



This document contains Deliverable D2.3 ‘EU-wide Inventory of CAIs’, which is connected to Task 2.2. Together with the publication of peer-reviewed papers related to the deliverable, it will be updated by the end of the COMETS project in April 2022. This includes at least a peer-reviewed article on the database itself and how the FAIR data principles were implemented, a peer-reviewed article about the national and EU-level aggregates on collective action initiatives (CAIs) for the energy transition, and a book publication analyzing the CAI inventory in depth. To summarize, the information compiled in this deliverable complements the COMETS inventory. The deliverable includes information on:

- Description of what is delivered in the inventory of CAIs;
- Description of the structure and a timeline for the disclosure.

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Abbreviations & Acronyms

CAI: Collective Action Initiative
 CE: Community Energy
 CHP: Combined heat and power
 CSP: Concentrated solar power
 EC: European Commission
 ET: Energy Transition
 FAIR: Findable, Accessible, Interoperable, and Reusable
 GDP: Gross domestic product
 GHG: Greenhouse Gas
 GW: Gigawatt
 SDGs: Sustainable Development Goals
 PV: Photovoltaic
 RDF: Resource Description Framework
 SI: Social Innovation
 SIEC: Standard Energy Product Classification

Contribution history

Date	Comment	Contributors
By 27.10.21	Inventory completion	Coordination and editing Valeria Jana Schwanitz, Ingrid Knutsdotter Koren; Supervision: Valeria Jana Schwanitz, August Wierling, Jan Pedro Zeiss; Contributors to country reports: EU: Valeria Jana Schwanitz et. al.; AUT: August Wierling, Valeria Jana Schwanitz, Jan Pedro Zeiss (Simon Dufner); BEL: Timothy Marcroft, August Wierling, Constantin von Beck; BGR: Valeria Jana Schwanitz; CHE: Lukas Müller, August Wierling, Timothy Marcroft; CZE: Jan Pedro Zeiss, Valeria Jana Schwanitz; CYP: Ingrid Knutsdotter Koren; DEU: Jan Pedro Zeiss, Constantin von Beck, August Wierling, Valeria Jana Schwanitz, Simon Dufner, Tobias Kraudzun; DNK: August Wierling, Valeria Jana Schwanitz, Jan Pedro Zeiss, Jay Sterling Gregg; ESP: Tobias Kraudzun, Izaskun Jimenez Iturriza, Valeria Jana Schwanitz; EST: Grete Glaase, Valeria Jana Schwanitz; FIN: Jan Pedro Zeiss; FRA: Timothy Marcroft, August Wierling, Jan Pedro Zeiss; GBR: Melake Getabecha, August Wierling; GRC: Zacharias Andreadakis, Valeria Jana Schwanitz, Ingrid Knutsdotter Koren; HRV: Ingrid Knutsdotter Koren, Jan Pedro Zeiss; HUN: Valeria Jana Schwanitz; IRE: August Wierling, Valeria Jana Schwanitz, Melake Getabecha, Jan Pedro Zeiss, Ingrid Knutsdotter Koren; ITA: Alessandro Sciullo, Veronica Lupi, Chiara Candelise, August Wierling; LTU: Valeria Jana Schwanitz; LUX: Valeria Jana Schwanitz, LVA: Valeria Jana Schwanitz; MLT: Constantin von Beck; NLD: August Wierling, Jan Pedro Zeiss, Constantin von Beck, Negar Safara Nosar; NOR: Ingrid Knutsdotter Koren, POL: Valeria Jana Schwanitz, Tadeusz Rudek, Wit Hubert, August Wierling; PRT: Tobias Kraudzun; ROU: Simon Dufner, Valeria Jana Schwanitz; SLV: Valeria Jana Schwanitz, Ingrid Knutsdotter Koren; SVK: Valeria Jana Schwanitz; SWE: Ingrid Knutsdotter Koren, Jan Pedro Zeiss, August Wierling.

27.10.21	Internal review	Valeria Jana Schwanitz, Ingrid Knutsdotter Koren, August Wierling, Jan Pedro Zeiss,
27.10.21	Version submitted	August Wierling
30.04.22	Update submitted	

Description of the inventory of CAIs

Brief summary: With Deliverable 2.3, we present a brief description of the inventory of CAIs and the pathway to publication.

Where? The final inventory of CAIs will be stored at zenodo.org and dataverse.no. The archive DataverseNO (<https://dataverse.no/>) is a national, generic repository for open research data, owned and operated by UiT The Arctic University of Norway. DataverseNO is aligned with the FAIR Guiding Principles for scientific data management and stewardship. The technical infrastructure of the repository is based on the open source application Dataverse, which is developed by an international developer and user community led by Harvard University. DataverseNO is CoreTrustSeal certified.

When? The collection of data will be finalized by the end of October. By the end of December, validation procedures will be carried out. Parallely, we prepare the submission of a manuscript (to Nature Scientific Data) to a) publish the inventory, and b) demonstrate how we solved the implementation of the FAIR principles, which ensure human-readability and machine-actionability. With the acceptance of the manuscript, the COMETS inventory is open to the public. The FAIRification of the inventory is part of the H2020 EERAdata project led by HVL.

What else? The publication will also feed directly into Deliverable D2.4, the technical manual for the inventory. Further, a publication summarizing the country and EU level aggregates of the inventory is planned (see Schwanitz et al, 2021 for the pre-print). In addition, we plan on publishing a book providing information on the socio-cultural, economic, legislative and political situation, as well as historical development, in each of the countries covered in the Inventory. The book will allow, among others, the users of the database to put the quantitative data into the country-specific context.

Timeline and process for publication of final database

November 2021

- Finalizing data collection and validation for inventory
- Transferring data into final FAIR database format (reference implementation files)
- Preparation of journal manuscripts (see below)

December 2021

- Final update of inventory
- Submitting manuscripts to publish the inventory. Targeted peer-reviewed journal: Nature Scientific Data. The manuscript completes D2.3 and D2.4.
- Submitting manuscript to publish national/EU aggregates (building on preprint). Targeted peer-reviewed journal: high ranking journal.

