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BALTIC SYNCHRONISATION – SMART DEPENDENCY CONTROL

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Welcome to my company, Litgrid AB

- The designated electricity transmission system operator
- Responsible for implementation and operation of 110-400 kV national power transmission grid:
  - Over 7000 km of overhead lines,
  - 347 km of high voltage cable lines, including HVDC connector to Sweden,
  - 247 substations.
- Appointed to implement the Synchronisation Project in Lithuania.

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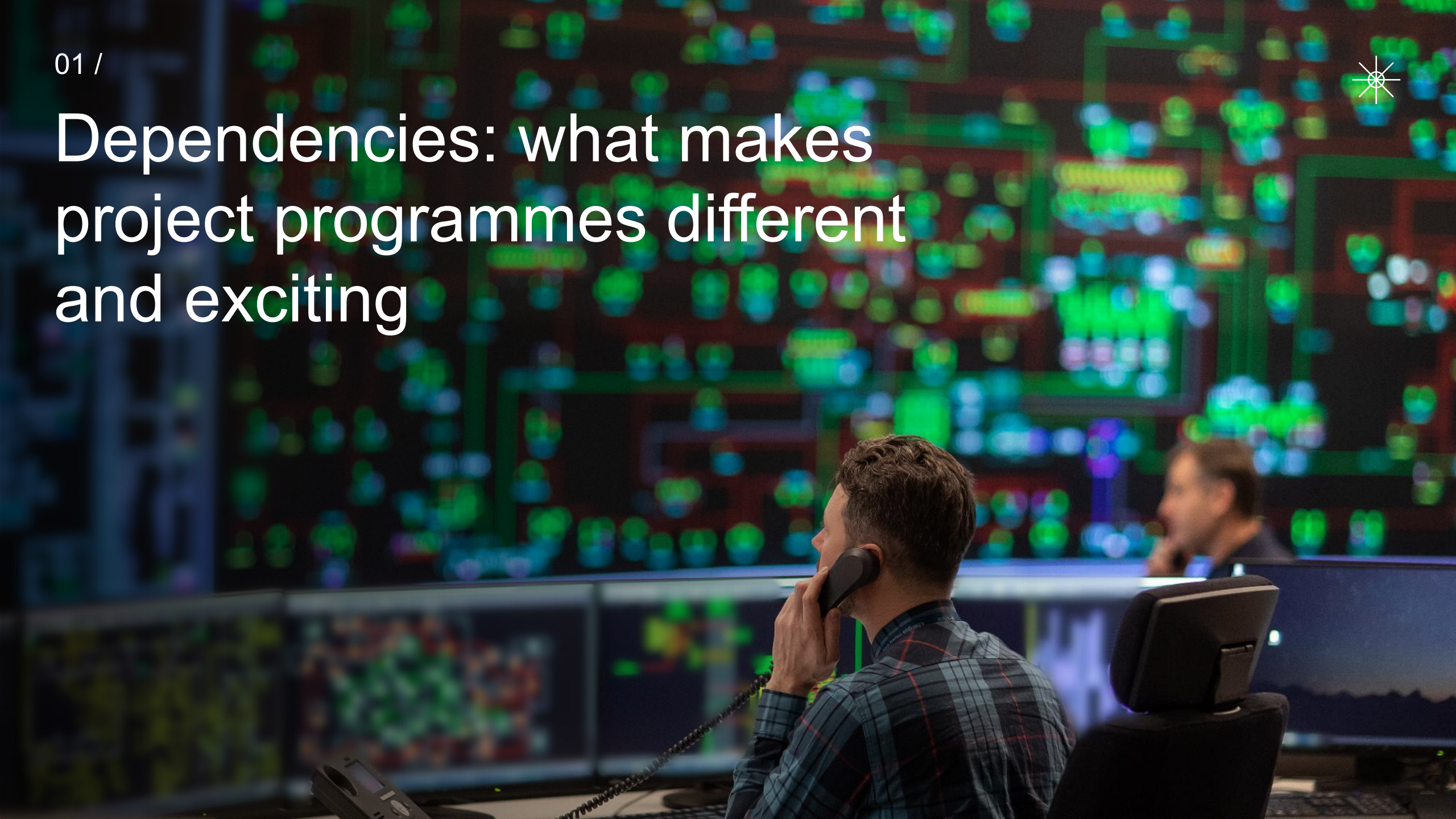
Dependencies: what makes project programmes different and exciting



Complexity is intrinsic to project programmes

Complexity of...	Manifests in...
Objectives:	Orientation towards intangible **outcomes** and **benefits** rather than **products**.
Governance:	Multi-layer governance model
Stakeholders and communication:	Ecosystem of stakeholders with varying communication demands
Scope:	Numerous **interrelated projects and non-project activities** that contribute to outcomes.

