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

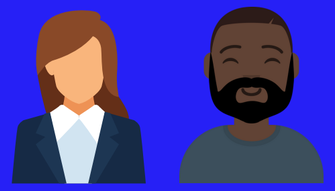
"**Flexibility** is the grid's ability to manage variability and volatility to balance supply and demand."

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

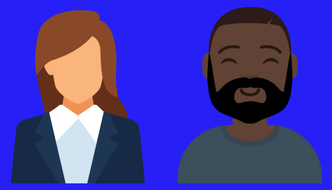
Who are you?

Scaling is hard!

ESCOs are the bridges we need!

asset owners & operators

energy flex specialists



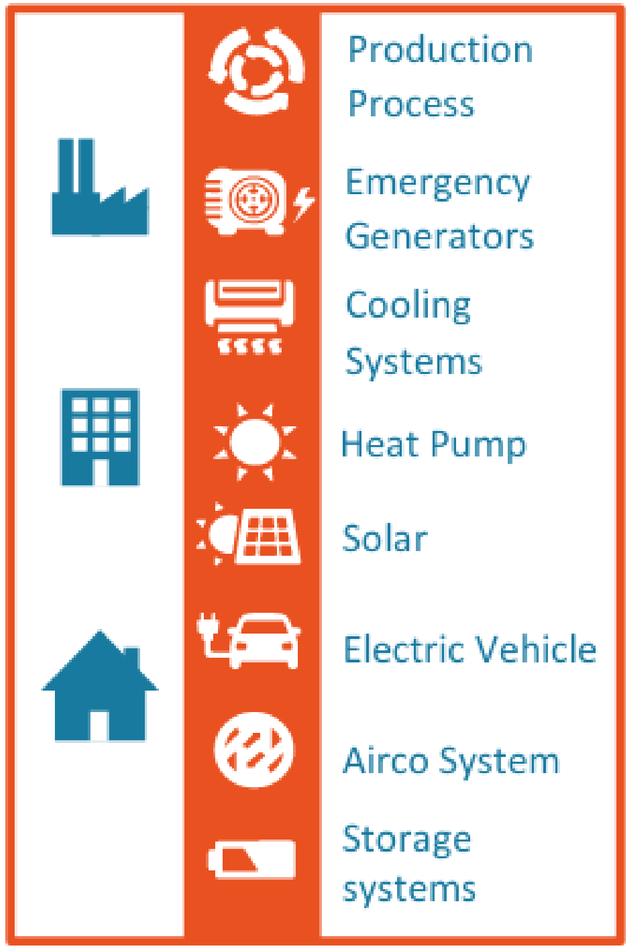
Our customers:
Energy Service Companies (ESCOs)

