



Integration of renewable energy sources into
the electrical grid High Level Conference,
SEVILLE

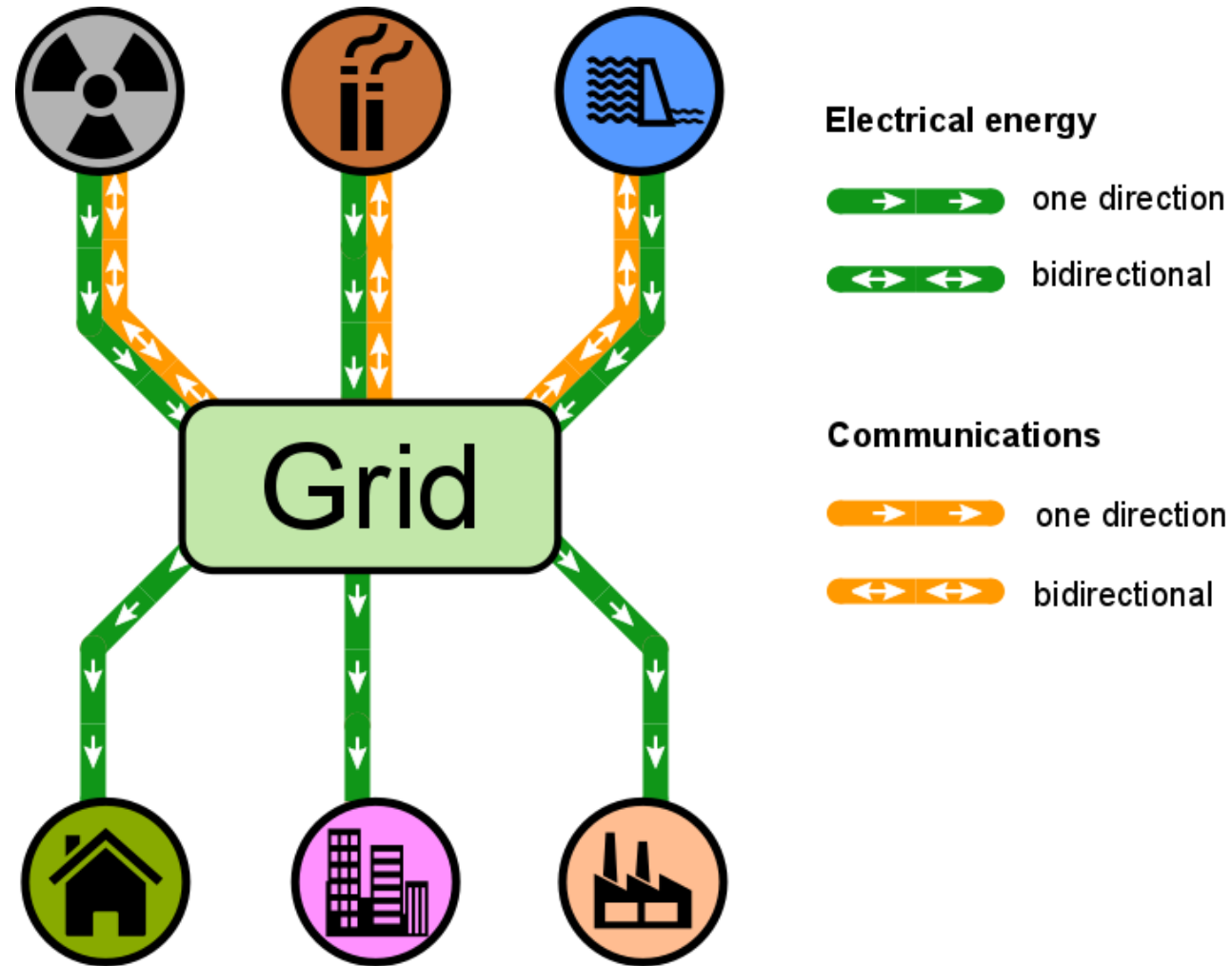


Innovative Solutions for Grid Integration of Renewable generation

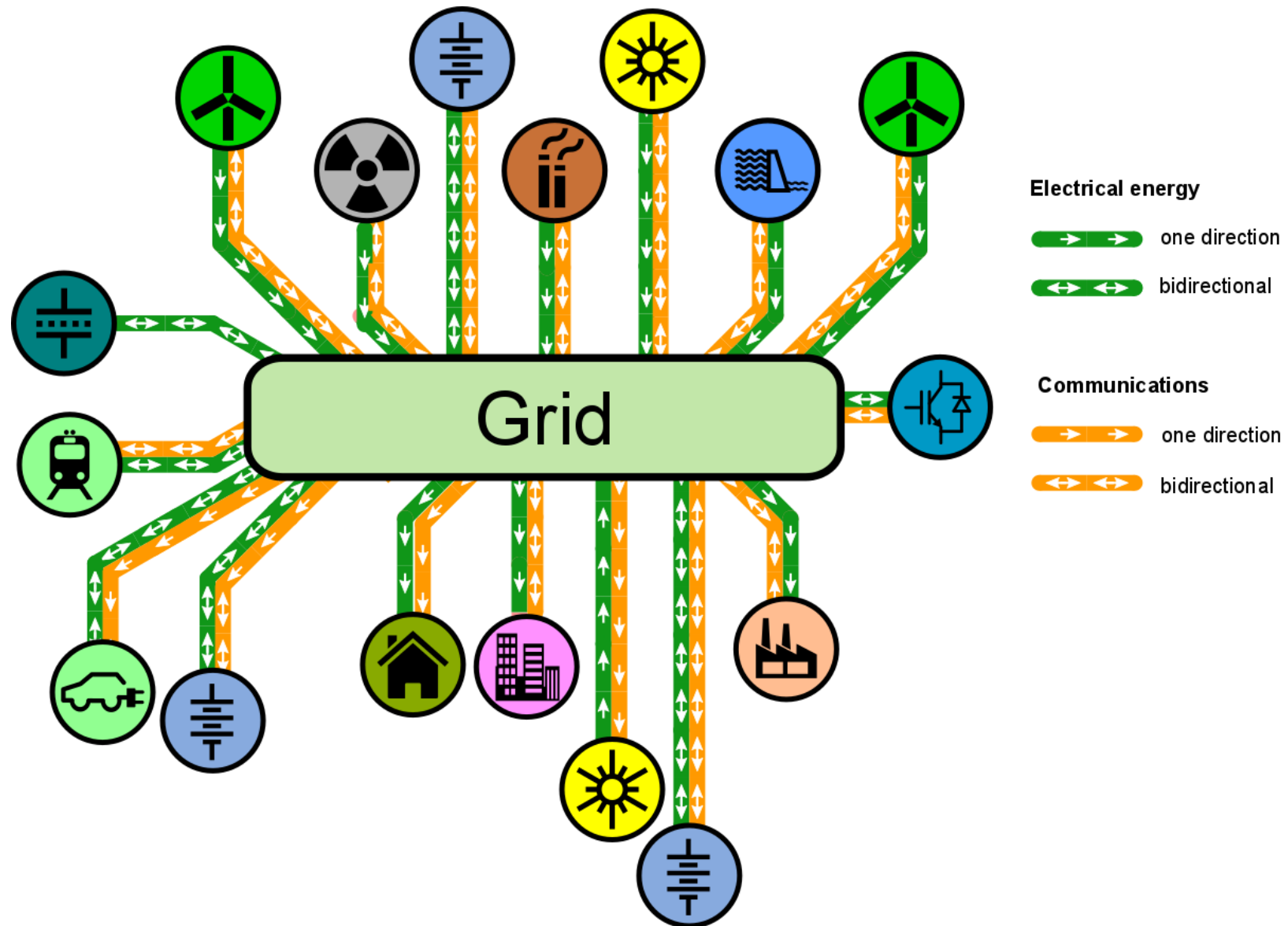
Daniel Morales Wagner
Ingelectus CTO

May 17, 2018

Innovative Solutions for renewable energy grid integration



Innovative Solutions for renewable energy grid integration



Innovative Solutions for renewable energy grid integration

What we do

Transmission systems

State Estimation (R&D)

- Parameters Estimation

SQTplus Vizimax (Product)

- Control Switching device

Almacena (R&D)

- Energy Storage applications transmission grid

Distribution systems

Monica (R&D)

- MV and LV State Estimator

Smartap (R&D)

- Smart Transformer Tap Changer

Renewable energy generation

SmartPPC (Product)

- Optimal Power Plant Controller

Grid integration Studies (Services)

- Grid codes

Electrical modelling and simulation (Services)

- PV, WT, STATCOMs, BESS, etc.

