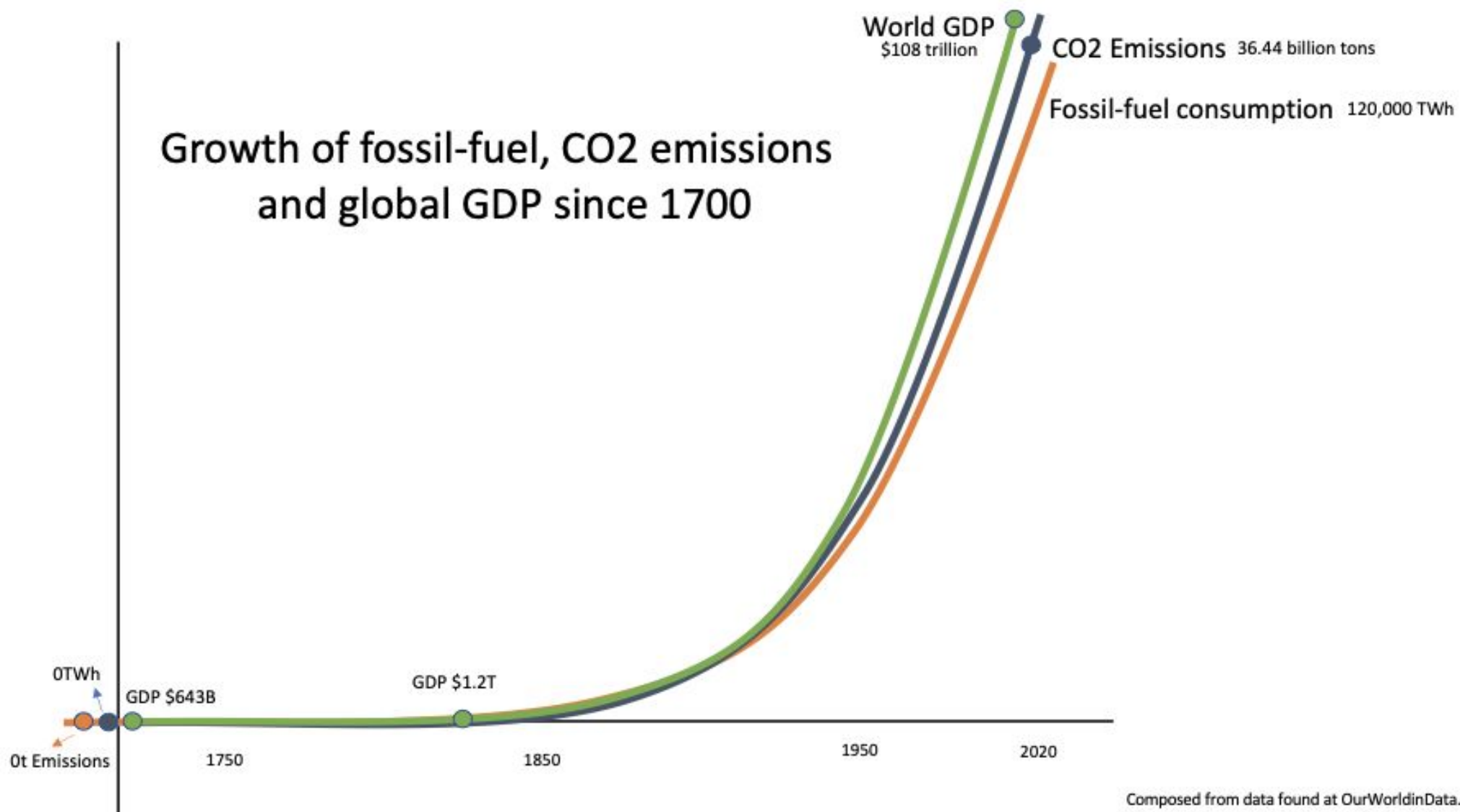


 **OLF**ENERGY

The Power of Together

Growth of fossil-fuel, CO2 emissions and global GDP since 1700



The background is a textured, pinkish-purple surface. A large, glowing orange and yellow arc, resembling a sunset or sunrise, curves across the left side. A dark, stylized world map is centered on the background. The text "The world around energy has changed." is written in white, bold, sans-serif font across the middle of the map.

The world around energy has changed.

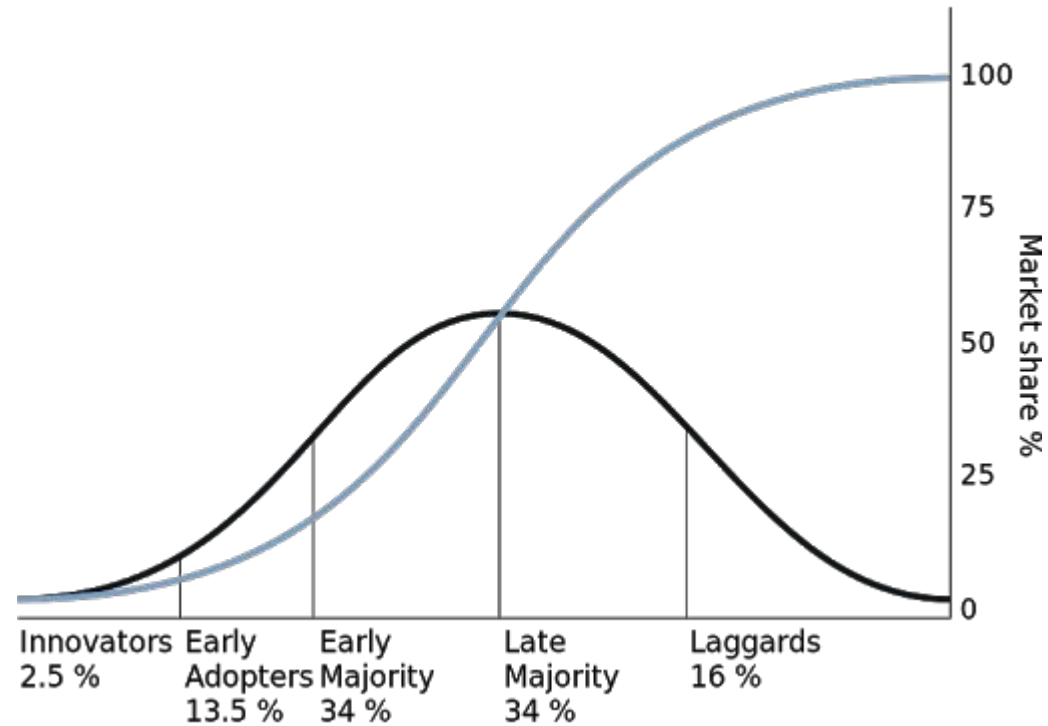


Remove carbon from our **power** and **transportation** systems to provide **65%-75%** of the reduction in **CO² emissions** that we need to stay below 1.5°C