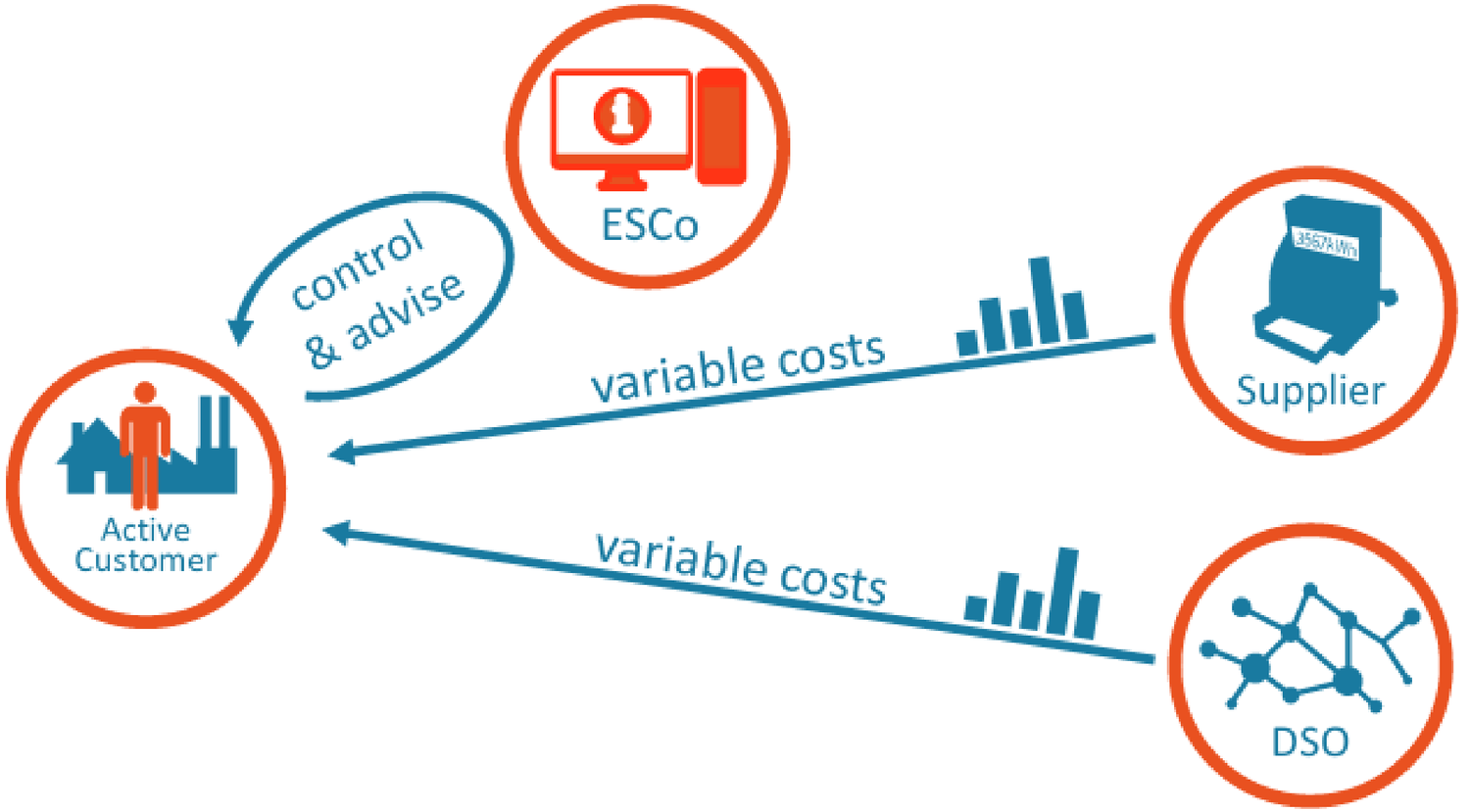
Market size: USD 29 billion, growing 8% / year

Examples:

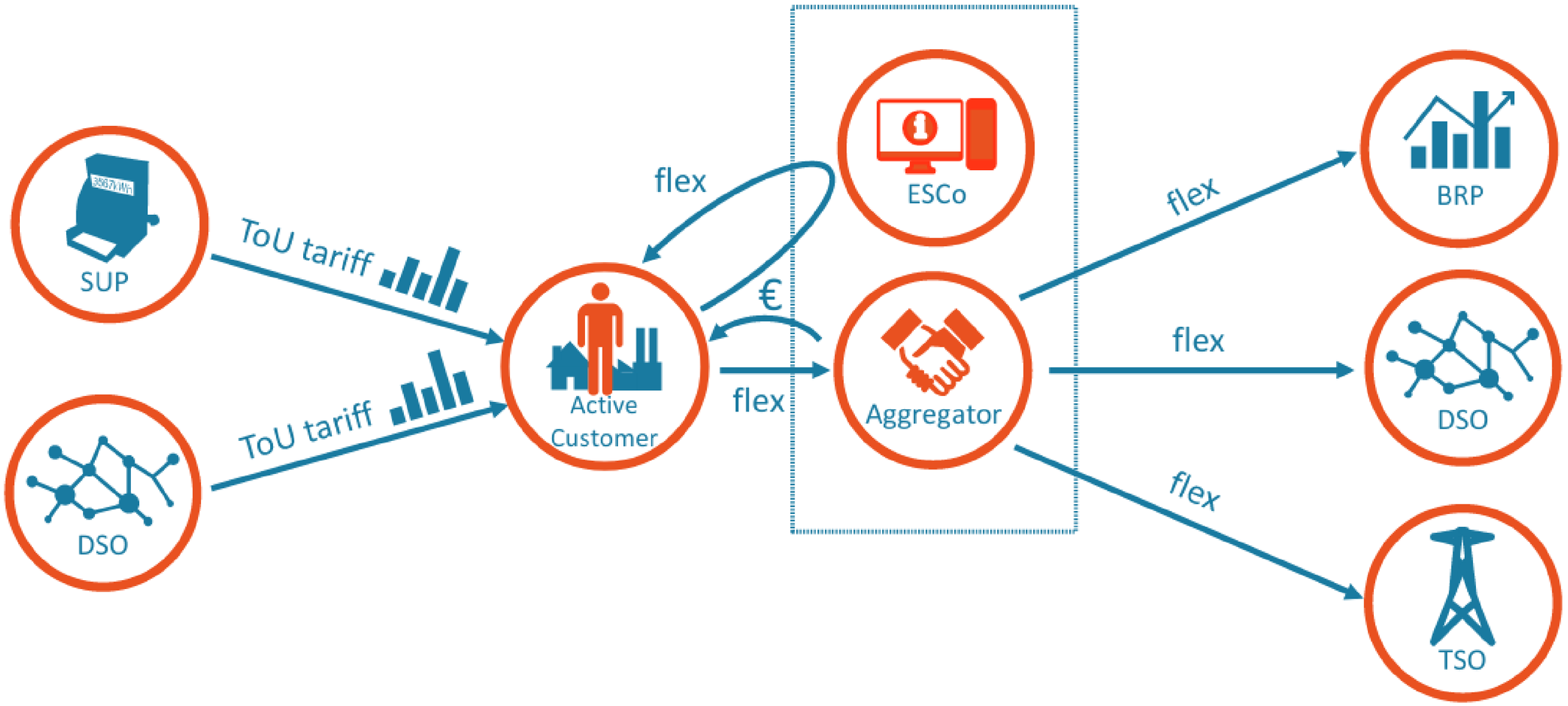
Metering companies, real estate developers, microgrid developers, car charging station operators, business parks, energy cooperatives ...

