LF ENERGY

LF Energy
2023 Annual Report

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Executive Summary

LF Energy (LFE) is an open source foundation accelerating the energy transition by building communities consisting of stakeholders in the technology and energy industries to collaborate with academia and government to develop open source technology solutions, frameworks, specifications, and standards to accelerate digital transformation in power generation, transmission, distribution.

The vision of LFE is to create a technology ecosystem that enables decarbonization of the energy sector through innovation and interoperability. This includes the entire technology stack used by those producing, transmitting, distributing, and using energy over large grids, microgrids, distributed energy resources and storage, electric vehicles, and more.

Message from Alex Thornton, Executive Director, LF Energy

For LF Energy, 2023 was a year of transformation and growth. The year started with the tragic loss of the beloved founder and leader of LF Energy, Dr. Shuli Goodman. The more I hear stories about her, the more I'm impressed with Shuli's tenacity to conjure LF Energy out of thin air and drive it to its current, vibrant state. Arpit Joshipura stepped in as interim leader, lending his well-seasoned and steady hand, and in December, I arrived to fill the giant shoes left by my predecessor.

Shuli and the community have clearly demonstrated the viability of LF Energy. 2023 saw tremendous growth, with nine new projects added to bring the total to 30. Nine new members also joined, contributor strength grew by 30% and lines of code hosted grew by 22%.

The SEAPATH and EVerest projects graduated to Early Adoption, and both are quickly emerging as vibrant ecosystems of their own and critical pieces of digital energy infrastructure. In fact, the US Joint Office of Energy & Transportation has now officially adopted the EVerest Project to improve the compatibility and reliability of EV chargers nationwide.

2023 also saw a series of deployments and commercial offers based on projects CoMPAS, SEAPATH, SOGNO, and PowSyBl — clear evidence of their growing industrial maturity. Across the board, projects continue to mature, grow their communities, and increase their impact.

Looking ahead to 2024 and beyond, we will build on this incredible success and take LF Energy to another level. The energy transition requires digitalization, and open collaboration on shared problems and is the proven best way to accelerate innovation. This is a multi-decade effort, and we're just getting started. Thank you for the opportunity to serve this community, I can't wait to see what we achieve together.

In Memoriam:

Shuli Goodman, Founding Executive Director, LF Energy

Shuli Goodman was the visionary, founder, and initial driving force behind LF Energy. She was a dear friend, colleague, and true champion of the open source energy community. Shuli passed away from cancer on January 3rd, 2023.

Shuli was passionate about protecting our natural environment, addressing the threat posed by climate change, and preserving our planet for future generations. She recognized early on the disconnect between traditional, closed, and inefficient energy systems and the dynamic, innovative, and transformational force unleashed by open source software. She made it her mission to bridge these two worlds. With dogged persistence and a unique ability to bring diverse stakeholders together, she made LF Energy a reality in 2018 and served as the Executive Director until her passing.

"A collaborative open source approach to development across companies, countries, and end users, will provide the innovation needed to meet our respective goals in renewable energy, power electronics, electric mobility, and rapid digitalization for the energy sector overall." –Shuli Goodman, 2018

From its inception, Shuli worked tirelessly to build LF Energy into the thriving community it is today. Even throughout her illness, Shuli remained deeply committed to seeing the mission of LF Energy through. She was a well respected leader and colleague, and those who had the honor of working closely with her will remember her unwavering passion to achieve urgent decarbonization targets through open source.

Throughout her successful career, Shuli was admired by all who knew her. She was especially proud of the community she founded and grew, and appreciative of the team members across the Linux Foundation and LF Energy who supported her in this mission.

In Shuli's memory, the Linux Foundation remains fully committed to the ongoing success of LF Energy as a community, recognizing its critical role for the future of our planet. The critical work of LF Energy continues with a dedicated team of LF staff and community members determined to honor Shuli's legacy with this impactful work.

Board Members

Antonello Monti
Professor
at Rwth Aachen
University

Arjan Stam
Treasurer
Value Stream Lead
at Alliander

Audrey Lee
Senior Director
Energy Strategy
at Microsoft Corporation

Bryce Bartmann
Chief Digital
Technology Advisor
at Shell International
Exploration &
Production, Inc.

Jordan Hughes
Senior Software
Engineer
at Apple Inc.

Lucian Balea
Chair, Open Source
Program Director
at RTE

Marissa Hummon
CTO
at Utilidata

McGee Young
CEO
at Wattcarbon

Savannah Goodman
Data and Software
Climate Solutions
at Google LLC.

Message from Lucian Balea, Board Chair, LF Energy

2023 has been an important year of consolidation for LF Energy.

When we think of the ground LF Energy has covered in recent years, our first thoughts go to Shuli. Her leadership, perseverance and generosity guided the emerging community through some tough early years towards a shared conviction that open source collaboration is a necessity for the future of energy on a global scale.

In addition to considerable growth in projects, members, contributions, and project maturity, a community highlight of 2023 was the LF Energy Deep Decarbonization Summit in Paris, where over 250 individuals representing over 150 organizations from 34 countries gathered after a break of more than three years. Everyone in attendance could feel a strong sense of collaboration and the tremendous momentum demonstrated at the event.

Significantly, we welcomed Alex Thornton as our Executive Director in December and started working all together on strategic goals.

