# FlexMeasures

Rapid & scalable energy flexibility services
for/by ESCOs

LF Energy TAC meeting, 2 Nov 2021

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

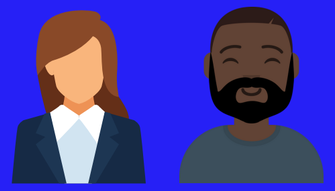
ACCENTURE

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

ROCKY MOUNTAINS INSTITUTE

energy flex specialists

asset owners & operators



Where's your data?

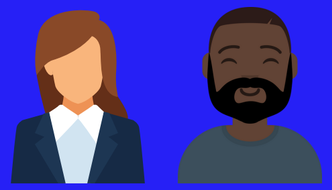
Who are you?

# Scaling is hard!

# ESCOs are the bridges we need!

asset owners & operators


energy flex specialists



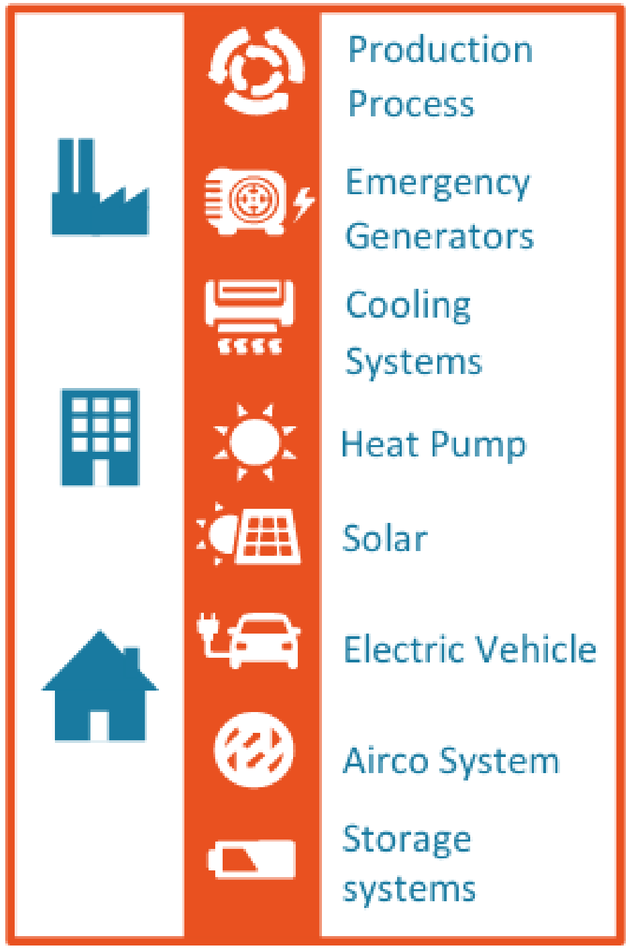
# Our customers:
# Energy Service Companies (ESCOs)