ESCos & implicit distributed flexibility





ESCos & explicit distributed flexibility



Many services?

The needs in energy flexibility service implementation changes with:

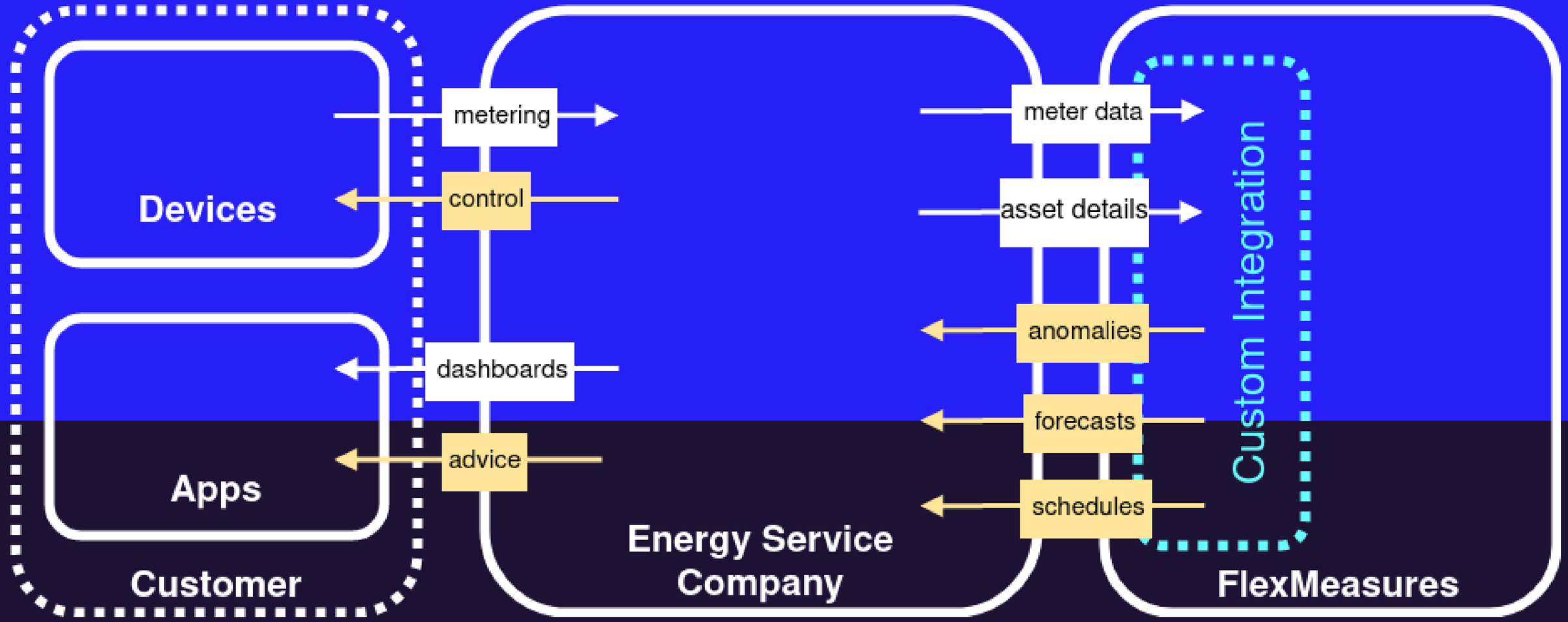
- type of use
- type of customer
- sector
- connection/grid
- markets
- storage?
- culture!
- etc.