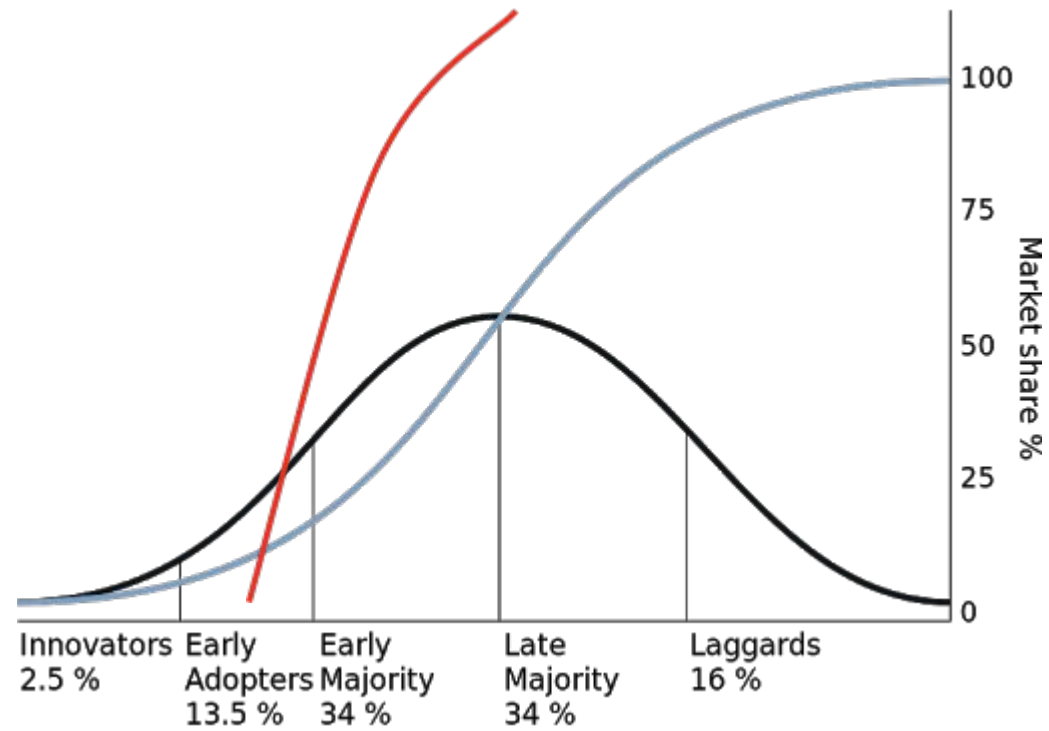


Providing a 21st century plan of action to decarbonization through open source, open frameworks, reference architectures, and a support ecosystem of complementary projects.

Typical technology adoption curve



The challenge for decarbonization - a technology adoption rate of 9% annual for 30 years!



LF ENERGY

VISION:

The grid of the future is composed of loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, the digitalization of energy enables engineers and markets to make high-impact changes frequently and predictably with minimal toil.

MISSION:

- The LF Energy Foundation's mission is to accelerate the energy transition by fostering and sustaining an ecosystem of open source, vendor-neutral projects.
- We democratize state-of-the-art patterns to make these innovations accessible for everyone.





Isolation and going
it alone are no longer viable.



We need speed, scale,
enhanced security, accelerated
innovation, and global talent.

A large flock of birds, possibly starlings, is captured in mid-flight against a warm, orange-hued sunset sky. The birds are densely packed in the center, forming a large, dark, V-shaped silhouette that tapers towards the top. The sky is a gradient of warm colors, from deep orange at the bottom to a lighter, hazy orange at the top. In the bottom right corner, the dark, silhouetted branches of bare trees are visible, adding a sense of scale and grounding to the scene.

We need mass collaboration.



The world's dominant open source platform.



100%

Supercomputer
Market



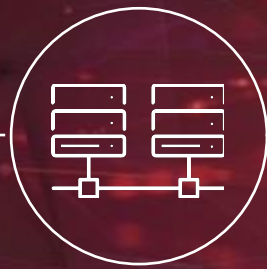
82%

Smartphone
Market Share



2nd

To Windows
in Enterprise



90%

Mainframe
Customers



90%

Public Cloud
Workload



62%

Embedded
Systems Market



#1

Internet
Client

A new member joins The Linux Foundation every day.



\$15.7B

Shared
Value



40,000+

Developers
Contributing Code



100%

of Fortune 100
Tech & Telecom



420+

Open Source
Projects



1625+

Members From
41 Countries



- AT&T saved \$1.6B through dis-aggregation
- In 12 months 80% of the worlds telecom subscribers (~3.5 billion people)
- \$576M of shared development by +2,500 developers.
- Reduced deployment from six months to 15 minutes.



- Five of Top 10 Automakers aligned and account for 70% of the worldwide vehicle shipments.
- 130+ Members
- Nine Major OEMs and their entire supply chains participating

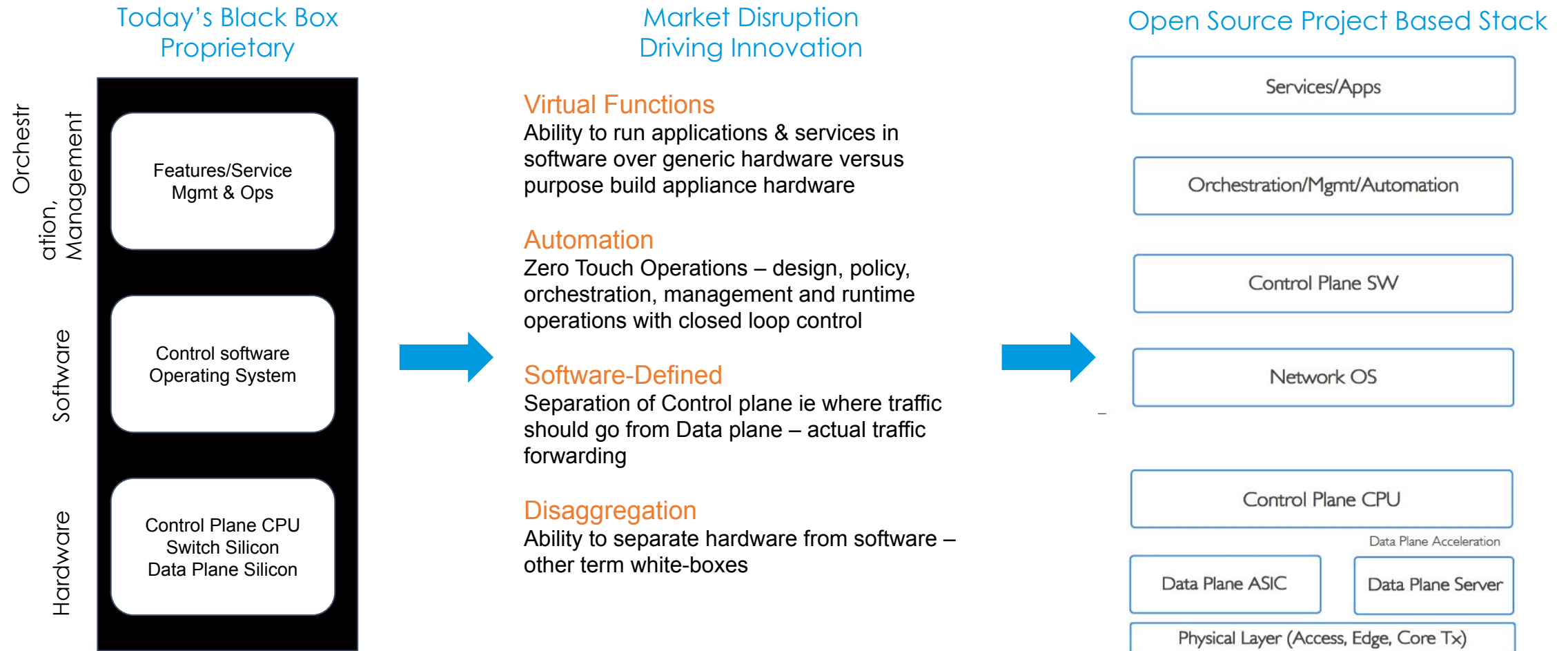


- 530 Members
- Kubernetes de facto standard for container management
- Home to 25 additional projects beyond Kubernetes
- 75 Kubernetes certified providers including 10/10 top public clouds