Cecovel (R&D)

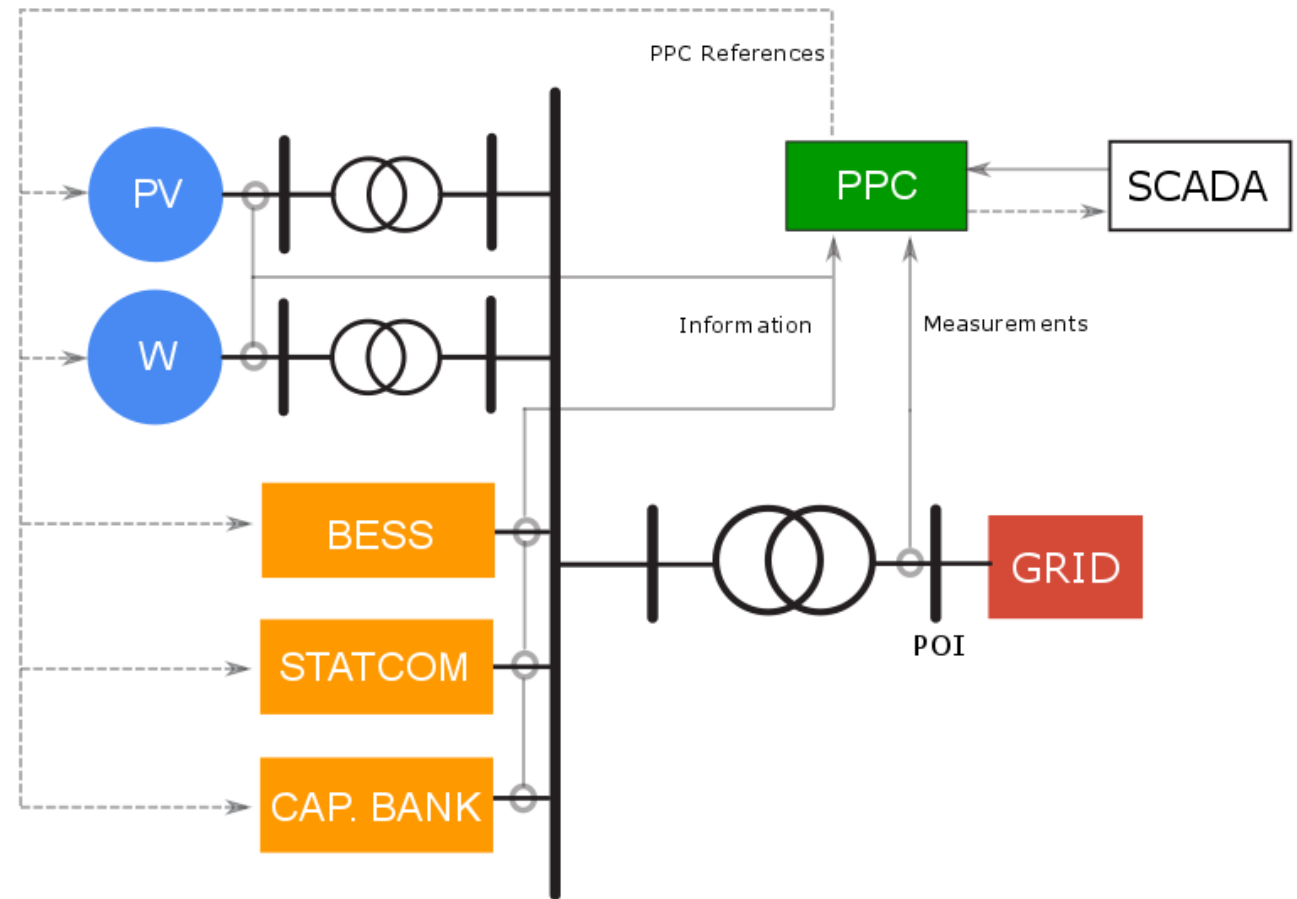
- National Electric Vehicle Consumption Forecasting

Innovative Solutions for renewable energy grid integration

Renewable energy generation

Functionalities:

- Active power curtailment
- Ramp rate limiter
- Frequency response
- Voltage control
- Reactive power control
- Power factor control
- Q-V static curve response



Innovative Solutions for renewable energy grid integration

Renewable energy generation

The same functionalities of Ingelectus PPC but with an optimal reactive power dispatch

- Maximizing active power output
- Minimizing stress at the wind or solar inverters

Ingelectus Experience:

- Carondio (Asturias) 50 MW
- Lamesa (USA) 100 MW
- Aura Solar (Mexico) 35 MW
- Wood Hills (USA) 20 MW



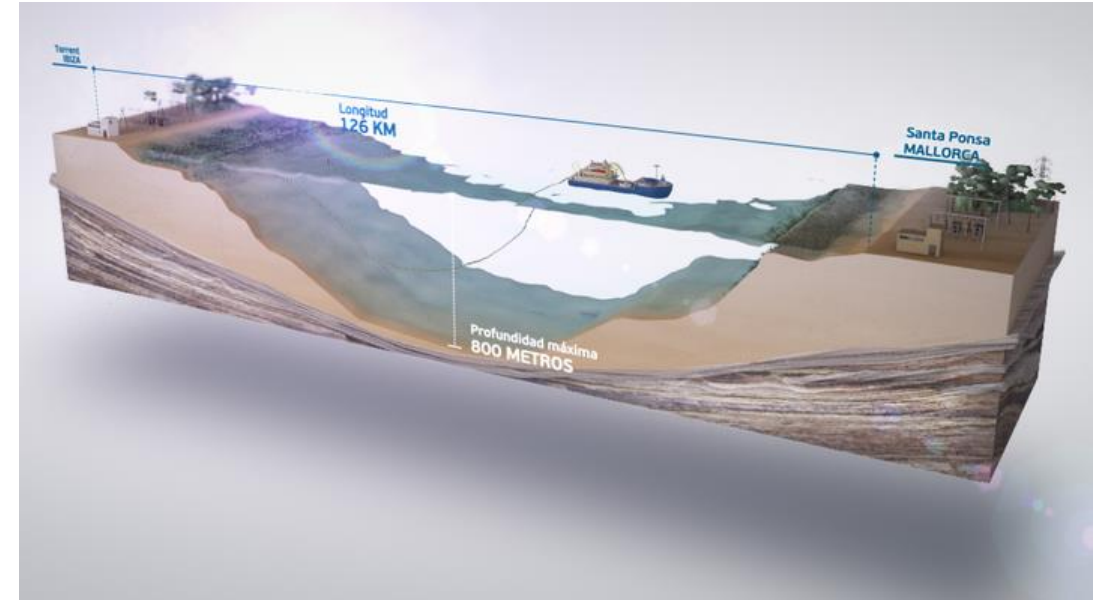
Innovative Solutions for renewable energy grid integration

Transmission systems

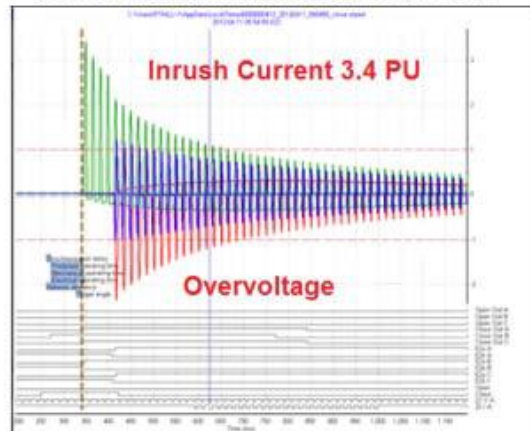
Controlled Switching Device

- **Mallorca-Ibiza (Rómulo 2)**

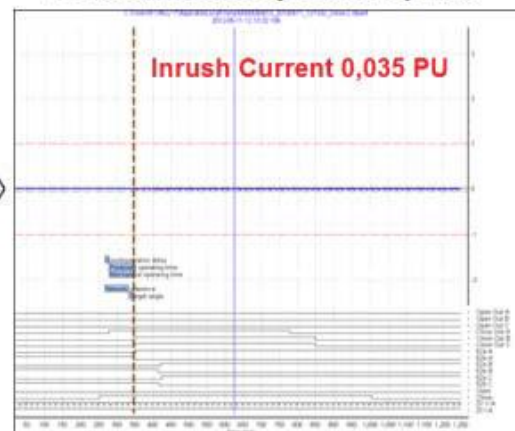
- The submarine electrical line between Mallorca - Ibiza is the world's longest in AC
- Controlled Switching for HV/MV Circuit Breakers (**SynchroTech Plus**)



Uncontrolled connection to the Grid



Connection with SynchroTeq Plus



Innovative Solutions for renewable energy grid integration

Distribution systems

MONICA (2015-2017):

- Knowledge of the state of the MV and LV grid
- Pilot: Smart City Malaga
- Detection of fraud connections
- Enabling renewable energy integration in MV and LV
- Monitoring the grid (overvoltages, undervoltages, unbalanced situations, etc.)