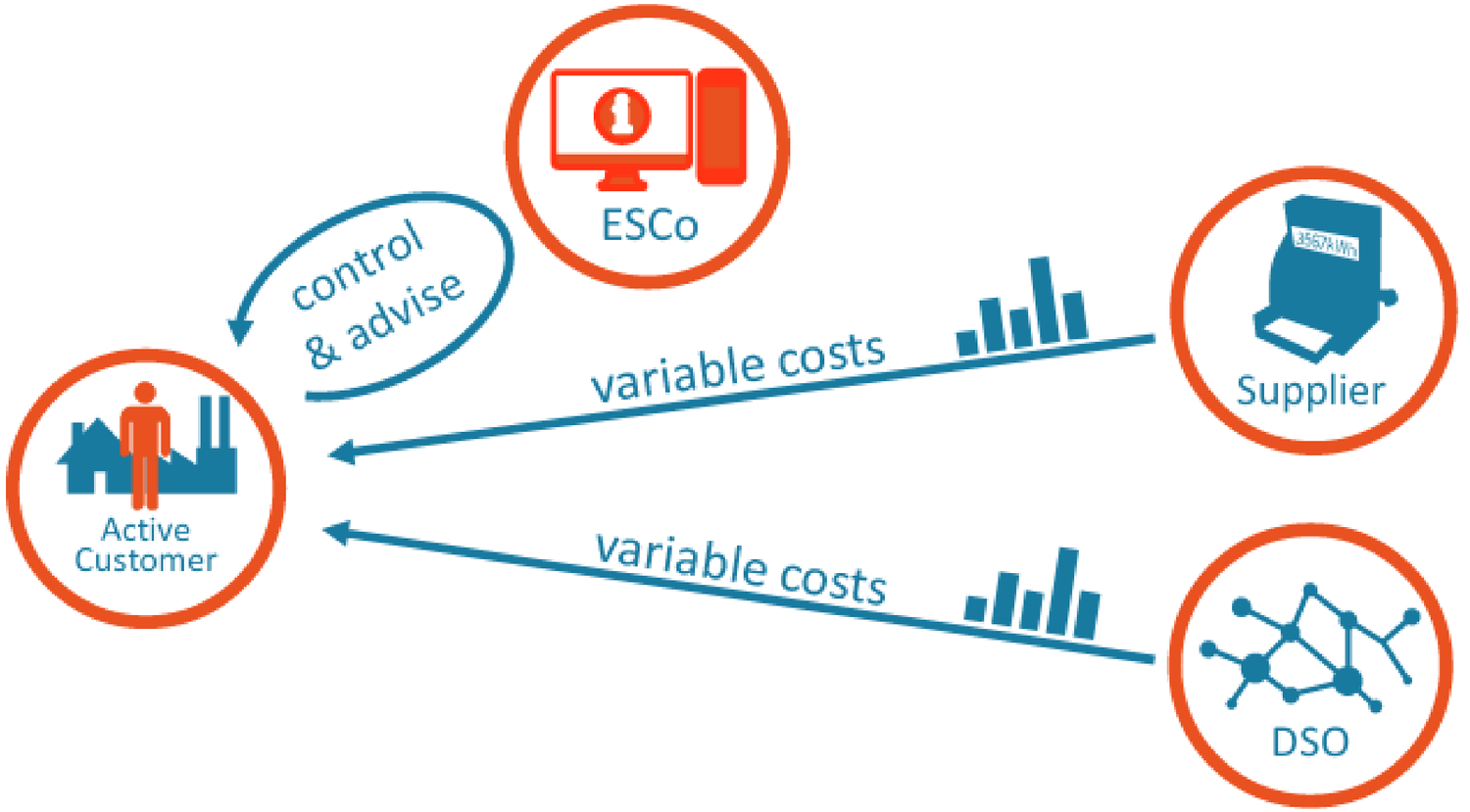
**Market size: USD 29 billion,**
**growing 8% / year**

