

Membership Overview

This deck is available in your [LFX Organizational Dashboard](#)



What is LF Energy?

LF Energy is the community for digital experts to collaborate on open industrial-grade technology platforms and agile standards that accelerate the energy transition.

We are part of the Linux Foundation, the largest shared technology investment in the world.



Where does LF Energy fit?

We complement existing collaborative efforts by focusing on:

- **Open collaboration**, following the best practices used by the most innovative organizations in the world
- **High Technology Readiness Level** (TRL) projects, hardened and ready for deployment
- **Partnership between vendors and their customers** to create commercial solutions on top of open platforms
- **A community for digital experts** (software engineers, data scientists, etc) working in energy



For energy, open source benefits by market segment

As a system operator / utility

- Advocate for open interoperable solutions as part of your procurement process
- Partner with your vendors and peers to co-develop solutions

Benefits: shared costs, better code quality, interoperability, transparency, less lock-in

As a vendor

- Co-develop open shared foundations to ease system integration and focus on high value components and services

Benefits: respond better and faster to your customer needs, out-innovate your competitors, less integration burden

As an R&D institution (academia, national lab)

- Structure your projects using open-source best practices from the very beginning
- Collaborate with vendors and utilities

Benefits: better long-term impact and path to market, align your work with industry needs

As a regulator / funding agency

- Encourage reference implementations, open standards, open source procurement
- Leverage open innovation as a sustainable path to market for R&D projects

Benefits: transparency, lower tariffs, more impact from public R&D funding

QLF ENERGY

Members

Strategic (6)



General (21)



Associate (41)





Projects



LF Energy Landscape

lfenergy.org

1,343 projects,
market cap of
\$7.5T and
funding of
\$17B.



lfenergy.org

LF Energy Landscape
1.0

See the interactive landscape at lfenergy.org

LF ENERGY Landscape

LF ENERGY Landscape is a community-driven initiative where various entities, innovators, and others can use it as a resource to connect with each other and the ecosystem.

lfenergy.org

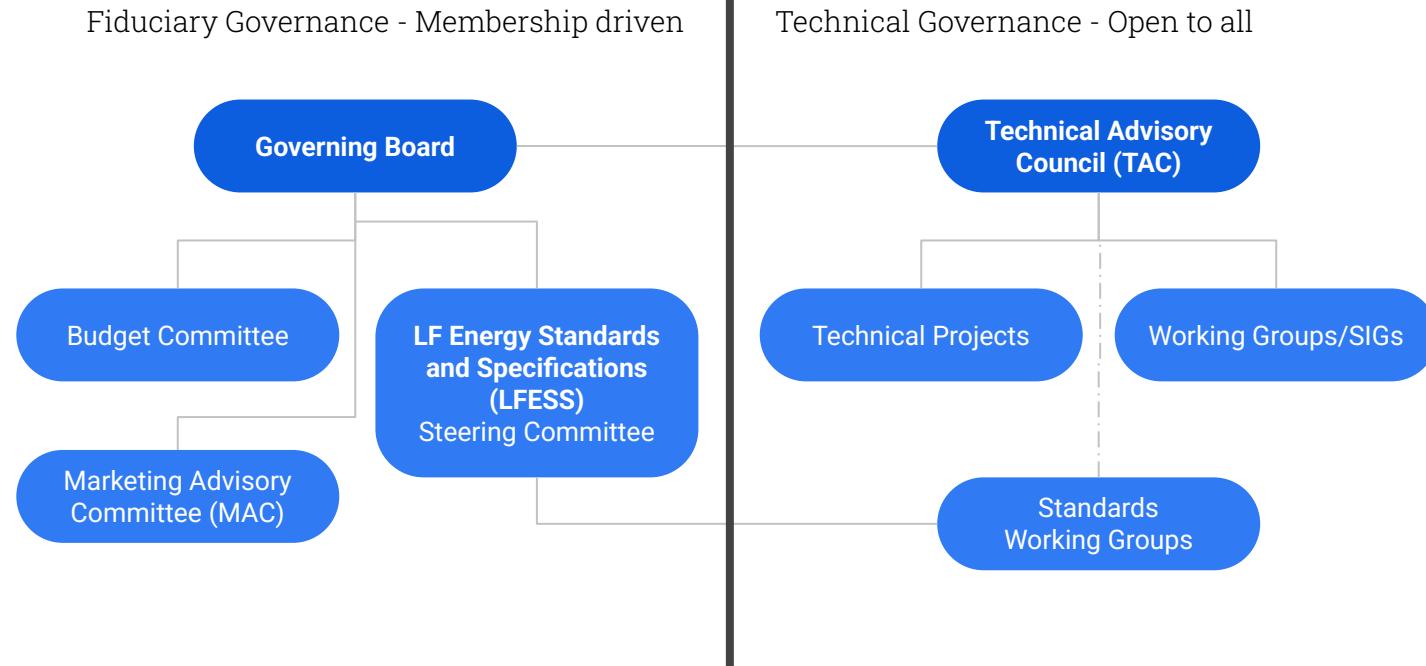
The LF Energy Landscape is a comprehensive map of energy-related projects, companies, and organizations. It is organized into several categories:

- Photovoltaics and Solar Energy**: Projects like SunPower, First Solar, Q CELLS, Trina Solar, and REC.
- Wind Energy**: Projects like Vestas, GE Renewable Energy, Siemens Gamesa, and Enercon.
- Hydro Energy**: Projects like Dams, Hydro One, and Hydro-Quebec.
- Geothermal Energy**: Projects like Ormat Technologies and Geodynamics.
- Bioenergy**: Projects like Bio-Logix and Bio-Logix.
- Reversible Energy**: Projects like Tesla Powerwall and GridX.
- Battery**: Projects like LG Chem, Samsung SDI, and CATL.
- Hydrogen**: Projects like Air Liquide, Linde, and Shell.
- Energy Storage**: Projects like AEGIS, GE, and Siemens.
- Modeling and Optimization**: Projects like OpenEI, GridX, and GridX.
- Monitoring and Control**: Projects like OpenEI, GridX, and GridX.
- Distribution and Grids**: Projects like OpenEI, GridX, and GridX.
- Datasets on Energy Systems**: Projects like OpenEI, GridX, and GridX.
- Buildings and Heating**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Mobility and Transportation**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Production and Industry**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Computation and Communication**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Consumption of Energy and Resources**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Carbon Intensity and Accounting**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Carbon Capture and Removal**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Emission Observation and Modeling**: Projects like EnergyGlobe, EnergyGlobe, and EnergyGlobe.
- Atmosphere**: Projects like NASA, NOAA, and USGS.
- Oceansphere**: Projects like NOAA, USGS, and USGS.
- Cryosphere**: Projects like NASA, USGS, and USGS.
- Hydrosphere**: Projects like NOAA, USGS, and USGS.
- Terrestrial Ecosystem**: Projects like NASA, USGS, and USGS.
- Earth Systems**: Projects like NASA, USGS, and USGS.
- Earth and Climate Modeling**: Projects like NASA, USGS, and USGS.
- Radiative Transfer**: Projects like NASA, USGS, and USGS.
- Metabolical Processes and Feedbacks**: Projects like NASA, USGS, and USGS.
- Climate Data Processing and Access**: Projects like NASA, USGS, and USGS.
- Integrated Assessment**: Projects like NASA, USGS, and USGS.
- Nature Reserves**: Projects like NASA, USGS, and USGS.
- Air Quality**: Projects like NASA, USGS, and USGS.
- Water Supply and Quality**: Projects like NASA, USGS, and USGS.
- Soil and Land**: Projects like NASA, USGS, and USGS.
- Agriculture and Nutrition**: Projects like NASA, USGS, and USGS.
- Natural Hazard and Disasters**: Projects like NASA, USGS, and USGS.
- Sustainable Development**: Projects like NASA, USGS, and USGS.
- Sustainable Investment**: Projects like NASA, USGS, and USGS.
- Knowledge Platforms**: Projects like NASA, USGS, and USGS.
- Data Catalogs and Interfaces**: Projects like NASA, USGS, and USGS.
- Curated Lists**: Projects like NASA, USGS, and USGS.