April 2022

- Submission of book manuscript. Targeted publisher: Routledge.
- Submission of update of D2.3, submission of D2.4

What is delivered in the inventory of CAIs - Structure of the inventory

As stated in the grant agreement, the Europe wide inventory aims to provide data on CAIs, structured along three different ontological tiers:

1. **Organizational structure & history of actions**, e.g. legal forms, memberships, and statutes; investments into provision of energy services, information and fund-raising campaigns;
2. **Performance and quantified contribution of CAI to the energy transition**, e.g. installed capacities, mobility services provided, distribution networks operated, energy saved, numbers of customers, jobs and companies created, finances mobilized, remuneration re-invested, taxes paid, economic records, people involved;
3. **Contextual data** characteristic of the national to regional level of the systems of energy services provision – down to NUTS 3, e.g. final energy demand and supply, share of renewables, energy intensity of GDP, regional GDP, labour and income statistics.

The inventory is planned as an open database in compliance with the FAIR principles. The FAIR principles of Wilkinson et al. (2016) are guiding principles for data to ensure that they are F-findable, A-accessible, I-interoperable, and R-reusable. The important point is that FAIR does not only imply to adhere to these principles from a human perspective, but - even more importantly - from a machine-perspective. Only with machine-actionability will data be of use and also exploitable along with other datasets.

To ensure machine-actionability, the database is structured following semantic web technologies. In particular, extensive use of the resource description framework (RDF) is made. A number of other options for file format were considered, such as interlinked spreadsheets or a collection of comma-separated-value (csv) files. RDF was selected for the following reasons:

- I. The use of readable text instead of a binary format;
- II. The publication of all data in a single document;
- III. The combining of several linked datasets by the use of appropriate semantic triple and named graphs;
- IV. The possibility to query the database with the help of e.g. the Simple Protocol and RDF Query Language (SPARQL). This allows us to retrieve and manipulate the data in the RDF file. SPARQL commands can also be used to form a simple user interface to the inventory without an extensive administrative burden;
- V. The implementation of the FAIR principles is straightforward: RDF implementations of metadata standards such as the DUBLIN core metadata element set exists. Many important controlled vocabularies for standards ranging from administrative to energy specific information are available as RDF documents. The use of internationalized resource identifiers (IRI) in PDF allows a relatively easy implementation of core elements in the inventory as persistent identifiers. At the same time, high modularity of concepts is still possible. While not implemented in the current version of the inventory, RDF also allows restricting access to certain parts of the inventory, if necessary. Linking semantic triples in RDF is a natural way to ensure machine-actionability. Finally, tools to screen semantic triple according to predefined schemas can be used for validation purposes;

- VI. The ease in extending the database beyond the submission in April 2022 by adding single or multiple semantic triples to it.

Further, the data granularity varies from country to country, depending on the available data. Implementing data with a large variation, such as csv files, would have led to a very inefficient use of storage resources.

The inventory itself will include data on organizational structure & history of actions and the performance and quantified contribution to the energy transition (see 1st and 2nd ontological tier described above). The database will include the following datasets:

1. Organizational and administrative data of CAIs (e.g name, address, ID,...);
2. Data on production units (e.g location of units, installed capacity);
3. Data on equipment other than production units;
4. Temporal data (e.g yearly energy production, member fluctuations, ...); and
5. Data on administrative activities (e.g date of foundation/merge/dissolution, date of purchasing/selling/construction of production unit).

Users will be able to access the database through a set of SPARQL queries. SPARQL also offers federated queries and in that way the option to link to other RDF databases, such as Open Street Map. This allows the provision of contextual data already available in other databases, such as final energy demand and supply, share of renewables or energy intensity of GDP, without the direct inclusion of the data in the COMETS inventory. See Fig. 1 for an illustration of the inventory structure.

Sources for data include publicly accessible registries, websites of CAIs (e.g. energy communities), reports, and social media. A comprehensive list of all data-sources will be made available in the Deliverable D2.4. At the same, metadata information contained in the RDF file will also point to the relevant data sources as required by the FAIR principles. Furthermore, results of other work packages such as data generated by surveys (T3.2) and case studies (T4.3) will feed the inventory. As much as possible, the mining of data will be organized semi-automatically. Note that all data will be classified into data open to the public and data, which is confidential in order to adhere to legislative requirements.