**Examples:**

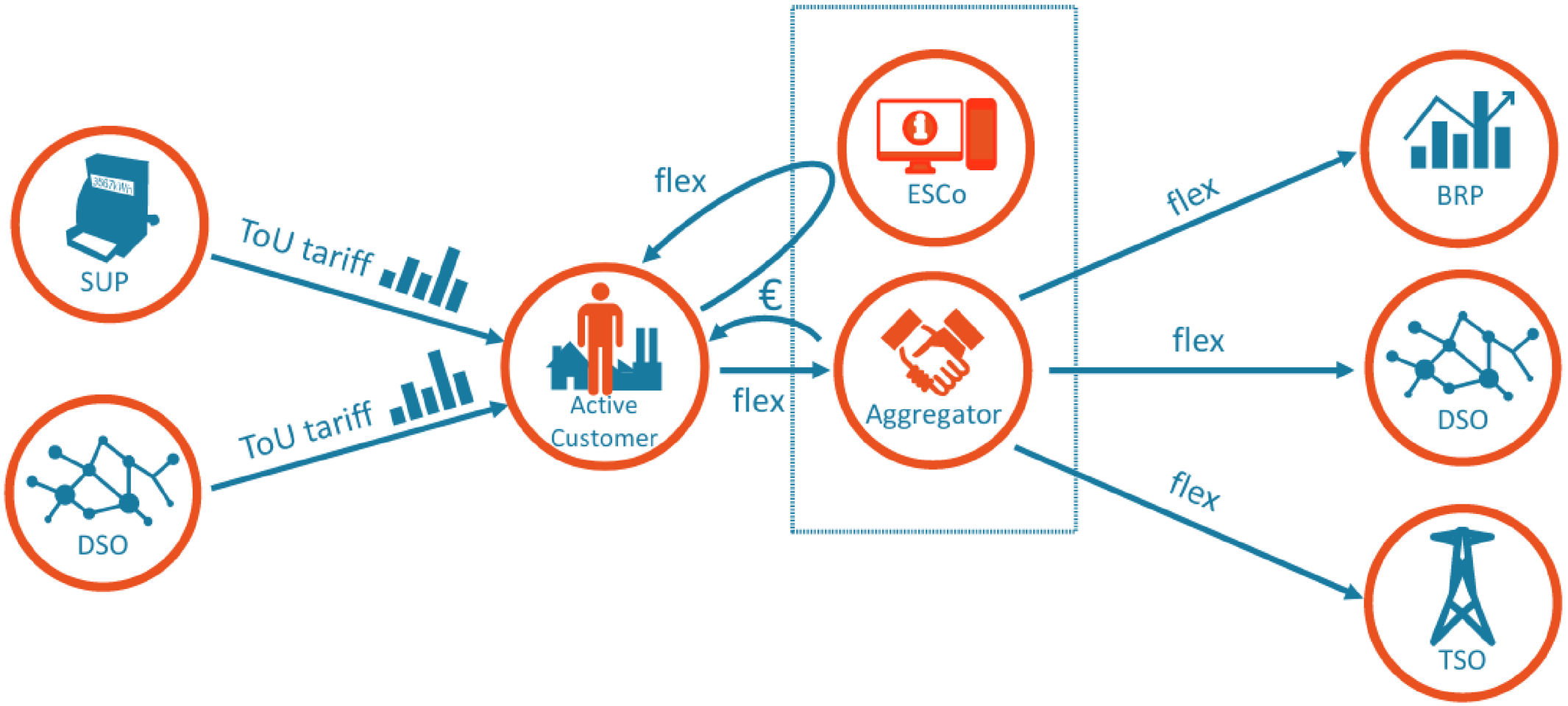
**Metering companies, real estate developers, microgrid developers, car charging station operators, business parks, energy cooperatives ...**