Governance

QLF ENERGY

Governance at a Glance



Governing Board overview

Comprised of one (1) voting representative from each Strategic LF Energy member, two (2) annually elected General member, the TAC Chairperson, the Governing Board's responsibilities include:

- Deciding on strategic business orientations, approving budget and new projects
- Electing a Chair to preside over Governing Board meetings, authorize expenditures approved by the budget and manage any day-to-day operations
- Overseeing all Project business, marketing, outreach and trademark matters



Governing Board voting representatives



Lucian Balea

Chair

Open Source
Program Director
RTE (Reseau de
Transport
d'Electricite)



Antonello Monti

TAC Representative

Professor
RWTH Aachen
University



Arjan Stam

Treasurer

Value Stream Lead
Alliander



Bryce Bartmann

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



**Christophe
VILLEMÉR**
General Member
Representative
Executive Vice
President
Savoir-faire Linux



Jordan Hughes
Senior Software
Engineer
Apple Inc.



Marco Möller
General Member
Representative
CEO
Pionix GmbH



**Savannah
Goodman**
Data and Software
Climate Solutions
Google LLC



**Sébastien
Lussier**

R&D Manager of
Information
Systems and High
Performance
Computing
Hydro-Québec

Appointing your Governing Board representative

(*Strategic Member benefit*)

As a Strategic Member, you are entitled to appoint a representative from your organization to serve on the Governing Board.

Expectations of this role:

- Attend monthly Governing Board meetings (1st Wednesday of the month at 8:00 am US Pacific Time)
- Participate in membership recruitment activities, including monthly membership pipeline review call.
- Be available from time-to-time for strategic discussions and calls.

ACTION: To appoint your representative, please file a request at members.lfenergy.org, and have the representative create an [LF ID](#).

You can change your representative at any time by making a request at members.lfenergy.org.

Governing Board representative election (General Member benefit)

Per the [LF Energy charter](#), Section 2(c):

General Members, acting as a class, will be entitled to annually elect one representative to the Governing Board for every ten General Members, up to a maximum of three representatives, provided that there will always be at least one General Member representative, even if there are less than ten General Members. The Governing Board determines the election process.

The General Member class elects new representative(s) during the month of June to serve a term from July 1st through June 30th the following year.

ACTION: Look for details regarding the election in April/May.
If you have any questions about this process or the role, please contact us at members.lfenergy.org.



CEO AT PIONIX GMBH
Marco Möller



EXECUTIVE VICE PRESIDENT AT SAVOIR-FAIRE
LINUX

Christophe VILLEMER

Technical Advisory Council (TAC) overview

The TAC is the technical governance heart and soul of LF Energy. As new projects get contributed to LF Energy they get reviewed and approved by this committee.

TAC members consist of Strategic members as well as the project leads for all active projects. Anyone in the community can attend TAC meetings.

The TAC meets every 3 weeks on Tuesdays, and members are invited to attend these calls. Subscribe to the technical mailing list at lists.lfenergy.org/g/tac for more information and add the [TAC Meeting to your Calendar Now.](#)



Technical Advisory Council (TAC) voting representatives



Antonello Monti

Chair
Professor
RWTH Aachen
University



Art Pope

Member of
Technical Staff
Google LLC



Boris DOLLEY

Director of OSPO
and Sustainable IT
Strategy
RTE (Reseau de
Transport
dElectricite)



Bryce Bartmann

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



Clément Bouvier
Software engineer

RTE (Reseau de
Transport
dElectricite)



**Jonas van den
Bogaard**
Vice Chair

Open Source Office
Lead
Alliander



Maarten Mulder
PO IoT Field Device
Platforms

Alliander



Moise Kameni
Entreprise Architect
and Head of Open
Source Program
Office

Hydro-Québec



Sophie Frasneda
Software developer

RTE (Reseau de
Transport
dElectricite)



Travis Sikes
Data Science
Manager

Recurve



Yixing Xu
Senior Program
Manager, Energy
Strategy
Microsoft
Corporation

Appointing your TAC representative

(*Strategic Member benefit*)

As a Strategic Member, you are entitled to appoint a representative from your organization to serve on the TAC. Expectations of this role:

- Attend TAC meetings held every three weeks on Tuesday at 8:00am US Pacific Time.
- Be available to serve as a TAC mentor to new projects coming into LF Energy
- Participate in out of meeting discussions.
- Be available from time-to-time for strategic discussions and calls.

ACTION: To appoint your representative, please file a request at members.lfenergy.org, and have the representative create an [LF ID](#).

You can change your representative at any time by making a request at members.lfenergy.org.

LF Energy project lifecycle

- Projects can become part of LF Energy through the submission of a mature code base.
- Projects can also be formed through working groups or special interests groups that submit a proposal and then form as a project.
- Learn more at lfenergy.org/host-your-project



Marketing Advisory Committee (MAC)

Member Representatives (**bold** indicates voting member)

The MAC advises on marketing and communications strategies including events and campaigns.

The MAC is made up of representatives from all members. There is no cap on the number of committee members.

The MAC meets the 4th Thursday of each month at 7 am US Pacific, and members are invited to appoint a representative to attend these calls.

Recordings and minutes from prior meetings are [available publicly](#).

Name	Company/organization
Daniel Lazaro	AVEVA
Duncan Johnston-Watt / Csilla Zsigri	BTP
Jonas van den Bogaard	Alliander
Chris Xie (Chair)	Futurewei
Mark Caine	Google
Matt Fawcett	Carbon Co-op
Christophe VILLEMER	Savoir-faire Linux
VACANT	Microsoft
Louisa Durkin	Open Earth Foundation
Nate Kinsey	UtilityAPI
Kelli Littleton	WattCarbon
Aarthi Thyagarajan	Shell
Morten Småstuen	Statnett SF
Sheii Lindley	Recurve Analytics
Tim Krentz	Vanderbilt University
Jessica Ridlen	Utilidata
Ben Mosler	PIONIX GmbH
Katia Di Pace	Areti
Boris Dolley	RTE
Fabian Kolley	d-fine

Appointing your MAC representative

(*Open to all members*)

As an LF Energy Member, you are entitled to appoint a representative from your organization to serve on the MAC. Expectations of this role:

- Attend MAC meetings held the 4th Thursday of each month at 7 am US Pacific / 10 am US Eastern / 16:00 Central European Time
- Participate in out-of-meeting discussions.
- Be available from time-to-time for strategic discussions and calls.

ACTION: To appoint your representative, please complete this [form](#) (select “Marketing/PR” then “Add or Change Marketing Committee Member”).

You can change your representative at any time by making a request at the same link.