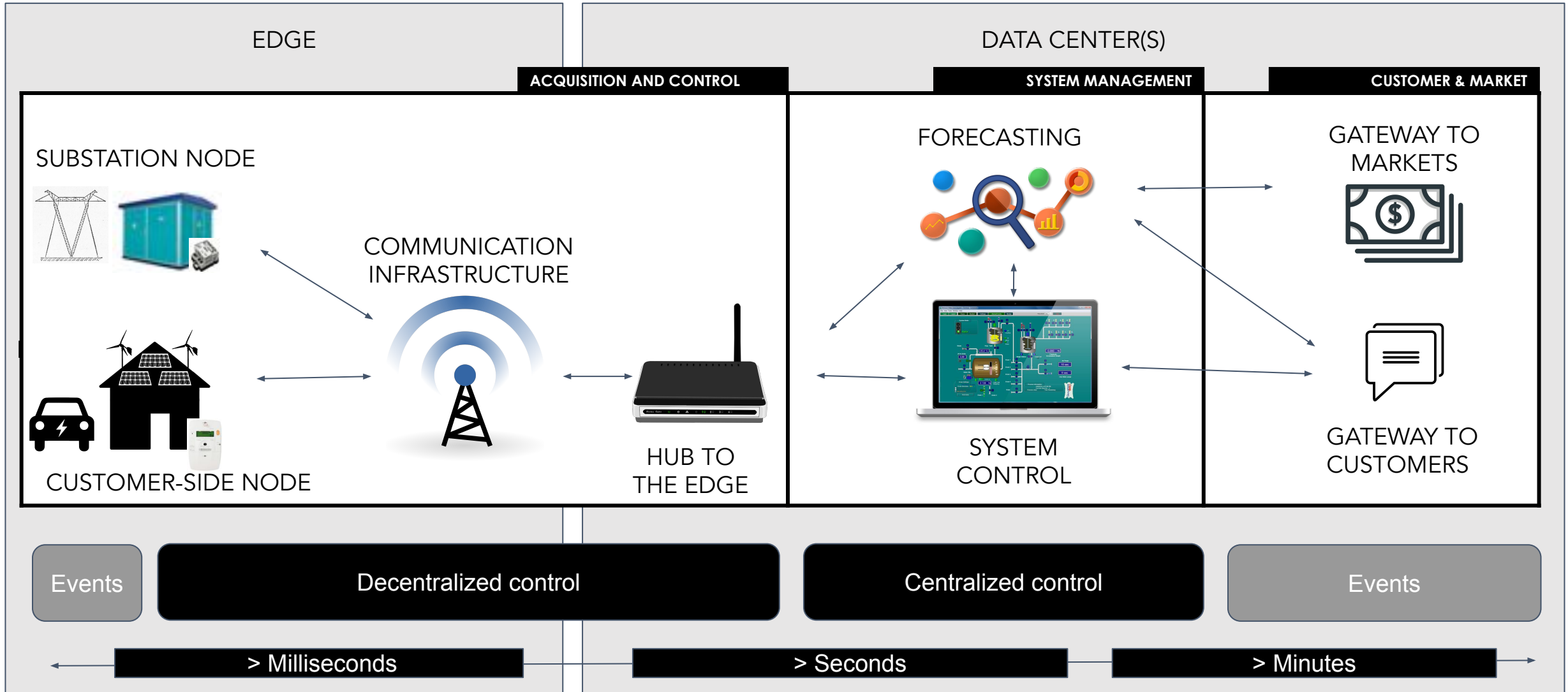


The LF Energy ecosystem alleviates the cost,
risk and stagnation of isolated solutions.

Direction of digitalization (Generic)



Distributed control VS centralized control





OUR COMMITMENT

To achieve our climate and energy transition goals we have **joined together** to create a common functional architecture defining a **fit-for-the-future** grid. Our goal is a common understanding of required functional capabilities. The architecture starts with a top-level view and progresses to a finer granularity. The final slide shows existing and near-future LF Energy projects fits into this architecture.

This is a start. We want your **feedback and involvement**. With this we proclaim a **commitment** under LF Energy to find shared **strategic** dependencies. By utilizing open source we can **accelerate** a technology **revolution** that enables rapid decarbonization by **digitalizing** the **global** energy grid. We see that cooperation and working together is the only path to individual and collective success.

Join us.

Capabilities related to customer and markets and other third parties

Capabilities related to managing the physical flow and balance of a power system

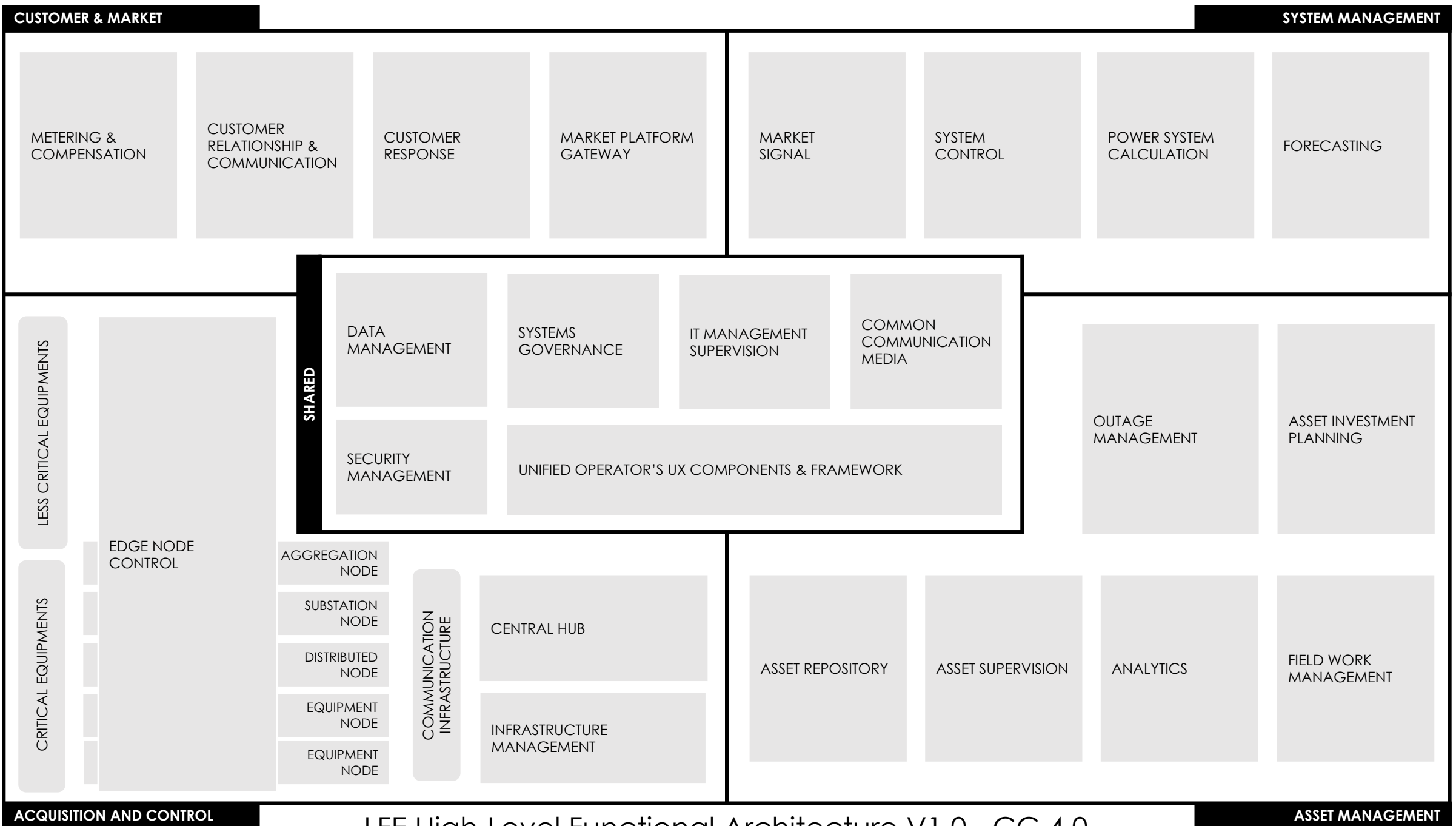
This is the top-level view that shows the 5 main blocks of the functional architecture that we also call categories.