Fig. 1: General Workflow: Creating and using the inventory

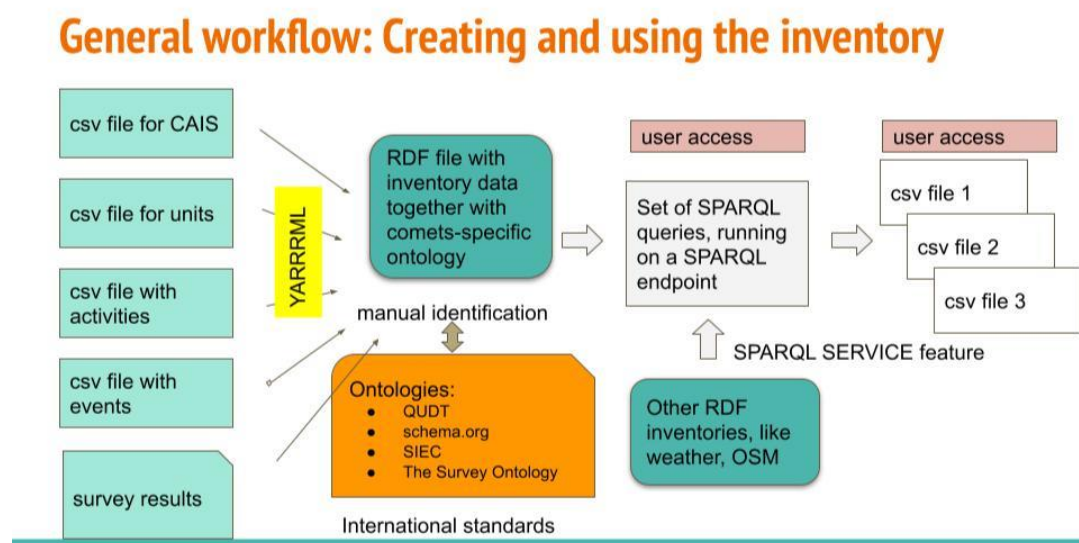


Fig. 1 outlines the general workflow in creating the inventory. The source data was downloaded from the relevant data sources either manually, as datasets or via application programming interfaces and organized into several csv files. The information in the csv files were transformed into semantic triples using declarative linked data generation rules (yarrml). All relevant properties were linked to controlled vocabularies and basic concepts were introduced. If not available already, these concepts are defined in a COMETS ontology to be published alongside with the inventory. The right side of Fig. 1 shows the option of user access via SPARQL queries and the generation of csv files with a subset of information from the overall inventory.

Preliminary aggregate numbers of the inventory

Currently, at least two million¹ citizens across Europe collectively engage in more than 8400 energy communities², realizing a minimum of 13000 projects³ since the year 2000 (Schwanitz et al. 2021). The countries with the most active CAIs are Germany and the Netherlands (> 1000 CAIs), followed by Austria, Switzerland, Denmark, Finland, France, Great Britain, Poland, Spain, Greece and Sweden with more than 100 CAIs in each country. For the remaining European countries, less than 100 CAIs were identified, respectively. Current total renewable capacities installed by citizen-led energy projects in Europe can be estimated at least as high as 6.3 GW⁴, contributing up to 7% to the nationally installed capacities⁵. The largest share is solar PV (~50%)⁶, followed by onshore wind (~10%).⁷ A conservative estimate of the total invested finances amounts to at least 2.6 billion EUR.⁸

Overview of activities of CAIs

In the inventory, we separate between activities accomplished and those in the planning phase. The former ones are connected to production or distribution units; they imply acquiring (e.g., purchasing or installing) these units. Services are not connected to such units.

I) Energy sector activities:

- **Production** (activities, e.g., purchasing, building, and the selling of production units). Production activities are defined as the transformation of primary energy to secondary and/or final energy (i.e., powerplant-based definition). We utilize the “Standard Energy Product Classification” ([SIEC](#)) with labelled production units. The list does not include end-use technologies, e.g. charging stations.
 - For production units, we differentiate between the share actually fed into the grid and the remaining (self-)consumption.
 - We account for: Solar PV, Solar CSP, Solar Thermal, Wind Onshore, Wind Offshore, Hydropower, Heat, Heat pumps, Geothermal (electricity), Cogeneration, Biogas, Biomass, Hydrogen.

¹ Based on numbers from 15 countries. Information is missing for CYP, LUX, SLV; NOR; IRE, ITA, HUN, LVA, ROM, PRT, ESP, GRC, MLT, BGR, LIE, SVK.

² Based on numbers from CAIs from 28 countries, missing information for CYP, LIE, and SLK.

³ Based on numbers for 19 countries, missing information for LUX, IRE, BGR, CYP, GRC, ESP, PRT, ROM, SLK, HUN, LVA, LIE.

⁴ Based on numbers from 18 countries, excluding terminated projects. Missing information for LUX, BGR, CYP, GRC, HUN, IRE, LVA, LIE, PRT, ROM, SLK, CHE, ESP.

⁵ Using the Belgium estimate (highest value).

⁶ Based on data from 12 countries, not counting terminated and planned initiatives as well as initiatives that do not have their primary focus on the energy sector (e.g., agricultural initiatives).

⁷ Counting the contribution from seven countries, excluding terminated and planned initiatives as well as initiatives not having a primary focus on the energy sector.

⁸ Estimate based on data from 10 countries.

- **Distribution** (activities, e.g., purchasing, building, and selling of Grid infrastructure/distribution networks). Defined as the transformation of electricity to end-use services. A SIEC classification or any other classification is not available.
 - Grid operation | Electricity, Grid operation | Heat, Grid operation | ICT, Grid operation | Gas, Trade, Grid operation | Water, Electricity, Trade| Electricity | Spot market, Trade |Electricity| Customer, Water supply, Storage, Trade | Tenant solutions, Self-Consumption, Trade | Biogas.
- **Consumption** (activities, e.g., self-consumption). Defined as consumption in a sector - transport sector, residential/commercial sector, industrial sector (following IAM classification).
 - Residential and Commercial Sector/Self-consumption, Transport sector/Self-consumption, Industrial sector/Self-consumption.
- **Energy Services** (activities, e.g., renting/sharing cars/bikes/vehicle sharing, apps connected to charging, ticket-sharing platforms).
 - Retrofitting
 - Energy saving (e.g., apps to optimize energy consumption)
 - Information/awareness | Training,
 - Information/awareness | Energy savings & Renewable energy,
 - Information/awareness | (Low carbon)Mobility,
 - Information/awareness | Consulting,
 - Information/awareness | Planning
 - Information/awareness | Environmental, Banking, Financing, Agriculture, Other
 - Contracting | Light; Contracting/...
 - Mobility | Operating/Management charging stations
 - Mobility | Investing into charging infrastructure | Investing into RE-fueled charging infrastructure
 - Mobility | Investing into mobility infrastructure (e.g., owning a gasoline station)
 - Mobility | Car sharing, Mobility | Vehicle renting services
 - Mobility| Carpooling, Mobility | Ride sharing (hitchhiking X.0)
 - Mobility | Ride hailing
 - Mobility | Ticket trading | Train tickets
- **Agriculture**
- **R & D** - Economic and statistical research, Technology & digital tools, Social and organizational innovation.
- **Other**

II) CAI administrative activities (running the CAI, yearly assembly, history of CAI in general, splitting/merging of CAI).

