Web X governance by adding more trusted validators to the Energy Web X blockchain. However, the design of Energy Web X and worker node networks demands a different way of thinking about traditional blockchain governance and incentives for three primary reasons:



First, Energy Web X is leveraging an existing token with its own governance and blockchain validation, EWT on the Energy Web Chain. There is no new token being minted on Energy Web X.



Second, the most valuable work being performed by the combined architecture of Energy Web X and worker nodes are the worker nodes themselves, not validators on the Energy Web X blockchain.



Third, validating Energy Web X will produce small rewards for Energy Web X validators. This is by design: the most crucial work being performed under the Energy Web X architecture is at the level of worker node networks, not the Energy Web X blockchain.

At the blockchain level, our ultimate vision is to enable enterprises to achieve finality for their applications using any layer one blockchain of their choosing. Once Energy Web X is deployed, enterprises will be able to achieve finality using either the existing Energy Web Chain or Energy Web X. Post launch, Energy Web will integrate Energy Web X with additional layer one blockchains based on feedback from the enterprise community, enabling Energy Web Tokens to be lowered to additional blockchains (such as Ethereum) and for those same blockchains to provide finality for enterprise solutions and associated worker node networks.

Energy Web X will initially be deployed as a substrate-based parachain. Currently, Energy Web X is deployed as a test parachain connected to the official Polkadot test relay chain, Rococo, in order to test and audit all functionalities described in this paper. The production Energy Web X parachain will launch as either a solo-chain, or as a parachain on a relay chain, new or existing, designed for enterprises.

Energy Web X chain governance will begin centralized:

Energy Web and Aventus, our partner in launching Energy Web X, will initially be the sole validators of the Energy Web X chain.

Energy Web X in context



Why Energy Web X?

Some may ask, “Why do we need another blockchain to make Energy Web’s vision for worker nodes reality?”

With over 40 validators, an improved code of conduct in place, and dozens of organizations running production solutions, the existing Energy Web Chain is stronger than ever. However, substrate-based blockchains offer several features and functionalities that the existing Energy Web Chain does not:

Substrate-based blockchains are developed for specific use cases, whereas technologies like the Ethereum virtual machine are generic. Considering the very specific use case for Energy Web X, substrate fits the community’s needs better than a generic Ethereum virtual machine.

Substrate pallets are developed in Rust, a modern developer language that offers multiple safety features and is widely used outside of the web 3 development space. This means faster development cycles, higher code quality, easier audits, and a broader open source community of developers who can interact with Energy Web X.

Substrate-based blockchains include native support for off-chain workers, off-chain storage and off-chain indexing (features not included with a traditional Ethereum virtual machine).

Unlike Ethereum smart contracts, pallets are reusable across chains and get be upgraded or exchanged without affecting other pallets.

How to get involved

Bringing Energy Web X to Market



As illustrated on the roadmap infographic on the following page, the worker node toolkit was open sourced in March 2023 and Energy Web X is currently validating blocks as a test parachain on the Polkadot test relay chain, Rococo. As of early Q2 2023, the Energy Web team is testing Energy Web X and an alpha version of the Marketplace. Beta versions of the Marketplace and Playground tool for configuring and deploying worker node networks is slated for delivery in the third quarter of 2023.

Mainnet launch of Energy Web X is targeted for Q4 in addition to production releases of the Marketplace and Playground tools. This will enable the first production worker node networks to launch prior to the end of the year supporting real-world deployments of Energy Web solutions.

Not shown on this roadmap are a series of planned enterprise releases for 2023 including new toolkits (and associated worker node templates) for Asset Management and Digital Spines; launching two Green Proof Registries (Green Proofs for Bitcoin and Sustainable Aviation Fuel), and releasing additional tools to help enterprises more easily deploy production Energy Web solutions.



2023 EWX ROADMAP

Q2

EWX testnet

Marketplace Alpha

Q3

Marketplace Beta

Playground Beta

Q4

EWX mainnet

Playground
Production

Marketplace
Production

Deploy initial
Worker Node
Networks



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