Looking ahead to 2024, we have even more compelling tasks to accomplish — from supporting more utilities in their adoption of the open source technologies and open standards and specifications developed at LF Energy, to delivering industrial-grade, cyber-resilient software for essential applications such as electric mobility, to onboarding more developers to meet growing needs.

On behalf of the Board of Directors, I would like to extend my warmest thanks to the entire community for its passionate commitment to the success of our projects, to the benefit of an increasingly important and urgent energy transition.

The Path to Innovation

LF Energy is building the technologies necessary to accelerate the energy transition and help the planet avoid the worst consequences of climate change. This is actualized when energy industry stakeholders get involved in the effort by open sourcing ongoing projects and internal tools, contributing to open source communities, and collaborating to recognize which elements of the ecosystem software stacks could and should be open sourced for the benefit of the ecosystem at large.

Open source foundations are the only proven vehicle that can unite industry giants and startups, competitors, and partners under a shared vision of an open, interconnected technology landscape through open source projects, open standards, and interoperability. There are direct parallels between LF Energy and other Linux Foundation projects such as LF Networking (LFN).

LFN has been transforming the networking and communications industry for over 10 years and now represents the broadest set of open source networking projects in the world in a broad industry coalition fostering a commercial-ready networking ecosystem.

Telecom and Energy are both traditionally heavy-regulated, and slow-moving industries, with a myriad of overlapping and competing global standards and protocols. By embracing open source and the best practices for software development that come with it, the energy ecosystem is set to follow the networking ecosystem's proven path for open source adoption and industry transformation.

Spotlight on Artificial Intelligence

By: Alexandre Parisot, Director of Ecosystem, AI & Energy, Linux Foundation

Artificial Intelligence (AI) is not new and has experienced several development cycles, but 2023 was undeniably a hot year in terms of breakthroughs and widespread interest across all industries. This is timely for LF Energy, as AI has massive potential to accelerate the transformation and decarbonization of energy systems in the following principal ways:

- Tackling complexity and variability as climate change and the energy transition make power systems even more complex.

- Handling rising volumes of data as power grids are increasingly digitalized and decentralized.

- Allowing further optimization and automation of processes, and thus improving performance and pushing the limits of existing systems.

Stakeholders in the energy industry are looking for ways to tap this potential — from enterprise level applications all the way to real time critical processes. However, this also involves tackling complex challenges such as privacy, cybersecurity, governance, trustworthiness, and explainability, and balancing these against AI's benefits. Open source, open innovation, open data, and open standards will be essential in addressing these issues.

In 2023, LF Energy members strategized to define AI priorities and determine where our projects and actions could generate the most value.

The potential of AI relies heavily on access to data, and much of the granular data in energy involves some degree of privacy, confidentiality, cybersecurity,

and critical infrastructure protection issues. Accordingly, facilitating access to realistic and relevant data was chosen as our number one priority. Open innovation and collaboration in this area will bring new solutions such as synthetic data generation based on real datasets, privacy preserving techniques, and more.

We strive to position LF Energy as the place for these techniques to be developed together, and for high-value, high-quality open benchmark datasets to be made available for open, use case driven, peer-reviewed collaborative research and innovation. As of early 2024, one LFE project is already positioned in this area, on residential level smart meter data (OpenSynth), and other initiatives like grid data for topology optimization are under discussion.

Many stakeholders in the energy industry are already using AI based on foundational open source packages from our sister Linux Foundation umbrella project, LF AI & Data, and leveraging best practices from OpenSSF, another sister foundation focused on open source security. Specific to LF Energy, we aim to host energy specific use case-driven initiatives in key areas such as:

- Forecasting of energy demand, generation and prices, building upon existing LF Energy projects such as OpenSTEF.

- Energy systems infrastructure asset management, based on computer vision and algorithms to monitor the health of assets.

- AI-accelerated optimization and simulation of grid operations, where AI and machine learning are used in conjunction with advanced optimization and simulation techniques to enhance performance and help tackle complexity.

Energy industry stakeholders are also exploring Generative AI (GenAI) and Large Language Model (LLM) applications. Conversational assistants can enhance customer experience and interactions, streamline access to data and knowledge, or help analyze and produce technical and legal documents, for example to help accelerate interconnection and permitting. Open source models are catching up with proprietary solutions for these use cases, and will dominate due to the importance of transparency, privacy, and security requirements.

Sharing AI best practices across the energy industry and with other verticals is another key area where we can leverage the Linux Foundation community at large.

We plan to share information around the latest developments in AI technology and regulation, key takeaways from industry events, and lessons learned by members when adopting AI into their operations. This includes commercial solutions with healthy business models. LF Energy aims to be a collaboration hub for AI and energy — facilitating adoption by providing open, industry-ready solutions while enabling a thriving ecosystem.

As we turn to 2024, LF Energy is launching a Special Interest Group (SIG) to drive these priorities forward with our members. We hope to provide relevant guidance for all stakeholders to embrace the potential of AI responsibly and make their organization and operations AI-ready. Whether you work for a utility, public utility commission, research institution, or vendor, we encourage you to reach out to us.