Further standards adopted in the inventory include (i) the QUDT ontology on quantities, units, dimensions, and data types, (ii) the schema.org ontology for administrative information, (iii) the ISO 8601 for all dates involved, (iv) the ISO 20275 for legal forms, (v) the NACE statistical classification of economic activities in the European Union, (vi) the basic geospatial vocabulary, and (vii) the xbrl vocabulary to report financial activities with the extensible business reporting language (xbrl).

Reference Implementations

Here we illustrate an example of the Reference Implementation Files that implement the COMETS inventory based on the FAIR principles. We take the example of Germany (refer to the Appendix 1 below) to illustrate the level of detail that is captured (depending on actual data availability). Where available, we use agreed-upon standards, otherwise we defined new standards which are machine-actionable through allocated persistent identifiers.

The detailed description and documentation are subject to the planned publication on FAIRifying the COMETS inventory (planned for submission by December 2021). We embed the following standards:

- Country codes: ISO 3166 alpha-2 and alpha-3
- Languages codes: ISO 639-1
- Currency codes: ISO4217
- Industrial sector classification: NACE and country-specific implementations
- Legal entities: ISO20275
- Energy Production: SIEC - Standard International Energy Product Classification
- Financial reporting: Based on xbrl using taxonomy of US-GAAP
- Geotagging: Latitudes, Longitudes WGS84

Ample information linking to various standards is provided to ensure both human-readability and machine-actionability. Also relating to several standards increases findability in the long run.

Note that font problems do not occur in the database; this is only introduced by copy & paste.

References

Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. *Sci Data* 3, 160018 (2016). <https://doi.org/10.1038/sdata.2016.18>

Schwanitz, V. J., Wierling, A., Zeiss, J. P., von Beck, C., Koren, I. K., Marcroft, T., ... Dufner, S. (2021, August 22). The contribution of collective prosumers to the energy transition in Europe - Preliminary estimates at European and country-level from the COMETS inventory. <https://doi.org/10.31235/osf.io/2ymuh>

Appendix 1: FAIR Reference Implementation File - Germany

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix ma: <http://www.w3.org/ns/ma-ont#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix schema: <http://schema.org/> .
@prefix comets: <http://www.comets-project.eu/> .
@prefix dbo: <http://dbpedia.org/ontology/> .
@prefix dbr: <http://dbpedia.org/resource/> .
@prefix geo: <http://www.w3.org/2003/01/geo/wgs84_pos#> .
@prefix siec: <http://dd.eionet.europa.eu/vocabulary/eurostat/siec/> .
@prefix orcid: <http://www.orcid.org/> .
@prefix wikidata: <https://www.wikidata.org/wiki/> .
@prefix grel: <http://users.ugent.be/~bjdmeest/function/grel.ttl#> .
@prefix geop: <http://aims.fao.org/aos/geopolitical.owl#> .
@prefix rov: <http://www.w3.org/ns/regorg#> .
@prefix xbrll: <https://w3id.org/vocab/xbrll#> .
@prefix mv: <http://schema.mobivoc.org/#> .
```