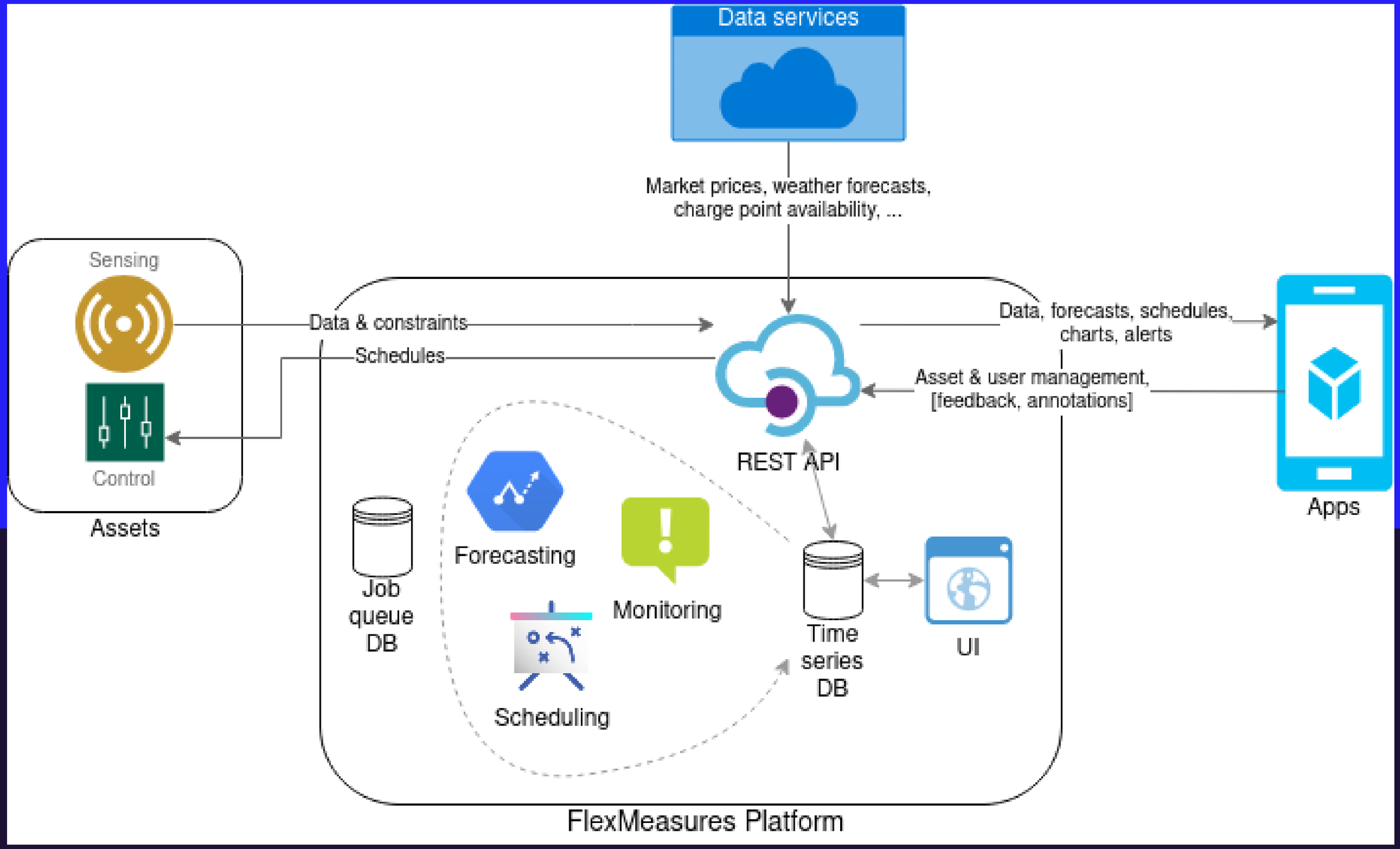
FlexMeasures: Design goal

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