LF Energy Projects

Early Adoption Projects

GXF
Software platform that enables hardware monitoring and control in the public space at scale

POWSYBL
Open source library dedicated to electrical grid modeling and simulation

SEAPATH
Enables building a real-time virtualization industrial-grade platform based on Yocto or Debian

EVerest
Open source modular framework for EV charging

OperatorFabric
Modular, extensible platform for alert management for systems operators

SOGNO
Microservice based architecture for distribution grid automation

Incubation Projects

CoMPAS
Common software blocks for IEC 61850 profile configuration

Dynawo
Hybrid C++/Modelica open source suite of simulation tools for power systems

FLEDGE POWER
Flexible, lightweight, industrial-grade, open source gateway that embeds Fledge (LF EDGE)

FlexMeasures
Intelligent & developer-friendly EMS to support real-time energy flexibility apps, rapidly and scalably

Hyphae
Open-source control for AC, DC, AC/DC microgrids

openLEADR
A friendly and compliant OpenADR implementation for Python 3

OpenSTEF
Predict future load on the electricity grid using machine learning

OPENEEMETER
Computing consistent and replicable estimates of changes in time series of energy consumption, primarily as measured for populations of commercial and residential buildings.

POWER GRID MODEL
High performance distribution grid calculation model

SHAPESHIFTER
Implements the Universal Smart Energy Framework for flexibility forecasting, offering, ordering, and settlement processes

Sandbox Projects

ARRAS
Simulation and analysis tool that models emerging smart grid energy technologies

CitrineOS
Open source charger network software for rapid OCPP 2.0.1 and NEVI compliant EV charge management

GRIP
Help electric grid operators anticipate, mitigate against, and recover from the effects of extreme weather events

OpenSCD
Substation Configuration Language editing tailored for utility, integrator, and vendor companies to transition to fully digital substations

Battery Data Alliance
Building sustainable open source software, best practices, and deliver standards for the battery industry

Grid Capacity Map
Enable grid operators — and the customers they serve — to more easily see when and where connections will be most optimal

OpenGEH
Enables fast, flexible settlement and hourly measurements of production and consumption of electricity

Open Sustainable Technology
A directory and analysis of the open source ecosystem in the areas of climate change, energy, biodiversity and natural resources

RTDIP
Easy access to high volume, historical and real time process data for analytics applications, engineers, and data scientists

Standards Projects

Carbon Data Specification Consortium
A data dictionary for raw data and a standard for data requirements that enable energy data access for measuring, quantifying, and tracking carbon emissions from energy production and consumption

Super Advanced Meter
An open source specification project focusing on a widely applicable smart meter data gateway

TROLIE
Accelerating the implementation of interoperable systems for the exchange of transmission facility ratings

Message from the Antonello Monti, LF Energy TAC Chair

2023 has been another fantastic year for the technical activities within LFE. We experienced growth and are making an outsized impact in the industry. The number of projects and their value is constantly growing to the point where we need to reconfigure the TAC workflow in 2024 for increased efficiency and responsiveness. Most importantly, our projects are now getting attention and recognition around the globe.

In the United States, the Joint Office of Energy & Transportation has now officially adopted the EVerest Project to improve the compatibility and reliability of EV chargers nationwide, and in Europe, the electric grid operator in Rome, Areti, is deploying a new generation of Distribution Management Systems (DMS) architecture that is completely open source and based on the SOGNO project.

Moving forward, we look forward to more cooperation and project shaping towards a full stack of open resources that can support the operation of the energy system at every level.

The Path to Production

Putting LFE projects, platforms, and tooling into deployment signifies a certain level of maturity, directly benefits members, and evolves the energy ecosystem towards an open source future.

CoMPAS

A collection of Dutch Grid Operators developed the CoMPAS software tool in LF Energy to streamline the IEC 61850 data model for the Real Time Interface (RTI) project. CoMPAS offers built-in functions that facilitate the validation and cleanup of data models, making them accessible even to users without extensive knowledge of the protocol and enables XML-based data models through a user-friendly and easily readable format. Using CoMPAS, the project team was able to remove unnecessary elements, expedite the overall development process, and reduce errors.

OpenSTEF

Alliander, a Dutch Distribution System Operator (DSO), required accurate forecasts of the load on the electricity grid looking hours to days ahead. With the rise in renewable energy and electrification of energy consumption pushing the capacity of grids even further, this need will only continue to grow. To address this important topic, Alliander started and deployed the OpenSTEF project (short for Short-Term-Energy-Forecasting) to anticipate congestion in the distribution grid, allow for grid safety analysis in the transmission grid, and enable smart grid innovations to locally balance supply and demand within the constraints of the grid.

Power Grid Model

Alliander's Delvi Project utilizes cutting-edge modeling coupled with LF Energy's Power Grid Model tool to orchestrate vital upgrades to the Low Voltage (LV) Grid. This is enabling Alliander to steer a path through the most significant grid transformation in the history of the energy industry. By weighting thousands of predictions with granularity across different consumer types and local demand patterns, Delvi with Power Grid Model empowers Alliander to proactively orchestrate capacity upgrades, ensuring a seamless transition in LV Grid capacity without disruption.

PowSyBl

Artelys, an optimization, decision support, and modeling company has been selected to develop the computational engine at the heart of a pan-European operational power grid security analysis platform. The CorNet program aims to set up an operational security analysis platform for the European electricity network. A key task is to coordinate exchanges between different Transmission System Operators (TSOs) to ensure security of supply and facilitate cross-border energy exchanges. To accomplish this, the LF Energy PowSyBl framework will be launched over an HPC cluster to simulate thousands of contingencies on the European grid (loss of a line, unavailability of a power plant, etc.) and determine if electric grids are at risk.

