Why our society needs free and open power grid data

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What is the total worldwide length of transmission lines?

- 6 million km
- 7.6 million km
- 7 million km

We don’t know!

- A (IEA World Energy Outlook)
- B (Global Transmission Length Index)
- C (ESA/Thunder Said Energy)

Power Grid as Physical Common

The **grid and energy infrastructure** are currently undergoing a process of **democratisation, transforming from a centralised, monopolistic system to a decentralised system** involving numerous public, corporate and **private participants**. This democratisation of the grid is also reflected in the data. Without open grid data, innovative digital products and smart grid applications will not be feasible in an increasingly decentralised grid comprising a variety of participants. However, the global energy industry has failed to create a globally applicable data schema that is implemented worldwide. **Fortunately, the open data community has stepped in**.

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OpenStreetMap's Grid Data

Power Mapping Started in 2008
Today 76% global coverage.
(85 % if we exclude China)
5.6 % line growth in 2025.
~8% of the lines miss voltages
~15 % miss cables
More information on quality by the GridInspector

MapYourGrid internal team in 2025:
+ 1694 power plants (mostly Solar, Wind and Hydro)
+ 300369 power towers
+ 109867 km of power line lengths
+ 9522 substations
+ 67 interconnectors between countries
+ 536559 total edits in OpenStreetMap

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Where open grid data is been used

Large Scale Energy System Planning

- Optimal power flow → Users: **Grid planners, energy suppliers**
- Integration of renewable energies (wind & solar) → Users: **research institutes, energy consultants**
- Grid expansion and reinforcement planning → Users: **TSOs, regulatory authorities**
- Sector coupling (electricity, heat, transport, hydrogen) → Users: **science, system analysts**
- Design and operation of storage facilities → Users: **energy companies, project developers**
- Decarbonization scenarios and climate strategies → Users: **Ministries, think tanks**
- Electricity market and price zone simulations → Users: **Market researchers, energy traders**
- Flexibility analysis (load management, storage, grids) → Users: **Grid operators, aggregators**
- Scenario comparison of future energy systems – Users: **Research, policy advice**

Small Scale Energy System Planning and Site Planning

Almost all GIS platforms used for the initial planning of battery energy storage systems, solar projects and other renewable energy projects, such as DVLP.energy, Continuum Industries, Gilytics and Glint Solar, use OpenStreetMap as their primary data source.

Open Grid Data Ecosystem

Industry

Academia and Research

More than **10,000 publications** use OpenStreetMap's power=* data, with exponential growth in recent years.

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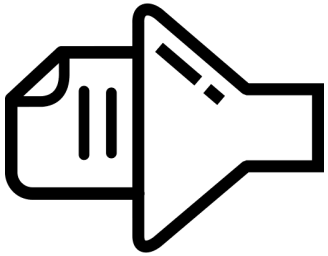
All data is verifiable against satellite imagery

Public Data and documents

Open Data

News

AI Generated Data



Open data with ODbL licence.

Open Satellite, Open Street View Imagery and Ground Surveys as Source!

“Hints” for Human Mappers

Validation and Mapping by a Human

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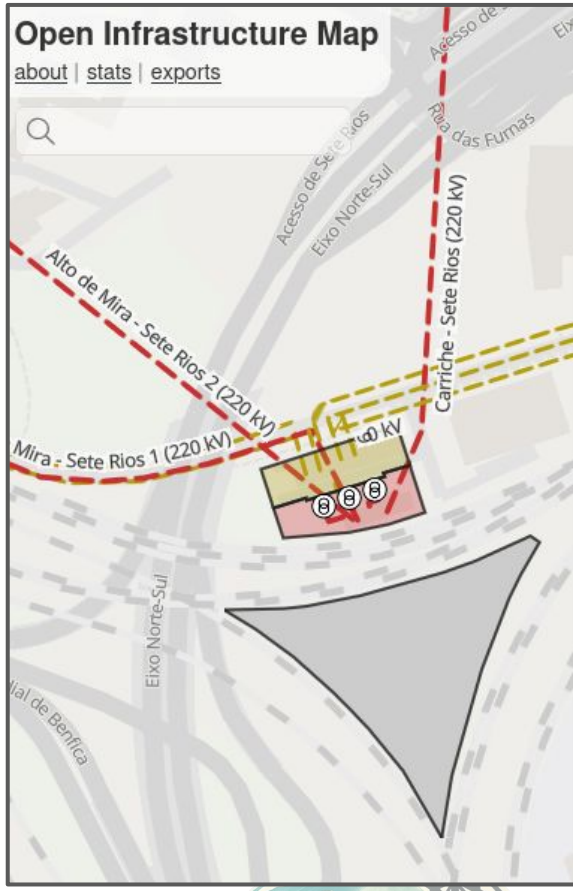
No secrets allowed