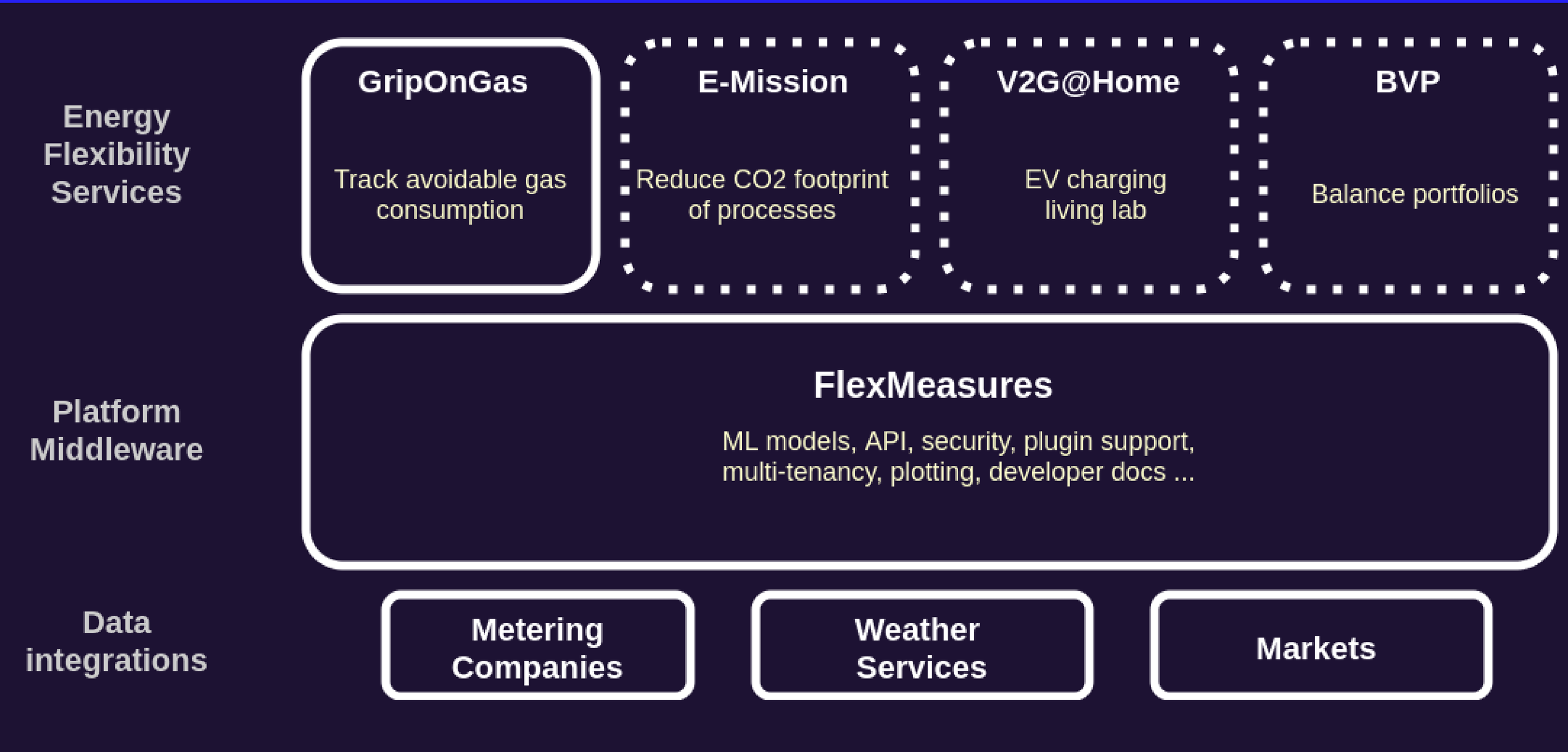
Developing energy flexibility services (e.g. to enable demand response) is crucial, but expensive.