SHARED

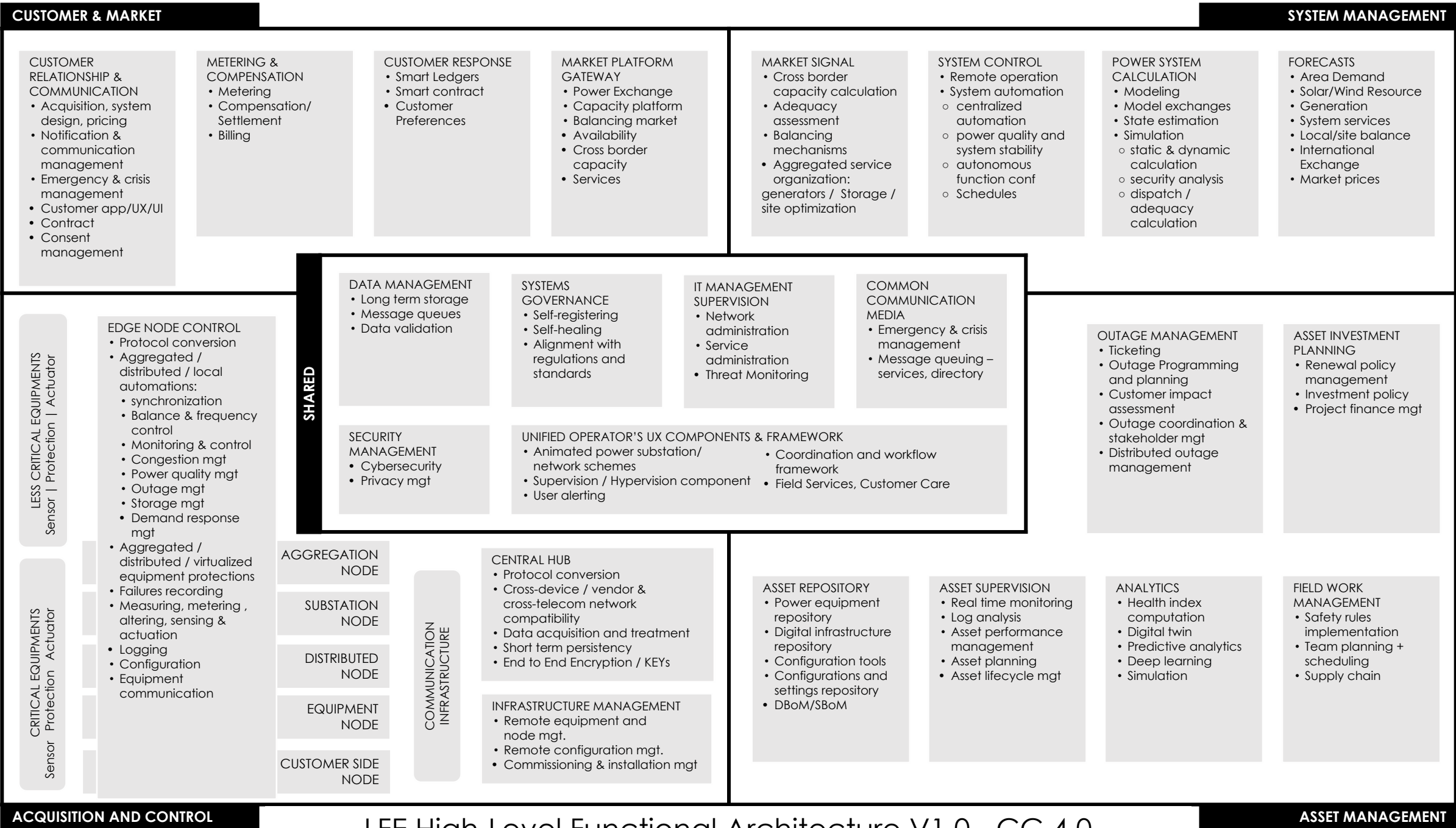
Capabilities that are required by each of the other categories