LF Energy staff

- [Alex Thornton](#), LF Energy Executive Director
- [Dan Brown](#), Marketing Director
- [John Mertic](#), Program Director
- [Yarille Ortiz](#), Sr. Project Coordinator



*Support requests for the staff can be made at
support.lfenergy.org.*

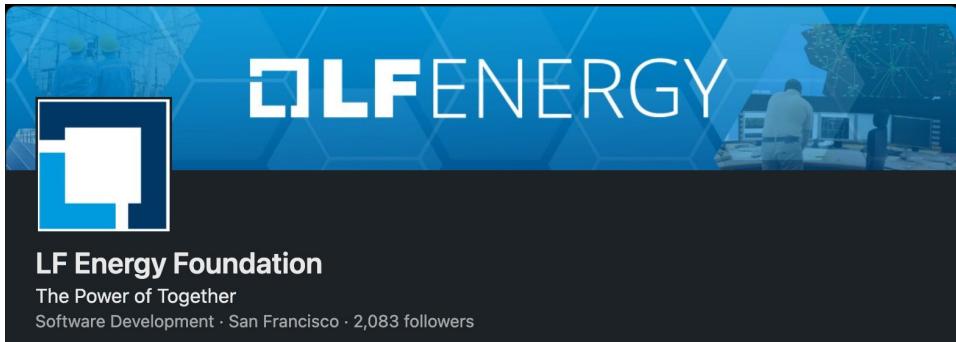
LFX Organization Dashboard

[LFX Organization Dashboard](#) provides access to key membership materials, including...

- Member contacts, which you can change at any time (look under 'Users' > and then under the 'Key People' tab)
- Membership details (look under 'Membership' > 'LF Energy Foundation'), including...
 - Membership Overview Deck and High Level Overview Deck (look under the 'Resources' tab)
 - Your fully executed membership agreement (look under the 'Membership' tab)
 - Details on how to leverage membership benefits (look under the 'Benefits' tab)
 - Insights on contributors from your organization (look under the 'Project Contributors' tab)

ACTION: Request access to LFX Organizational Dashboard [here](#).

Make sure you are following us on social!



Follow us on LinkedIn at
linkedin.com/company/lf-energy-foundation

And sign up for the [LF Energy newsletter](#) to keep up to date on project happenings

LF ENERGY



Leveraging your membership benefits



Announcing your membership

We will include your company in an upcoming momentum press announcement. These are typically done quarterly and timed around events for maximum impact.

ACTION: Please provide 1-2 sentences on your company, name of a spokesperson, and a quote to include in the press announcement. Submit request to members.lfenergy.org.

Please note that these announcements are often picked up by press and media, and there may be requests for briefings.

APR
11

LF Energy Adds New Software and Specifications Projects, Significantly Growing Membership

By LF Energy |

LF Energy, the open source foundation focused on harnessing the power of collaborative software and hardware technologies to decarbonize our global economies, announces five new software projects and 19 new Strategic, General and Associate members.

Read More

Marketing and Event Benefits

The LF Energy staff is here to help you get connected with hosted projects and other members, ensuring value for your investment in the LF Energy Foundation.

All members receive the following benefits:

- Support for member announcements and member PRs
- If member requests, LF Energy will provide quote for member press release or blog
- Logo on the website once your membership has been announced
- Discount on Event Sponsorship packages

ACTION: Contact us at members.lfenergy.org for more details.



You can get LF Energy member logos to use on your website and materials at artwork.lfenergy.org/other/lf-energy-member/

Participate in Standards Development

LF Energy Members can contribute to the specifications being driven under LF Energy Standards and Specifications by completing the membership agreement at joinnow.lfess.energy.

- As an LF Energy Strategic Member, you receive representation on the LFESS Steering Committee
- As an LF Energy General Member, you can run for election to serve on the LFESS Steering Committee.

More information on LFESS Governance at
<https://github.com/lf-energy/lfess-resources/blob/main/GOVERNANCE.md>



Additional Benefits for Strategic Members

Strategic members are key partners in driving the direction of the LF Energy Foundation, and we partner closely with in driving the mission and vision of the foundation.

Exclusive benefits for Strategic members include:

- Send signal that you are committed and serious about the energy transition and 100% planetary decarbonization
- Guaranteed seat on the LF Energy Governing Board and LF Energy Technical Advisory Council, where your organization can shape where funds are directed, direction of project investments, branding, messaging, PR, marketing, developer events, training
- Placement of member brand at forefront of LF Energy web properties and promotion in top news outlets
- Participation in Linux Foundation Member Summit (Additional Seat)
- Direct assistance with your open source strategy activities, and R&D portfolio, with premium access to the project ED to understand business goals help you succeed in those goals any way possible and premium access to the LF Energy open source leadership to advise member of advancing brand leadership worldwide in open source
- LF Leadership support to keynote member events, participate in outreach (eg roadshows, events, conference meet ups etc.)
- Priority for hosting LF Energy Roadshows and meetups at the location of their choice
- 2x guest blog pieces on LF Energy blog

ACTION: Contact us at members.lfenergy.org for more details.