# ESCos & implicit distributed flexibility



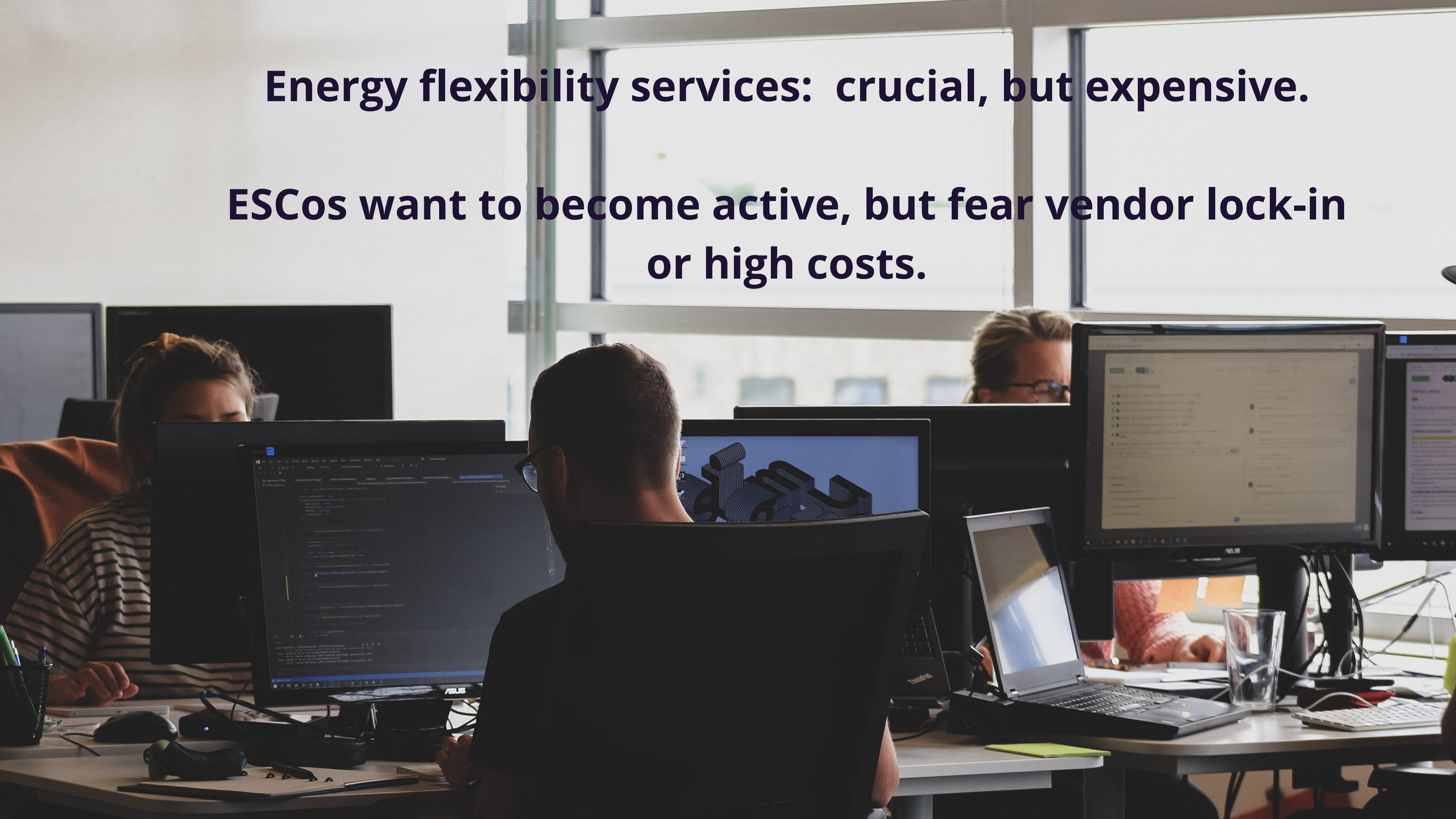
# ESCos &  explicit distributed flexibility



# Many services?

The needs in energy flexibility service implementation change with:

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

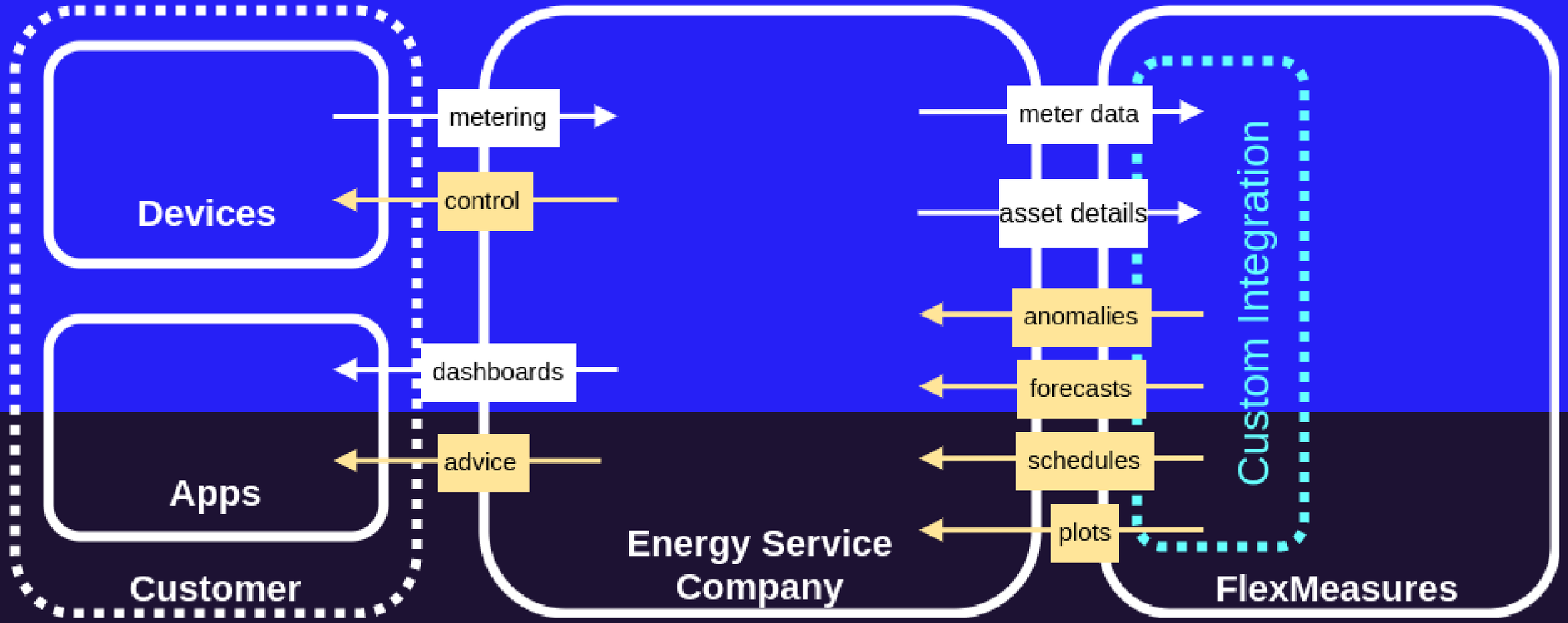


**Energy flexibility services:  crucial, but expensive.**

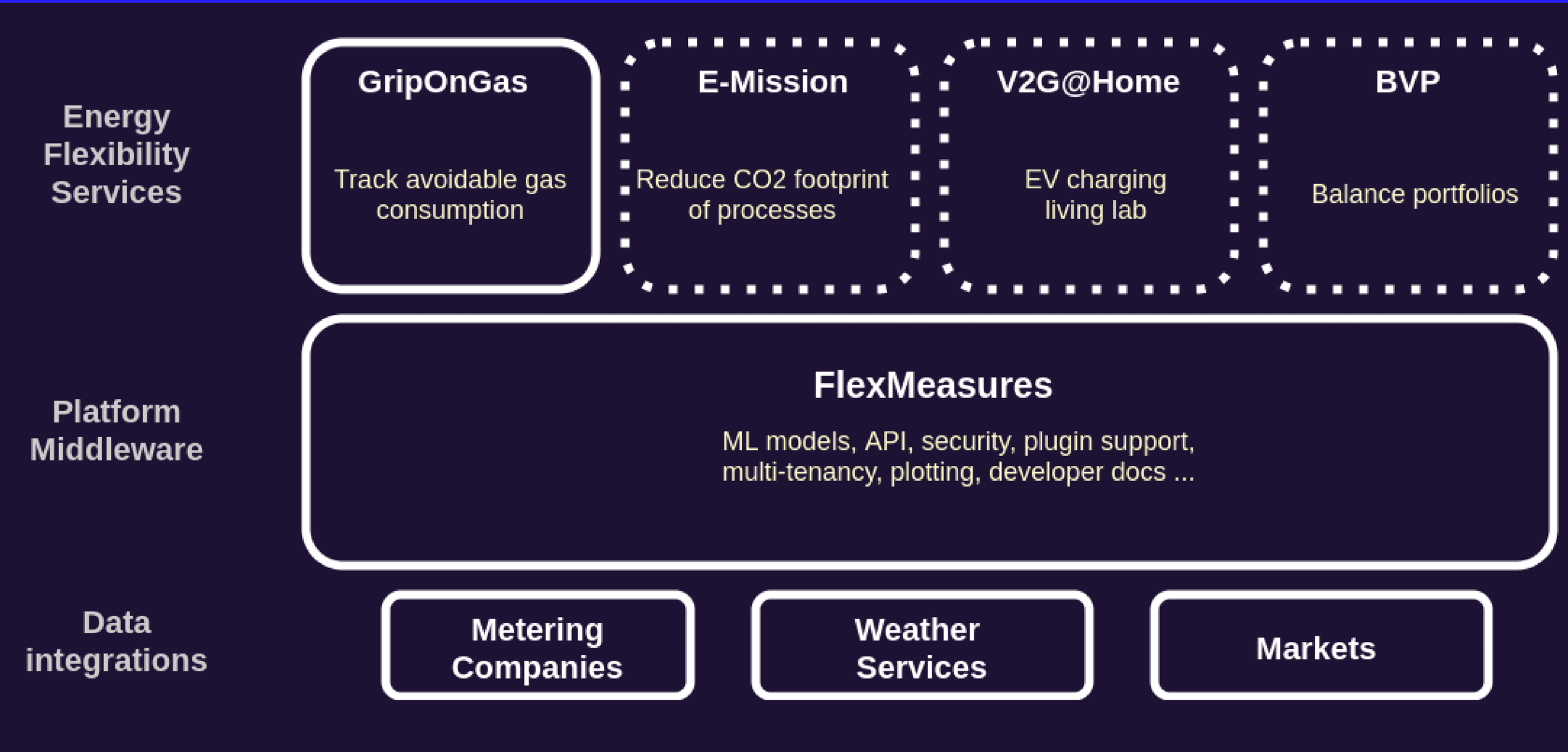
**ESCos want to become active, but fear vendor lock-in or high costs.**

