10 years of power infrastructure mapping on OSM: what’s next?

State of the Map Europe – November 12, 2023
Bonjour !

I've been contributing to OSM since 2012
- mostly involved on infrastructures topics and tagging
- OSM French board member since 2018

Let's get in touch on wiki or osm.org
Energy transition ... means more complex grids

Yesterday

Generation

Transmission

Distribution

Urban

Rural

Top-down flows

Bi-directional flows

Yet another NIMBY substation

Bicycles

Generator

Yet another

Juicy Studio LTD (copyright) - Iconshock
What key roles OSM can play here?

- Third parties awareness
- Contribute to network operators own knowledge
- For the sake of it
Some disclaimers

OpenStreetMap won’t encourage to put yourself at risk while mapping, nor while using the data.

Don’t trespass on restricted perimeters

Power facilities are always dangerous places. Mapping guidelines won’t ever expect you to get inside. Stay safe and always obey local regulations.

Call before you dig

Underground networks are often disrupted by poorly planned works. Many countries now provide official processes to get you informed on time. OpenStreetMap data must not be used for works planning.
State of mapping of European transmission grids

Thanks to OpenInfraMap.org
State of mapping of European transmission grids

Overhead power lines
1,2M km

Overhead power minor lines
700k km

Insulated power cables
60k km

Substations
450k

Power plants
40k

UK solar project-of-the-month

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Baked with

OSM History Analyzer
Tagging works
Power generation mapping

Early evolution – Most of what was defined between 2010 and 2013 is still in use

Proposals authors:
- TomChance
- Don-vip
- Fanfouer
- Clorox

And proposal process would lead to nothing without reviewers
Power substations mapping
Continuous evolution and more and more details

Proposals authors:
- Polderrunner
- Fanfouer

And proposal process would lead to nothing without reviewers
Power substation refinement outlook

It looks like a very successful refinement, despite 7-years long lasting

A more robust tag comes out of two with less meaning.

A constant effort in contribution is seen along years afterwards approval and the relevancy to replace tags with the appropriate method is no longer in doubt.

Baked with https://taghistory.raifer.tech by Martin Raifer
Lines mapping
A global framework to describe them all, not only power lines

tower:type=
  - suspension
  - anchor
pole:type=
  - suspension
  - anchor

Proposal Lines attachment
  line_attachment=
    - anchor
    - suspension
    - pin
    - pulley

Proposal Lines management
  line_management=
    - straight
    - branch
    - split
    - transpose
    - termination
    - transition
    - cross

Proposals authors:
  - Fanfouer

And proposal process would lead to nothing without reviewers

Juicy studio LTD (copyright) – Just icon (CC BY 3.0) – Robert Walsh
Lines mapping

In a nutshell

\[
\begin{align*}
\text{line_management} &= \text{straight} \\
\text{line_arrangement} &= \text{triangular} \\
\text{line_attachment} &= \text{anchor}
\end{align*}
\]
Lines mapping
A global framework to describe them all, not only power lines

Termination
Branch
Split
Branch
Cross
Transpose

OSM topology

Ground view
(from the top)
Lines mapping

Sometimes, even most usable tagging fails
Utilities facilities

Power networks are part of a wider universe to document hosting of utilities activities

Previously

<table>
<thead>
<tr>
<th>Utility</th>
<th>Site industriel</th>
<th>Bâtiment technique</th>
<th>Poteau</th>
<th>Borne</th>
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Utility=* key is now a common concept to attribute which activity is hosted by a given building, marker, cabinet...

As of 2023

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Interoperability strategy

Tagging should be as consistent to several external norms and regulations as possible.

International norms (pretty good)

IT standards (to be done)

National regulations (to be done)

IEC 60050
IEC 60038 ...

https://wiki.openstreetmap.org/wiki/Category:IEC60050

Sustainable and used OSM tagging concepts

Star-Elec EclExt...
Enedis / OSM France partnership

- OSM Foundation's French local chapter in France
- 3-years partnership: 2021-2023
- Largest distribution grid operator in Europe serving 33.4M households in metropolitan France
- ~ Approx 1200 people involved in cartography activity
- Linemen and linewomen, mostly working on ground. Engineers and planners working in office.
Encouraging crowdsourcing on chosen features, with:

- ~7 300 km² covered by **5cm aerial imagery** produced by Enedis by its own means, dedicated to OSM contribution
- Additional **opendata** about overhead power infrastructure
- Maintained and enriched **OSM documentation**, dedicated platform for engagement monitoring day by day.

**Share views and technical abilities**

- General knowledge about power networks operations
- Planning and design about a possible comparison between OSM and internal GIS, with data feedback
- Implementing business references as to make links between official opendata and OSM

François Lacombe – Adam Okuciełewski – Barrymieny – CC BY SA
Enedis / OSM France partnership

As of mid-October 2023, compared to beginning 2022:

- **1,063,258** (+25%) poles and **254,699** (+0.3%) towers supporting power networks, all operators.

- **85,000** (+35%) poles are tagged with a material (thanks StreetComplete)

### Poles Material

- **90k**
  - Wood
  - Concrete
  - Steel

### Poles Operator (mostly distribution)

- **1,2M**
  - Enedis
  - RTE
  - Remainder

### Towers Operator (mostly transmission)

- **300k**
  - Enedis
  - RTE
  - Remainder

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Enedis / OSM France partnership

A relentless involvement is seen over 3 years. **2 users each day** at least, among 1,476 contributors. Average stands at 10.5 people, no holidays, no weekends.

What remains to be done

Tagging

Software development

Connect with other communities
Finalise routing over networks

What most power contributors are used to (and will continue to map)

What is happening here?
Finalise routing over networks

A 10-years-old proposal is still under RFC (by Surly)

What most power contributors are used to (and will continue to map)

What routing allows

Creating circuits relations has been a thing on OSM for years yet. Several approaches coexist.

It’s not different from public transport relations over physical roads. We get a better balance between physical and logical properties on dedicated features.

Two improvements are wished:

Relation’s members tagging

Downstream graph processing
Continuous improvement for tagging

Most of opened tracks in OSM tagging are still to be improved. Here are some short-terms points:

- Bring consistency into **power generation framework**, finalise heating generation and more detail splitting in thermal power plants.
- Complete **power storage** description (batteries, flywheels, potential storage...). Anticipate related LVDC grids that could appear with appropriate compensators and converters.
- Localise **designs of power supports** with `design:ref help`
- Handle complex combinations of `line_attachment`, `line_management` and `line_arrangement`
- Obviously, many **wiki pages remains to be refreshed**. New `/Power` and `/Power_lines` to come.
Quality assurance

Quality assurance is continuously improving as well, usually following tagging. Power contributions rely on common QA tools: editors, validators, and Osmose.

Advice contributors on possible add of line_management by topology analysis, including upcoming route relations coming for routing.

Measure conflation distances between OSM and opendata and observe how it evolves along years.

Implement advanced analysis in every editors as to ensure of proper validation prior to contribute (some tagging are dedicated to certain kind of geometries, and so on...)

Give a try to recently presented Clearence!
Connect with other communities

We could (or already) share practices and data with several partners:

Key points that matters:

- Share data models
- Licence enforcement
- Feedback from OSM
- Partners contributing to code and data
As seen from the moon
Thank you

See you at SOTM-EU 2033

https://www.openstreetmap.fr

@OSM_FR

@InfosReseaux

lacombef