⛔ “OSM data is just copied data”⛔

✅ Data on OSM is publicly verifiable & primary data

⚠️ Violating rules is not accepted by the community



e.g. location of underground infrastructure (dashed) is only permitted in exceptional cases with local community involved.

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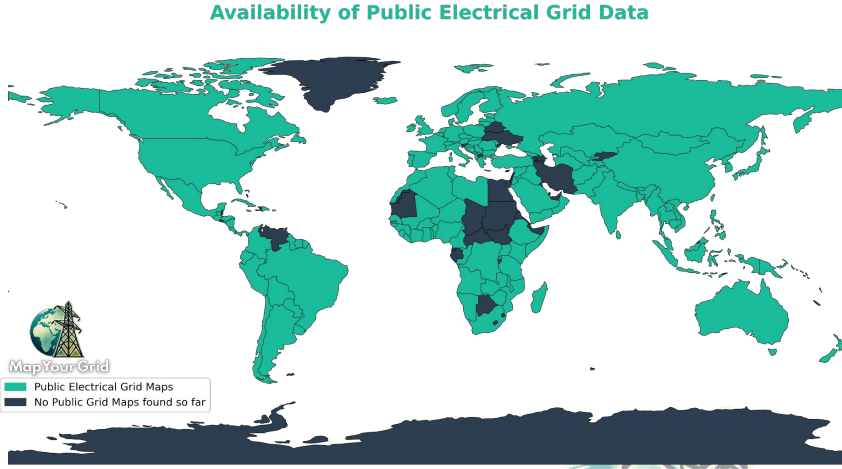
Why are we in this situation?

1. **Historical Reasons: Asset management remains hard for monopolistic centralised energy infrastructure**
2. **A lack of competence in knowing how to cooperate in a more decentralized energy system.**
   a. Licencing and legal issues
   b. No open and global industrial standard
   c. No shared data governance strategy
   d. Discrepancies about who needs which data and when in the planning phase
   e. No successful industry-driven attempt at harmonization
3. **Security by obscurity**
   a. Professional bad actors
   b. Unprofessional bad actors



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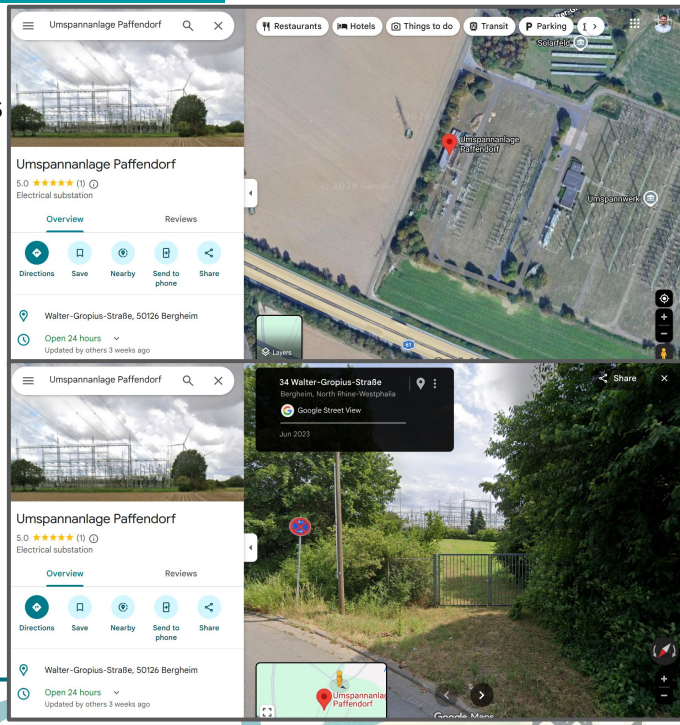
Too big to hide in a digital world where public spaces are under constant observation.