# FlexMeasures: Design goal

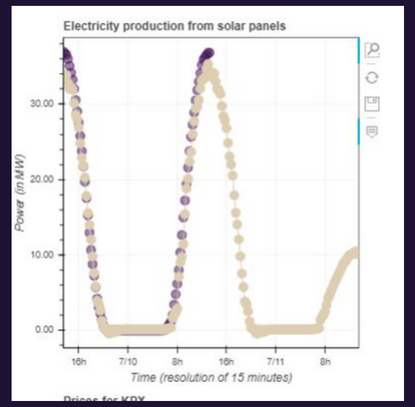
Build real-time energy flexibility
services, *rapidly* and *scalable*.
On top of open source.


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

# How we use FlexMeasures as a middleware.



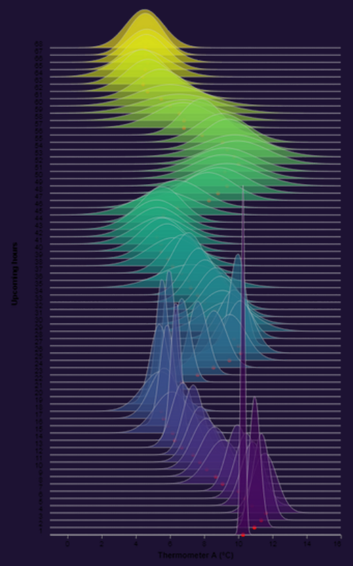
# FlexMeasures value adds




**2.** A data model to model uncertainty in forecasts and outcomes accurately.

**1.** Integrate data multiple times per day or hour:

- Support for real-time updates
- Forecasting for the upcoming hours
- Schedule optimization



**3.** Reduce software development costs:

- Well-documented API
- Plugin support
- Plotting support
- Multi-tenancy

https://github.com/SeitaBV/timely-beliefs

# FlexMeasures in the LFE context

**New target group**:

ESCos

**Possible integrations**:

- OpenLEADR
- ShapeShifter
- OpenEEMeter

# Resources

- https://github.com/SeitaBV/flexmeasures/
- https://flexmeasures.readthedocs.io
- https://flexmeasures.io
- https://seita.nl/core-technology/flexmeasures/
- https://seita.nl/services/

Thank you.

