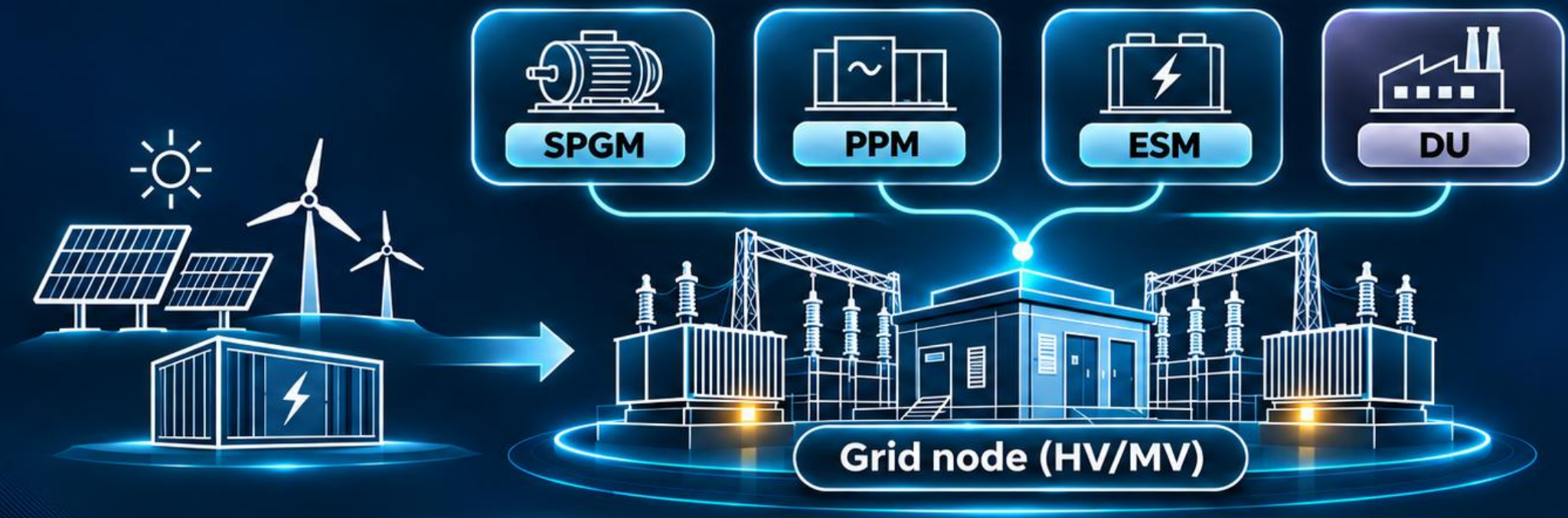
ReBuild Ukraine – Solar BESS GRID Forum

SMART ENERGY HOLDING

Grid Codes, Flexibility & Distributed Resource Coordination

From technology-agnostic compliance to node-based control of regulatory objects

Panel 3 – Grid: Development. Connection. Integration.



Szymon Witoszek | CEO | PGM Expertise & Solutions

Grid codes classify regulatory objects, not technologies

Capability at the point of connection matters more than the internal technology mix.

SMART ENERGY HOLDING

Solar PV

Wind

Battery storage

Synchronous generator / genset

Flexible load

PoC

Regulatory objects at PoC

PGM

SPGM

PPM

ESM

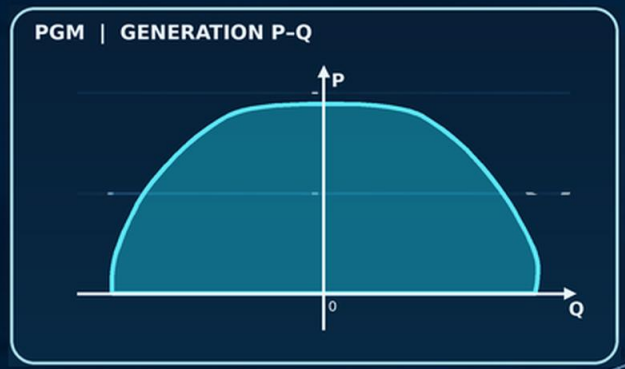
DU

NC DC

A → D

A B C D

Significance at PoC: Pmax + Un



From unit dispatch to node dispatch

Keep central coordination. Move dispatch from units to grid nodes.

