Toward a smarter electricity consumption

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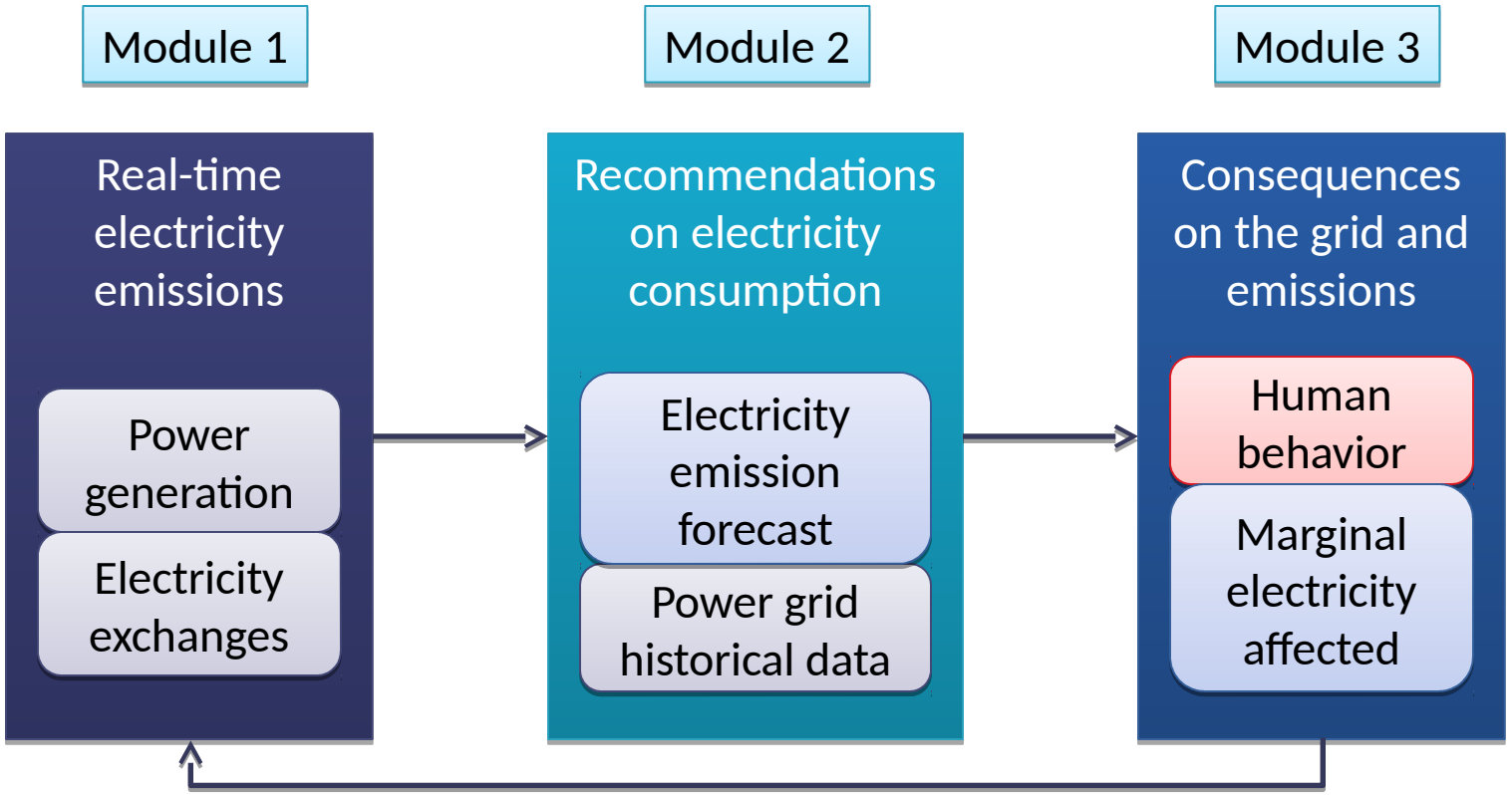
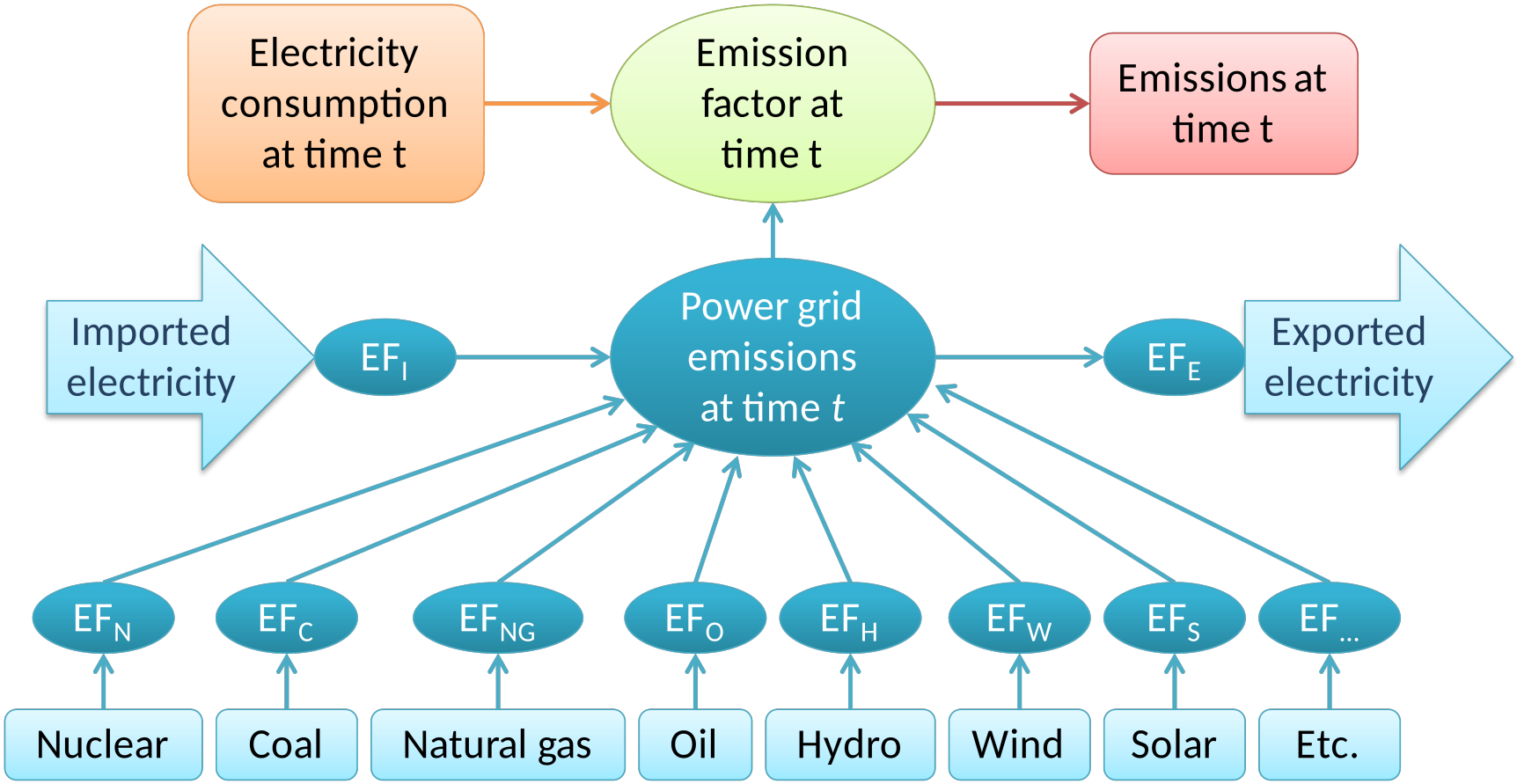
Model – What it does