Current Strategic Members



Contact Us

Linux Foundation Energy

548 Market St
PMB 57274
San Francisco CA 94104
Phone/Fax: +1 415 723-9709
www.lfenergy.org

General Inquiries

support@lfenergy.org

Membership

membership@lfenergy.org

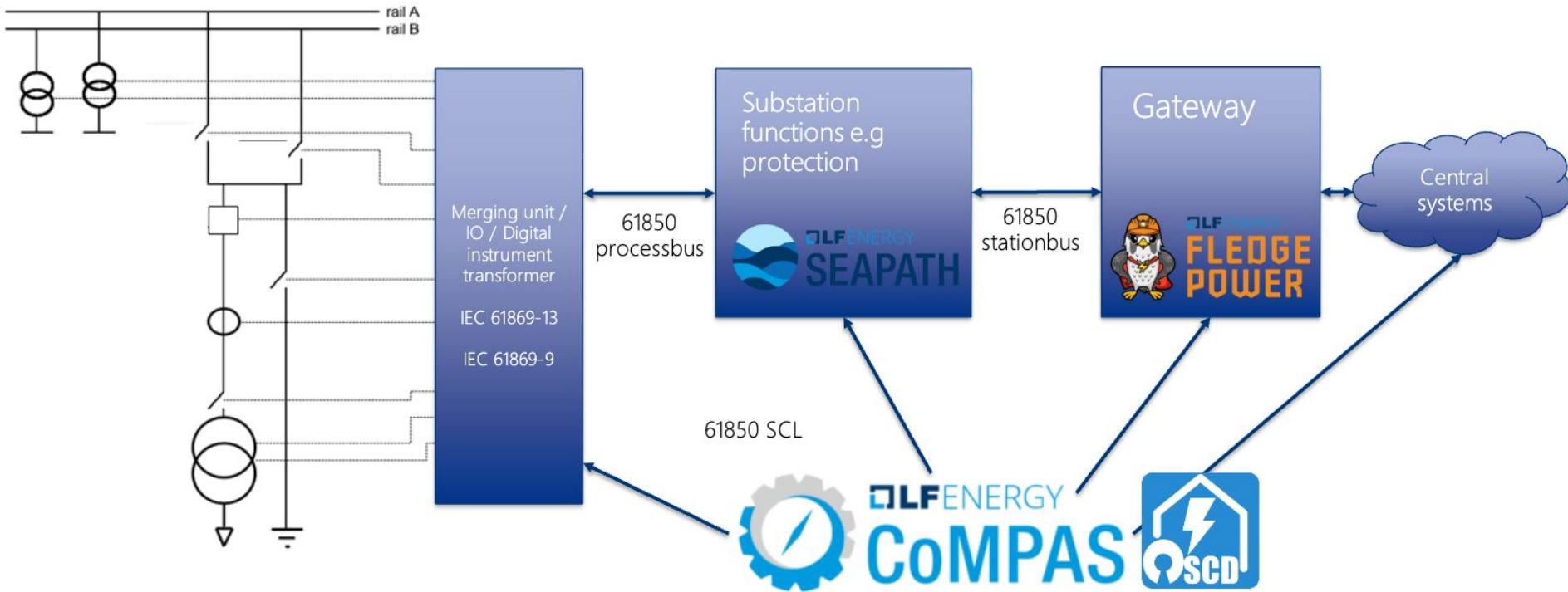


Projects in Detail

QLF ENERGY

Digital Substations

Digital Substation Architecture





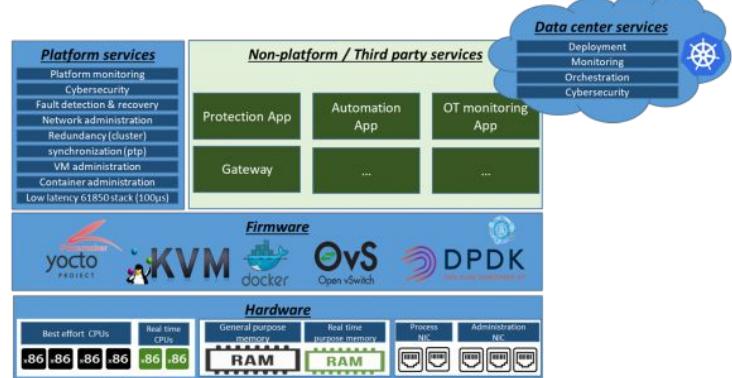
Real-time platform that can run virtualized automation and protection applications

Early Adoption

"Reference design" and "industrial grade" open source real-time platform that can run virtualized protection, automation and control applications.

Meets the high requirements of substation reliability, performance and availability.

- **Hosting of virtualization systems:** a heterogeneous variety of virtual machines can be installed and managed on the platform.
- **High availability and clustering:** machines on the cluster are externally monitored in order to guarantee the high availability in case of hardware or software failures.
- **Distributed storage:** data and disk images from the virtual machines are replicated and synchronized in order to guarantee its integrity and availability on the cluster.
- **Intelligent virtual network:** the virtualisation platform is capable of configuring and managing the network traffic in a data layer level.
- **Administration:** system can be easily configured and managed from a remote machine connected to the network as well as by an administrator on site.
- **Automatic update:** the virtualisation platform can be automatically updated from a remote server.



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Learn more at seapath.energy | [GitHub](https://github.com/lf-energy/seapath) | [Video](#)

Contributions and adoption by



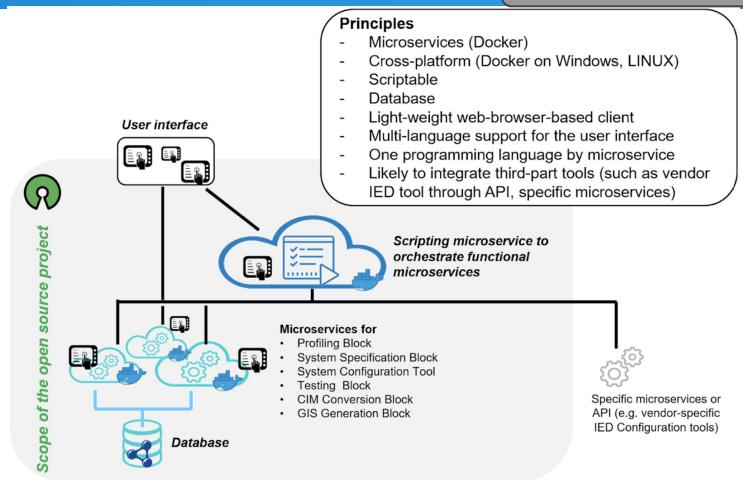
Profile management and configuration for IEC 61850 protection, automation and control systems

Incubation

Common software blocks for IEC 61850 profile configuration, using an open source shared development model, accelerating conformity to IEC 61850 through software implementation.

Primary use cases:

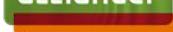
- Tools for IEC 61850 profile management and configuration are needed at various business processes of the power grid industry
- The planning process for grid infrastructure components facilitates the design of power system adaptations and the engineering of substation PACS to be installed or upgraded
- Specifying requirements and performing multi-vendor system integration and commissioning during the PACS procurement and delivery phase
- Adapting to changes in operational conditions and performing system configuration updates during the operational life of PACS
- Managing assets in order to perform maintenance actions and PACS upgrades
- Improving the interlinkage between grid planning and PACS engineering processes
- Improving the interlinkage between the configuration of PACS and the configuration of central systems, including SCADA and asset management



Learn more at compas.energy | [GitHub](#) | [Video](#)

Contributions by

allianz



OMICRON



RTE

SPRINTEINS

TRANSNET BW





Multi-protocol translation gateway for power systems based on the industrial IoT LF Edge project Fledge

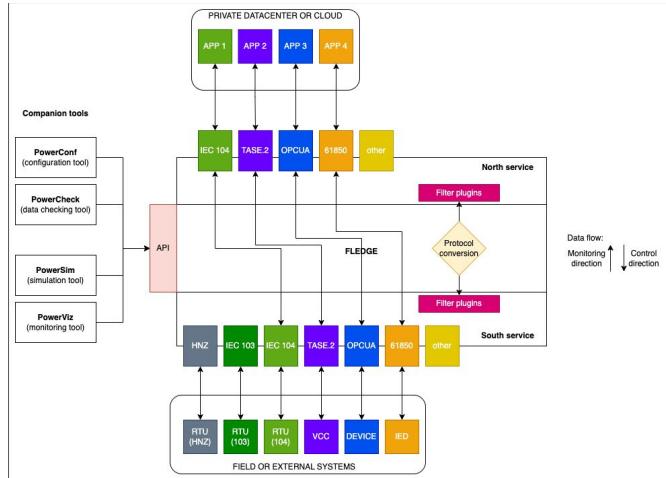
Incubation

Flexible, lightweight, industrial-grade, open source gateway that embeds Fledge (LF EDGE). Additionally, FledgePOWER provides a toolbox for simulation, data configuration, and checking focused uniquely on power systems' protocols translation and power systems' use cases.

Features: lightweight, extensible, modular, flexible, scalable, secured, interoperable

Use cases:

- Improving the availability of an IEC 104 substation by deploying FledgePower with multi-centre IEC 104 redundancy.
- Securing an old generation substation in HNZ protocol, by deploying FledgePower with IEC 104 over TLS.
- Power grid simulation, using FledgePower to integrate with the substation in IEC 104 on the one hand and the simulation system in OPCUA on the other.



