

The EU FP7 Project “INCREASE”

*INCREASING THE PENETRATION OF RENEWABLE
ENERGY SOURCES IN THE DISTRIBUTION GRID BY
DEVELOPING CONTROL STRATEGIES AND USING
ANCILLARY SERVICES*

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CoSSMic, Konstanz, July 14, 2015



Introduction of JOANNEUM RESEARCH

- Graz, Austria
- 2nd biggest applied research institute in AT
- 6 Departments
 - Materials, Health, Digital, **Resources**, Policies, Robotics
- Approx. 400 employees
- Interdisciplinary research



- INCREASE challenge
- INCREASE solution → control strategies
- Project overview – tasks, outcomes
- Consortium

INCREASE challenge

How to meet the 20-20-20 targets?

- Significantly increase in distributed renewable energy sources (DRES) is necessary.

What does this mean for the TSOs and DSOs?

- DSO has to connect DRES guaranteeing the power quality,
- at low cost,
- in minimal time



INCREASE seeks for answers of...

How to actively manage renewable energy sources in LV and MV networks (new innovative options → control strategies)

How could “Distributed RES” (DRES) participate in providing ancillary services towards DSOs and TSOs

- Voltage control
- Voltage unbalance mitigation
- Line congestion mitigation
- Reserve provision

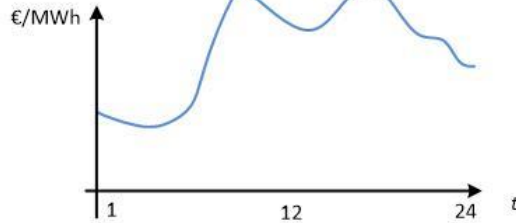
Control Strategies

Service layer

Price signal of wholesale electricity market (Day-ahead market)

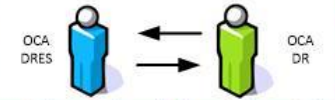
Forecasting tools

Ancillary services



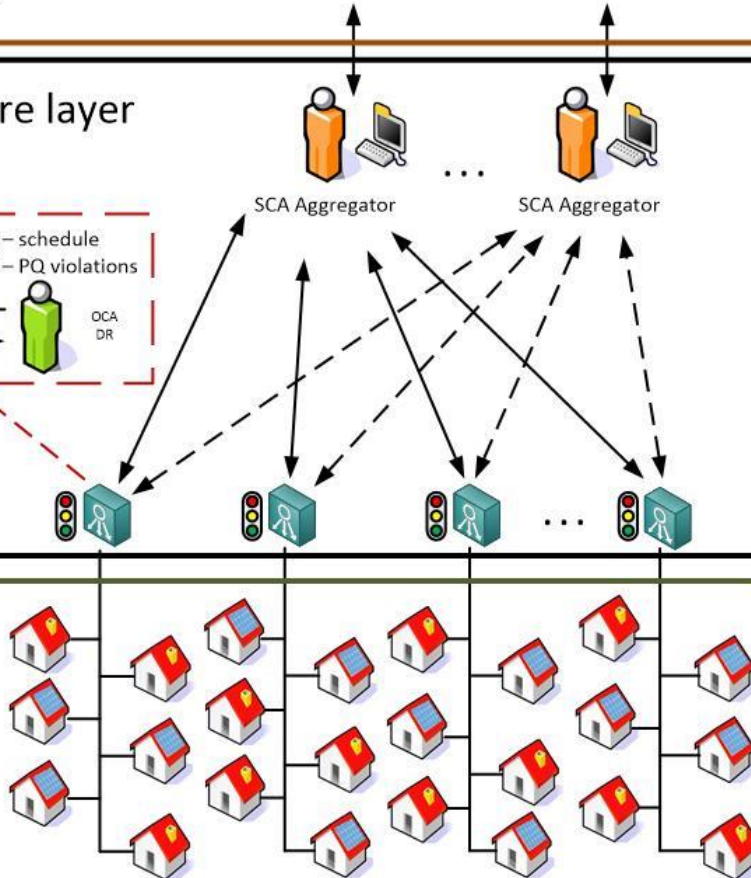
Middleware layer

OCA DR to OCA DRES – schedule
OCA DRES to OCA DR – PQ violations



SCA Aggregator

SCA Aggregator



Physical layer

- A **multilevel agent structure (MAS)** is proposed

– Scheduling control agent (SCA)