```
comets:cai_deu_1 a schema:Organization, dbo:Organisation, rov:RegisteredOrganization,
comets:CAI ;
```


schema:name "3E Eigene Erneuerbare Energie"@de ;
schema:legalName ""@de ;
comets:status "active"@en ;
comets:isLegalOrganization "YES"@en ;
schema:alternateName "" ;
schema:identifer "C-1191457" ;
schema:addressCountry "DE" ;
wikidata:P298 "DEU" ;
schema:streetAddress "Karl-Böhm-Straße 171"@de ;
schema:addressLocality "Vaterstetten"@de ;
schema:postalCode "85598" ; schema:contactPoint "" ;

schema:url "https://www.3e-eg.de/node" ;
schema:foundingDate "2013-03-19" ;
schema:dissolutionDate "" ;
comets:nationalLegalForm "Genossenschaft"@de ;
comets:energyAsSecondaryActivity "NO" ;
schema:makesOfer "Production|Solar PV", "Production|Heat - Wood pellet",
"Production|Heat - Unspecified", "Other" ;
comets:nationalIndustrialClassificationCode "D35.11" ;
comets:nationalIndustrialClassificationText "Elelektrizitätserzeugung"@de ;
comets:nationalIndustrialClassificationText "Production of electricity"@en ;
comets:oneMemberOneVote "YES"@en ;
comets:hasNACE "D35.1.1" ;
comets:hasELF "US8E" ;

comets:hasPurpose "Gegenstand des Unternehmens: Errichtung und Betrieb von Anlagen zur Erzeugung und Speicherung regenerativer Energien und/oder Verteilung - auch in Form von Contracting-Modellen (insbesondere Bereitstellung von Wärme und Betrieb entsprechender Erzeugungsanlagen für Dritte); Absatz der gewonnenen Energie; Durchführung von Maßnahmen zur Steigerung der Energieeffizienz; Beteiligung an Unternehmen und Kooperationen mit Anlagen zur Erzeugung und Speicherung regenerativer Energien; Beteiligung an Unternehmen zum Betrieb lokaler Netze zur Verteilung von Strom, Gas und Wärme; Unterstützung und Beratung in Fragen der regenerativen Energiegewinnung einschließlich einer Information von Mitgliedern und Dritten sowie einer Öffentlichkeitsarbeit; gemeinsamer Einkauf von Anlagen zur Erzeugung regenerativer Energien für Mitglieder und Dritte, geeigneten falles einschließlich der Bestellung werkvertraglicher Leistungen; gemeinsamer Einkauf von regenerativ erzeugter elektrischer Energie, Biogas oder Wärmeenergie für Mitglieder im Sinne einer Bündelung von Nachfrage; Handel mit Energieträgern zum Zweck eines wirtschaftlichen Betriebs von Energiespeicheranlagen."@de ;

dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
dc:contributor "https://orcid.org/0000-0002-8016-929X" ;
dc:source "https://www.3e-eg.de/blog" ; dc:publisher
"Høgskulen på Vestlandet"@no ;
dc:publisher "Western Norway University of Applied Sciences"@en ;
dc:date "2021-09-08" .

comets:cai_deu_2 a schema:Organization, dbo:Organisation, rov:RegisteredOrganization,
comets:CAI ;

schema:name "Bürger-Energie Südbaden"@de ;
schema:legalName ""@de ;
comets:status "active"@en ;
comets:isLegalOrganization "YES"@en ;

schema:alternateName "" ;
schema:identifer "C-161722" ;
schema:addressCountry "DE" ;
wikidata:P298 "DEU" ;
schema:streetAddress "Marktstraße 1-3"@de ;
schema:addressLocality "Müllheim"@de ;
schema:postalCode "79379" ;
schema:contactPoint "" ;
schema:url "http://www.buerger-energie-suedbaden.de/" ;
schema:foundingDate "2012-08-30" ;
schema:dissolutionDate "" ;
comets:nationalLegalForm "Genossenschaft"@de ;
comets:energyAsSecondaryActivity "NO" ;
schema:makesOfer "Production|Solar PV", "Production|Wind Onshore",
"Production|Hydropower", "Production|Heat - Unspecified" ;
comets:nationalIndustrialClassificationCode "D35.11" ;
comets:nationalIndustrialClassificationText "Elelektrizitätserzeugung"@de ;
comets:nationalIndustrialClassificationText "Production of electricity"@en ;
comets:oneMemberOneVote "YES"@en ;
comets:hasNACE "D35.1.1" ;
comets:hasELF "US8E" ;
comets:hasPurpose "" ;
dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
dc:contributor "https://orcid.org/0000-0002-8016-929X",
"https://orcid.org/0000-0001-9134-3356" ;
dc:source "" ;
dc:publisher "Høgskulen på Vestlandet"@no ;
dc:publisher "Western Norway University of Applied Sciences"@en ;
dc:date "2021-09-08" .

comets:cai_deu_3 a schema:Organization, dbo:Organisation, rov:RegisteredOrganization,
comets:CAI ;

schema:name "Pro Guben e.V."@de ;
schema:legalName "Pro Guben Verein für Energie und Umwelt e.V."@de ;
comets:status "active"@en ;
comets:isLegalOrganization "YES"@en ;
schema:alternateName "" ;
schema:identifer "C-161722" ;
schema:addressCountry "DE" ;
wikidata:P298 "DEU" ;
schema:streetAddress "Frankfurter Straße 6"@de ;
schema:addressLocality "Guben"@de ;
schema:postalCode "03172" ;
schema:contactPoint "https://www.proguben.info/de_DE/kontakt/" ;
schema:url "https://www.proguben.info/de_DE/" ;
schema:foundingDate "1994" ;
schema:dissolutionDate "" ;
comets:nationalLegalForm "eingetragener Verein"@de ;
comets:energyAsSecondaryActivity "YES" ; schema:makesOfer
"Production|Solar PV" ; comets:nationalIndustrialClassificationCode "D35.11" ;
comets:nationalIndustrialClassificationText "Elelektrizitätserzeugung"@de ;

schema:name "Bürger Energie Drebach"@de ;
 schema:legalName ""@de ;
 comets:status "active"@en ;
 comets:isLegalOrganization "YES"@en ;
 schema:alternateName "" ;
 schema:identifer "C-1938108" ;
 schema:addressCountry "DE" ;
 wikidata:P298 "DEU" ;
 schema:streetAddress "Herolder Str. 23"@de ;
 schema:addressLocality "Drebach"@de ;
 schema:postalCode "09430" ;
 schema:contactPoint "" ;
 schema:url "https://www.buerger-energie-drebach.de" ;
 schema:foundingDate "2014-07-17" ;
 schema:dissolutionDate "" ;
 comets:nationalLegalForm "eingetragene Genossenschaft"@de ;
 comets:energyAsSecondaryActivity "NO" ;
 schema:makesOfer "Production|Solar PV", "Distribution|Trade|Electricity|Customer",
 "Distribution|Trade|Biogas", "Services|Information/awareness|(Low carbon)Mobility",
 "Services|Mobility|Operating/Management charging stations" ;
 comets:nationalIndustrialClassificationCode "D35.11", "D35.14" ;
 comets:nationalIndustrialClassificationText "Elelektrizitätserzeugung"@de,
 "Elelektrizitätshandel"@de ;
 comets:nationalIndustrialClassificationText "Production of electricity"@en,
 "Trade of electricity"@en ;
 comets:oneMemberOneVote "YES"@en ;
 comets:hasNACE "D35.1.1", "D35.1.4" ;
 comets:hasELF "US8E" ;
 comets:hasPurpose ""@de ;
 dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
 dc:contributor "https://orcid.org/0000-0001-9134-3356" ;
 dc:source "" ;
 dc:publisher "Høgskulen på Vestlandet"@no ;
 dc:publisher "Western Norway University of Applied Sciences"@en ;
 dc:date "2021-09-08" .

comets:cai_deu_6 a schema:Organization, dbo:Organisation, rov:RegisteredOrganization,

comets:CAI ;

schema:name "BürgerEnergie Rhein-Main eG"@de ;
 schema:legalName ""@de ; comets:status
 "active"@en ;
 comets:isLegalOrganization "YES"@en ;
 schema:alternateName "" ;
 schema:identifer "C-3437551" ;
 schema:addressCountry "DE" ;
 wikidata:P298 "DEU" ;
 schema:streetAddress "Menzelstraße 9B"@de ;
 schema:addressLocality "Märfelden-Walldorf"@de ;
 schema:postalCode "64546" ;
 schema:contactPoint "" ;
 schema:url "https://www.bermeg.de/" ;
 schema:foundingDate "2013-01-15" ;

schema:dissolutionDate "" ;
 comets:nationalLegalForm "eingetragene Genossenschaft"@de ;
 comets:energyAsSecondaryActivity "NO" ;
 schema:makesOfer "Production|Wind Onshore", "Production|Heat",
 "Production|Cogeneration", "Distribution|Trade|Electricity|Customer",
 "Distribution|Trade|Biogas", "Services|Mobility|Car sharing",
 "Services|Mobility|Operating/Management charging stations" ;
 comets:nationalIndustrialClassificationCode "D35.11", "D35.14", "N77.11" ;
 comets:nationalIndustrialClassificationText "Elelektrizitätserzeugung"@de,
 "Elelektrizitätshandel"@de, "Vermietung von Kraftwagen mit einem Gesamtgewicht
 von 3,5 t oder weniger"@de ;
 comets:nationalIndustrialClassificationText "Production of electricity"@en,
 "Trade of electricity"@en, "Renting and leasing of cars and light motor vehicles"@en ;
 comets:oneMemberOneVote "YES"@en ;
 comets:hasNACE "D35.1.1", "D35.1.4", "N77.1.1" ;
 comets:hasELF "US8E" ;
 comets:hasPurpose ""@de ;
 dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
 dc:contributor "https://orcid.org/0000-0001-9134-3356" ;
 dc:source "" ;
 dc:publisher "Høgskulen på Vestlandet"@no ;
 dc:publisher "Western Norway University of Applied Sciences"@en ;
 dc:date "2021-09-08" .
 comets:cai_deu_7 a schema:Organization, dbo:Organisation, rov:RegisteredOrganization,
 comets:CAI ;
 schema:name "Weiler Wärme eG"@de ;
 schema:legalName ""@de ;
 comets:status "active"@en ;
 comets:isLegalOrganization "YES"@en ;
 schema:alternateName "" ;
 schema:identifer "C-81582" ;
 schema:addressCountry "DE" ;
 wikidata:P298 "DEU" ;
 schema:streetAddress "Im Lehnle 15"@de ;
 schema:addressLocality "Pfalzgrafenweiler"@de ;
 schema:postalCode "72285" ;
 schema:contactPoint "" ;
 schema:url "http://waerme.weilerwaerme.de/" ;
 schema:foundingDate "2009-06-03" ;
 schema:dissolutionDate "" ;
 comets:nationalLegalForm "eingetragene Genossenschaft"@de ;
 comets:energyAsSecondaryActivity "NO" ;
 schema:makesOfer "Production|Solar PV", "Production|Heat", "Distribution|Grid
 operation|Heat", "Services|Mobility|Car sharing" ;
 comets:nationalIndustrialClassificationCode "D35.11", "D35.13", "D35.3", "N77.11" ;
 comets:nationalIndustrialClassificationText "Elektrizitätserzeugung"@de,
 "Elektrizitätshandel"@de, "Wärme- und Kälteversorgung"@de, "Vermietung von Kraftwagen mit
 einem Gesamtgewicht von 3,5 t oder weniger"@de ;
 comets:nationalIndustrialClassificationText "Production of electricity"@en, "Trade of
 electricity"@en, "Renting and leasing of cars and light motor vehicles"@en ;
 comets:oneMemberOneVote "YES"@en ;