- **Motivation**: develop a model that can help the end-users to mitigate their electricity environmental impacts
- **Main output**:
  - **Environmental diagnostic** of past and real-time electricity consumptions
  - **Recommendations** to plan future electricity consumptions

Model – How it works



Model – Module 1: electricity emissions

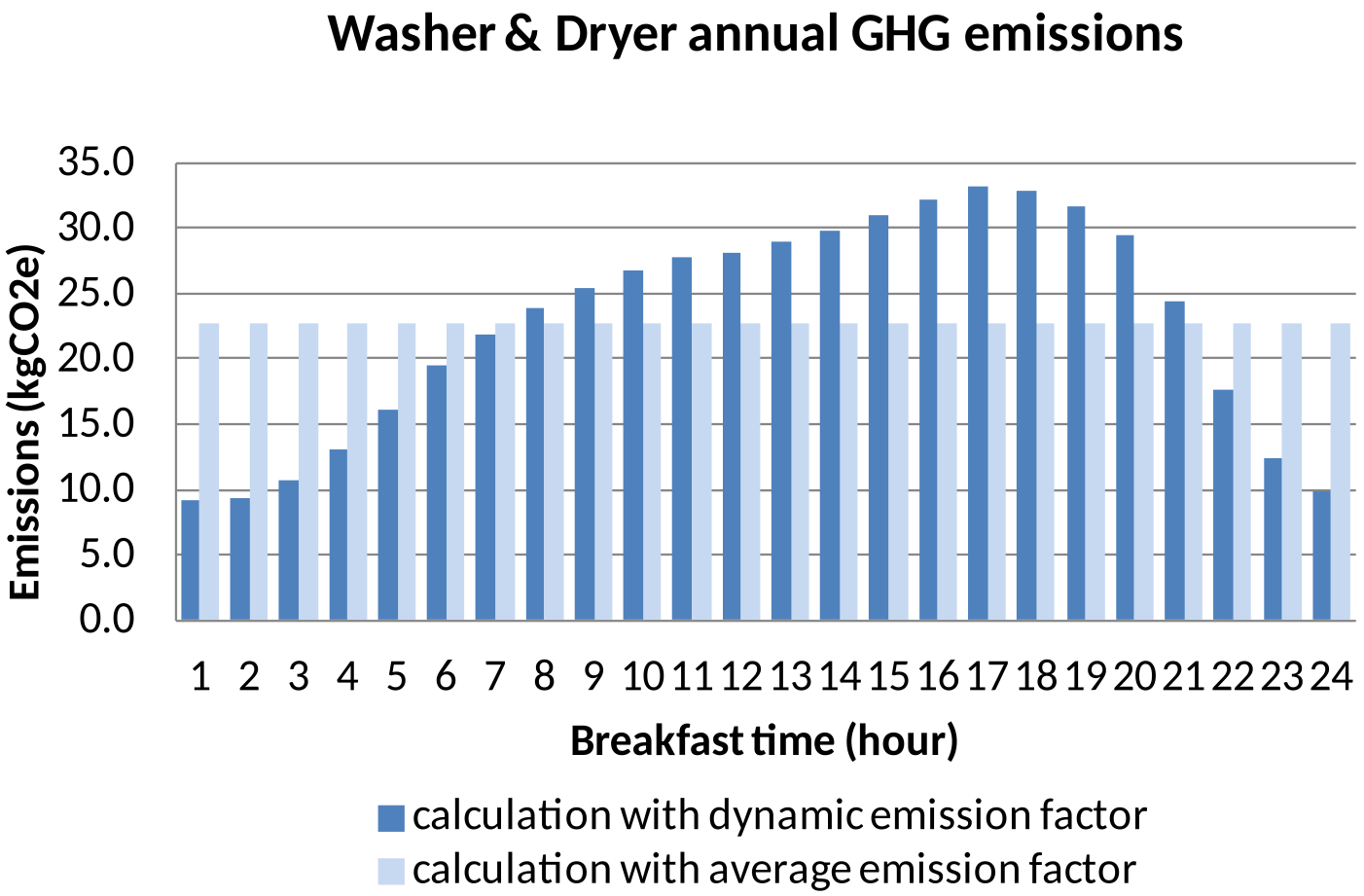


Example of application