Learn more at fledgepower.energy | [GitHub](https://github.com/LF-Energy/FledgePower) | [Video](#)

Contributions and adoption by



EV Charging





Open source modular framework for EV chargers

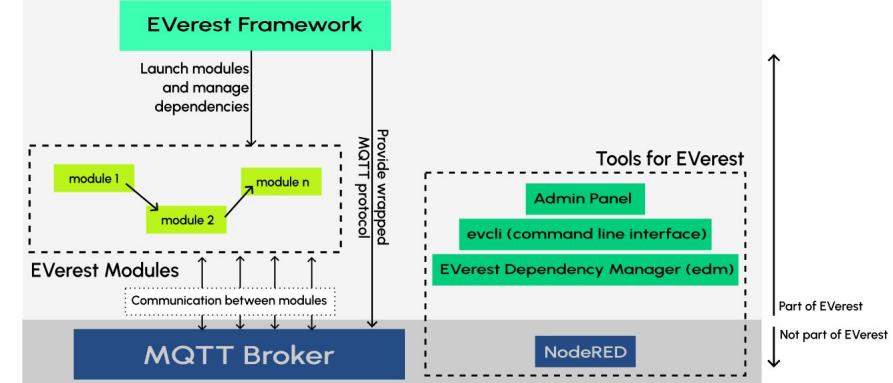
Early Adoption

Software for EV chargers with implementations of:

- communication protocols
- software modules for representations of hardware devices (chargers, cars, etc.)
- tools for simulating the charging process

By digitally abstracting the complexity of multiple standards and use cases, EVerest runs on any device, from unmanaged AC home chargers to complex multi-EVSE satellite public DC charging stations with battery and solar support.

EVerest supports all protocols needed to facilitate frictionless and reliable charging.



Learn more at everest-project.energy

[Documentation](#) | [GitHub](#) | [Video](#)

Contributions by





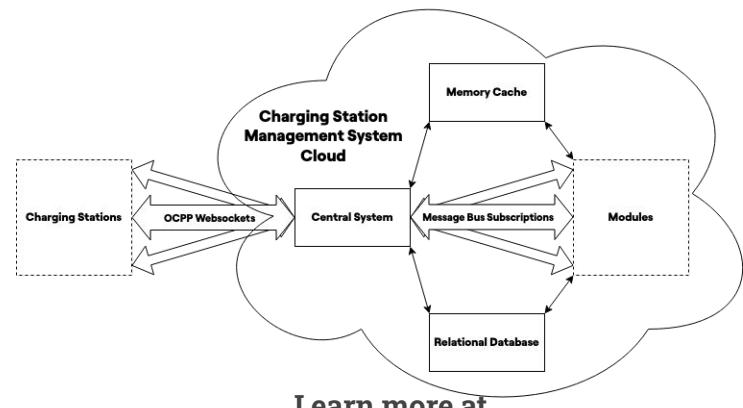
Open source charger network software for rapid OCPP 2.0.1 and NEVI compliant EV charge management

Sandbox

The primary goal of CitrineOS is to develop and maintain an open source Charging Station Management System (CSMS) software stack.

CitrineOS is developed having modularity and extensibility in mind. It consists of logically separated modules, each encapsulating a subset of functionality pertaining to the definitions of OCPP 2.0.1 – the standard protocol for communication between charging stations and charge management software.

All modules handle and emit all necessary OCPP messages and are loosely coupled by a message broker interface connecting them to a central component that relays the messages to the charging station and vice versa.



Learn more at

<https://lfenergy.org/projects/citrineos/> | [GitHub](#)

[Video](#)

Contributions by



Data Standards and Tooling



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

Incubation

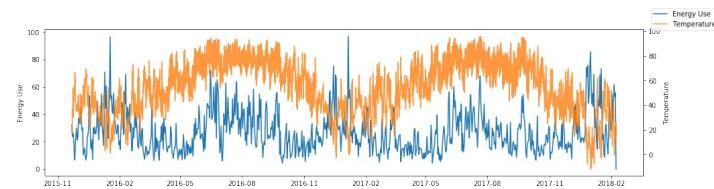
Top Use Cases

OpenEEmeter, as implemented in the eemeter package and its companion eeweather package, contains the most complete open source implementation of the [CalTRACK methods](#), which specify a family of ways to calculate and aggregate estimates avoided energy use at a single meter particularly suitable for use in pay-for-performance (P4P) programs

Technical Summary

OpenEEmeter emphasizes consistency and replicability to facilitate payments and market transactions that may be take the energy savings outputs of the software as inputs.

Project contributed by [Recurve](#)



Learn more at [openeemeter.energy](#) | [GitHub](#) |

[Video](#)

Contributions by

RECURVE

WattCarbon





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

[Sandbox](#)

Design: One key challenge arises from the lack of open source battery data and a standardized method to access existing datasets. As a result, companies often find themselves engaged in redundant efforts concerning data collection and conversion.

Testing: Many companies manually configure their testing equipment. There is a gap in the market between available testing standards and the actual execution of tests.

Manufacturing: Variations in battery data structures across manufacturers lead to unnecessary complexities in schema design and data conversion leading to inefficiencies and barriers for collaboration.

Telemetry: The area of battery telemetry remains largely unexplored from an open-source perspective. There is untapped potential for development and growth in this area.

Learn more at

<https://lfenergy.org/projects/battery-data-alliance/>

Contributions by



BattGenie.





OpenSynth

Open community designed to democratize synthetic data

[Sandbox](#)

The initial focus for the community includes:

- Defining what comprises 'good' synthetic data (to include how synthetic data in energy might be evaluated for common concepts such as privacy, fidelity and utility)
- Developing an open repository for synthetic smart meter data and algorithms
- Encouraging community members to contribute data by using our initial algorithms

Learn more at

<https://lfenergy.org/projects/opensynth/>

Contributions by



Centre for Net Zero

Powered by Octopus Energy



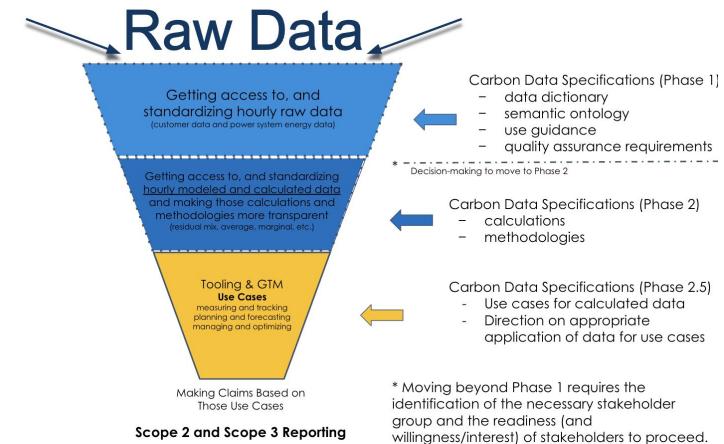
Specifications for the underlying measured/raw data used to calculate energy and carbon-related metrics.

Use Cases

- Customer data. This may include, but is not limited to:
 - Metering consumption and production data
 - Account and bill data needed for project analysis
 - Authorization and consent processes
- Power systems data. This may include, but is not limited to:
 - Power generation emissions
 - Delivery capacities and/or constraints
 - Generation mix
 - Power imports and exports
 - Power market data
 - Contractual data

Technical Summary

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.