```

comets:hasNACE "D35.1.1", "D35.1.4", "N77.1.1" ;
comets:hasELF "US8E" ;
comets:hasPurpose ""@de ;
dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
dc:contributor "https://orcid.org/0000-0001-9134-3356" ;
dc:source "" ;
dc:publisher "Høgskulen på Vestlandet"@no ;
dc:publisher "Western Norway University of Applied Sciences"@en ;
dc:date "2021-09-08" .

#
# describe membership numbers, shares, size of shares
#
comets:event_deu_1 a comets:Membership_Number ;
    comets:measurement_date "2013" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_1 ;
    comets:numberOfMembers "134" .
comets:event_deu_2 a comets:Membership_Number ;
    comets:measurement_date "2014" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_1 ;
    comets:numberOfMembers "134" .
comets:event_deu_3 a comets:Membership_Number ;
    comets:measurement_date "2015" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_1 ;
    comets:numberOfMembers "134" .
comets:event_deu_4 a comets:Membership_Number ;
    comets:measurement_date "2016" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_1 ;
    comets:numberOfMembers "136" .
comets:event_deu_5 a comets:sizeShare ;
    comets:measurement_date "" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:shareOf comets:cai_deu_1 ;
    comets:priceShareAmount "1000" ;
    comets:priceShareCurrency "EUR" .
comets:event_deu_6 a comets:Membership_Number ;
    comets:measurement_date "2013" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_2 ;
    comets:numberOfMembers "190" .
comets:event_deu_7 a comets:Membership_Number ;
    comets:measurement_date "2014" ;

```



```

    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_2 ;
    comets:numberOfMembers "217" .
comets:event_deu_8 a comets:Membership_Number ;
    comets:measurement_date "2015" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_2 ;
    comets:numberOfMembers "243" .
comets:event_deu_9 a comets:Membership_Number ;
    comets:measurement_date "2016" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:membersOf comets:cai_deu_2 ;
    comets:numberOfMembers "332" .
comets:event_deu_10 a comets:shares_Number ;
    comets:measurement_date "2013" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:sharesOf comets:cai_deu_2 ;
    comets:numberOfShares "3820" .
comets:event_deu_11 a comets:shares_Number ;
    comets:measurement_date "2014" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:sharesOf comets:cai_deu_2 ;
    comets:numberOfShares "5125" .
comets:event_deu_12 a comets:shares_Number ;
    comets:measurement_date "2015" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:sharesOf comets:cai_deu_2 ;
    comets:numberOfShares "7489" .
comets:event_deu_13 a comets:shares_Number ;
    comets:measurement_date "2016" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:sharesOf comets:cai_deu_2 ;
    comets:numberOfShares "13262" .
comets:event_deu_14 a comets:sizeShare ;
    comets:measurement_date "" ;
    comets:measurement_agent "" ;
    comets:measurement_source "" ;
    comets:shareOf comets:cai_deu_2 ;
    comets:priceShareAmount "100" ;
    comets:priceShareCurrency "EUR" .