1. The internet provides a massive amount of news, documents, planning documents and tenders for transmission lines, substations and power plants for almost all countries.
2. Mapping services have provided data on the locations of substations around the world for over 20 years. People need to navigate to these places regularly!
3. Substation, power towers and often even power lines can easily be seen in medium resolution satellite imagery. Google Maps even provides a large number of images of the inner areas of substations and power plants
4. Transmission towers are one of the biggest landmarks in the landscape and can therefore not been hidden.
5. All LLMs provide detailed information on substations and other power infrastructure for every place in the world.



Most western countries publicly release accurate maps of their power infrastructure. This often includes capacity per line and substation.

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But what about bad actors ?

1. For decades, professional bad actors have had access to detailed reports on the critical infrastructure of every neighbouring country.
   a. Public data will reveal vulnerabilities that would otherwise remain hidden, and there would be no pressure to close them.
   b. For a country like Germany, creating a map of critical power infrastructure based solely on Google Maps data would take a good GIS expert about a week.
   c. Public data enables discussing and implementing appropriate protection and resilience measures.

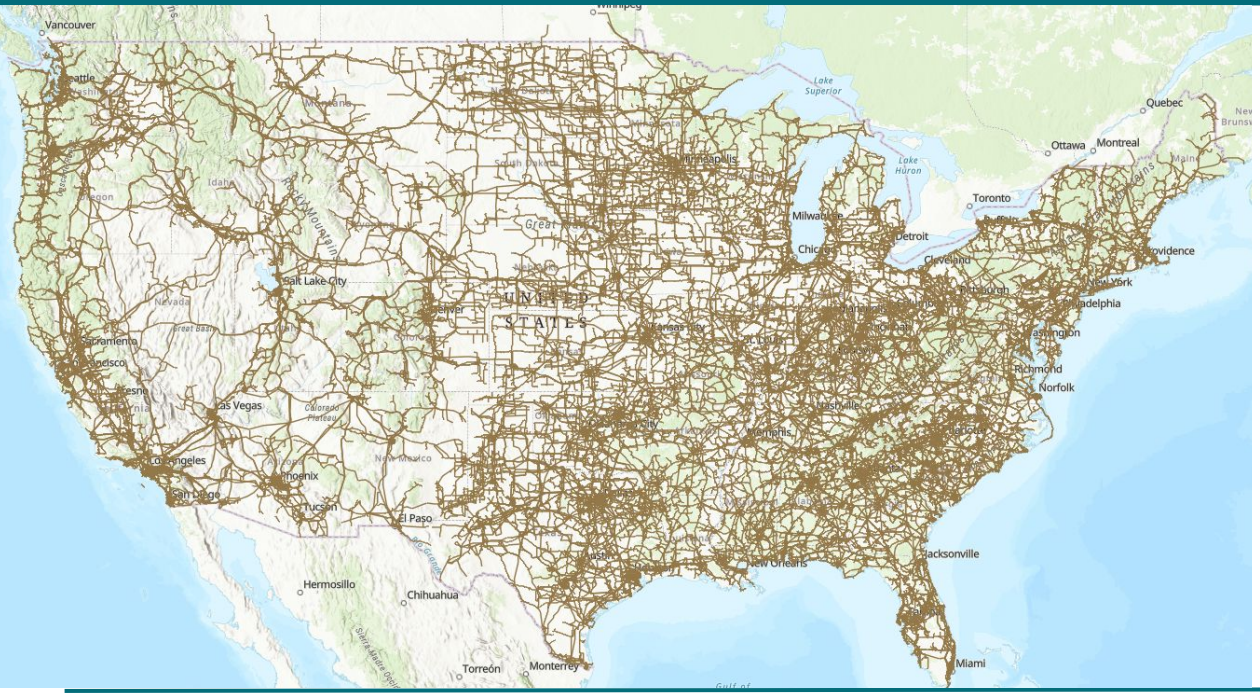
2. But what about the unprofessional bad actors?

   If unprofessional actors can easily cause harm to infrastructure, then professional actors can certainly do so on a large scale. Open data enables professionals to reveal where critical weak spots can be identified and closed.