Capabilities related to monitor and control your assets on the grid

Capabilities related to manage your assets

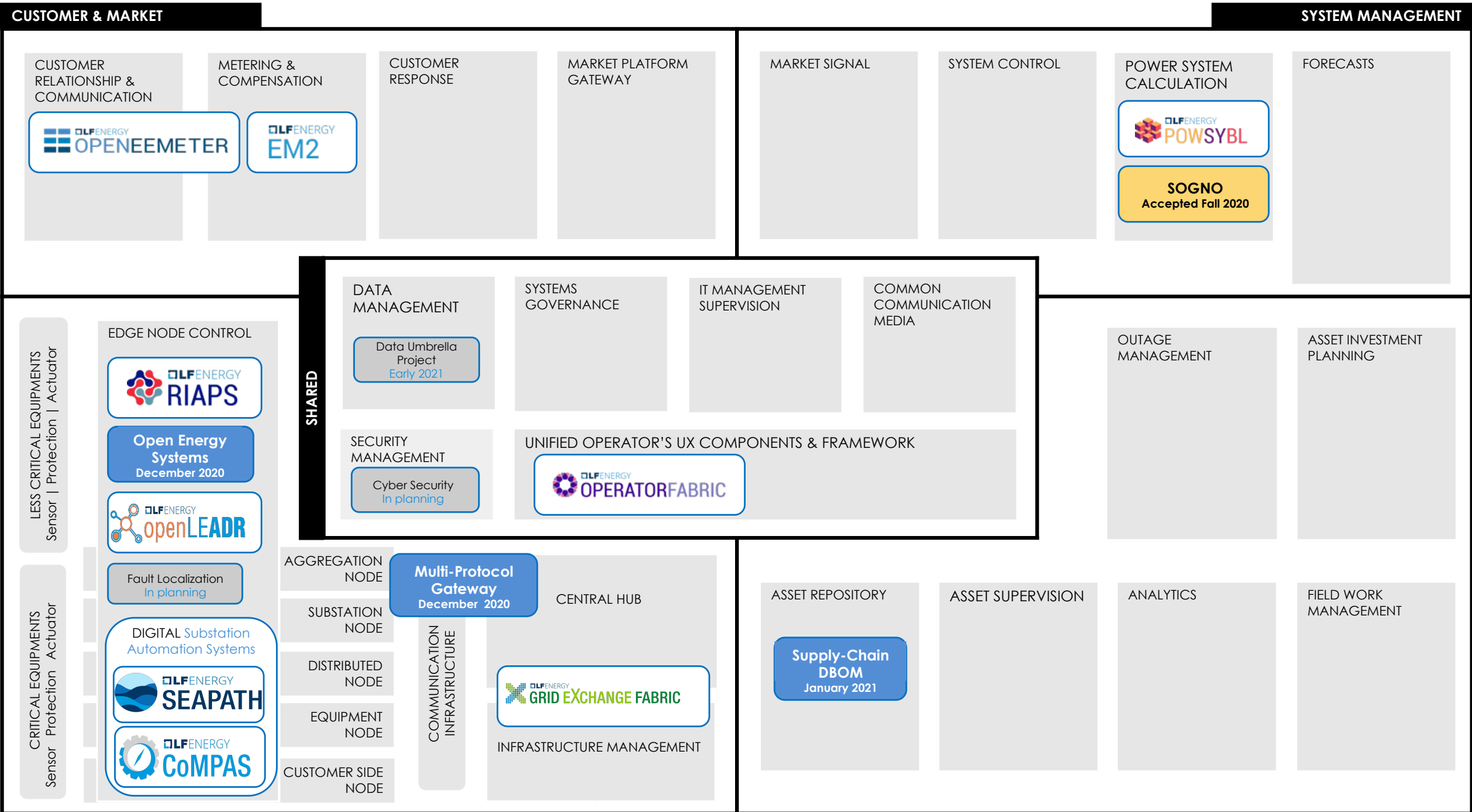


LFE High-Level Functional Architecture V1.0 - CC 4.0

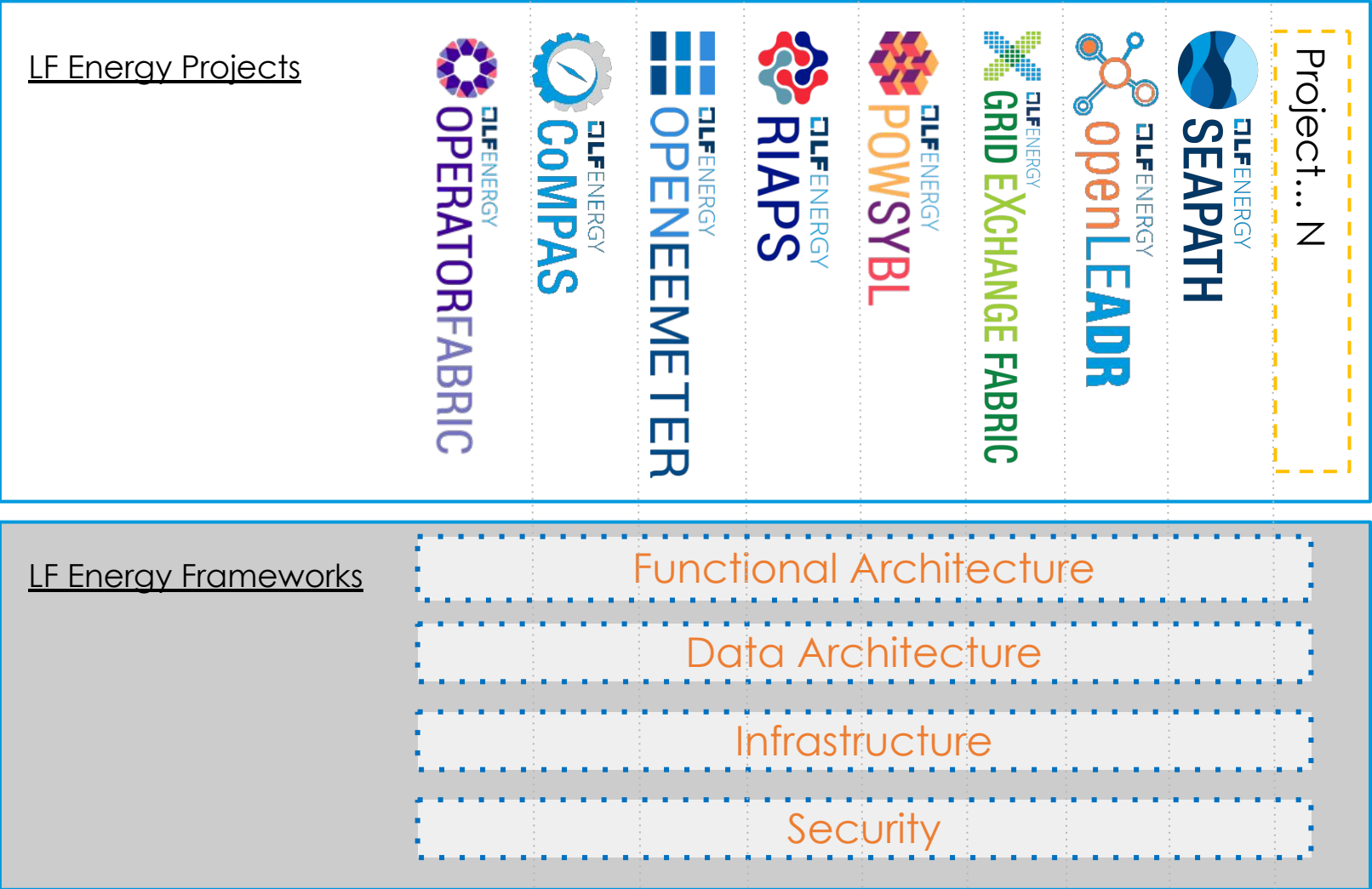


LF Energy Projects





LF Energy Project/Framework Matrix



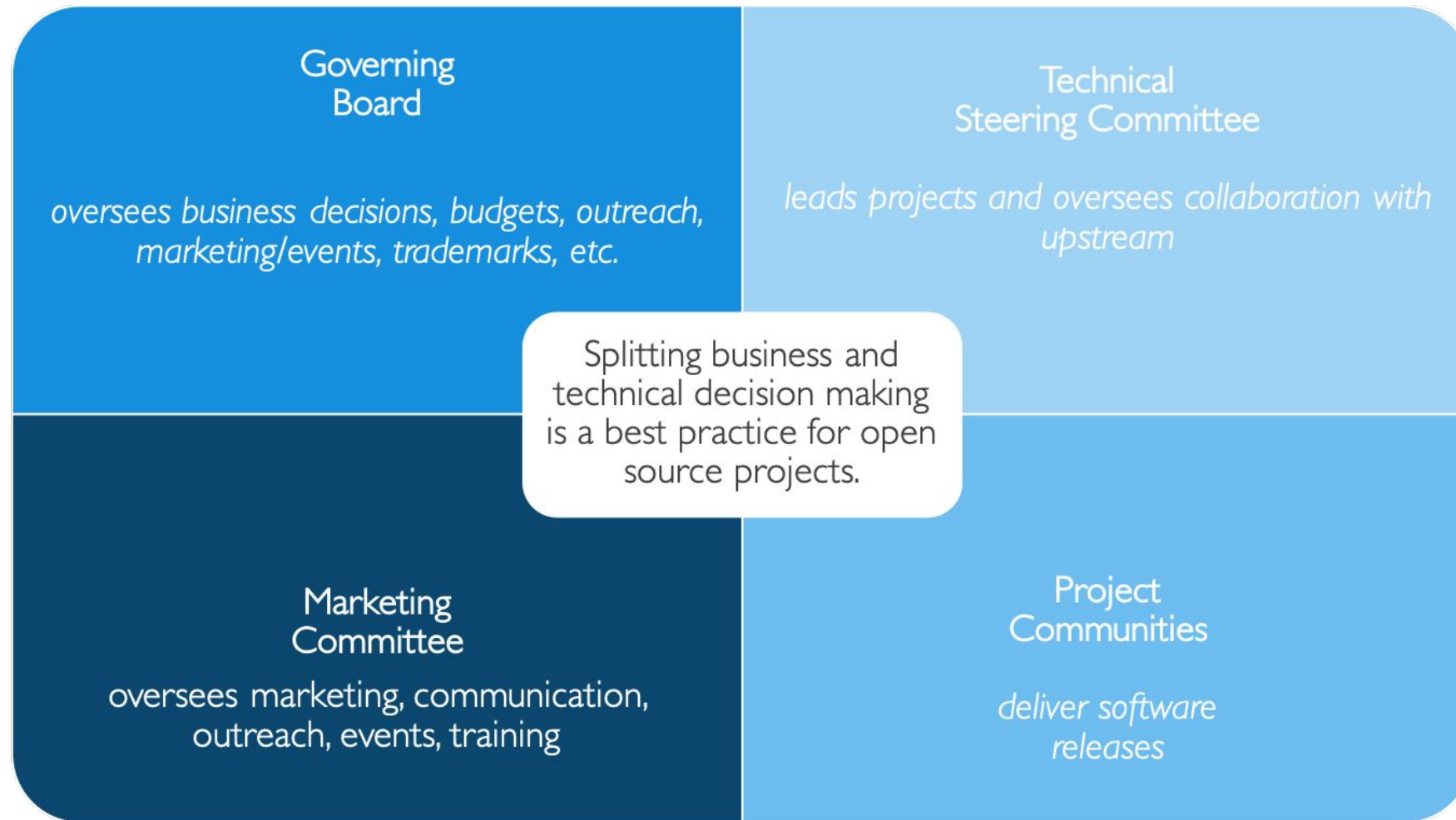
Reference implementations

Cross project frameworks officially being integrated into the Technical Advisory Council - Fall 2020