Complexity of scope: cross-project dependencies

Schedule dependency

- Pharma programme:
- clinical trials can only start AFTER in vitro testing study

Design dependency

- Software programme
- Application project depends on support of platform project

Resource dependency

- Construction programme
- Projects competing for the same resources

Types and causes of dependencies

Types of dependencies

Schedule dependencies:

- Certain activities in the impacting project should happen before, after, or exactly on a specific date.

Design dependencies:

- Any requirements towards how the outputs of the impacting project are designed or implemented.

Resource dependencies:

- Requirements towards release of resources used in the impacting project for use in the impacted project.

Causes of dependencies

Technical dependencies:

- Dependencies caused by physical or practical limitations of the systems, environment, or resources used in the programme.

Legal/regulatory dependencies:

- Dependencies caused by the legal or regulatory requirements.

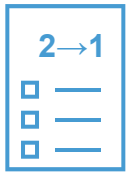
Artificial dependencies:

- Dependencies that are introduced in planning without objective justification above.

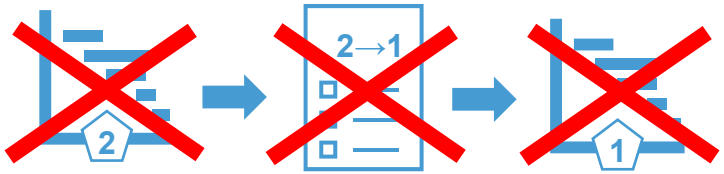
Anatomy of a cross-project dependency

Project 1 („impacted project“) ...

... can proceed as planned provided that Project 2 („impacting project“) ...



... consistently meets specific requirements („zero impact conditions“, ZIC).



Failure to meet the ZIC by Project 2 would throw Project 1 off schedule, budget, scope, etc.

Dependencies, risks, and issues

- Dependencies in a programme of projects can translate into risks or issues against the impacted project.

If at a given moment in time...

...zero impact conditions are **not** met:	...zero impact conditions are met, but can be violated later:
• there is an **issue** requiring a swift solution or a project change against the impacted project.	• there is a **risk** against the impacted project that has to be identified, assessed, and addressed.