It requires a "Whole of Nation" approach that empowers

"every citizen to have an active role in our security"- US Homeland Security

Homeland Infrastructure Foundation-Level Data



Homeland Security

The Department of Homeland Security has conducted assessments of the risks and benefits of public grid data.

Results: From 2022 onwards, transmission grid data on existing and planned lines will be made available for download without any access restrictions for users around the world licensed in the public domain.

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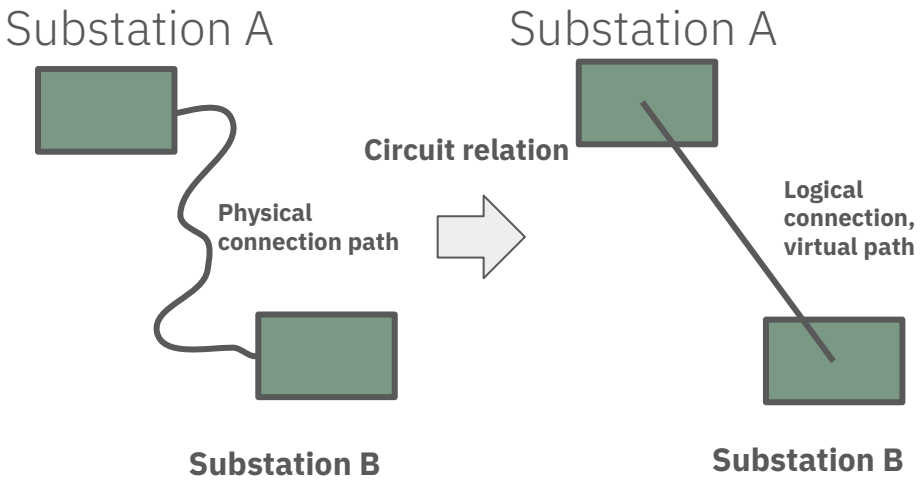
Does everything need to be open?



No!

Depending on use, not all information that is on OSM is required. (Like routing of underground cables)

Moreover, not all detailed information is available and verifiable, i.e. not permitted on OSM.

Our solution?

Allow grid point relations in OSM. Instead of a line, this represents a connection without a detailed, physical path. E.g. for underground infrastructure or infrastructure with to-be-kept-secret paths.

However. Verifiability issue by this approach!