#
# describe production units
#
comets:prod_deu_1 a comets:production_unit, comets:PV_plant, wikidata:Q1003207 ;

```

comets:hasName "Anlage Musikspielhaus" ;
comets:isGridConnected "YES" ;
comets:status "active" ;
schema:streetAddress "Ahornstraße 25"@de ;
schema:addressLocality "Guben"@de ;
schema:addressCountry "DE" ;
schema:postalCode "03172" ;
wikidata:P298 "DEU" ;
comets:product_unit_identifer "SEE949649881741" ;
comets:technology "Solar PV" ;
comets:hasSIEC "RA420" ;
comets:commissionDate "2007-06-27" ;
comets:decomissionDate "" ;
comets:nameplateCapacity "6.732" ;
comets:equipmentSpecifcation "66 modules" ;
dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
dc:contributor "https://orcid.org/0000-0003-3012-2052" ;

dc:source

"https://www.marktstammdatenregister.de/MaStR/Einheit/Detail/IndexOefentlich/2812083" ;
dc:publisher "Høgskulen på Vestlandet"@no ;
dc:publisher "Western Norway University of Applied Sciences"@en ;
dc:date "2021-09-08" .

comets:prod_deu_2 a comets:production_unit, comets:PV_plant, wikidata:Q1003207 ;
comets:hasName "3E-PV-Parkhaus Vaterstetten" ;
comets:isGridConnected "YES" ;
comets:amountGridConnection "FULL"@en ;
comets:status "active" ;
schema:streetAddress "Bahnhofstraße 47"@de ;
schema:addressLocality "Vaterstetten"@de ;
schema:addressCountry "DE" ;
schema:postalCode "85591" ;
wikidata:P298 "DEU" ;
comets:product_unit_identifer "SEE979444129236" ;
comets:technology "Solar PV" ; comets:hasSIEC
"RA420" ;
comets:commissionDate "2017-04-13" ;
comets:decomissionDate "" ;
comets:nameplateCapacity "65.00" ;
comets:equipmentSpecifcation "" ;
dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
dc:contributor "https://orcid.org/0000-0002-8016-929X" ;

#

Note: a better reference compare to the entry in the xls file would be the real link to the MaStR
as given by the fnal internal number. Can we fnd someone to enter this information? dc:source
"https://www.marktstammdatenregister.de/MaStR/Einheit/Detail/IndexOefentlich/1956664" ;

dc:publisher "Høgskulen på Vestlandet"@no ;
dc:publisher "Western Norway University of Applied Sciences"@en ;
dc:date "2021-09-08" .

comets:prod_deu_3 a comets:production_unit, comets:windfarm, wikidata:Q194356 ;
comets:hasName "Windpark Großer Wald Hettingen/Rinschheim" ;

comets:isGridConnected "YES" ;
 comets:amountGridConnection "FULL"@en;
 comets:status "active" ;
 geo:lat "49.53802" ;
 geo:long "9.4008" ;
 schema:streetAddress "Gemarkung Hettingen: 13214,
 13216 & Gemarkung Rinschheim: 697"@de ;
 schema:addressLocality "Buchen"@de ;
 schema:addressCountry "DE" ;
 schema:postalCode "74722" ;
 schema:url "http://www.windpark-grosser-wald.de/ueber_uns/ueber_uns.html" ;
 wikidata:P298 "DEU" ;
 comets:product_unit_identifer "SGE925172620095" ;
 comets:technology "Wind Onshore" ;
 comets:hasSIEC "RA310" ;
 comets:commissionDate "2013-11-30" ;
 comets:decomissionDate "" ;
 comets:nameplateCapacity "15850" ;
 comets:estimatedGeneration "28000000" ;
 comets:equipmentSpecifcation "5x Typ REpower 3.2M114 " ;
 dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
 dc:contributor "https://orcid.org/0000-0001-9134-3356" ;
 dc:source "Website" ;
 dc:publisher "Høgskulen på Vestlandet"@no ;
 dc:publisher "Western Norway University of Applied Sciences"@en ;
 dc:date "2021-09-08" .
 comets:prod_deu_4 a comets:production_unit, comets:CHP_plant, wikidata:Q61867910 ;
 comets:hasName "" ;
 comets:isGridConnected "YES" ;
 comets:amountGridConnection ""@en;
 comets:status "active" ;
 geo:lat "48.518453" ;
 geo:long "8.576938" ;
 schema:streetAddress "Karl-Berner-Straße 6"@de ;
 schema:addressLocality "Pfalzgrafenweiler"@de ;
 schema:addressCountry "DE" ; schema:postalCode
 "72285" ; schema:url "" ;
 wikidata:P298 "DEU" ;
 comets:product_unit_identifer "SEE931353255291", "KWK964398232118" ;
 comets:technology "" ;
 comets:hasSIEC "" ;
 comets:commissionDate "2014-07-31" ;
 comets:decomissionDate "" ;
 comets:nameplateCapacityElectric "70" ;
 comets:nameplateCapacityThermal "115" ;
 comets:equipmentSpecifcation "" ;
 dc:creator "http://www.orcid.org/0000-0002-7443-7593" ;
 dc:contributor "https://orcid.org/0000-0001-9134-3356" ;
 dc:source "Website" ;
 dc:publisher "Høgskulen på Vestlandet"@no ;

```

dc:publisher "Western Norway University of Applied Sciences"@en ;
dc:date "2021-09-08" .