SEAPATH

French-Canadian company Savoir-faire Linux launched its first-ever commercial support offering for the LF Energy SEAPATH project. SEAPATH, now ready for deployment, provides a reference design and a real-time, industrial-grade open-source platform to run virtual automation and protection applications for the electricity network industry, and potentially beyond. Offering commercial support on SEAPATH helps ensure other industry players (e.g. energy transporters, distributors, vendors or technology providers) can readily industrialize SEAPATH-based solutions.

SOGNO

The grid operator in Rome, Areti, adopted the SOGNO platform in its architecture that is completely open source. The deployment increases customer engagement by connecting them directly to the Distribution Management System (DMS) by means of a blockchain layer and a specific piece of hardware, called Light Node, deployed at the point of delivery. It also provides flexibility to Transmission System Operators (TSO) to avoid local congestion and increase efficieny. It's the first deployment of its kind and represents a new paradigm for grid operators to emulate.

LF Energy Members

Strategic

alliander | Google | Microsoft | Rte Le réseau de transport d'électricité | Shell

General

aspentech | AVEVA | chargebyte | d-fine | ENERGINET | FUTUREWEI Technologies | GE

LUTECH | M-RETS | PIONIX | RECURVE | Savoir-faire LINUX | REPLY SENSE | Statnett

TenneT | Utilidata | UTILITYAPI | VATTENFALL | WattCarbon

Associate

Carbon Co-op | centerdenmark intelligent energy | CRESYM | TU Delft | EDSN energiedata voor iedereen | Elaadnl | EPRI ELECTRIC POWER RESEARCH INSTITUTE | ENACCESS | ENERGY FOUNDATION | EnergAi Berlin | EnergyTag

entsoe | EPFL | FIWARE | Fraunhofer IIS | FAU FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG | IOWA STATE UNIVERSITY | KTH VETENSKAP OCH KONST | Lucerne University of Applied Sciences and Arts HOCHSCHULE LUZERN | NREL NATIONAL RENEWABLE ENERGY LABORATORY | OPEN CLIMATE FIX | OPENEARTH FOUNDATION

openADR ALLIANCE | Open:UK | OwnTech Fondation | PECAN STREET | Project Haystack | RWTH AACHEN UNIVERSITY | Stanford | The Alan Turing Institute

the Energy Coalition | TRUSTED COMPUTING GROUP | UNIVERSITI TEKNOLOGI MARA | UNIKASSEL VERSITÄT | VANDERBILT UNIVERSITY | VF VOLTA FOUNDATION | WASHINGTON STATE UNIVERSITY | WattTime

Significant Milestones

The SEAPATH and EVerest projects graduated to the early adoption stage. SEAPATH, develops a "reference design" and "industrial grade" open source real-time platform for virtualized automation and protection applications for the power grid industry while EVerest creates an ecosystem to transform mobility by building and operating the requisite infrastructure to ensure EV charging is interoperable and easily deployed.

The Early Adoption stage signifies that these projects are operating as healthy open source communities, seeing a growing and diverse number of contributors and users of the project, and have completed the necessary steps for end users to consider them for production deployments.

GridLAB-D became the LFE Arras Project. GridLAB-D was originally developed for the US Department of Energy (DOE) to address emerging electric power system engineering challenges associated with grid modernization. HiPAS GridLAB-D, funded by the California Energy Commission (CEC), upgraded it for commercial use — providing tools needed to respond to climate change, tariff modernization, load electrification, and resilience challenges. Now coming into LF Energy as the Arras project, it is an important open source tool for utilities, researchers, and technology vendors in the development, maturation, and deployment of smart grid and renewable energy resource integration technology.

This move benefits the Linux Foundation, the DOE, and CEC and signifies that LF Energy has become a partner of choice for government agencies to ensure sustainable and thriving communities around projects that they fund.

OperatorFabric issues 4th Release (v4.0). OperatorFabric, a founding project at LF Energy, is a modular, extensible, industrial-strength platform for use in electricity, water, and other utility operations. It streamlines operational activities for utilities by centralizing real time business events in a single place and facilitates interactions between operational control centers.

Now in its fourth release, Operator Fabric is a production-grade tool actively in use and development by RTE. It offers comprehensive documentation and sets the standard across the community for open source project excellence.

Research Reports

LF Energy, with assistance from Linux Foundation Research, produced four research reports in the energy sector with data-driven insights into open source software, hardware, and standards based on empirical research methodologies for the benefit of the energy ecosystem.

Cybersecurity in Energy Infrastructure

As the energy landscape undergoes a transformative shift driven by the urgency to address climate change, consumer demands, distributed energy resources, and the rise of energy electrification, the role of cyber security becomes paramount. The Cyber Security in Energy Infrastructure whitepaper from LFE and OpenSSF delves into how open source software is critical to the innovation and transformation of our energy infrastructure. Contrary to common misconceptions, OSS offers not just affordability and adaptability but also a robust shield against cyber threats.

The report includes insights and best practices in:

- The Evolution of Energy Systems
- The Role of Open Source in Energy
- Current State of Cybersecurity in Energy
- Open Source for Cybersecurity

2023 Energy Transformation Readiness Study

The 2023 Energy Transformation Readiness Study from LF Energy, was developed in partnership with LF Research, Linux Foundation Training & Certification, G-PST, RWTH Aachen, and Zpryme, to provide survey-based insights into energy sector digitalization through open source. The study confirmed that the energy industry has indeed begun digitalization and is open to open source; although further industry consensus is needed.