ESCos want to become active in this segment, but fear vendor lock-in or high costs.


Devices
Apps
Customer
metering
control
dashboards
advice
Energy Service Company
meter data
asset details
anomalies
forecasts
schedules
Custom Integration
FlexMeasures


Data services
Market prices, weather forecasts,
charge point availability, ...
Sensing
Control
Assets
Data & constraints
Schedules
Data, forecasts, schedules,
charts, alerts
Asset & user management,
[feedback, annotations]
REST API
Apps
Job
queue
DB
Forecasting
Monitoring
Scheduling
Time
series
DB
UI
FlexMeasures Platform

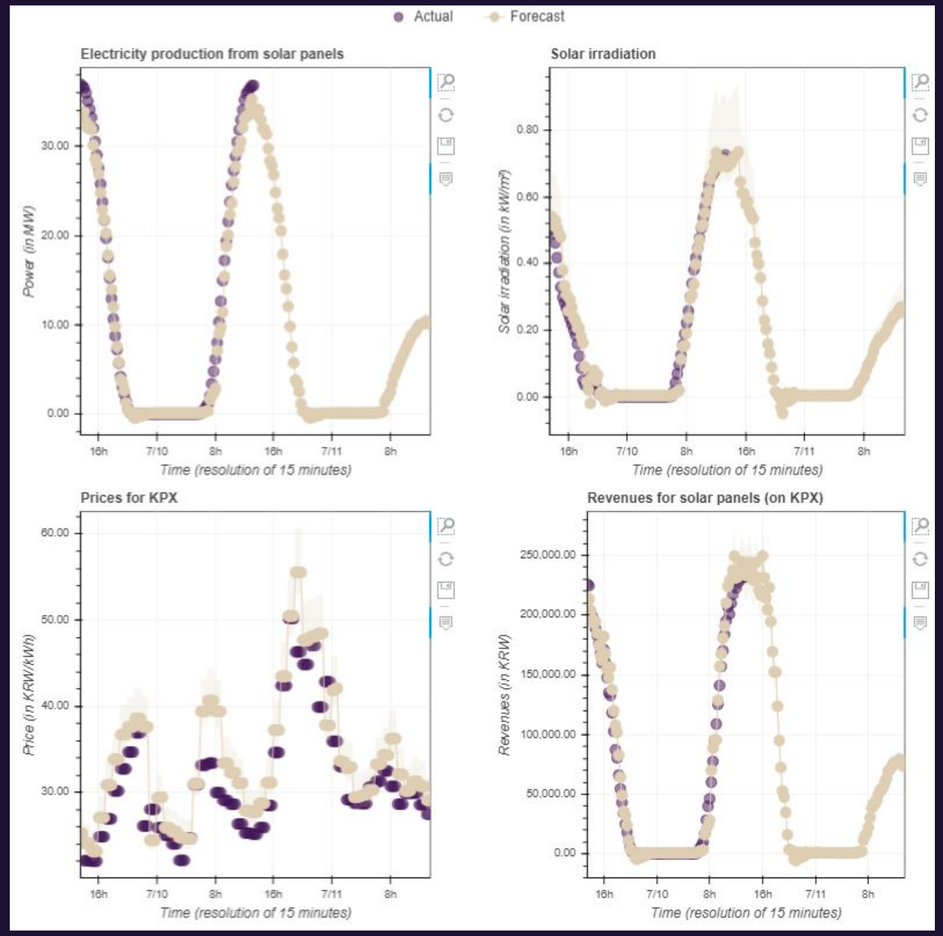
How we use FlexMeasures as a middleware.



