



OLF ENERGY

OpenSynth



Centre for Net Zero

Powered by Octopus Energy Group



OLF ENERGY

SYNTHETIC SMART METER DATA - OPEN SOURCE COMMUNITY

Gus Chadney, Centre for Net Zero

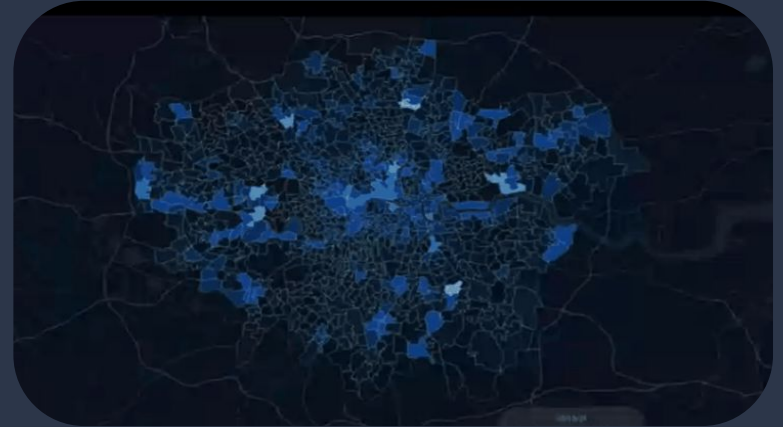


WHY SYNTHETIC DATA?

Smart meter data is essential to rapid and successful energy transitions. Researchers, modellers and policy-makers need to understand how energy demand profiles are changing, in a system that requires greater real time optimisation of demand and supply on the grid.

Current energy modelling is still largely based on static and highly aggregated data from the past - when energy flowed in one direction, consumer profiles were relatively predictable, and power generation was highly controllable.

Access to demand data is highly restricted, as a result of privacy protections. Rather than joining industry calls to unlock raw smart meter data through existing mechanisms, by challenging current data regulations and smart meter legislation, we believe generating synthetic data is the fastest way to achieve widespread access to energy datasets.



Demand data is essential to understand and plan for energy transitions, e.g. heat electrification in London

LAYING THE FOUNDATIONS: FARADAY



Modelling the impact of low carbon technology adoption on energy consumption - using generative AI

CUTTING-EDGE TECHNIQUES

Uses a combination of **Variational Autoencoders** (VAEs) and **Gaussian Mixture Model** (GMM) to provide best in class synthetic data

TRAINED ON REAL-WORLD DATA

Faraday was trained on **7 million** daily profiles over a **1 year** period from **20K** Octopus Energy UK households.

SUPPORTS ARCHETYPES

Household profiles can be generated with different **LCT** mixtures, **seasonality** and **EPC** ratings

Faraday Alpha V3

About Faraday Alpha V3

The latest version of Faraday Alpha is capable of generating synthetic household-level smart meter profiles given certain inputs. It works the same as earlier versions - user creates a population of archetypes and the tool returns synthetic smart meter profile of that population.

Note however that generating household level profiles is computationally expensive and there are several limitations in this version:

- Only the following inputs are available:
 - EPC ratings: `4`, `5` or `6`
 - Property Type 1: `1` or `2`
 - Property Type 2 (House subtypes): `1`, `2`, `3`, `4`, `5`, `6`, `7`, `8`, `9`, `10`, `11`, `12`, `13`, `14`, `15`, `16`, `17`, `18`, `19`, `20`, `21`, `22`, `23`, `24`, `25`, `26`, `27`, `28`, `29`, `30`, `31`, `32`, `33`, `34`, `35`, `36`, `37`, `38`, `39`, `40`, `41`, `42`, `43`, `44`, `45`, `46`, `47`, `48`, `49`, `50`, `51`, `52`, `53`, `54`, `55`, `56`, `57`, `58`, `59`, `60`, `61`, `62`, `63`, `64`, `65`, `66`, `67`, `68`, `69`, `70`, `71`, `72`, `73`, `74`, `75`, `76`, `77`, `78`, `79`, `80`, `81`, `82`, `83`, `84`, `85`, `86`, `87`, `88`, `89`, `90`, `91`, `92`, `93`, `94`, `95`, `96`, `97`, `98`, `99`, `100`
 - LCT Ownership: `1`, `2`, `3`, `4`, `5`, `6`, `7`, `8`, `9`, `10`, `11`, `12`, `13`, `14`, `15`, `16`, `17`, `18`, `19`, `20`, `21`, `22`, `23`, `24`, `25`, `26`, `27`, `28`, `29`, `30`, `31`, `32`, `33`, `34`, `35`, `36`, `37`, `38`, `39`, `40`, `41`, `42`, `43`, `44`, `45`, `46`, `47`, `48`, `49`, `50`, `51`, `52`, `53`, `54`, `55`, `56`, `57`, `58`, `59`, `60`, `61`, `62`, `63`, `64`, `65`, `66`, `67`, `68`, `69`, `70`, `71`, `72`, `73`, `74`, `75`, `76`, `77`, `78`, `79`, `80`, `81`, `82`, `83`, `84`, `85`, `86`, `87`, `88`, `89`, `90`, `91`, `92`, `93`, `94`, `95`, `96`, `97`, `98`, `99`, `100`
 - Seasonality: `1` vs `2`, and Months of the year
- You can only request a maximum of 1000 profiles at one go. If you need more than 1000 profiles, you have to fetch and download them one at a time.
- Generating 1000 profiles may take up to 2 minutes (before timing out).

We'll be working up on scaling the tool to be able to generate more profiles simultaneously more quickly

Profiles generated are synthetic, respecting customer privacy and GDPR requirements.

A **wide range of uses** for researchers, policymakers and network operators, including modelling the grid impacts of:

- EV and heat pump adoption
- Adding new properties in a given area
- Adoption of smart tariffs designed to change energy consumption
- Changes in weather conditions, including more extreme events

BUILDING A SYNTH DATA COMMUNITY: OpenSynth



In partnership with **The Linux Foundation**, we recently launched a new international open data community to democratise synthetic data to accelerate the decarbonisation of global energy systems.

Designed to empower both holders of raw smart meter data to generate and share synthetic data, and for community members and energy researchers to generate, improve and share algorithms.

Our initial focus for the community includes:

- 1. DEFINING WHAT COMPRISES 'GOOD' SYNTHETIC DATA: TECHNICAL PAPER**
- 2. DEVELOPING AN OPEN REPOSITORY FOR SYNTHETIC SMART METER DATA & ALGORITHMS**
- 3. ENCOURAGING COMMUNITY MEMBERS TO CONTRIBUTE DATA BY USING OUR INITIAL ALGORITHMS**

LAUNCH EVENT: OPENSYNTH



Democratising access to global
synthetic smart meter data

📅 9th April 2024

🕒 5.30pm - 7.30pm

📍 **Octopus Energy HQ**, UK House,
2 Great Titchfield Street, W1D 1NN



Centre for Net Zero
Powered by Octopus Energy Group



DLFENERGY



To join the OpenSynth community, go to:
<https://lfenergy.org/projects/opensynth/>

Get touch to discuss this project or our wider work:
info@centrefornetzero.org.

You can find out more about our range of ongoing
research on our website:
centrefornetzero.org



Centre for Net Zero

Powered by **Octopus Energy**