Key finding include:

- 76% of energy stakeholder organizations surveyed have a clear strategic plan for digitalization
- 64% use more open source software than closed source
- 43% (a plurality) believe energy industry consensus is still key to increasing OSS adoption
- 51% of energy stakeholders see IT & OT on the way to convergence in their organizations
- Cost reduction and transition speed-up are seen as the main benefits of OSS in the energy sector, while performance, support, and security are the main barriers to adoption

2023 Open Source Sustainability Ecosystem Report

LF Energy and Protontypes contributed to the The Open Source Sustainability Ecosystem report. The report provides qualitative and quantitative insights into the landscape of open source sustainability projects, identifies those having the biggest impact, as well as gaps that stakeholders across the energy industry should look to fill. Following the analysis of the open source sustainability ecosystem, the report goes on to make more than 20 recommendations for effectively supporting and building capacity for open source in sustainability.

Some of these include:

- Enhancing collaboration between state and non-state actors
- Closing the knowledge gap on the environmental impact of industry
- Adapting existing open source solutions to the global south
- Establishing an open earth intelligence incubator
- Applying "open first" criteria when funding sustainability technologies
- Developing an open data commons with open source code
- Providing maintainers with training and support to preserve projects

The Open Source Opportunity for Microgrids

Produced in partnership with LF Energy and Intentional Futures and sponsored by Futurewei Technologies, the The Open Source Opportunity for Microgrids: Five Ways to Drive Innovation and Overcome Market Barriers for Energy Resilience research report, offers actionable insights and recommendations for key stakeholders to engage with open source microgrid initiatives. The report examines how participation in relevant open source programs and activities can help address gaps and challenges, and accelerate learning, development, and governance of microgrid initiatives.

Key findings include:

- Improving access to microgrid resources lowers barriers to energy access, expertise, and understanding across all stakeholders
- Accelerating microgrid design and time-to-market helps overcome economic and policy hurdles through open data sharing, improved cost efficiencies, and modularity
- By driving consensus on standards and fostering transparent collaboration, open source can improve the interoperability and standardization of microgrids
- Resistance from industry incumbents must be met with onramps to open source programs and education to address security concerns

Events in 2023

LF Energy Summit

After a three year hiatus due to the pandemic, the LF Energy Summit took place June 1-2 in Paris with a focus on deep decarbonization. Hosted by RTE with sponsorship support from Google, Savoir-faire Linux, and non-profit community partners, over 250 individuals representing over 150 organizations from 34 countries attended to learn how LF Energy and its projects are working collaboratively to develop new technologies, onboard clean energy resources, and deploy infrastructure, load balancing, and interoperability.

Across the more than 35 keynotes and breakout sessions at the event, several key themes emerged:

- Leaders are realizing that the energy transition requires a different approach and that new ways of building and managing energy systems require more collaboration and faster innovation

- The industry has accepted that digitalization coupled with the convergence of IT and OT is the only way to achieve decarbonization goals and manage distributed energy resources, but education around open source as the best way to achieve this is needed

- Better use of data, in terms of collection, storage, and analytics, is key to speeding the energy transition

Presentation slides from most sessions are available by visiting the LF Energy Summit 2023 schedule, clicking on the session of interest, and looking for the PDF download link. Session videos are available on the LF Energy YouTube channel.

The feedback from attendees was positive, with 96% of survey respondents indicating they were very or extremely likely to recommend the event to a friend or colleague.
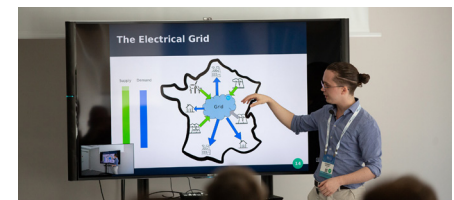
Other Key Events

2023 was a busy year for events overall with the LF Energy community gathering regularly for presentations, in person collaboration, and key discussions. Key events, among others, included:

- FOSDEM, Feb 4-5, Brussels, Belgium. For the first time, the developer-centric crowd met up in a dedicated Energy devroom.

- The Linux Foundation SustainabilityCon — new additions to the Open Source Summit and the first time the Linux Foundation has hosted sustainability-focused events — took place in North America, May 10-11 in Vancouver, Canada, and in Europe September 19-21 in Bilbao, Spain.

- The LF Energy Embedded Open Source Summit took place in Prague, Czechia, June 26 - 30th and explored open embedded solutions for the energy transition.
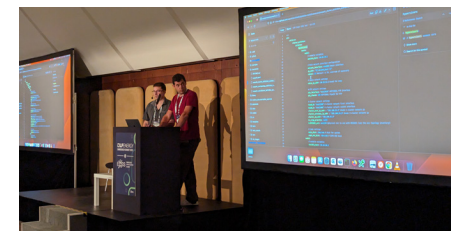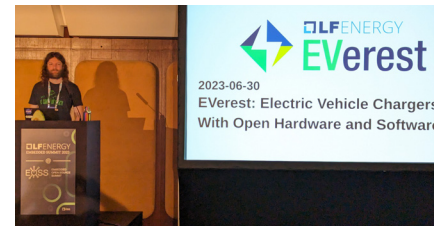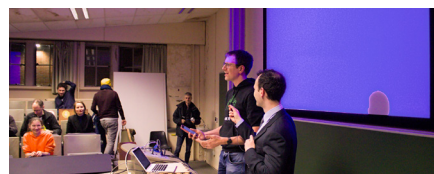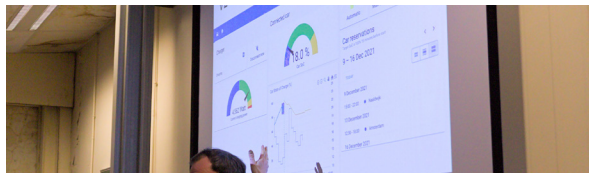
Key Metrics