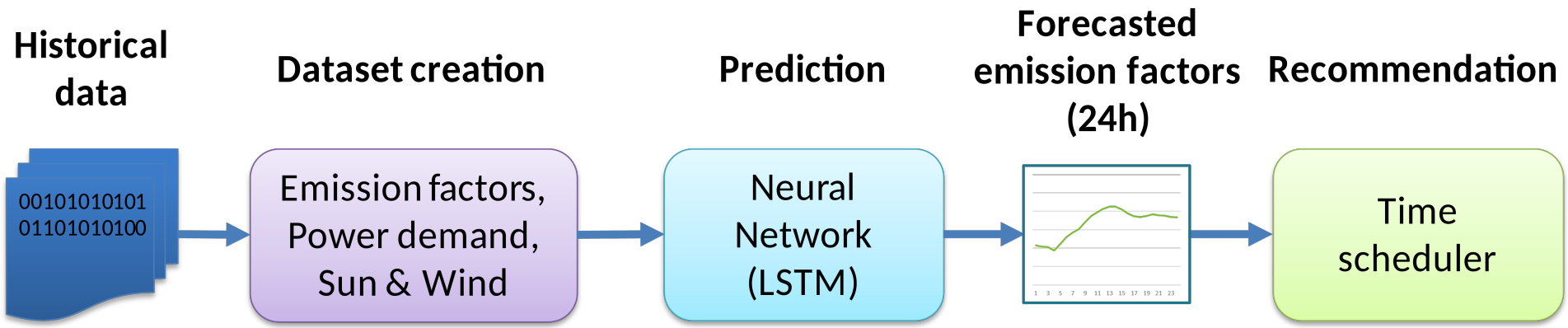
- **Electricity consumption scenario**
  - Use of a washing machine and a dryer everyday for one year in Ontario (2018 data)
  - We investigated the GHG emissions depending on the time when the appliances are used

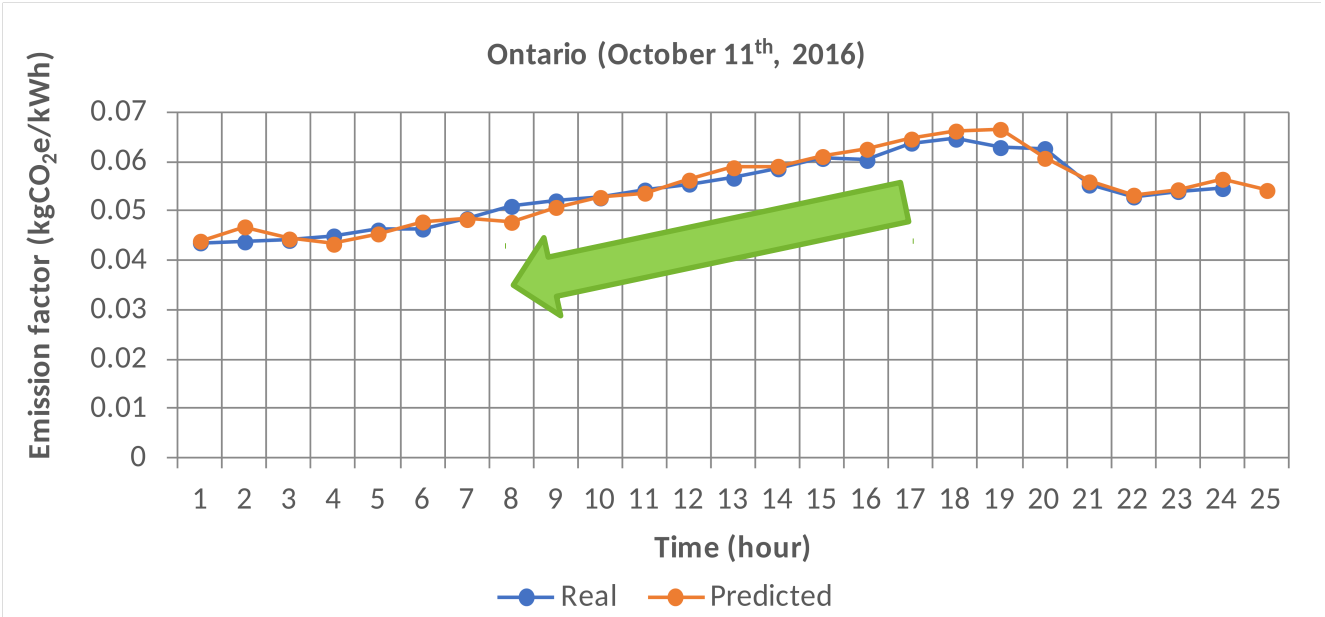
2.6 kWh/day (hour 1: 0.4 kWh, hour 2: 2.2 kWh)
Laundry starts at time t, t is an integer ≤ 24