Learn more at carbondataspec.org | [GitHub](https://github.com/CarbonDataSpecification)

Contributions by





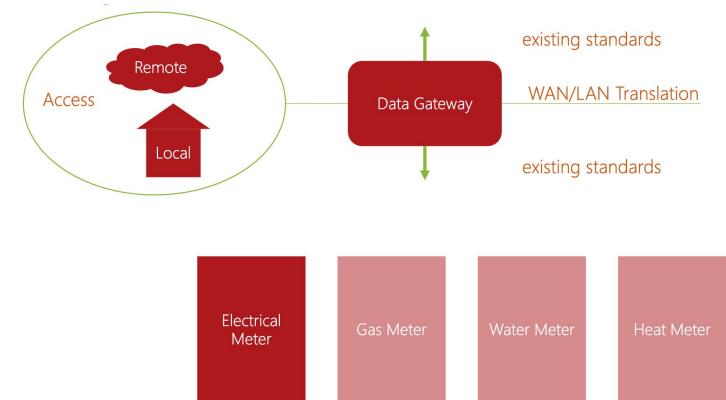
Worldwide applicable meter and respective data gateway specification

Use Cases

- Basic metering functionality
- Country-specific functionality
- Third party functionality and integration capability for system operation applications

Technical Summary

Standards collaboration



Learn more at superadvancedmeter.energy |
[GitHub](#) | [Video](#)

Contributions by



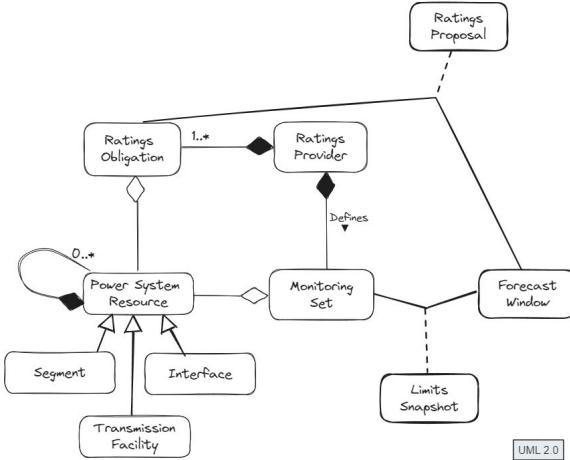


Accelerating the implementation of interoperable systems for the exchange of transmission facility ratings

With FERC Order 881, North American Transmission Owners, Transmission Operators, Transmission Providers, and Reliability Coordinators must establish a means to exchange ratings information based on current and forecasted ambient conditions.

The project's specific aims are:

- Define API specification for the exchange of ratings and ratings-related information to support organizations working to comply with FERC Order 881.
- A conformance program that emulates that Zowe Conformance Program or the Certified Kubernetes Conformance Program insofar as they give vendors a means to demonstrate their conformance to the above specification and signal their commitment to maintaining their conformance over time.
- An open commons for the development of clients of the API specification.



Learn more at <https://itenergy.org/projects/tolie/>

| [Documentation](#) | [GitHub](#) | [Video](#)

Contributions by



Grid Operations



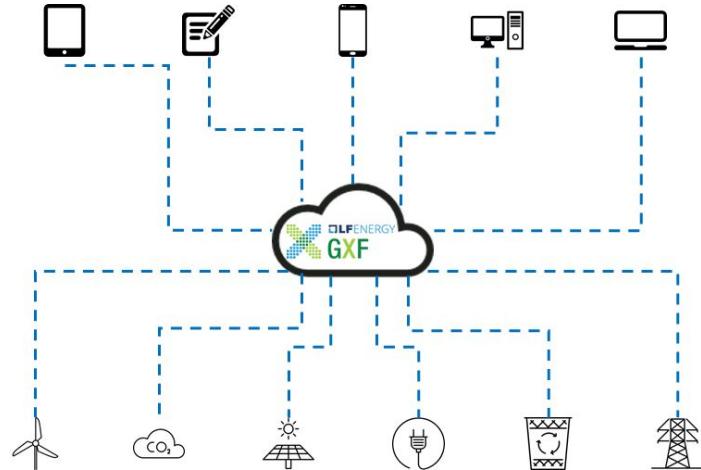


Industrial IoT backend that enables hardware monitoring and control at scale

Early Adoption

GXF provides several functions out of the box and provides scalability & high availability, high security, a generic design, and no vendor lock-in. GXF is currently deployed in several public use cases, including microgrids, smart metering, public lighting, and distribution automation.

GXF can be deployed to multiple servers or distributed over multiple data centers in an active-active setup so that even if one data center fails, no data or functionality is lost. In a cloud-hosted setup, it is possible to use auto scaling to automatically add or remove servers on any of the platform layers to scale the platform to the current load and use. Servers can automatically be scaled up and down when necessary, thereby reducing hardware costs. This setup can also be used to minimize the costs during the phased rollout of smart devices.



Learn more at gxf.energy | [GitHub](#) | [Video](#)

Contributions by



Modular, extensible platform for alert management for systems operators

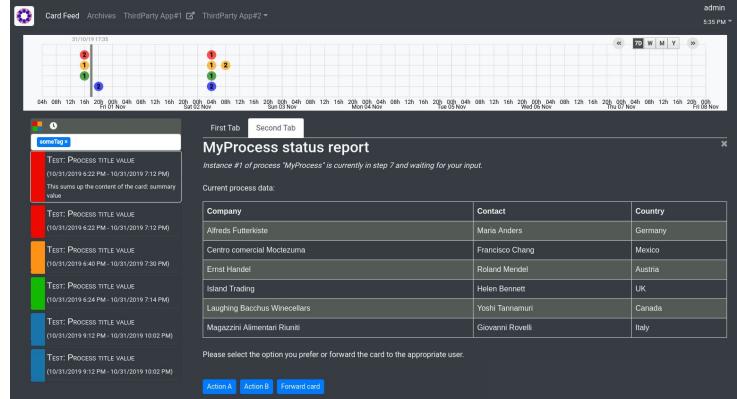
Early Adoption

Top Use Cases

- Electricity, water, and other utility operational dashboard for managing field devices and alert response
- Organizational power system coordination, visibility, communication, and workflow between distributed users across national and regional boundaries.

Technical Summary

- Written in Java and based on the Spring framework



Learn more at operatorfabric.energy | [GitHub](https://github.com/operatorfabric/operatorfabric) |

[Video](#)

Contributions by



Microservice based architecture for distribution grid automation

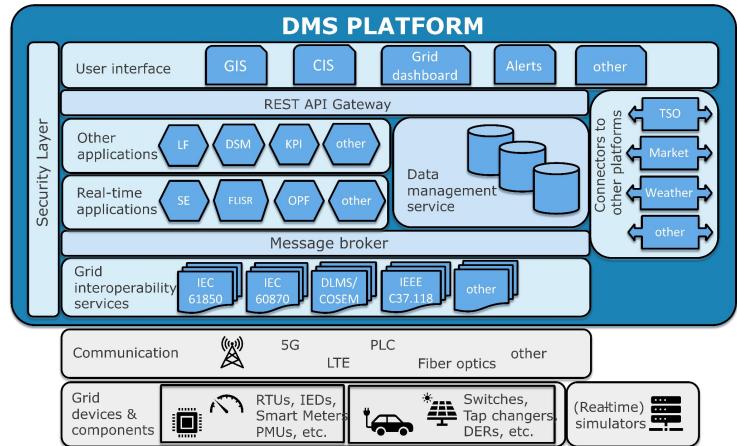
Early Adoption

Top Use Cases

- State Estimation
- Load Prediction
- Voltage Control

Technical Summary

- Microservices architecture; designed to be deployed using Kubernetes, either in the cloud or at the edge
- Seamless integration of development, testing, and deployment enables new automation functionalities to be developed and thoroughly tested against a virtual real-time representation of the power system before deployment.
- Developed under European Union's Horizon 2020 research and innovation programme under grant agreement No 774613, and open sourced by RWTH.