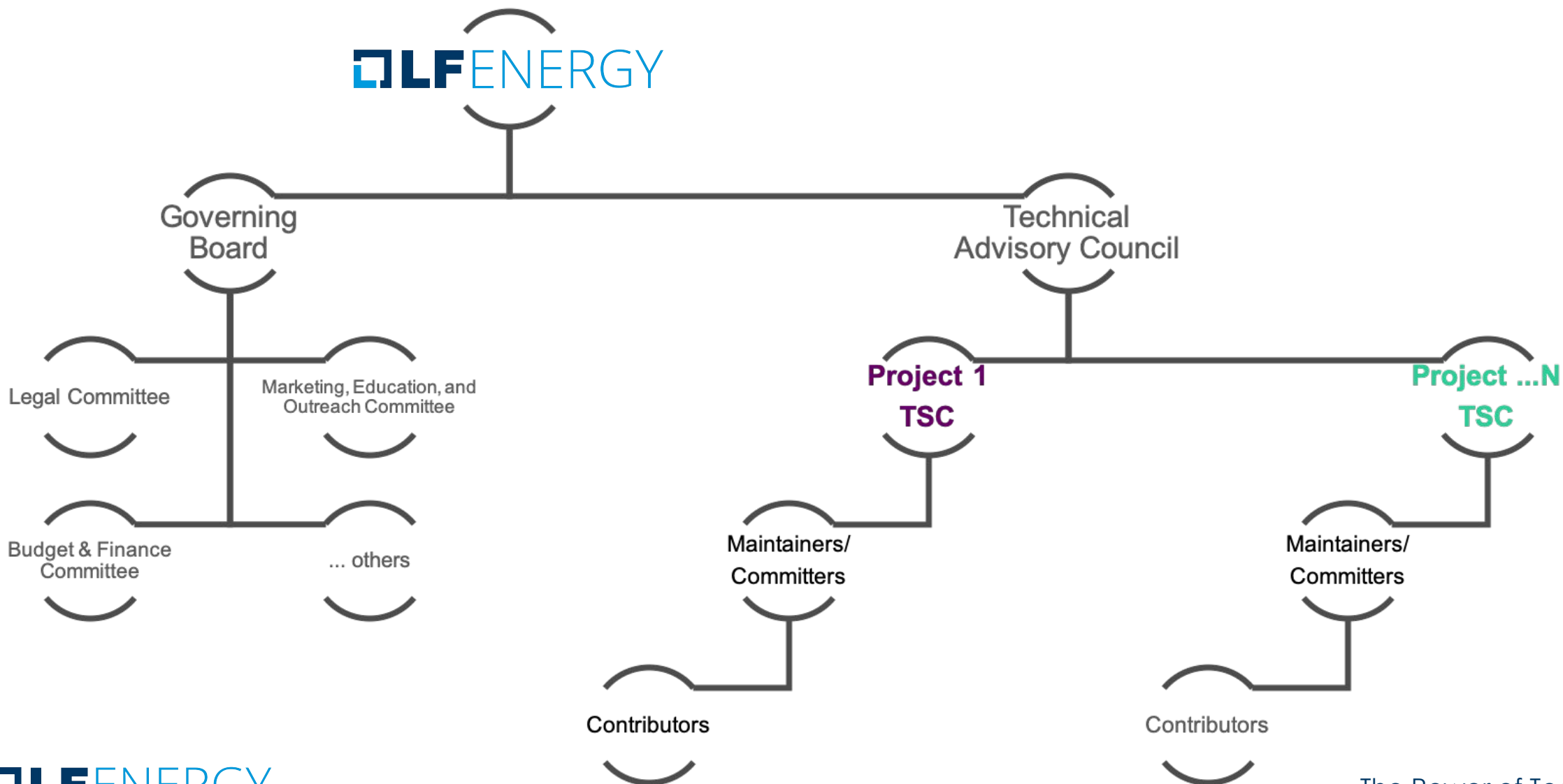
Governance

 **QLF**ENERGY

LF Energy Governance Model



Governance Model

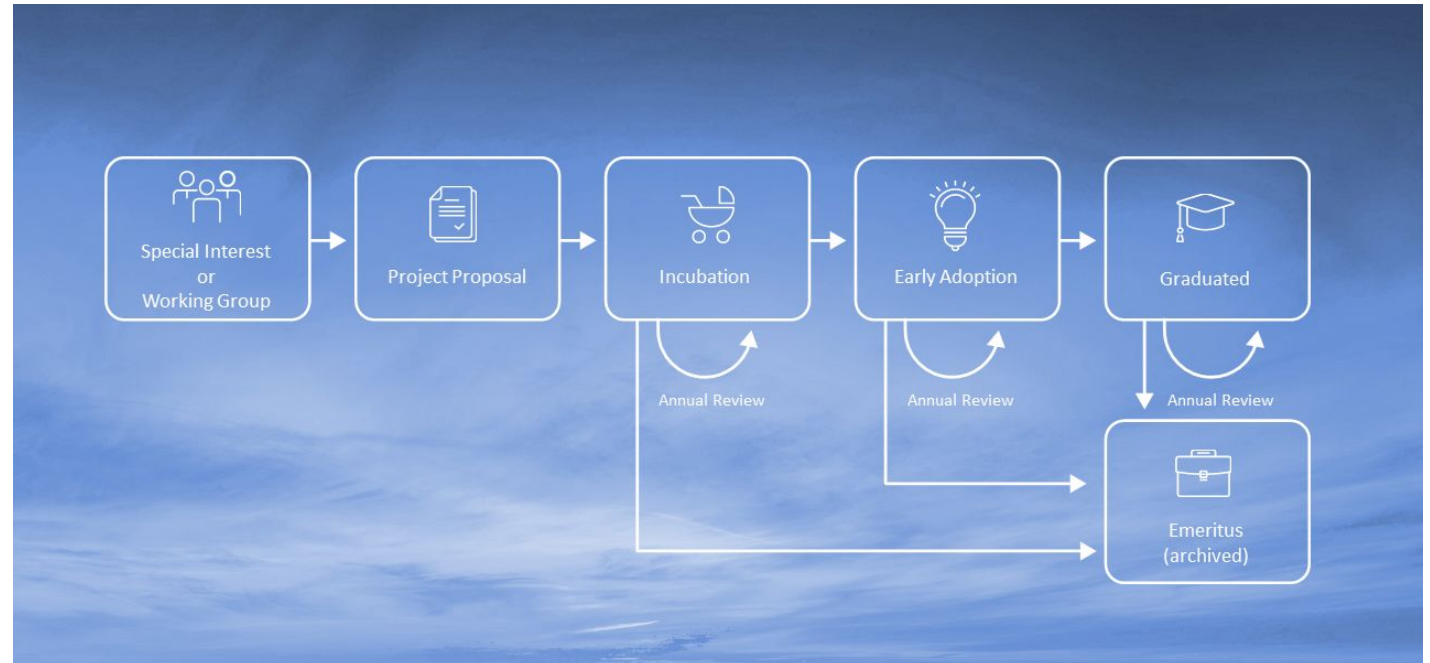


LF Energy Governance in Roles

- A Technical Steering Committee (TSC) oversees each project. Each TSC has an elected Chair who both leads a project TSC and represents the concerns of a project to the Technical Advisory Committee (TAC). Participation on the Technical Steering Committee is based on merit, expertise, and contribution to the code or other artifacts (e.g. testing, documentation) of the technical community.
 - Strategic Members can appoint 1 representative to a TSC for an initial 6-month basis to jump start engagement
 - Membership on a TSC thereafter is based on technical contribution—e.g., contributing a new project
- A Technical Advisory Committee (TAC) addresses technical community concerns such as: new projects, release planning, cross-project collaboration, and documentation practices. The TAC is composed of the Chairs for each project TSC, plus a Governing Board representative to ensure alignment between technical and business concerns. There is an elected TAC Chair who represents the technical community on the Governing Board.
- The Governing Board (GB) is limited to members and the elected TAC Chair. The GB determines allocation of funding to priorities and provides members with control over where their funding goes.
 - Strategic Members each appoint 1 representative
 - General Members can elect 1 representative for every 10 General Members, up to 3 total
 - For the first six (6) months, there will be an assignment of provisional membership to the GB of 1-3 representatives of organizations who can provide leadership and vision to ensure a smooth start to the project
 - Governing Board establishes additional committees to address topics (e.g. legal, marketing, budget)