Example of results



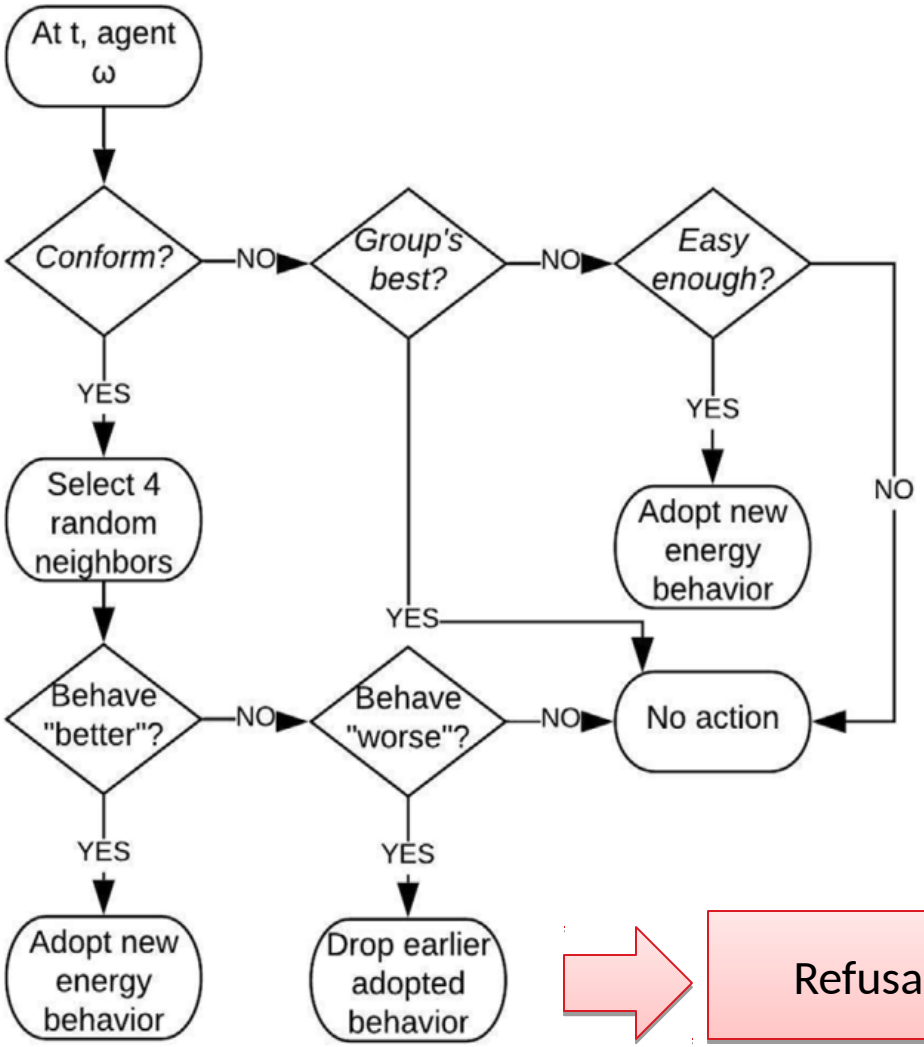
Model – Module 2: recommendations





Module 3: human behavior

Recommendation provided to a population

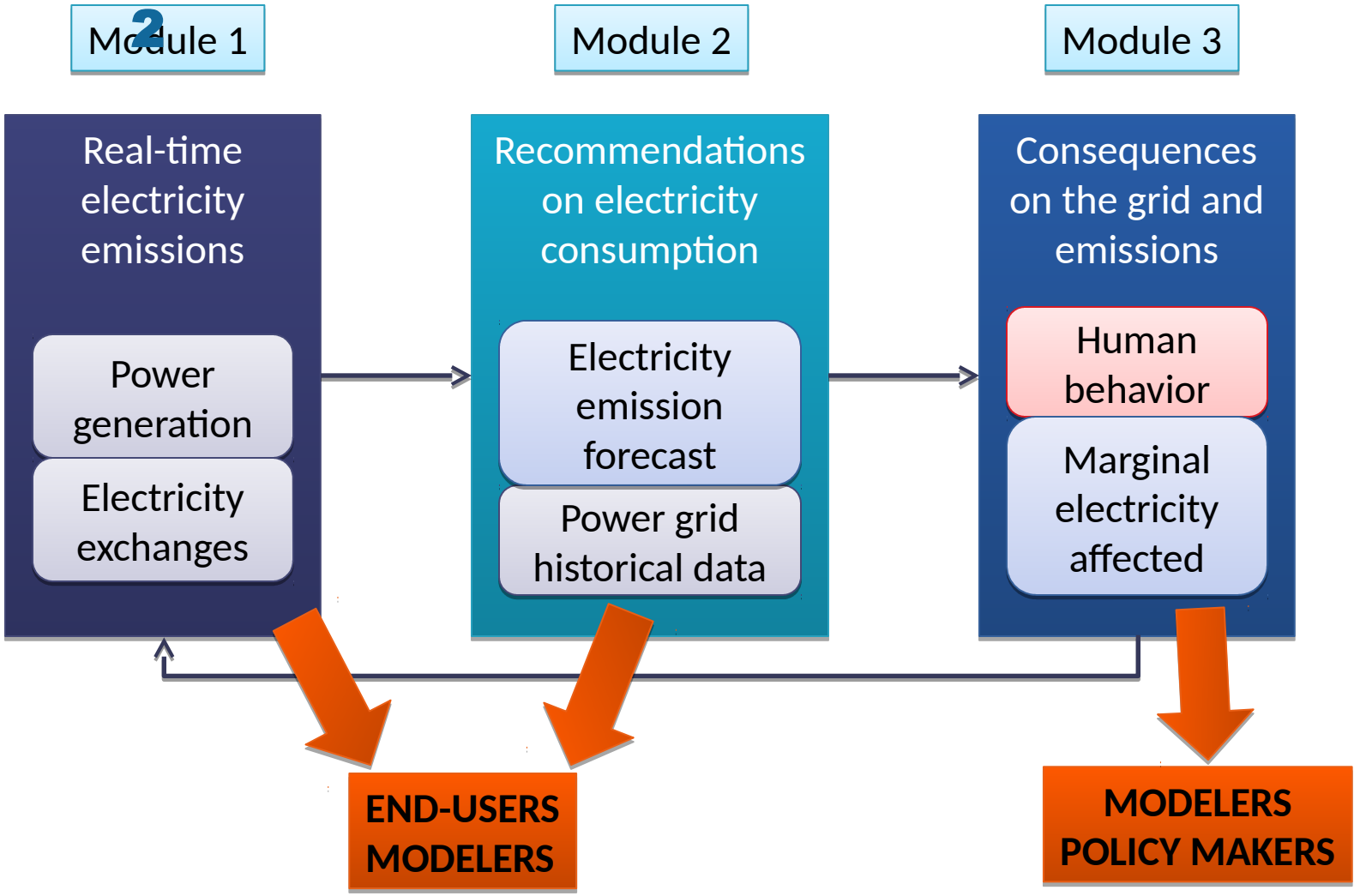


Compliance rate

Refusal rate

Model – How it works

IEEE1922.2



Direct and Indirect emissions

- The model can calculate:
  - **Direct emissions**
    - **Emissions** related to power consumption (use phase)
  - **Indirect emissions (Life Cycle Assessment)**
    - **All life cycle stages** (manufacturing, fuel supply chains, not only the use phase)
    - GHG emissions and **Climate change**
    - **Other emissions** (toxic substances, particulate matter, NOx, etc…) and impacts on the **Ecosystems** and **Human health**
    - Not only emissions but also **resource consumption** leading to **Natural resource depletion**

Discussion

- **Links to other energy models**
  - Our model can help you if you need:
    - Accurate electricity emission assessment
    - Short-term power mix predictions
    - Human behavior modelling
- **Support to design energy policies**
  - Our model can help to assess environmental impacts of energy policies that involve a change in power consumption or human behavior (demand-side management, energy efficiency measures, etc.)
- **Integration in 5G & Internet of things systems**
  - Our model has a great potential to mitigate GHG emissions in systems controlled by connected objects (tasks automation and scheduling)

Thank you for your attention and to our partners