Learn more at sogno.energy | [GitHub](#) | [Video](#)



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

Top Use Cases

The problem it helps to solve is “What are the best times to run flexible assets, like batteries, heat pumps or industry processes?”

- Industry: Shift process running times to minimize balancing costs as well as CO₂ & support network congestion
- Built Environment: Optimize heating to satisfy comfort and energy costs (use rooftop solar & dynamic tariffs)
- E-Mobility (optimal charging time to lower bills, including vehicle-to-grid)

Technical Summary

FlexMeasures is designed to be developer-friendly, which helps you to go to market quickly, while keeping the costs of software development at bay.

FlexMeasures supports:

- Real-time data integration & intelligence
- Model data well – units, time resolution & uncertainty (of forecasts)
- Faster app-building (API/UI/CLI, plugin & multi-tenancy support)

Incubation



Learn more at flexmeasures.energy | [GitHub](https://github.com/flexmeasures)

Contributions by



Seita



DLF ENERGY

SHAPESHIFTER

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

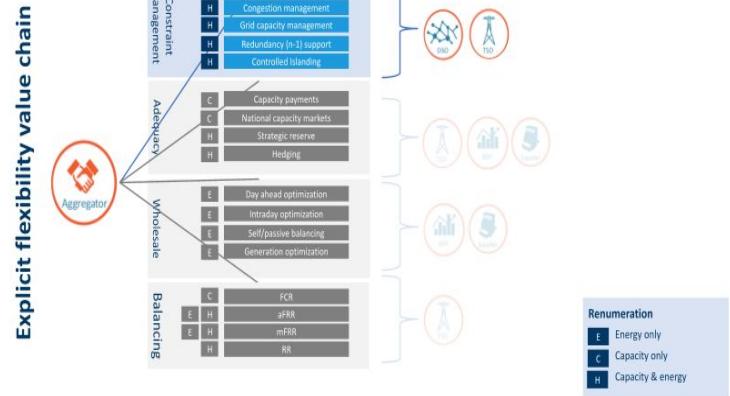
Incubation

Top Use Cases

- Exchange of flexibility between aggregators (AGRs) and distribution system operators (DSOs) or between aggregators and transmission system operations (TSOs).
- Enables DSO and TSO to resolve grid constraints by applying congestion management or grid capacity management

Technical Summary

- Based on the market-based coordination mechanism (MCM) described by USEF



Learn more at shapeshifter.energy | [GitHub](https://github.com/shapeshifter-energy) |

[Video](#)

Contributions by



GOPACS



Easy access to high volume, historical and real time process data for analytics applications, engineers, and data scientists wherever they are.

Use Cases

- Process time series data for preventive maintenance management

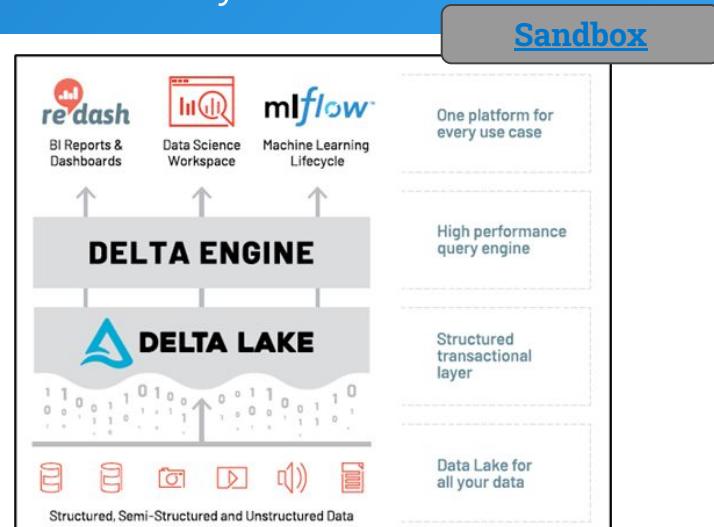
Technical Summary

Key components are:

- The Delta Ingestion engine used to process streaming data from streaming sources and files stored in cloud storage into Delta format. The data ingested is typically sourced from Pi Historians, OPC UA Servers, IoT Devices 2.
- Python SDK that enables data consumers to read and query raw, sampled, interpolated or time weighted averages of the data stored in Delta3.
- REST APIs that are wrappers for the Python SDK that enable developers in non-python languages to consume the data

Contributed by [Shell](#)

OLF ENERGY



Learn more at [rtdip.io](#) | [GitHub](#) | [Video](#)

Contributions by



Grid Simulation and Modeling



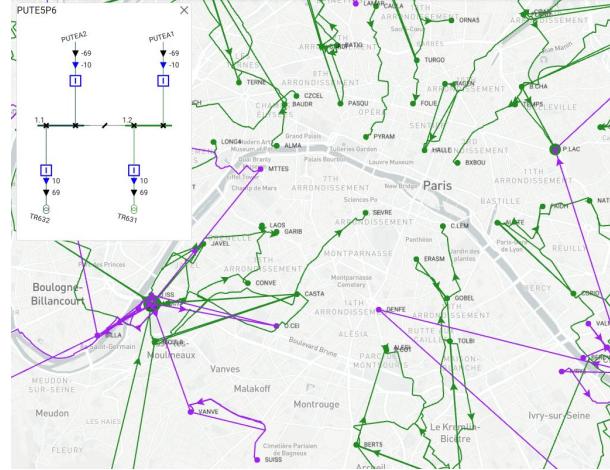
Early Adoption

Top Use Cases

- Dynamic power flow simulations and security analyses across a power grid
- Data exchanges using a variety of formats including ENTSO-E CIM/CGMES, UCTE-DEF, and more.

Technical Summary

- Written in Java
- Can be used for one-off scripting and scale up to production application usage.



Learn more at powsybl.energy | [GitHub](https://github.com/powsybl/powsybl) | [Video](#)

Contributions by



Artelys
OPTIMIZATION SOLUTIONS



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

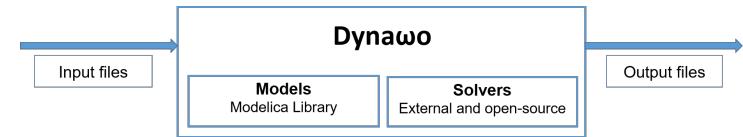
Incubation

Top Use Cases

- Power system simulations
- Decision making on operational grid needs

Technical Summary

- Hybrid C++/Modelica codebase



Learn more at

<https://lfenergy.org/projects/dynawo/> | [GitHub](#)

[Video](#)

Contributions by



Predict future load on the electricity grid using machine learning

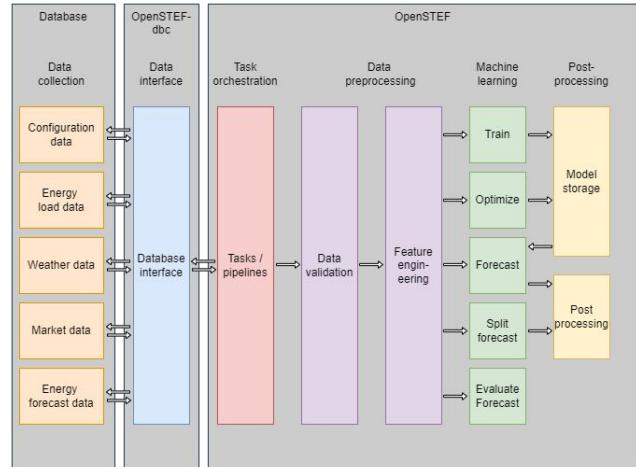
Incubation

Top Use Cases

- Forecasting load at the DSO/TSO interface
- Forecasting load for the DSO to perform congestion management
- Forecasting load on secondary substations or individual customers to facilitate smart-grid applications

Technical Overview

- OpenSTEF validates input data, uses external predictors such as weather and market prices, trains machine learning models, and provides a forecast via API and graphical user interface.
- The stack is based on open source technology, organized in a microservice architecture, and optimized for cloud-deployment.