FlexMeasures value 1/3: real-time updates and advice

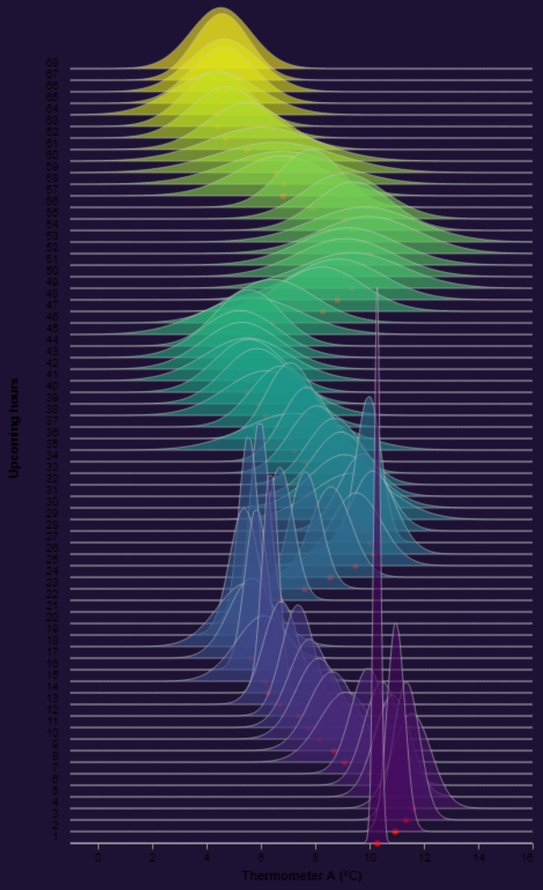
Energy flexibility services need to interact multiple times per day or hour. Thus, FlexMeasures supports:

- **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-1.2.0, cov-2.12.1
collecting ...
 a_new_service/api/tests/test_api.py ✓
50% ████████
 a_new_service/cli/tests/test_cli.py ✓
100% ████████████████