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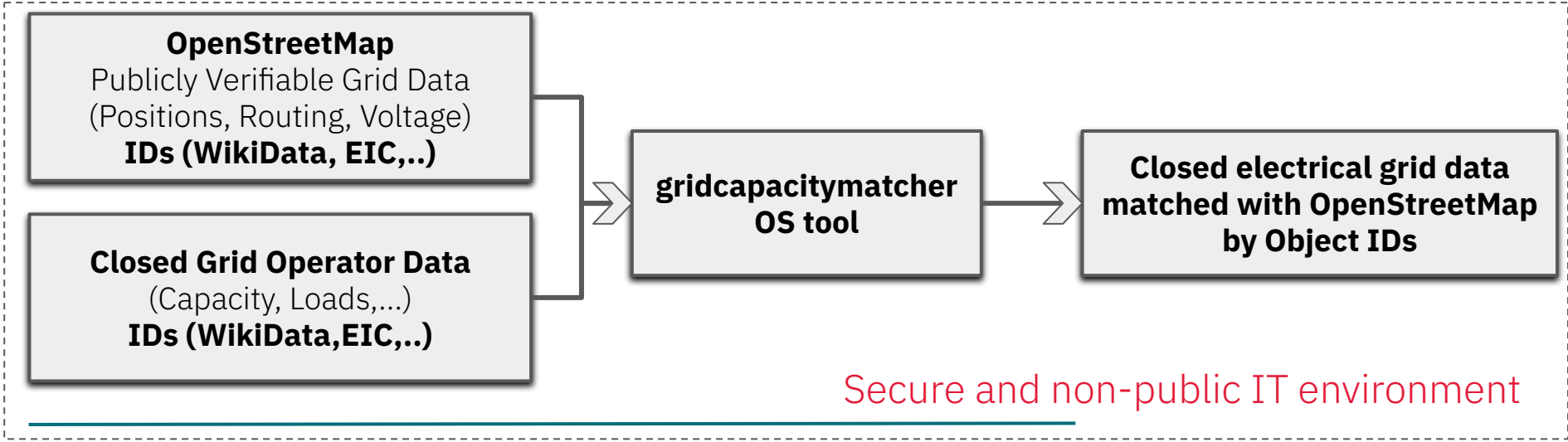
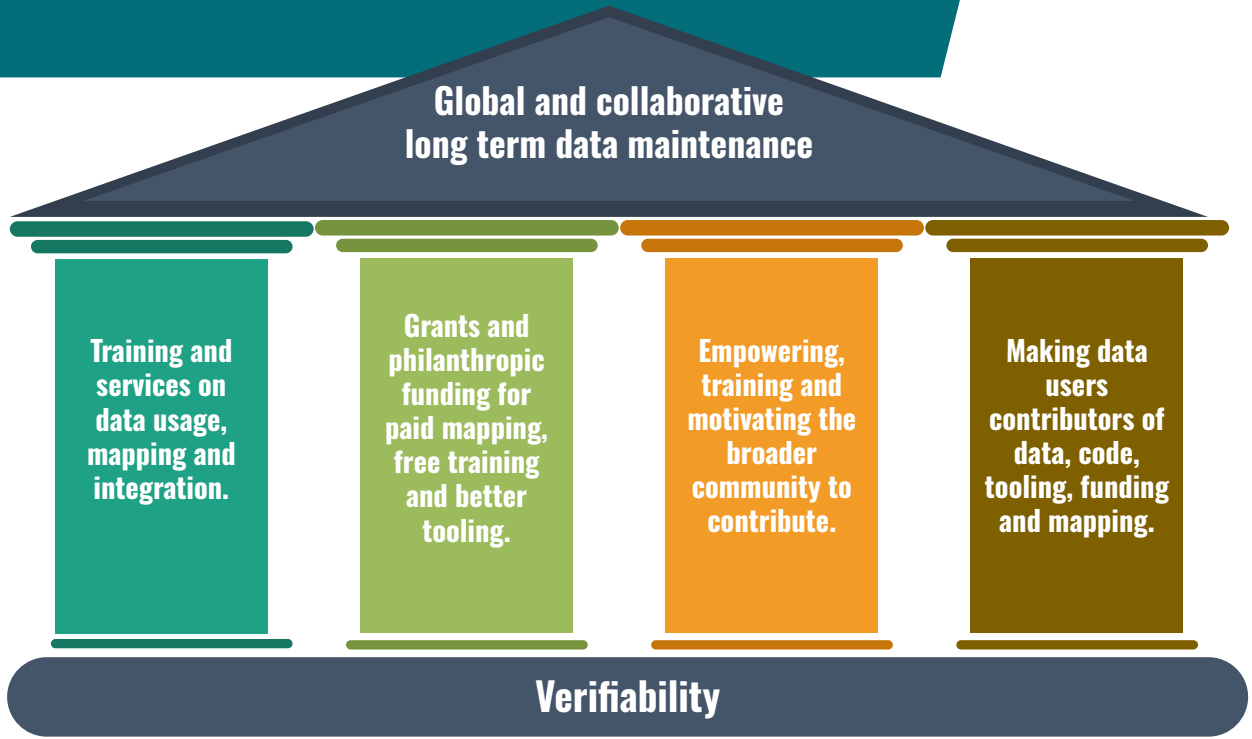
How to keep Critical Data Closed?



The Grid (Data) Needs You!



Questions?!

Join MapYourGrid!

We Provide:

1. Service on Power Mapping and QA for closed and Open Data.
2. Tooling and Methodologies on Power Infrastructure
3. Training for QA and tooling in Power Mapping (free 2-hour incentive course).
4. Open Consortium with Open Governance you are welcome to join!
5. Visit MapYourGrid.org, watch our YouTube Videos and learn grid mapping.

Open Energy Transition · DATACTIVIST · dynartio · JUNGLE BUS · Infrageomatics

https://projectgeospatial.org/geospatial-frontiers/the-rise-power-and-uncertain-future-of-americas-open-infrastructure-data

https://ag.kritis.info/2026/01/15/n-1-oder-stromausfall-berlins-infrastrukturproblem-hat-eine-technische-loesung/