Learn more at openstef.energy | [GitHub](https://github.com/alliander/OpenSTEF) | [Video](#)

Contributions by



High performance distribution grid calculation model

Incubation

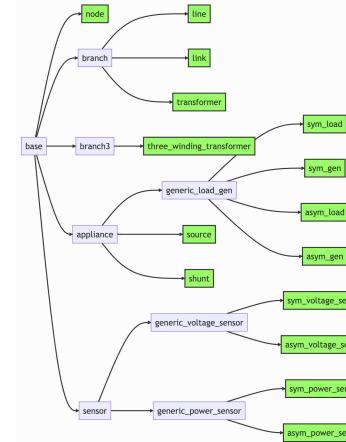
Top Use Cases

- Short term real-time state estimation and forecasting
- Long term grid planning
- Congestion management

Technical Summary

Power Grid Model has a C++ calculation core with a mature C-API and Python API. Currently, it supports the following calculations:

- Symmetric and asymmetric power flow calculations
- Symmetric and asymmetric state estimation with iterative linear method



Learn more at powergridmodel.energy | [GitHub](#) | [Video](#)

Contributions by





Simulation and analysis tool that models emerging smart grid energy technologies

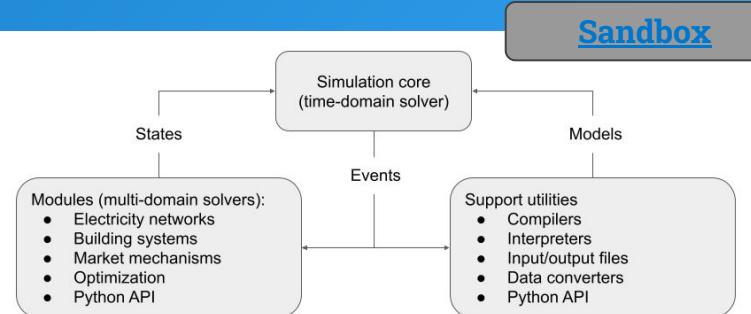
Top Use Cases

- Distributed energy resource hosting capacity, tariff design, and end-use load electrification
- Extreme weather resilience and wildfire safety and protection,
- Peer-to-peer energy and advanced load modeling and forecasting.

Technical Summary

- Originally called HiPAS GridLAB-D.
- Primarily built in C++ and Python.

Project contributed by California Energy Commission and US Department of Energy Cybersecurity Energy Security and Emergency Response Office



Learn more at arras.energy | [Website](#) | [GitHub](#)

Contributions by





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

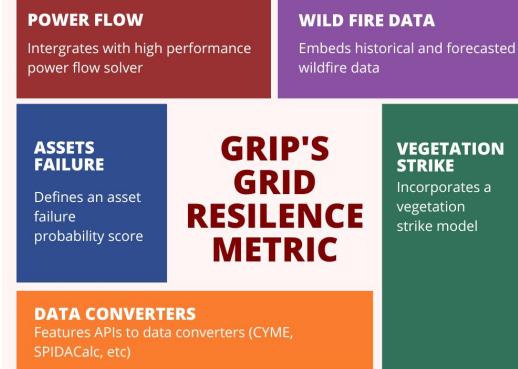
[Sandbox](#)

GRIP uses telemetry data to identify infrastructure most at risk from severe weather. One of the key strengths of GRIP is its threat-agnostic grid modeling capabilities. Regardless of the type of extreme weather event, if telemetry data is available regarding the failed asset, GRIP's system modeling capabilities can provide actionable insights to the grid operator.

Use cases:

- Anticipating grid events using machine learning and artificial intelligence techniques with diverse data sources.
- Absorbing grid events by employing validated control strategies for distributed energy resources; and
- Reducing recovery time by managing distributed energy resources in the case of limited communications.

With GRIP, electrical utility operators can reduce operating costs by optimizing grid hardening costs and lowering liability costs and shareholder exposure. These grid operator benefits will ultimately lead to lower electricity rates for customers.



Learn more at <https://www.grip.energy/> | [GitHub](#) | [Website](#)

Contributions by

SLAC NATIONAL ACCELERATOR LABORATORY

aws



SOUTHERN CALIFORNIA EDISON
Energy for What's Ahead™
Pacific Northwest NATIONAL LABORATORY

HITACHI

Enable grid operators - and the customers they serve - to more easily see when and where connections will be most optimal

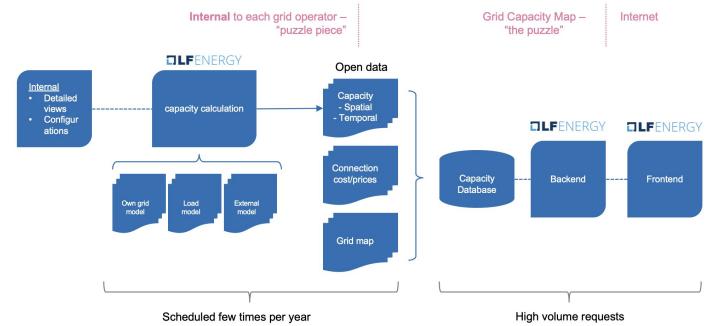
Sandbox

Top Use Cases

- Ensure customer and stakeholders expectations on grid connections are realistic to give a better connection experience with fewer surprises for both grid owner (DSO/TSO), grid customers and other stakeholders.
- Giving a utility ability to advise a company to move locations to get connection sooner.

Technical Summary

- Built in Python; using the [panda power](#) grid model and power flow calculation



Learn more at [gridcapacitymap.energy](#) | [GitHub](#)

Contributions by

VATTENFALL 



OLF ENERGY

covXtreme

Model and software for hazard risk analysis of extreme events

[Sandbox](#)

Hazard risk analysis often involves modelling extreme events, for example of natural phenomena such as rainfall, temperature and ocean waves, or of man-made systems such as industrial processes and stock-markets. We seek to understand the characteristics of the most exceptional (largest or most rare) events we have seen historically, and potentially might see if we look harder.

covXtreme was developed for oceanographic applications, but it has been used more widely. You will probably find covXtreme interesting, if:

- You are interested in quantifying extremes using statistical analysis of a data set, and might want to estimate extreme quantiles or “return levels”,
- The characteristics of your data are not steady; that is, they vary with covariates which you know about,
- You may be interested in quantifying extremes of multiple variables at the same time, and
- You want to quantify how confident you can be in your modelling.

Learn more at

<https://lfenergy.org/projects/covxtreme/> | [GitHub](#)

Contributions by