Results (0.07s):
       2 passed
```

Documentation

3 Sep 2021

V0.6.0: MULTI-TENANCY & ERROR MONITORING

Version v0.6.0 of FlexMeasures is out (see changelog). The two most notable new features are that users and assets now belong to accounts (allowing for multi-tenancy setups), and that it's…

FULL STORY

7 Jun 2021

V0.5.0: OPENWEATHERMAP AND PLUGIN CUSTOMISATION

OpenWeather

Version v0.5.0 of FlexMeasures is out (see changelog). Aside from great additions to the documentation (tutorials!) and some smaller things, there's new features for customisation of your project and an…

FULL STORY

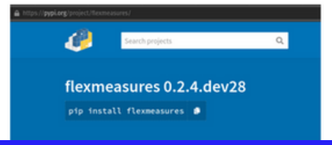
29 Apr 2021

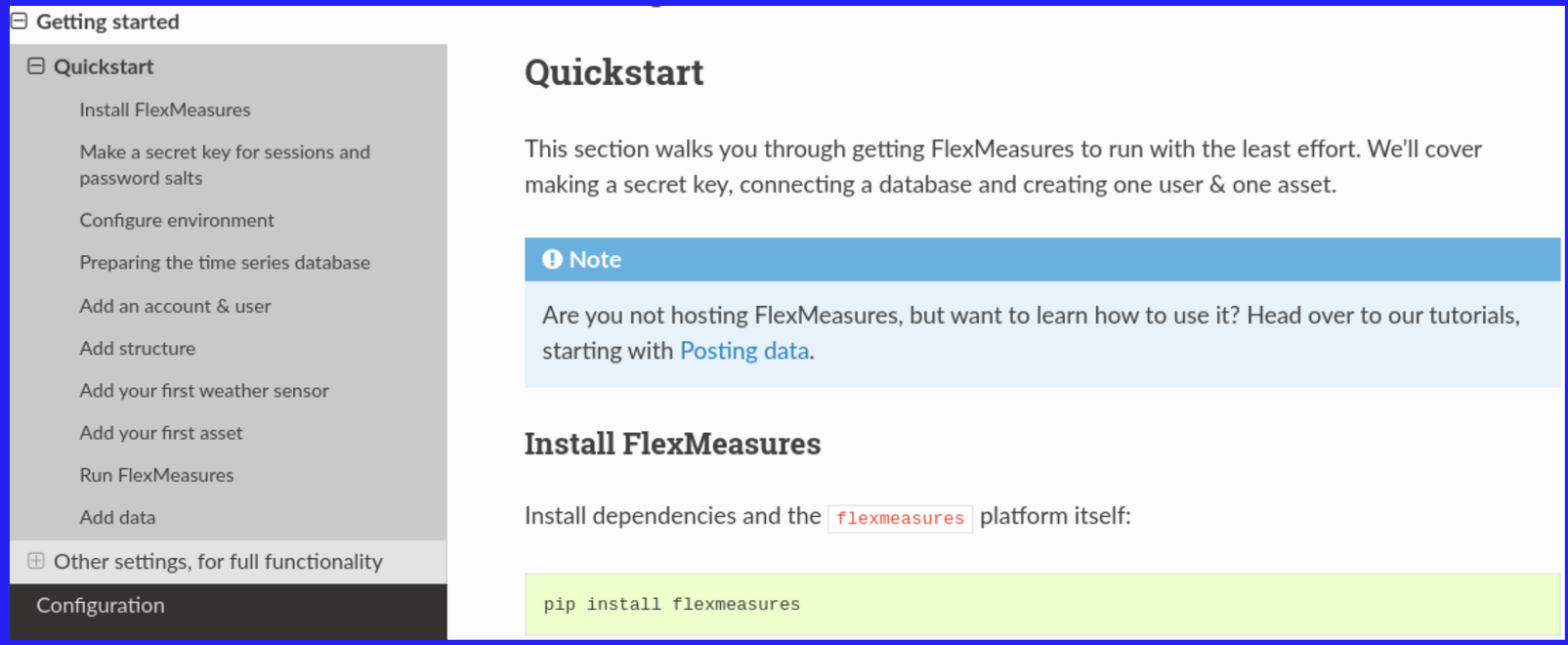
V0.4.0: PLUGIN SUPPORT

Version v0.4.0 of FlexMeasures is out (see changelog). Aside

2 Apr 2021

V0.3.0: PIP-INSTALLABLE, CLI COMMANDS & BELIEF TIME COMMUNICATION IN API





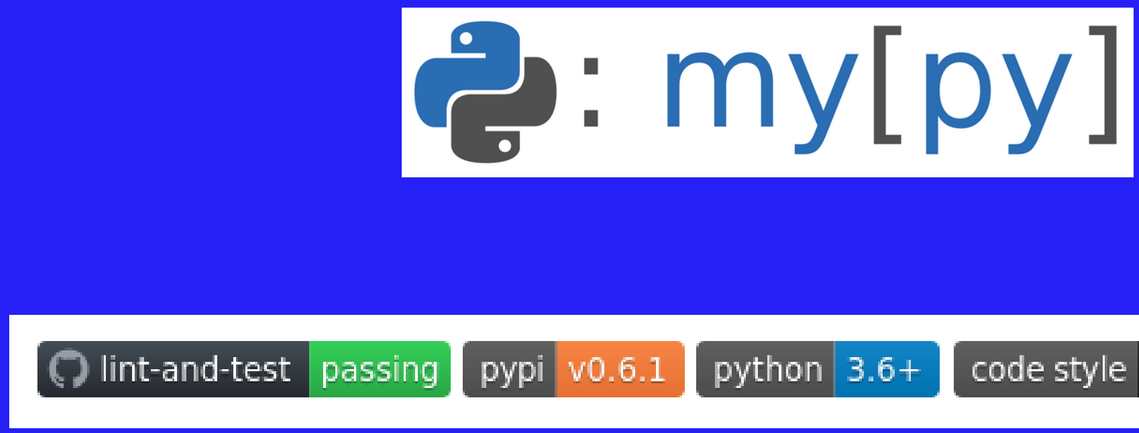
Code hygiene

- require higher pip-tools version
  deploy-to-staging #141: Commit 3a4aa3b pushed by nhoening
- require higher pip-tools version
  lint-and-test #795: Commit 3a4aa3b pushed by nhoening
- Enable plugin list to be an app creation param, use…
  deploy-to-staging #140: Commit 3a3506f pushed by nhoening
- Enable plugin list to be an app creation param, use…
  lint-and-test #794: Commit 3a3506f pushed by nhoening
- do not rely on a actual secret_key file in testing / CI
  lint-and-test #793: Commit c5ae1ef pushed by nhoening
- add changelog entry
  lint-and-test #792: Commit 2ebc974 pushed by nhoening
- document caveats when testing plugins
  lint-and-test #791: Commit 93bd642 pushed by nhoening
- Prepare changelogs for v0.6.1 release
  lint-and-test #790: Commit 232427d pushed by Flix6x
- Backport PR #127: Add release date (#127)
  lint-and-test #789: Commit fa3939c pushed by Flix6x
- get_or_create_source might create data source wit…
  lint-and-test #788: Commit 6dbc2c8 pushed by Flix6x

flake8

Black

: my[py]



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

Revenue flow

Status:

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