- **Optimizes** DR operating schedule in regulation zone
- Provides **link to markets**
- Coordinates other MAS levels

– Overlaying control agents (OCA)



• OCA DRES

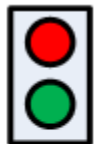
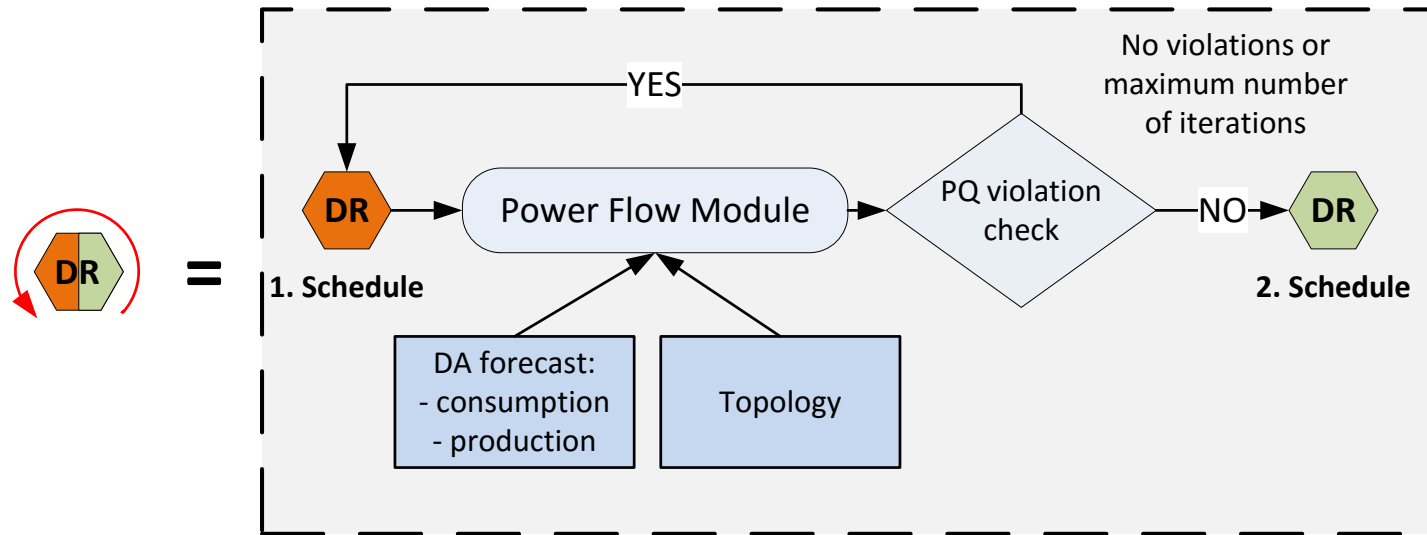
- Control DRES units
- Take care of individual feeders
- Coordinate Local control
- Prevent PQ violations



• OCA DR

- Control DR units
- Receive schedule from SCA

Scheduling control – simple and advanced „traffic lights“



Simple traffic light:

Does PQ violation exist?

1. YES – Reject DR schedule
2. NO – Accept DR schedule



Advanced traffic light:

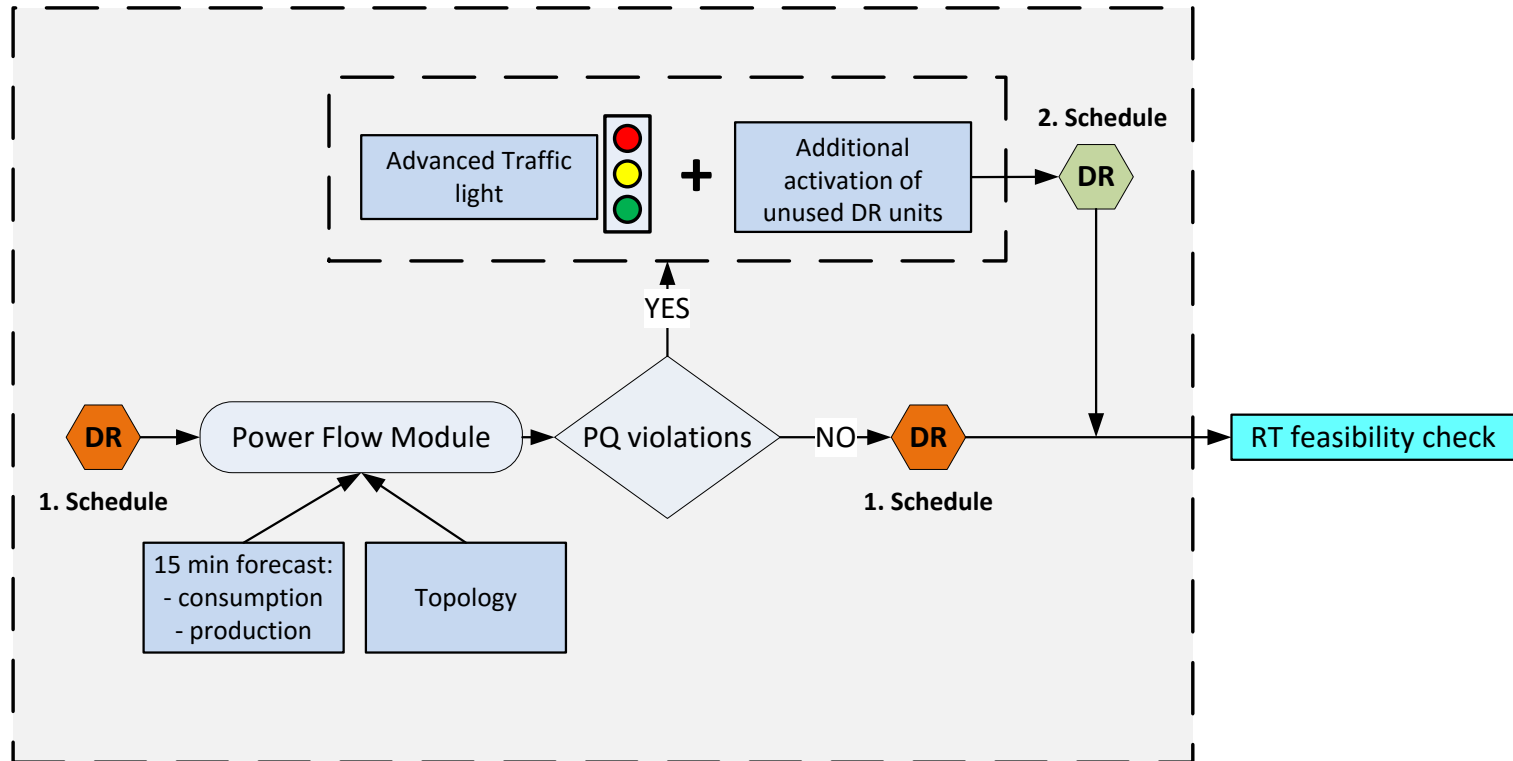
Does PQ violation exist?

1. YES –
 - a) Is DR in line with PQ mitigation?
 - YES – Accept DR Schedule
 - NO – Reject DR schedule
2. NO – Accept DR Schedule

Scheduling Control- Intelligent Traffic Light System

⌚ 15 min
PQ forecast RT check

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INCREASE investigates

- Regulatory frameworks
- Grid code structures
- Ancillary market mechanisms

INCREASE propose adjustments to facilitate successful provisioning of ancillary services (AS)

- DRES and DR provide also AS
- DSO evolve from congestion to capacity manager

INCREASE provides simulation platform

- Validation of proposed solution
- Tool for DSOs to investigate DRES influence on their network

1. Development of a three-phase four-wire inverter for the LV grid
2. Development of a multi-service/objective distributed control system
3. Development and implementation of an ICT system architecture (field trials)
4. Development of a simulation toolset to thoroughly analyze the INCREASE control strategies
5. Lab-scale and real-life validation
6. Investigation of the market and regulatory framework

INCREASE consortium

INCREASE is oriented at **delivering tools and solutions to DSOs**. To ensure that these tools and solutions are well accepted and fit the needs of this target group as much as possible, 4 DSOs from different regions in Europe are partner in the project, apart from several research institutes and industrial partners.



INCREASE consortium

Austria:

- Joanneum Research
- Stromnetz Steiermark

Belgium

- Alenco
- Eandis
- Elia
- Ghent University

Greece

- Aristotle University of Thessaloniki

Slovenia:

- Elektro Gorenjska
- Korona
- University of Ljubljana

The Netherlands:

- Liander
- Mastervolt
- Technische Universiteit Eindhoven



Thank you for your attention!

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www.project-increase.eu