Empowering Utilities with Advanced Energy Disaggregation
NET2GRID is an Energy AI company that unlocks value from energy data.
Agenda

- Energy transition
- Energy disaggregation
- NET2GRID services
Energy transition
The **energy transition** shakes the energy industry...

- The Washington Post
  - The Worst of Europe’s **Energy Crisis** Isn’t Over

- euronews.green
  - ‘Tipping point’: **Renewable energy** to become the world’s top source of electricity by 2025

- CANARY MEDIA
  - Fixing the **US power grid**: A challenge for 2023 and beyond

- CONSTRUCTIONDIVE
  - California Leans Hard Into **Demand Response** Programs to Manage Energy Consumption
Changes in the energy market...

- Grid modernization turns consumers into energy producers (and forces them to electrify)
- Rising energy prices make energy costs (reduction) a high priority for consumers
- Balancing supply and demand: Weather-dependent power generation and increased energy demands force companies to better align production and consumption to offload grid

...are creating opportunities for **utility companies** to...

- Help their customers invest and reduce energy costs
- Build longer and more profitable relationships with these customers
- Enable growth by better balancing supply and demand

...by broadening their portfolio of products and services.

Commodity

- electricity
- gas

Energy as a Service - Installing, financing, and managing smart energy assets

- Variable tariffs
- Heat pumps
- Local energy storage
- High efficiency appliances
- Solar PV
- Smart charging
- Home Energy Management

- Grid modernization
- Rising energy prices
- Balancing supply and demand
What does the energy transition mean for energy retailers?

Engage
Help customers understand their energy consumption

Empower
Help customers take direct action and experience quantifiable savings

Collaborate
Help customers optimize the efficiency of their DER assets
Energy disaggregation
Definition

- Consumption breakdown at appliance/activity level
  - = Estimate the energy of each appliance or activity
- Intrusive Load Monitoring
  - Hardware-based approach
  - Install a meter behind each appliance
- Non-Intrusive Load Monitoring (NILM)
  - Software-based approach
  - Analyze SM measurements
Example of NET2GRID’s disaggregation

- Solar detected daily production 11 kWh
  Warning: obstruction detected

- Fridge detected daily consumption 1.4 kWh
  Warning: above peer consumption

- EV charging detected daily consumption 23 kWh
  Alert: optimal cost charging hours tomorrow between 2-8 pm

- Oven detected daily consumption 0.3 kWh

- Washing machine detected daily consumption 1.2 kWh

Appliance energy models
- heat pump
- EV charging
- washing machine

NET2GRID signal disaggregation - appliances detected

Appliance energy reports
- Washing Machine event with time, consumption and efficiency metrics
- EV charging event with consumption, charger level

NET2GRID signal disaggregation - appliances detected
Benefits

● Customer engagement
  ○ Increased energy efficiency and awareness

● Personalized services
  ○ Understanding end-users’ needs
  ○ Offer meaningful and personalized services

● Grid awareness
  ○ Locate major behind-the-meter assets (e.g., EVs, PVs, and storage units) in the grid
  ○ Enable better planning and foreseeing of grid investments
Customer engagement

Design richer & more meaningful touchpoints with end-users

**Insight**
Energy consumption and bill break down by activities or appliance

**Am I Normal?**
Implementing self and peer comparisons

**How Can I Save?**
Personal relevant recommendations

**Alert Me!**
Heating Cost, Self Consumption and peak activity alerts

**Surprise Me!**
Solar and EV Monitoring and Insights Without Hardware

Delivered through API

- ‘My utility’ app
- Call center
- Portal
Personalized services

Access richer customer insights to ...

Make marketing more efficient

offer personalized contracts

and upsell to new energy saving solutions & products
Grid awareness

- Create a digital twin of the distribution network
- Enhance grid visibility by locating major behind-the-meter assets
- Enable better grid planning and management
Grid awareness - Digital twin

- 3 MW
- 2.7 MW
- 48 MW
- 90% of capacity
- Maintenance needed
- Power failure
- 3 MW power failure
- 2.7 MW maintenance needed

Consumption / Production:
- Inefficient heating / cooling
- Solar production performance
- EV charging daily 15 kWh
- EV charging daily 25 kWh
NET2GRID services
One stop solution for disaggregation of all granularities

15-30-60 min MDM

1-10 sec realtime
Data granularity

● Low resolution
  ○ 15/30/60 min. data
  ○ Typical SM measurements

● High resolution
  ○ 1-10 s. data
  ○ More advanced meters (AMI 2.0) or additional hardware
Low resolution data (15-60 min.)
Overview

- Low sampling frequency
- Energy measurements at intervals of 15/30/60 min.
- Already-installed meters owned by DSOs
- Profile Information
- Not detailed enough to provide appliance-level disaggregation
- **Category-level** disaggregation
Produced reports

**Daily Reports**
- **Disaggregation Categories Report**
  - Cumulative per-category breakdown of energy consumption for a month, updated on a daily basis.
  - Daily solar production estimation along with relevant metrics (e.g., peak value).

- **Solar Production Metrics Report**
  - A comparative overview of the installation’s overall and category-level consumption with previous months and peers.

- **Insights Report**

- **Recommendations Report**
  - A set of recommendations focused on helping the end-users reduce their consumption.
High resolution data (1-10 s.)
Overview

● High sampling frequency
● 1-10 s. power data
● Very detailed consumption patterns
● Profile Information
● Detection of specific **appliances**
  ○ start/stop time and
  ○ energy per event
● Additional hardware is required
Produced Reports

**Appliance events (start/stop time, energy consumption per event) for the previous day.**

Efficiency score of appliances (dishwasher, washing machine and refrigeration)
DER Intelligence
Overview

● Energy measurements at intervals of 15/30/60 min.
● No profile information required
● Focus on major behind-the-meter assets:
  ○ Electric Vehicle:
    ■ Monitor the integration and charging sessions of EVs in the network
  ○ Photovoltaic Unit:
    ■ Estimate decentralized generation in hourly intervals
  ○ Battery Energy Storage System:
    ■ Detect storage units in the grid
Distributed Intelligence
Overview

- Direct access to high resolution data (1-10 s)
- Data analytics on the edge integrated into smart meters
- Optimized disaggregation models for constraint processing capacity
- **Electric Vehicles:**
  - Installed charger type (L1, L2 single- and multi-phase charger)
  - Charging events (start/stop timestamp and energy per event)
- **Continuous development:**
  - PV and storage insights
Edge-to-Cloud Continuum
Combining cloud and edge models

- Higher data resolution results in:
  - higher storage costs
  - higher transfer costs

- Combining low-resolution analysis on cloud and high-resolution on the edge to minimize cost and improve accuracy
Thank you!

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