# 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.**

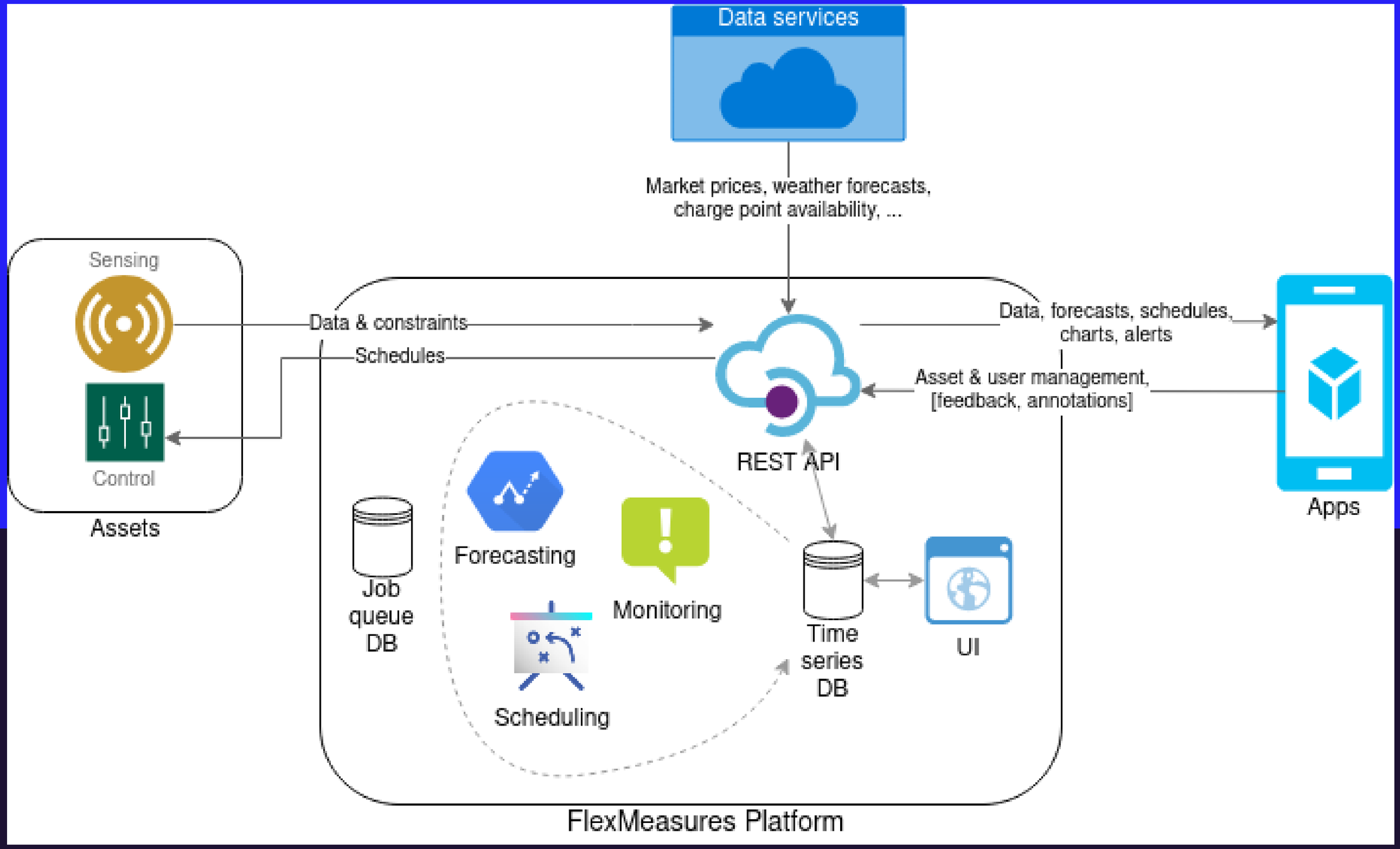
**2022: Scale 1st service, grow team, start 2nd service**

**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


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

# 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

# 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

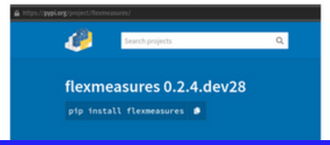
29 Apr 2021

### 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






## 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
```

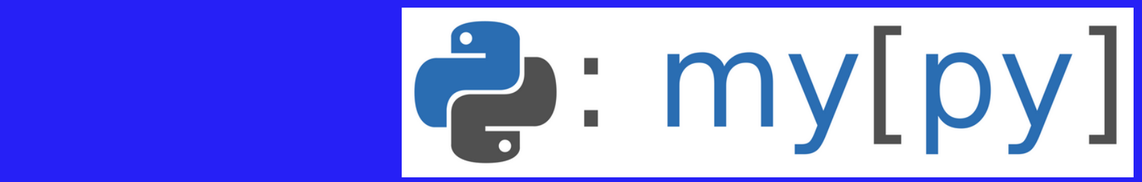
# Code hygiene

- 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]



# 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.**

# Our business model: Subscriptions via SaaS


Revenue flow

**Status**:

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