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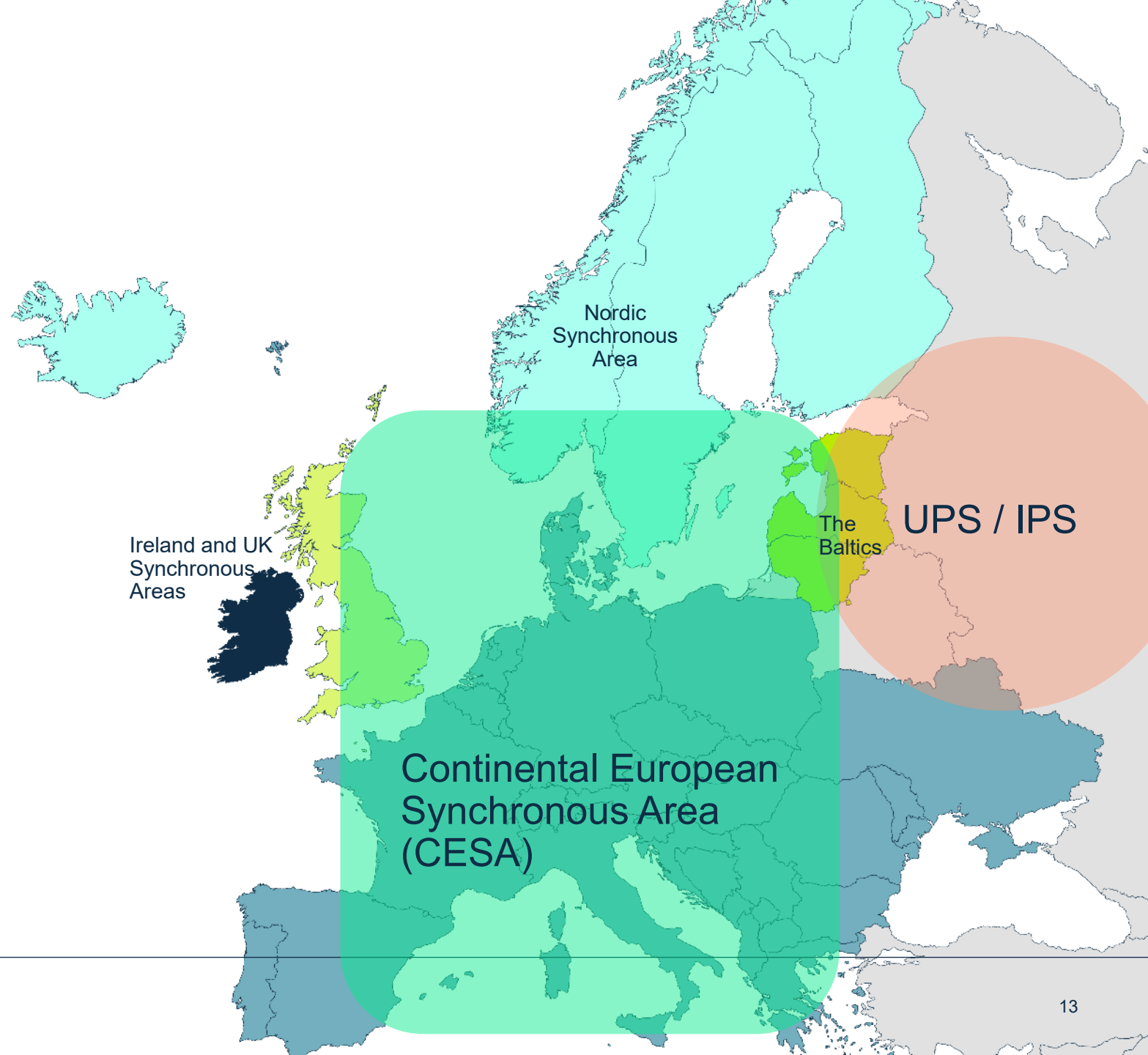
The Challenge of Synchronisation

The Challenge of Synchronisation

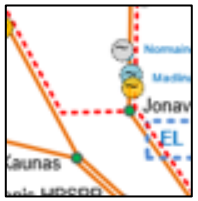
- Transition to Continental Europe Synchronous Area (CESA) while disconnecting from post-soviet IPS/UPS.
- Technically complex undertaking due to geography and geopolitics
- Unique technology solutions needed to ensure stability of the grid in island mode.
- The programme started in 2019.

Project objective:
- to prepare electricity transmission infrastructure and systems in the Baltics for desynchronization from IPS/UPS and synchronization with CESA by 2025.



Scope: Infrastructure and IT development

Building synchronous interconnections with Continental Europe (LitPol Link upgrade, Harmony Link)

