Modular Control Center System of the Next Generation

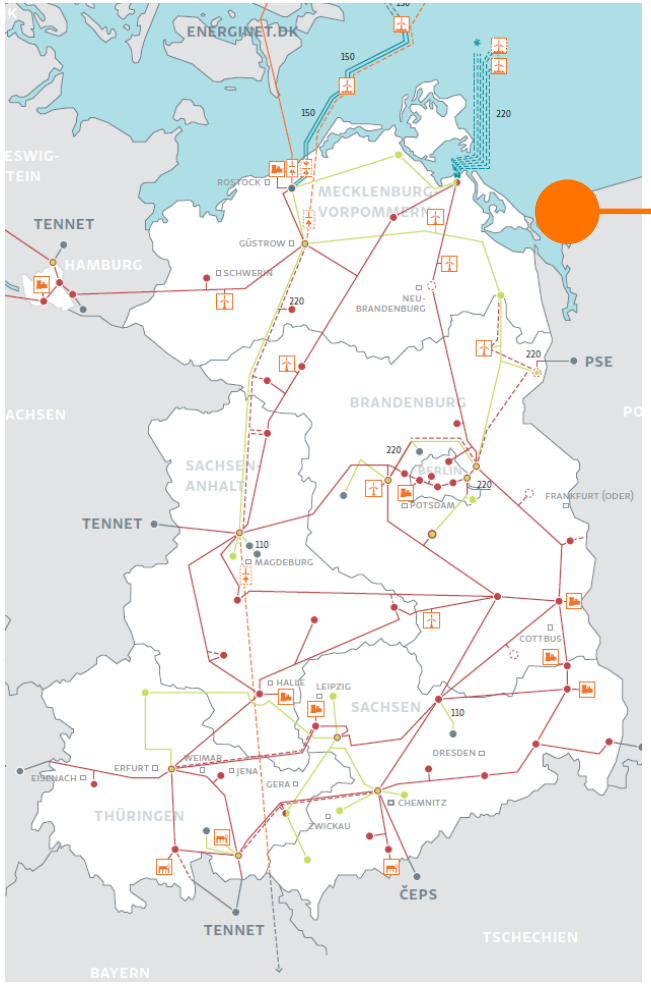
Designing a Future-oriented Control Center System for a Successful Energy Transition

22.02.2022 Mirko Pracht, Ralf Heisig

The transmission system operator 50Hertz – responsible for ...

- … securing electricity supply to 18 million people in northern and eastern Germany
- ... operating the electrical system in Berlin, Brandenburg, Hamburg, Mecklenburg-Vorpommern, Saxony, Saxony-Anhalt and Thuringia
- ... operation, maintenance, expansion and safety of the extra-high voltage grid – onshore and offshore