LF Energy Project Lifecycle

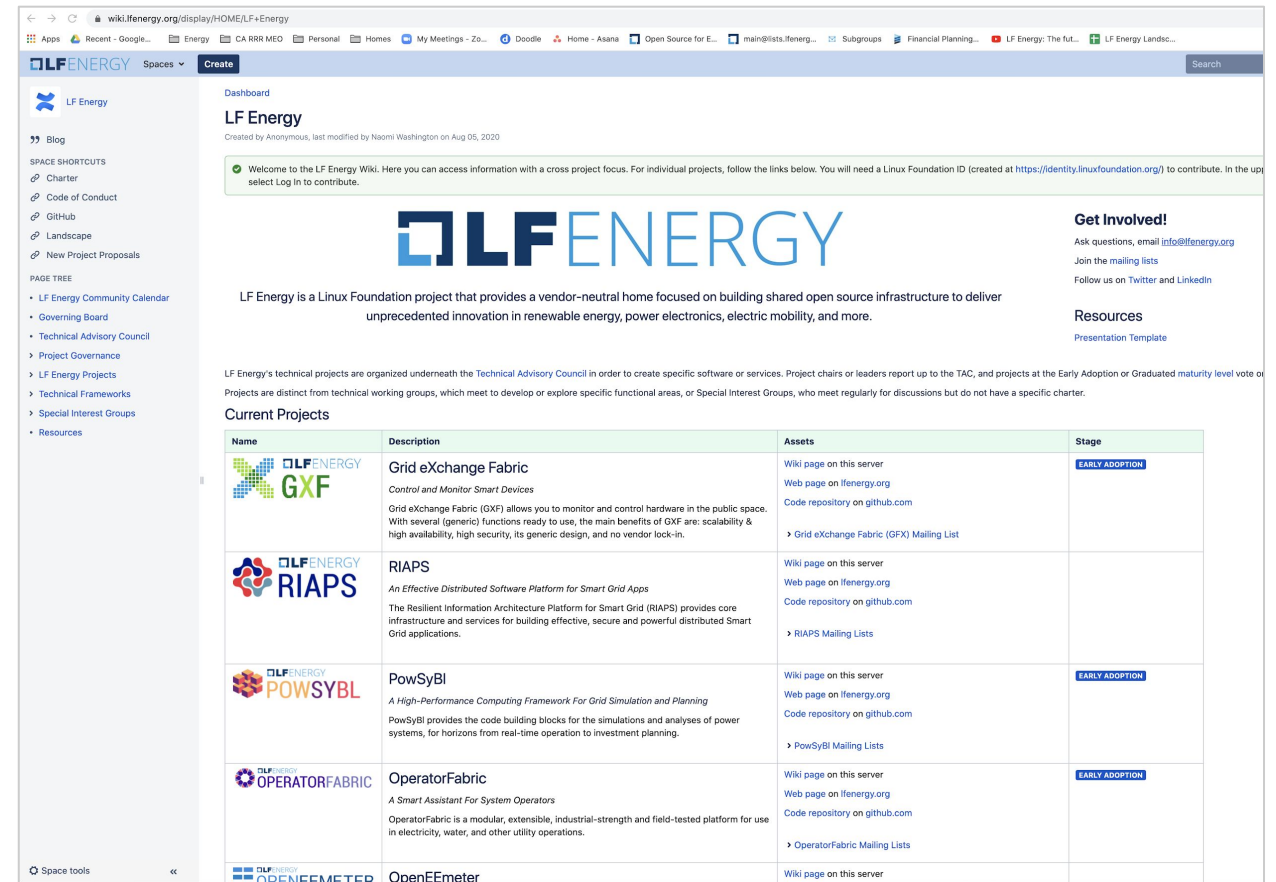
- Projects can become part of LF Energy through the submission of a mature code base.
- Projects can also be formed through special interests groups that submit a proposal and then form as an incubation project.








Transparency

All project governance documentation can be found at:

<https://wiki.lfenergy.org/display/HOME/LF+Energy>



The screenshot shows the LF Energy Wiki homepage. The browser address bar displays `wiki.lfenergy.org/display/HOME/LF+Energy`. The page features a sidebar with navigation links such as "Blog", "SPACE SHORTCUTS", and "PAGE TREE". The main content area includes a "Dashboard" section with the LF Energy logo and a welcome message. Below this, a "Current Projects" table lists four projects: Grid eXchange Fabric (GXF), RIAPS, PowSyBl, and OperatorFabric. Each project entry includes a logo, a brief description, and links to its wiki page, web page, and code repository. The "Stage" column for all listed projects is marked as "EARLY ADOPTION".

Name	Description	Assets	Stage
 Grid eXchange Fabric <i>Control and Monitor Smart Devices</i> Grid eXchange Fabric (GXF) allows you to monitor and control hardware in the public space. With several (generic) functions ready to use, the main benefits of GXF are: scalability & high availability, high security, its generic design, and no vendor lock-in.	Wiki page on this server Web page on lfenergy.org Code repository on github.com › Grid eXchange Fabric (GXF) Mailing List	EARLY ADOPTION	
 RIAPS <i>An Effective Distributed Software Platform for Smart Grid Apps</i> The Resilient Information Architecture Platform for Smart Grid (RIAPS) provides core infrastructure and services for building effective, secure and powerful distributed Smart Grid applications.	Wiki page on this server Web page on lfenergy.org Code repository on github.com › RIAPS Mailing Lists		
 PowSyBl <i>A High-Performance Computing Framework For Grid Simulation and Planning</i> PowSyBl provides the code building blocks for the simulations and analyses of power systems, for horizons from real-time operation to investment planning.	Wiki page on this server Web page on lfenergy.org Code repository on github.com › PowSyBl Mailing Lists	EARLY ADOPTION	
 OperatorFabric <i>A Smart Assistant For System Operators</i> OperatorFabric is a modular, extensible, industrial-strength and field-tested platform for use in electricity, water, and other utility operations.	Wiki page on this server Web page on lfenergy.org Code repository on github.com › OperatorFabric Mailing Lists	EARLY ADOPTION	
 OpenEEmeter	Wiki page on this server		

LF Energy Members

Strategic Members



General Members



Associate Members



Membership Model



20%

Compete on Products & Services

Marketplace

80%

Leveraged Development & Open Source Software Ecosystem

LFENERGY

Membership Benefits

Leadership & Support



We insure the neutral ecosystem. Collaborate and form strategic relationships across key stakeholders.

Marketing & PR



Promote your innovations and share definitive action to ALL stakeholders. Gain leading-edge insights, driving faster/better ME&O.

Training & Talent



Access to top talent and training. Expand your resources cost effectively. Develop deeper understanding of specialized subject matter.

Security



Global strength testing; beyond what any one in-house team can do. Surface and drive enhanced cyber security doctrine through insights.

Badging & Certification



Elevate the skills of your team and keep them engaged with emerging breakthroughs.

IP Legal Support



Removes IP ownership issues and costs.

Global Events



Access to global thought leaders and influencers. Seamlessly transitioned to virtual events.

Membership and Participation Levels

Membership Level	Annual Fee	Plus Linux Foundation Membership: Silver (if not a member)	Board Seat	TSC Seat	Outreach Committee	Suggested Minimum FTE*	Notes
Strategic	Flat fee: \$150k	\$20k	Yes	Yes	Yes	1	Two year minimum commitment
General	\$5k-50k based on org size ¹	Based on number of employees \$20K (5000+) \$15K (499-4999) \$10K (100-499) \$5,000 (0-99)	(Possible) 1 per every 10 General members	Based on Merit	Yes	N/A	A TSC seat may be earned by technical contribution as a project leader
Associate	No fee	No	(Provisional at start-up)	Based on Merit	Yes	N/A	Limited to academic, research and NGO organizations

General Annual Fee Scale

\$50K - > 5,000 employees
 \$30K - 1,000 – 4,999 employees
 \$20K - 200 – 1,000 employees
 \$10K - 100 – 200 employees
 \$5K - < 100 employees

* FTE = Full Time Equivalent (e.g. 2 employees each spend 50% of their time on a project). This suggestion is meant to provide a minimum resource investment to ensure members are contributing technically. Most projects see much higher investment of resources than the minimum requirement.