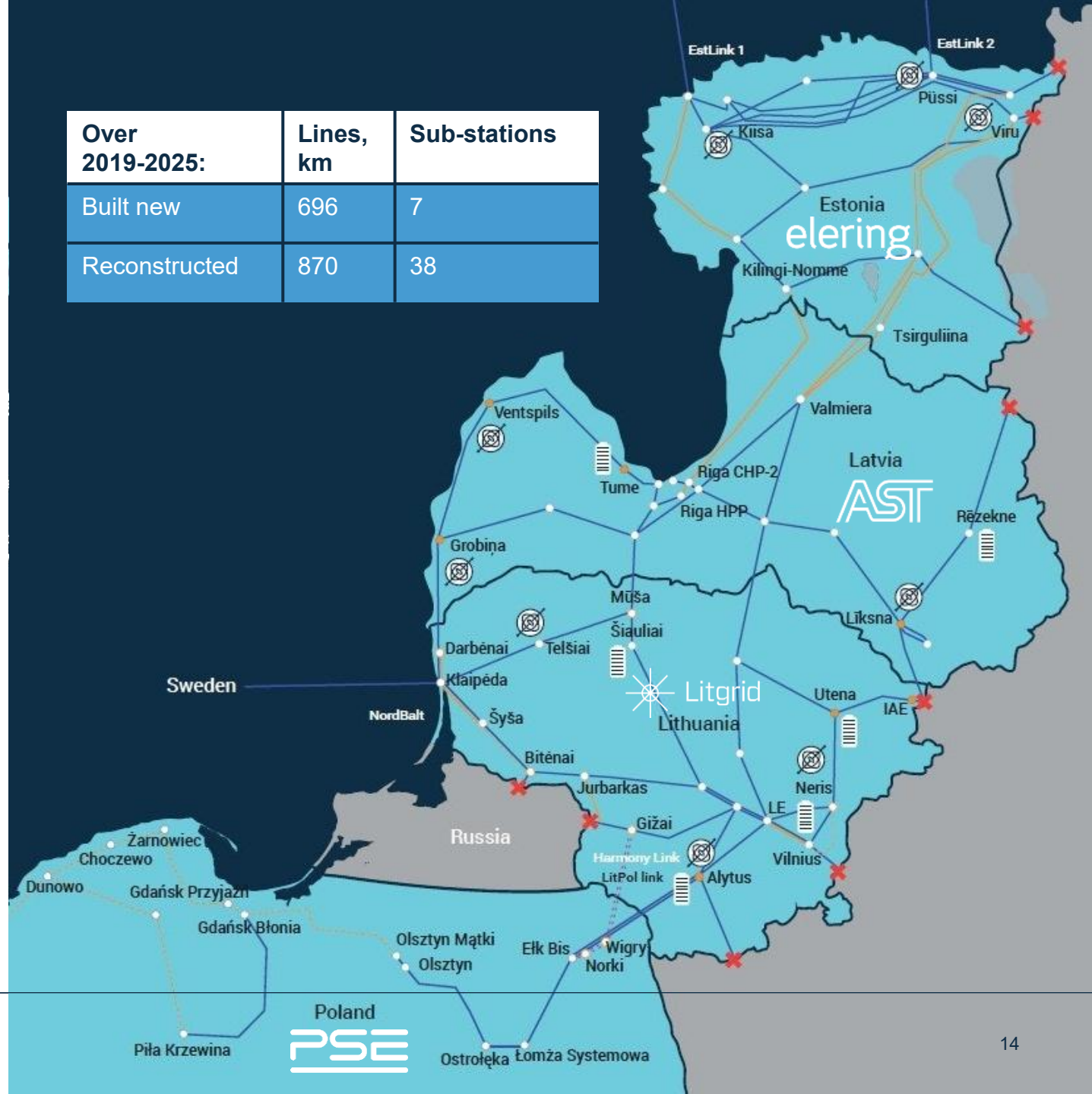


New internal and cross-border lines and substations

Synchronous condensers and battery energy storage systems (BESS) for frequency stability and system balancing