Growth

2023 was a year of tremendous growth and momentum for LF Energy. Highlights for the year include:

- Nine new members and nine new projects
- Unique aggregate contributors across all hosted projects increased by 30% to a total of 1,720
- Commits made across all monitored repositories increased by 26% to 58,740
- Lines of code added across all unique commits increased by 22% to 67.4 million

The growth of LF Energy since its inception in 2018 can be seen in the LFX Insights Dashboard. Highlights include:

Members

Contributors

TOTAL CONTRIBUTORS
1.74K

Active Contributors

Commits

TOTAL COMMITS
59.56K

Commits

Source: https://insights.lfx.linuxfoundation.org/foundation/lfenergy

Lines of Code

TOTAL LOC ADDED
67.55M

Legend: Total LOC added

Source: https://insights.lfx.linuxfoundation.org/foundation/lfenergy
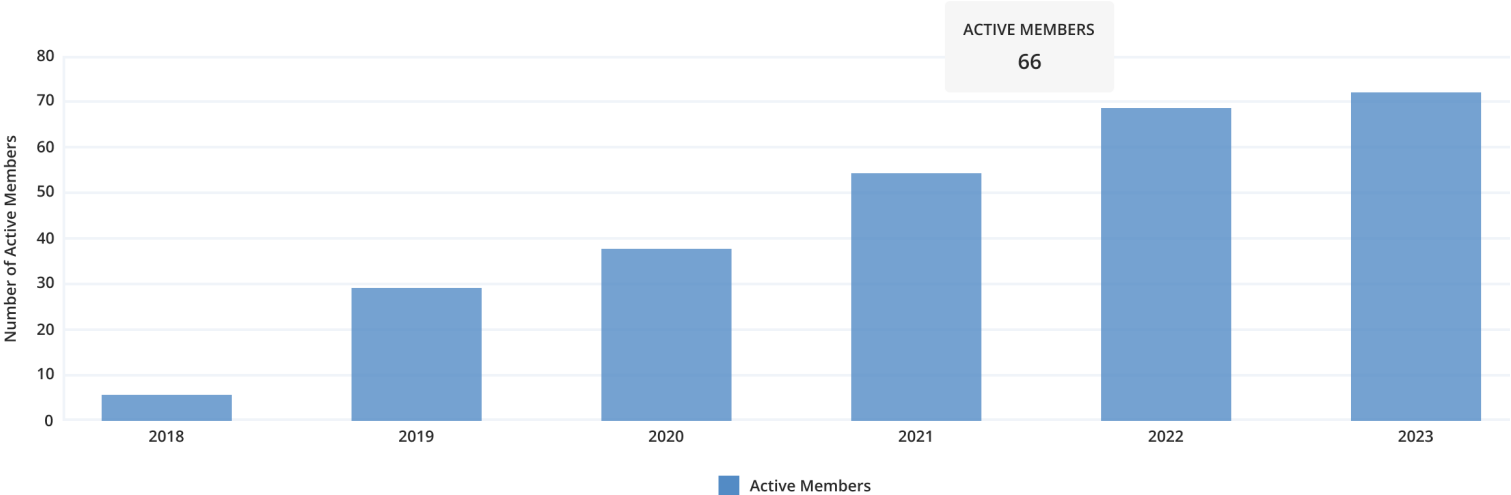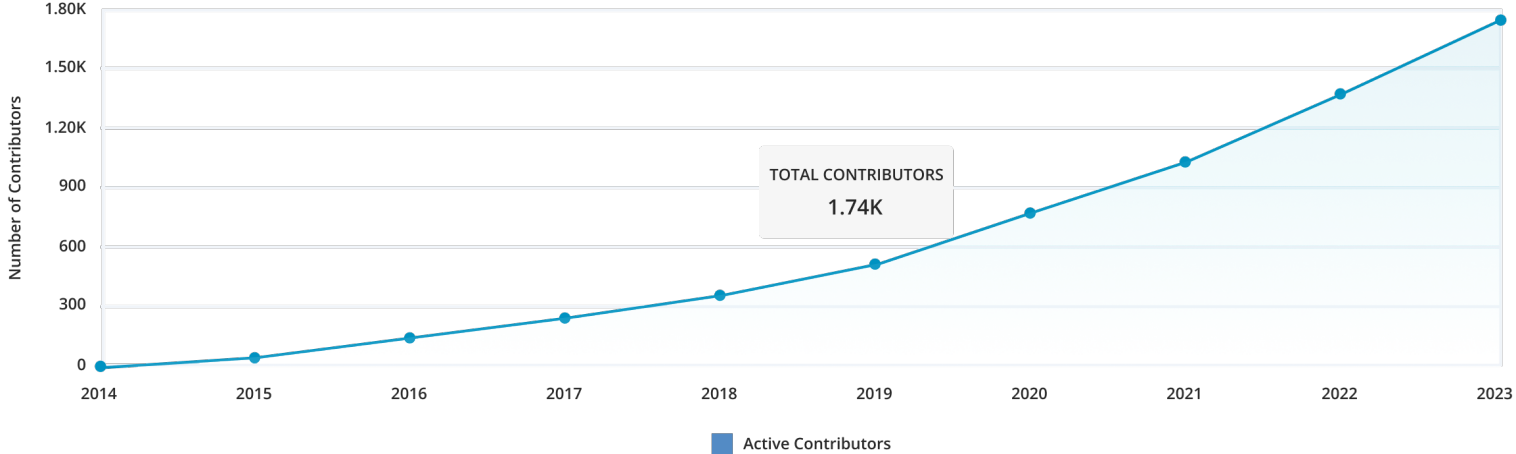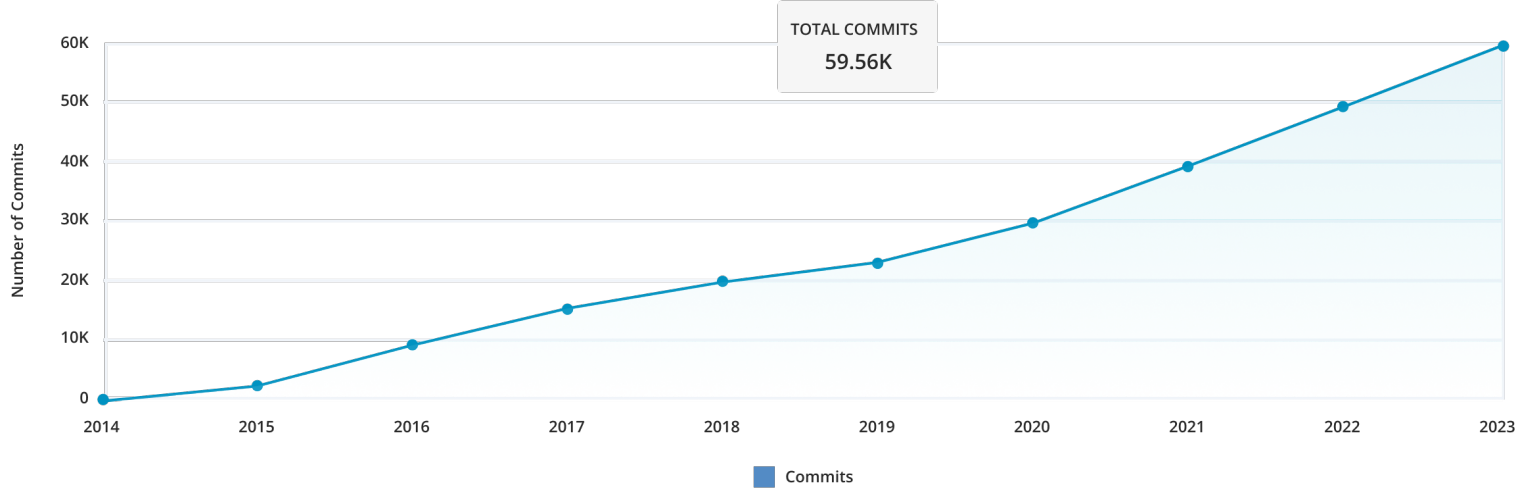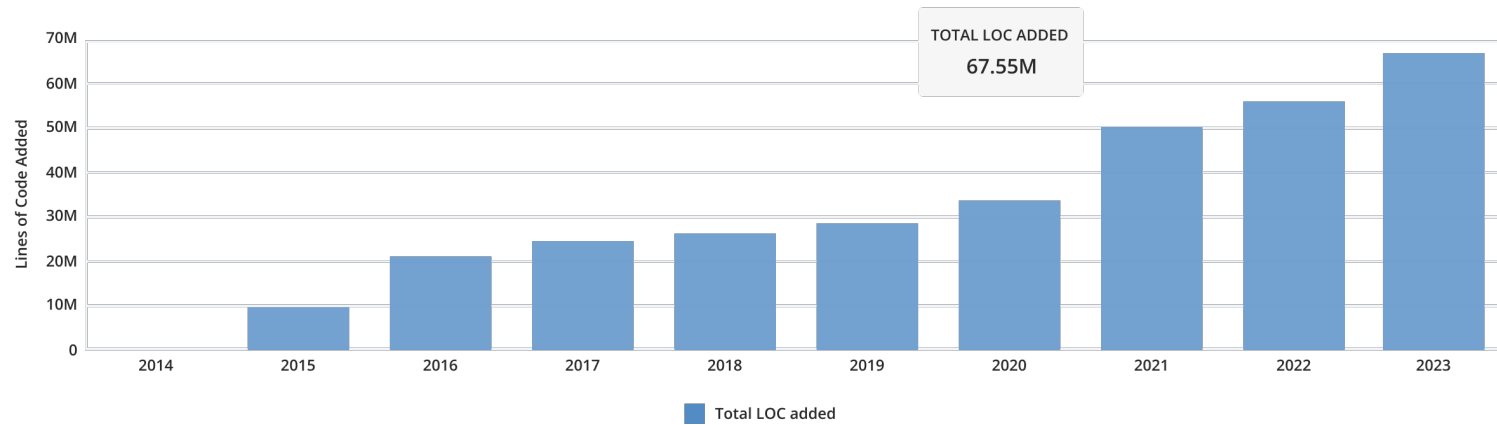
Industry Impact

