FlexMeasures

Rapid & scalable energy flexibility services for ESCOs

FAWG meeting, 25 Oct 2021
Seita: journey & team

2016-2017: Academic spin-off
   (initial idea: energy pricing)

2018-2019: Apply data skills as consultants, first ESCO relationship.

2020: Open-source FlexMeasures

2021: First energy flexibility services, second ESCO client.

2022: Scale 1st service, grow team, start 2nd service

Nicolas Höning
- Web/Cloud engineering lead
- PhD in smart grid mechanisms
- Ex-data engineer @ Senfal / Vattenfal

Felix Claessen
- Data science lead
- Ex-smart grid researcher
- USEF expert
"**Flexibility** is the grid’s ability to manage variability and volatility to **balance** supply and demand."

**ACCENTURE**

"Demand **flexibility** uses communication and control technology to **shift** electricity use across hours of the day."

**ROCKY MOUNTAINS INSTITUTE**
energy flex specialists

Where's your data?

asset owners & operators

Who are you?

Scaling is hard!
ESCOs are the bridges we need!

energy flex specialists

asset owners & operators

relationship data
Our customers: Energy Service Companies (ESCOs)

Market size: USD 29 billion, growing 8% / year

Examples:
- Metering companies
- Real estate developers
- Microgrid developers
- Car charging station operators
- Business parks
- Energy cooperatives
ESCos & implicit distributed flexibility
ESCos & explicit distributed flexibility

The diagram illustrates the interactions between different components in an energy management system, including ESCo (Energy Service Company), Active Customer, Aggregator, BRP (Balancing Residential Programs), DSO (Distribution System Operator), and TSO (Transmission System Operator). The ToU (Time of Use) tariff is shown as a cost implication for these entities, indicating the role of ESCos in providing distributed, explicit flexibility for energy management.
Many services?

The needs in energy flexibility service implementation changes with:

- type of use
- type of customer
- sector
- connection/grid
- markets
- storage?
- culture!
- etc.
FlexMeasures: Design goal

Build real-time energy flexibility services, *rapidly* and *scalable*. On top of open source.

Developing energy flexibility services (e.g. to enable demand response) is crucial, but expensive.

ESCos want to become active in this segment, but fear vendor lock-in or high costs.
How we use FlexMeasures as a middleware.

- **Energy Flexibility Services**
  - GripOnGas: Track avoidable gas consumption
  - E-Mission: Reduce CO2 footprint of processes
  - V2G@Home: EV charging living lab
  - BVP: Balance portfolios

- **Platform Middleware**
  - FlexMeasures: ML models, API, security, plugin support, multi-tenancy, plotting, developer docs...

- **Data integrations**
  - Metering Companies
  - Weather Services
  - Markets
Energy flexibility services need to interact multiple times per day or hour. Thus, FlexMeasures supports:

- Support for real-time updates
- Forecasting for the upcoming hours
- Schedule optimization
FlexMeasures value 2/3: Uncertainty models

Dealing with uncertain forecasts and outcomes is crucial. FlexMeasures' data model helps to model this real-world aspect accurately.

https://github.com/SeitaBV/timely-beliefs
FlexMeasures value 3/3: Service building

Building customer-facing services is where developers make impact. Let's make their work easy.

- Well-documented API
- Plugin support
- Plotting support
- Multi-tenancy
Open source: Think big

What if we could build for energy flexibility, what WordPress has become for web publishing?

A technology to raise the standard by which every small ESCo in the world can approach this problem.
FlexMeasures in the LFE context

New target group: ESCos

Possible integrations:
- OpenLEADR
- ShapeShifter
- OpenEEMeter
FlexMeasures and USEF

Already supported by FlexMeasures (with hands-on experience):

- Meter Data and Price Data (but also generally any type of Sensor Data)
- D-Prognoses (i.e. day-ahead meter data prognoses)
- UDI Events (description of available flexibility from individual devices)
- Device Messages (which tell devices what to do, usually in response to a UDI event)

Not yet officially supported by FlexMeasures (so far only simulations with these concepts):

- Flex Requests
- Flex Offers
- Flex Orders
- Flex Settlements
Thank you.
Plugins: Getting started

$ cookiecutter https://github.com/SeitaBV/flexmeasures-plugin-template

plugin_name [Your plugin name, e.g. 'My Plugin']: A new service
plugin_slug [a_new_service]:
module_name [a_new_service]:
description [] Providing flexible scheduling to X customers in region Y:
author_name [] Nicolas Höning
author_email [] nicolas@seita.nl
plugin_url []:
minimal_flexmeasures_version [0.7.0]:
api_blueprint [y]:
ui_blueprint [y]: n
cli_blueprint [y]:

$ ls A\ new\ service
a_new_service Makefile README.md requirements run_mypy.sh setup.cfg setup.py

$ ls A\ new\ service/a_new_service
api\ cli__init__.py

$ cd A\ new\ service

$ pytest
Test session starts (platform: linux, Python 3.8.10, pytest 6.2.4)
rootdir: /home/nicolas/workspace/seita/My Plugin/A new service/plugins: sugar-0.9.4, requests-mock-1.9.3, flask-12.0, cov-2.12.1
collecting...

a_new_service/api/tests/test_api.py ✓
50%

a_new_service/cli/tests/test_cli.py ✓
100%

Results (0.07 s):
2 passed
Documentation

Quickstart

This section walks you through getting FlexMeasures to run with the least effort. We’ll cover making a secret key, connecting a database and creating one user & one asset.

Note

Are you not hosting FlexMeasures, but want to learn how to use it? Head over to our tutorials, starting with Posting data.

Install FlexMeasures

Install dependencies and the `flexmeasures` platform itself:

```
  pip install flexmeasures
```
Code hygiene
Resources

- https://github.com/SeitaBV/flexmeasures/
- https://flexmeasures.readthedocs.io
- https://flexmeasures.io
- https://seita.nl/core-technology/flexmeasures/
- https://seita.nl/services/
Our business model: Subscriptions via SaaS

Seita
ESCos
End customers

Revenue flow

Status:
- 1st ESCo partner (25K end customers)
- 1st end customer paying subscriptions