Upgrades and improvements in power system management and control systems

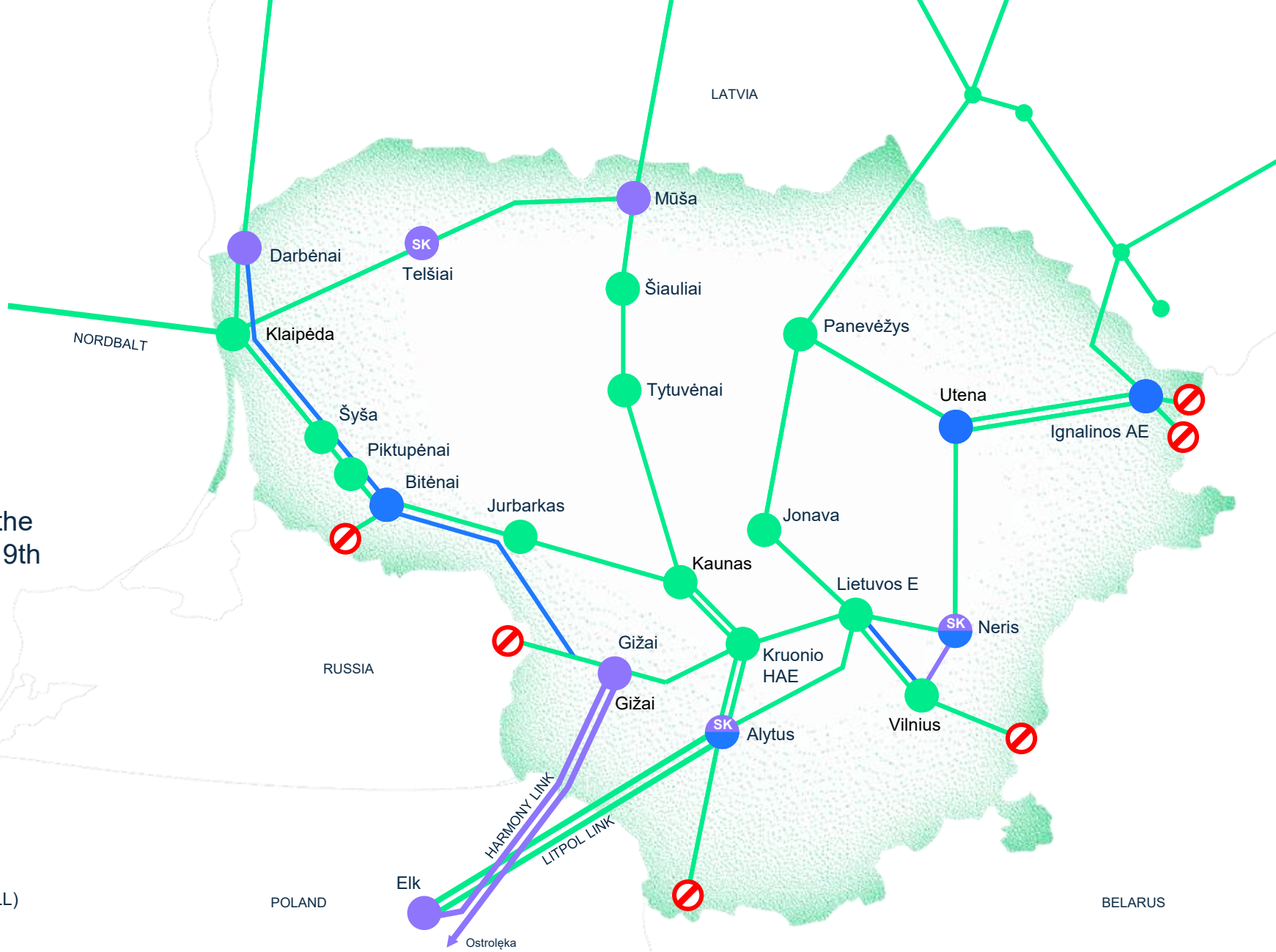
Over 2019-2025:	Lines, km	Sub-stations
Built new	696	7
Reconstructed	870	38



Co-funded by the European Union

Synchronisation Programme in Lithuania

- 20 projects
- The first project was incepted in 2011
- The last project will go on till 2030
- The major milestone was reconnecting the Baltic grids to the continental Europe on 9th February 2025



Existing 330 kV electricity transmission lines and substations, direct current connections

Construction and reconstruction of transmission lines and substations, direct current connections

Construction and reconstruction projects already completed

SK Installation of synchronous condensers

Disconnection for separation from the IPS / UPS system (BRELL)