LF Energy grew its online presence significantly in 2023, including followers, impressions, engagements, and clicks on LinkedIn and X/Twitter, and video views on YouTube. In the press, LF Energy was featured in 104 articles in 2023 — up from 18 in 2022.
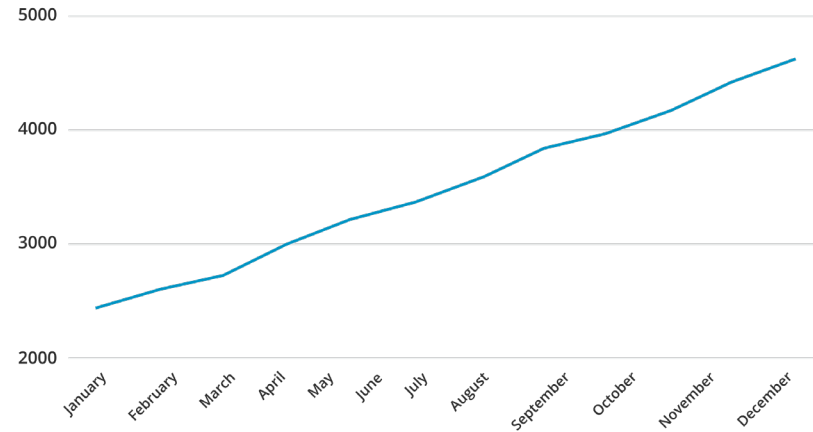
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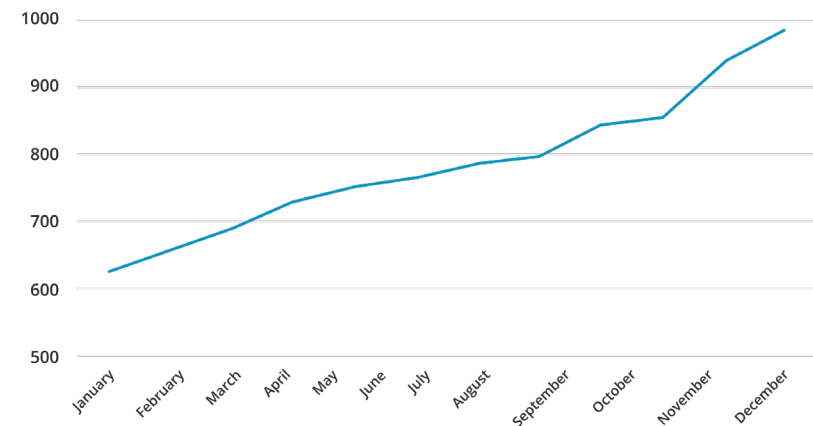

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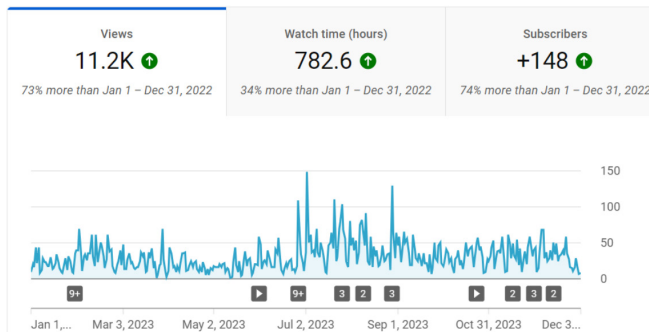
LinkedIn Growth (2022-2023) in

LinkedIn Followers

X/Twitter Growth (2022-2023) X

Twitter/X Followers

Why LF Energy

From mitigating vendor lock-in to fostering rapid innovation and ensuring robust security, open source stands as a reliable and future-proof vehicle for energy industry stakeholders seeking a dynamic, flexible, and sustainable technological foundation. Embracing open source is not just a paradigm shift; it is a strategic leap towards a resilient, adaptable, and innovative energy future.

Open source drives the following market forces:

- **Customizability:** Direct access to source code enables faster customization allowing users to match specific requirements

- **Security:** The transparency of open source systems means they are more secure than proprietary approaches as vulnerabilities are quickly identified and addressed

- **Speed of Innovation:** Open source developers get quickly onboarded into projects facilitated by documentation and straightforward development cycles with common tooling

- **Interoperability:** Open source interfaces and reference implementations facilitate interoperability and foster collaboration and compatibility between diverse solutions

LF Energy provides a pre-competitive platform to build the power systems of the future leading to 100% decarbonization. It connects members with the technical projects, innovative utilities, customer-centric suppliers, and developer communities that are transforming the energy sector. LF Energy enables you to reduce costs, speed innovation, and deliver greater value.

Get Involved

To be successful, we need the global energy ecosystem to get involved, contribute code, and help spread the word. We encourage you to sign up for a mailing list, join a committee, participate in discussions, contribute to a project, and stay informed about LF Energy news and events.

https://lfenergy.org/about/get-involved/

Benefits of Membership

- Get a seat at the table to influence the strategic direction of LF Energy and the projects that will shape the future of energy

- Accelerate innovation and increase market opportunity by sharing the burden of non-differentiating commodity software (an R&D Multiplier)

- Achieve vendor and hardware interoperability that allows you to solve for complexity while creating and maximizing value

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