SMART ENERGY HOLDING

OLD MODEL

Unit dispatch



Central dispatcher

SPGM | PPM | ESM | DU

Direct setpoints to individual resources

NEW MODEL

Node dispatch



System coordination

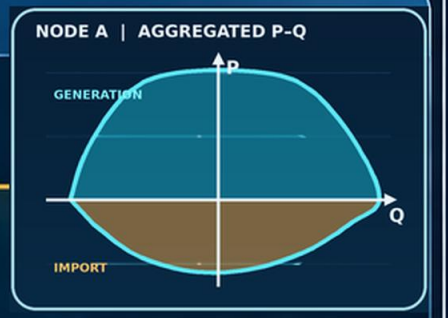
P / Q

P / Q



Grid node A (HV/MV)

Grid node B (HV/MV)



- P/Q target
- power-flow
- losses

PGM: SPGM | PPM | ESM

DU: NC DC

PGM: SPGM | PPM | ESM

DU: NC DC

FROM: gross unit references → **TO:** network references P / Q

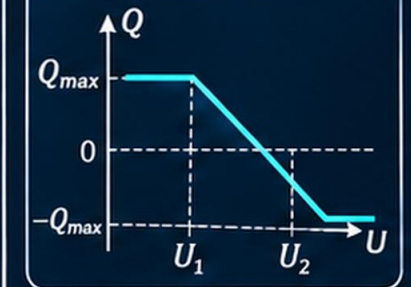
Nodes publish needs and operating characteristics

Grid needs are broadcast from the node to all regulatory objects behind it.

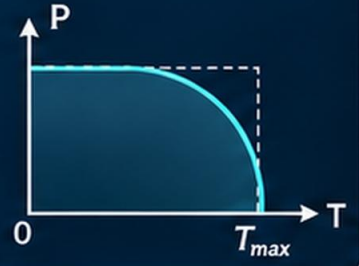
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Node characteristics (published)

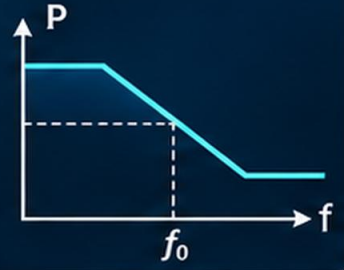
Q(U)



P(thermal)



P(f)



Mode / Priority

Normal | N-1 | N-x

Refresh 2 s



Grid node (HV/MV)

Regulatory objects

PGM

- SPGM
- PPM
- ESM

DU

- NC DC

Published by node • interpreted locally • **executed by regulatory objects**

Closed-loop node coordination

Measure → update → publish → respond → verify.

SMART ENERGY HOLDING

1 Measure

P | Q | U | f | thermal / loading

2 Update

Update node target / operating rule

3 Publish

Publish normalized request

PGM		DU
P/Pmax	0.72	flexibility request
Q/Pmax	0.28	

4 Respond

Respond by regulatory objects

PGM | DU

5 Verify

Verify aggregated response



HV/MV Node

Time response



N-x mode: capability adjustments

- faster refresh
- steeper gradient / faster response
- higher synchronous share / inertia / SCR support
- grid-forming enabled

Scope of Services

Compliance, qualification, advisory and digital operating concepts

SMART ENERGY HOLDING

- Compliance NC RfG
- Compliance NC DC
- Compliance NC ER
- Flexibility services qualification
- Balancing market qualification
- Advisory
- Digital concepts
- Energy sector digitalisation
- Decentralised / distributed resources management
- Dedicated operational systems (EMS)

Contact / QR

pgmex Compliance Experts