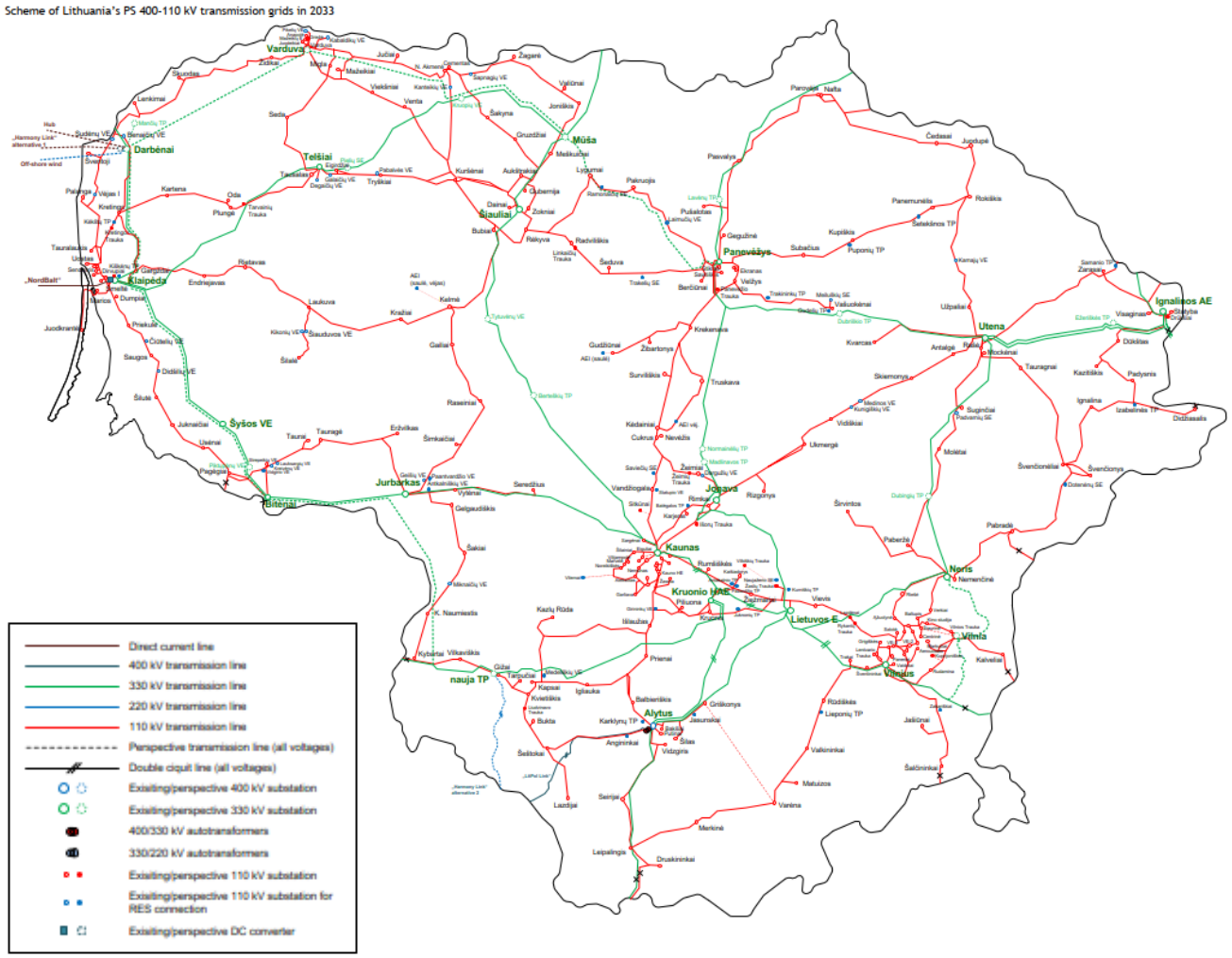
What makes dependencies critical in electricity projects

Topology of electricity grid emphasises interconnectivity

- The transmission grid is one large system of interconnected nodes.
- Changes in one part of the system will impact other parts.

Outages are limited and coordinated

- N+1 principle allows to take nodes or connections out without disconnecting consumers.
- Operator maintains an outage schedule that optimizes ability to progress against time.
- Delays in individual projects can cause major upheavals in outage schedule.



The problems we had at Synchronisation team

- How to identify and track dependencies?
- How to allocate responsibility for the whole registry and individual entries?
- How to mitigate dependencies in time and effectively?

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The innovative approach to dependency management

Lifecycle of the dependency at Litgrid

1. Programme management owns the dependency registry.
2. Project managers are involved in managing the dependency through a „Dependency agreement“
3. Impacted projects are from inside programme, but impacting projects can come from anywhere in portfolio.

Identification sequence

1. PMs capture design and planning assumptions, with associated key assets and infrastructure.
2. Programme Management:
   - reviews the assumptions
   - identifies those that depend on other projects or activities
3. In a three-way communication, the dependency is established or disproved, Dependency Agreement is set up.

What is documented in the cross-project dependency agreement

For the impacted project
Project manager
Dependency description
„Zero impact conditions“ – what conditions need to be met to avoid an impact to the current plan.

For the impacting project
Project manager
Current estimate of meeting zero impact conditions

Parties agree
1. To inform each other of known changes in stated parameters
2. Work to mitigate the dependency on each end to reduce its effect on the „impacted project“.
3. Revisit the agreement according to the established review cycle

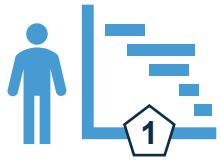
Assessment of dependency	
If there is no conflict:	If there is a conflict:
Reference to programme level **risk** of conflict in the future (if needed).	Reference to programme level **issue**

For the impacted project
Plan the response to risk/issue

For the impacting project
Plan the response to risk/issue

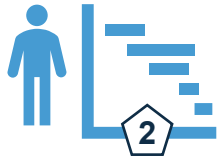
For the programme manager
Set the monitoring/review cycle

A sample dependency review ritual



PM1

My project will proceed on time if your project delivers milestone X on Date A.



