Why a Real-time Market?

- An efficient way to meet the future challenge of balancing
  - High(er) demand of flexible consumption/production
  - High(er) volatility
  - High(er) balancing cost

- An efficient instrument to wide spread adoption of small-scale end-users/prosumers in the power market(s)

- Increasing competition on the power market(s)
  - Small scale end-users can attain economic benefits
  - TSOs get access to alternative balancing resources

DESIGN OF AN ECOGRID PROTOTYPE REAL-TIME MARKET PLACE IS A REALISTIC APPROACH BECAUSE IT IS ‘JUST’ WIDENING THE SCOPE OF THE CURRENT POWER MARKET SYSTEMS
The Scope of a Real-time Market

THE ECOGRID REAL-TIME MARKET WILL BE AN INTEGRATED PART OF THE CURRENT POWER MARKETS AND SUPPORTS THE NEED OF DIRECT CONTROL OPTIONS ON A VERY SHORT TIME SCALE.
An Additional Source of Regulation Capacity

The current Nordic system:

- TSO’s obtain a certain quantity by selecting/accepting bids
- Include only large producers, large consumers and aggregated smaller units (minimum 10 MW)
- Loads are updated every 15 minutes

The new real-time market:

- No restriction on the size of units (MW)
- TSOs set a price every 5 minutes that result in a certain quantity of fast(er) response from smaller units
The Market concept allows regulation of DER price signal without direct measurement of the individual DER response.
EcoGrid EU in the Wholesale Market

**Present balance settlement:**

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<th>Day-ahead</th>
<th>Intra-day</th>
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**EcoGrid EU settlement:**

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Price based on present and expected system balance as well as forecasts of price elasticity (no bids)

Price = Metered values

Trade (Scheduled/contracts) + Operation (Unscheduled/real-time) = Settlement
Key Functions and Responsibilities

- TSO Control room
- Price generator
- AGGREGATION
- PRODUCERS & CONSUMERS
- ELECTRICITY NETWORK
- TSO BILLING
- BRP
- SUPPLIER
- AUTOMATIC METER READING
- METER DATA MANAGEMENT
- TSO DATAHUB
- Business entity
- Technical entity
Implementation of the Real-time Price

Demo phase I: Open-loop pricing
- External input e.g. power exchange prices
- Price calculation / transformation
- Price signal (real-time)
- Distributed Energy Resources

Demo phase II: Close-loop pricing
- Objective e.g. power balance setpoint
- Price calculation with response prediction
- Price signal (real-time)
- Feedback (real-time)
- Distributed Energy Resources

External input of “ex post” price information from the current day-ahead market (i.e. published spot prices from the Nord Pool)

Calculation of real-time prices based on forecast of demand response. Prices are broadcasted to the market in order to obtain a certain objective (e.g. required balancing power)