LF Energy Membership Benefits

Details	Strategic	General
Guaranteed seat on the LF Energy Governance Board - shape where funds are directed	☐	
Guaranteed seat on the LF Energy Technical Advisory Council - shape the direction of projects	☐	
Host strategic and critical projects and lead industry efforts	☐	
Direct oversight and influence on all of LF Energy, including access to briefing on the pipeline and inclusion of new projects	☐	
Direct ability to govern and create new projects	☐	
Direct influence on messaging, PR, marketing, developer events, training	☐	
Budget Influence/approval, how and where the project spends money	☐	
Advise member of advancing brand leadership worldwide in open source	☐	
Promotion in top news outlets	☐	
Placement of member brand at forefront of LF Energy web properties	☐	
Participation in Linux Foundation Member Summit (Additional Seat)	☐	

LF Energy Membership Benefits

Details	Strategic	General
Direct assistance with your open source strategy activities, and R&D portfolio	<input type="checkbox"/>	
Send signal that you are committed and serious about the energy transition and 100% planetary decarbonization	<input type="checkbox"/>	
Premium access to the project ED to understand business goals help you succeed in those goals any way possible	<input type="checkbox"/>	
Premium access to the LF Energy operations staff. This is across all LF Energy functions like IT and technical expertise across projects in the Linux Foundation ecosystem, Marketing, and Operations,	<input type="checkbox"/>	
Participate in any cross project strategy discussions on harmonization and future direction of LF Energy	<input type="checkbox"/>	
LF Leadership support to keynote member events, participate in outreach (eg roadshows, events, conference meet ups etc..)	<input type="checkbox"/>	
Priority for hosting LF Energy Roadshows and meetups at the location of their choice	<input type="checkbox"/>	
2x guest blog pieces on LF Energy blog	<input type="checkbox"/>	
Support for member announcements and member PRs	<input type="checkbox"/>	<input type="checkbox"/>
If member requests, LF Energy will provide quote for member press release or blog	<input type="checkbox"/>	<input type="checkbox"/>
Logo on the website once your membership has been announced.	<input type="checkbox"/>	<input type="checkbox"/>
Discount on Event Sponsorship packages	<input type="checkbox"/>	<input type="checkbox"/>

For Further Information

Shuli Goodman

Executive Director
LF Energy
sgoodman@lfenergy.org

Mike Dolan

VP of Strategic Programs,
Linux Foundation
mdolan@linuxfoundation.org

Our Website: <https://lfenergy.org>

Membership: <https://www.lfenergy.org/join/>

Mailing Lists: <https://lists.lfenergy.org>



Appendix



The Taxonomy and glossary

Functional Architecture		Business Function	Business Function Services	Glossary (yellow = missing, red = needs revision)	Temp TR Comments, can be hidden as needed	Comment	To be included in version 1.0	from "aggregat or layer"	Connection	Cont
Category	Subcategory									
Customer & Market				Covering all the functionalities related to the customer and interaction with markets and other third parties Determination and financial handling realization of market contracts and consequences of system operation.			TRUE			
	Metering & Compensation						TRUE			
		Metering		Handles the various physical measurements (energy, power (including active- and reactive power), voltage, frequency, power quality) gathering, storage, and quality management to provide for compensation, control and / or services settlement	Added a definition, feel free to edit, Added active and reactive power		TRUE			
		Compensation / Settlement		Compensation and Settlement represents payment or trade of value for transactions between market actors as distinct from customer billing. Includes auditing / verification activities. Settlements are often bi-directional in nature	Representing trades of value, could be combined with billing if billing was less specific	We should merge them in the deck only billing remains. Definition to be update to cover Compensation/settlement	TRUE			
		Billing		Billing is supported by a combination of software and hardware components that receive consumption details and service usage information, groups this information for specific accounts or customers, produces invoices, creates reports for management / investors, and records (posts) payments made to customer accounts. Includes Auditing / Verification Activities			TRUE			
		Rewards		Monetary or non-monetary compensation for customer provided services / behaviors modified in market integrated and non-market integrated programs	This is intended to represent marketing / customer behavior program activities	Not familiar with that. Is there a link with incentives pass-through/mgt ?	FALSE	TRUE		
		Incentives pass-through/mgt		Calculates the percentage of financial incentives allocated for the production/consumption of specific categories of goods or services	Represents regulatory pass throughs to cust. Could be combined with Balance Edited	And actually, could it be included in Compensation/settlement?	FALSE	TRUE		
	Customer / Investor Relationship & Communication			Functions required to support customer / investor relationship management and communication.	Edited		TRUE			
		Acquisition, system design, pricing		Functions required to acquire the right assets with the right capabilities both in long term and dynamically in short term for services	Edited		TRUE	TRUE		
		Notification & communication management		Enables the delivery of information (regularly or in case of specific occurrences) to consumers / partners			TRUE			
		Emergency & crisis management		Communication to customers in event of outage or other reduction in services	Edited		TRUE			
		Customer app/UX/UI		Customer centric access to energy services, or information of current state of system vs. preferences and economics.	Edited		TRUE	TRUE		
		Contract (PPA, lease, loan)		Contractual commitment enabling development / funding of the resource, will typically include performance requirements and reporting	Edited		TRUE	TRUE		
		CRM		The three main functions of Customer Relationship Management are: Customer Acquisition: Turning prospects into customers and adding services where possible. Customer Retention: Keeping current customers happy and coming back for more. Managing Data: Tracking customer interactions and other information that can improve customer experience / network performance	Edited		FALSE	TRUE		
		Consent management		Consent management is a system, process or set of policies for allowing consumers to determine what information they are willing to permit their various energy companions to access.			TRUE	TRUE		
	Customer Response			Covering the digital functionalities supporting customers providing information.			TRUE			
		Smart Ledgers ("distributed ledgers"?)		A distributed ledger (also called a shared ledger or distributed ledger technology or DLT) is a consensus of replicated, shared, and synchronized digital data geographically spread across multiple sites, countries, or institutions, without a central administrator or centralized data storage	Looks good		TRUE			
		Smart Contract		A smart contract is a protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of credible transactions without third party intervention, in a trackable and irreversible way.			TRUE			
		Customer Preferences		A register of customer needs, goals and economics that allows energy system to optimize delivery. Allows users to configure various ied interacting with digital energy services provided by the utility/local energy community, -> device settings: thermostat settings, storage back-up reserve, water heater settings, over-ride, EV charge schedule	This is a critical aspect of the above two items. Preferences are essential to give flexibility in delivery which reduces cost and system demand		TRUE	TRUE		
	Market Platform			Platforms allowing energy market participants to retrieve and provide market information and engagements (e.g. providing energy consumption details to energy suppliers).			TRUE			
		Power Exchange		Trading Platform to ensure short-grid stability by injecting or absorbing power depending on observed local conditions or based on remote dispatch request	Edited		TRUE		Market signals gene	
		Capacity platform		Trading Platform long-term grid reliability by procuring the appropriate amount of power supply resources needed to meet predicted energy demand X years in the future	Edited		TRUE			
		Balancing market		Trading Platform to insure system balance and frequency, as production and consumption levels must match during the operation of electric power systems.	Edited		TRUE			
		Availability		Availability Platform calculates the proportion, expressed as a percentage, of the total Available Time during which assets or services are available.	Edited		TRUE	TRUE		

<https://docs.google.com/spreadsheets/d/1snoRu-gBvY1RbpVCUpnpMF1fZQqWRd14SfWwzh1IOd4/edit#gid=0>

LF Energy



Data Architecture Working Document

<https://docs.google.com/document/d/1QcHqPRSmUUJQIJnfygGDkOpDPId6U1V22pBuvZvDYk/edit?pli=1#>