PM2

I estimate that I will deliver milestone X 10 days before the date A.

Programme Manager

Reports by both of you indicate that:

1. The dependency is still intact, but slack is down to 10 days.
2. I am filing the risk of severity 2 of overlap into both projects, let's work on it to reduce a possible damage.
3. Next review in N days.

How to Act on Dependencies

Disentangle the dependency

- Extra resources
- Changes in technical design
- Moving scope between projects

Reduce/eliminate uniqueness

- Standardization/ commoditization
- Standby resources

Schedule changes

- Increase slack
- Reverse order of activities

Detect and remove artificial dependencies

- Partial or conditional corporate decisions, gate transitions
- Reassessing risk-based governance decisions

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Important considerations for effective dependency management

Key success factors for good dependency management

See the whole picture

- Open and effective communication with PMs
- Engaged programme management
- Consider having Chief Technical Officer in the programme

Robust process

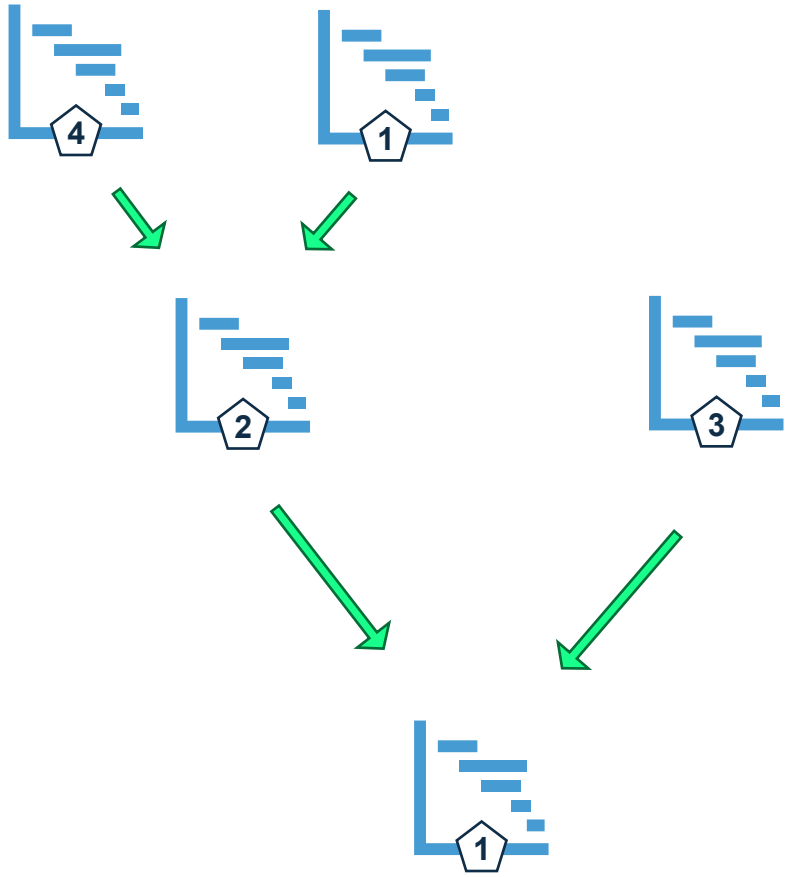
- Training and documentation
- Rituals of review followed strictly
- Have KPIs for dependency management as process

Accountability and motivation

- Dependency agreement has to be committed to
- Impacting project treats risks and issues arising from dependencies as its own

What‘s coming: problems solvable with technology

- Tracking and analysis of large trees of indirect dependencies require support from project management IT solution (implemented at Litgrid).
- Identify cross-project dependencies by scanning project documents (tested with Microsoft Copilot),
- Suggest and plan risk response based on complex dependency patterns.



With a proper IT project management solution, complex indirect dependencies (including mutual dependencies) can be tracked and recalculated faster.


Litgrid
Thanks!
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