Innovative Solutions for renewable energy grid integration

Distribution systems

Voltage analysis

Overloads

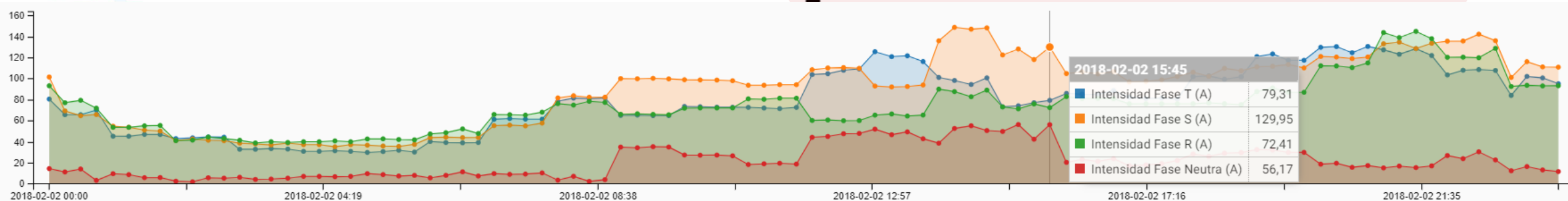
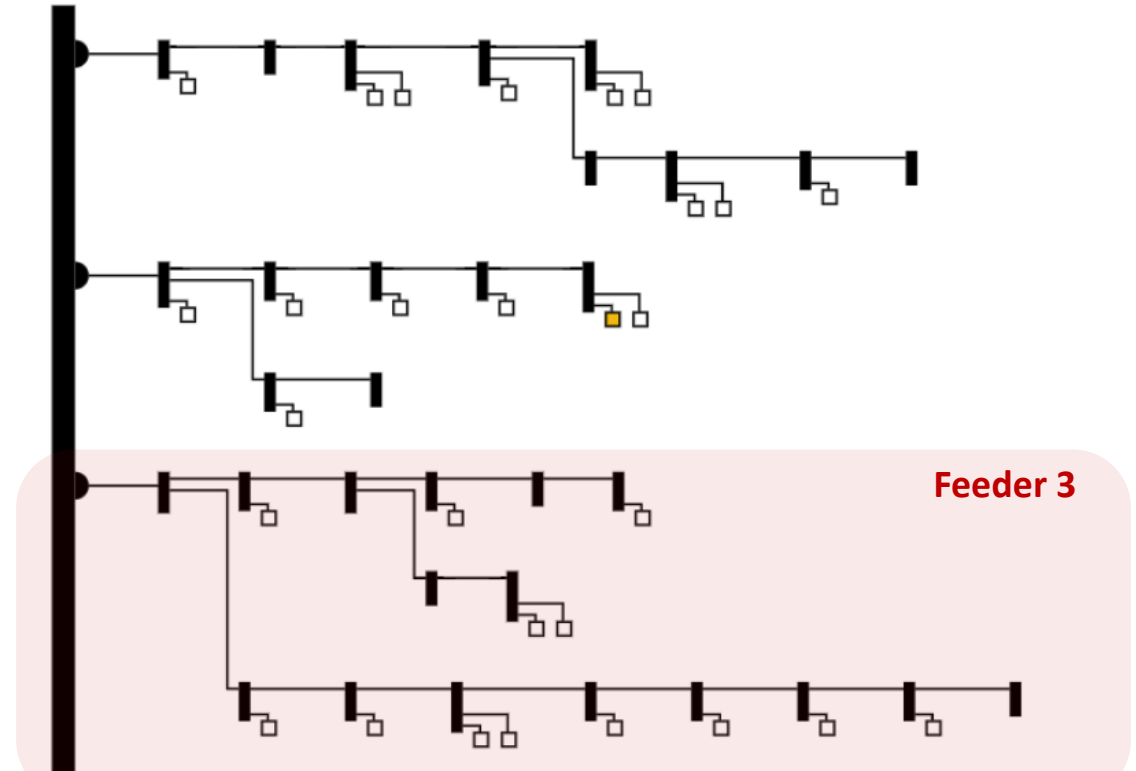
Unbalances

Losses

Wrong measurements



02/02/2018 CD 312 feeder 3 (Rama 1)



Thank you for your attention