#
# define a charging station
#
comets:char_deu_1 a comets:charging_station ;
  mv:name "Ladesäule Bahnhof Scharfenstein" ;
  schema:streetAddress "Bahnhofstraße 45" ;
  schema:addressLocality "Drebach" ;
  schema:addressCountry "DE" ;
  schema:postalCode "09435" ;
  mv:capacity "22" .
comets:char_deu_2 a comets:charging_station ;
  mv:name "" ;
  schema:streetAddress "" ;
  schema:addressLocality "" ;
  schema:addressCountry "DE" ;
  mv:capacity "" .
comets:char_deu_3 a comets:charging_station ;
  mv:name "" ;
  schema:streetAddress "" ;
  schema:addressLocality "" ;
  schema:addressCountry "DE" ;
  mv:capacity "" .
comets:char_deu_4 a comets:charging_station ;
  mv:name "" ;
  schema:streetAddress "" ;
  schema:addressLocality "" ;
  schema:addressCountry "DE" ;
  mv:capacity "" .

#
# describe ownership information
#
comets:event_deu_15 a comets:ownership_information ;
  comets:measurement_date "2020" ;
  comets:measurement_agent "" ;
  comets:measurement_source "" ;
  comets:ownershipBy comets:cai_deu_3 ;
  comets:ownershipOf comets:prod_deu_1 ;
  comets:ownershipShare "100" .
comets:event_deu_16 a comets:ownership_information ;
  comets:measurement_date "2020" ;
  comets:measurement_agent "" ;
  comets:measurement_source "" ;
  comets:ownershipBy comets:cai_deu_1 ;
  comets:ownershipOf comets:prod_deu_2 ;
  comets:ownershipShare "100" .
comets:event_deu_17 a comets:ownership_information ;
  comets:measurement_date "2020" ;
  comets:measurement_agent "" ;
  comets:measurement_source "" ;

```

```

        comets:ownershipBy comets:cai_deu_4 ;
        comets:ownershipOf comets:prod_deu_3 ;
#
# why does it mention in a 37.5 % in the comments?
#
        comets:ownershipShare "28" .

comets:event_deu_18 a comets:chargingEquipmentOwned ;
        comets:ownedBy comets:cai_deu_5 ;
        comets:measurement_date "2021" ;
        comets:measurement_agent "" ;
        comets:measurement_source "" ;
        comets:numberACstations "4" ;
        comets:numberDCstations "1" ;
        comets:numberACchargers "5" ;
        comets:numberDCchargers "2" .
comets:event_deu_19 a comets:sharedCarsOwned ;
        comets:hasMobilityBrand "mobileeee mein E-Carsharing Märfelden-Walldorf" ;
        comets:ownedBy comets:cai_deu_6 ;
        comets:measurement_agent "" ;
        comets:measurement_source "" ;
        comets:numberSharedCars "9" .
comets:event_deu_20 a comets:chargingEquipmentOwned ;
        comets:ownedBy comets:cai_deu_6 ;
        comets:measurement_date "2021" ;
        comets:measurement_agent "" ;
        comets:measurement_source "" ;
        comets:numberACstations "9" ;
        comets:numberDCstations "0" ;
        comets:numberACchargers "18" ;
        comets:numberDCchargers "0" .

#
# describe activities
#
comets:activ_deu_1 a comets:purchase ; comets:actor
        comets:cai_deu_4 ; comets:itemPurchased
        comets:prod_deu_3 ;

#
# Is the purchase date the same as the production begin?
#
        comets:datePurchased "2013" ;
        comets:pricePurchased "7000000" ;
        comets:pricePurchaseCurrency "EUR" .
comets:activ_deu_2 a comets:product_ofer;
        comets:actor comets:cais_deu_4 ;
        comets:productType "Electricity" ;
        schema:date "2021" ;
        comets:oferName "Bürgerstrom Neckar-Odenwald" ;
        comets:tradePlatform "Bürgerwerke" ;
        comets:numberOfCustomers "" ;
schema:url "http://www.buergerenergie-neckar-odenwald.de/buergerstrom-neckar-odenwald/" .

```

```
#
# Financial information (balance sheets)
#
comets:fact_1 a xbrll:Fact ; xbrll:hasEntity
    comets:cai_deu_4 ; xbrll:concept
    "Assets" ; xbrll:startDate "2017-01-
01" ; xbrll:endDate "2017-12-31" ;
    xbrll:value "588503.31 EUR" .
comets:fact_2 a xbrll:Fact ; xbrll:hasEntity
    comets:cai_deu_4 ; xbrll:concept
    "Equity" ; xbrll:startDate "2017-01-
01" ; xbrll:endDate "2017-12-31" ;
    xbrll:value "565420.89 EUR" .
comets:fact_3 a xbrll:Fact ; xbrll:hasEntity
    comets:cai_deu_4 ;
    xbrll:concept "FixedAssetsFormationExpensesExcluded" ;
    xbrll:startDate "2017-01-01" ;
    xbrll:endDate "2017-12-31" ;
    xbrll:value "550314.60 EUR" .
comets:fact_4 a xbrll:Fact ; xbrll:hasEntity
    comets:cai_deu_4 ; xbrll:concept
    "CurrentAssets" ; xbrll:startDate
    "2017-01-01" ; xbrll:endDate
    "2017-12-31" ; xbrll:value
    "38188.71 EUR" .
comets:fact_5 a xbrll:Fact ; xbrll:hasEntity
    comets:cai_deu_4 ; xbrll:concept
    "TangibleFixedAssets" ; xbrll:startDate
    "2017-01-01" ; xbrll:endDate "2017-
12-31" ; xbrll:value "57007 EUR" .
comets:fact_6 a xbrll:Fact ; xbrll:hasEntity
    comets:cai_deu_4 ; xbrll:concept
    "FinancialFixedAssets" ; xbrll:startDate
    "2017-01-01" ; xbrll:endDate "2017-12-
31" ; xbrll:value "493307.60 EUR" .
```