50Hertz – at a glance

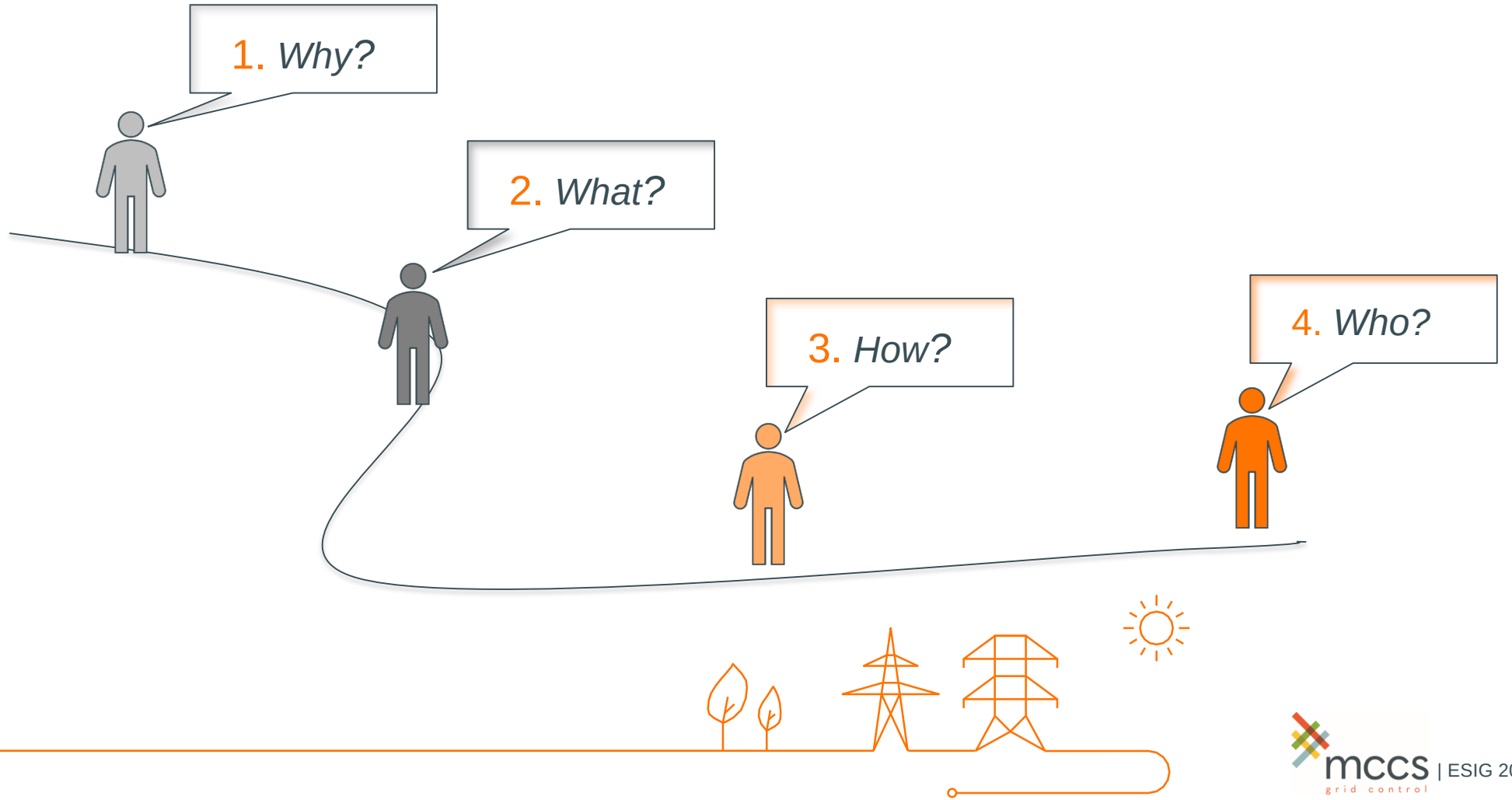


	2019	2010
RES share in power consumption	~ 60 %	~ 25 %
Installed capacity	57.432 MW *(~ 26 %*)*	38.354 MW *(~35 %)*
thereof wind	19.777 MW *(~ 34 %)*	11.318 MW *(~40 %)*
thereof photovoltaics	12.705 MW *(~ 22 %)*	
Power consumption	ca. 99 TWh *(~ 20 %*)*	ca. 98 TWh *(~20 %)*
Turnover	10,2 bn. €	5,6 bn€
Staff	1.138	643

*Data as of 13/02/2020

(share of Germany)

Storyline MCCS NextGen



MCCS NextGen

50Hertz MCCS NextGen Project At One Glance

Today

manual data synchronization

strong personal identification and feeling of responsibility

STRENGTHS

in depth know-how of current solution

costly maintenance

work-grounds

data redundancy

WEAKNESSES

vendor lock-in

no standard integration

Future

INTEGRATION PLATFORM

easy integration of new services

FUNCTIONAL SERVICES

use cases across platforms

Harmo-nized Protocols

Redispatch service

Load Frequency Service

Message Streaming Service

SCADA

Energy Management System

State Estimation

Micro-services

big data

data lake

master data management

HW infrastructure

scalability

reuse n-to-n

single point of truth

DIGITAL TRANSFORMATION

stakeholder identification and analysis

information & communication

success factors and barriers

mind-set/ agile thinking

training and development

Change Process

NEW

iterations

testing

alternatives

Agile Process

culture of failure

Group Innovation

IT-Security

Digital & Data Teams

Application Development Maintenance

System Operations

Group Infrastructure

others...

WELCOME

Stakeholders

Build for the future!

PoC1

PoC2

MVP1

Roll-out

Digital and innovative TSO!

A stable, reliable, performant and resilient house!

parallel projects

vendor independency

50hertz

Elia Group

CHRISTIAN RIDDER
Kick Consulting

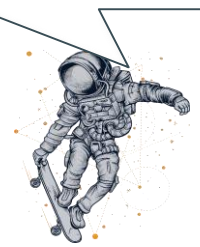
Typical TSO Problems

What stays!

Our systems stay >99,99% reliable & available

Fulfilling of all high security requirements

Fantastic how many challenges of TSOs we are about to solve with Modular Control Center Solution NextGen!



The Old Way	Vs	We Do It Better!
"…speed of change slow… availability of new functions only in large "time intervals…"		With our fast and short implementation cycles, results are available after short time period!
"…High costs, always linked to major changes…"		Smaller deliverables/ packages related to minor costs!
"…Results late and often different to expectation…" (Black box development)		Product is continuously developed & evaluated by System operation ! (e.g. frequency measurement in MVP1)
"…Change Requests are not fulfilled by supplier because they might not match with supplier's product strategy…" (e.g. for Interfaces)		We own the product and drive the changes by our self!
"…Changes only possible for the "entire system" as update or upgrade, no partial replacement ..." (Monolithic Block)		Function by function or service by service can be updated or replaced (Modular approach)
"…High Risk when changing monoliths – it fully works or not -..."		Safe rollouts via multiple but smaller and manageable changes, small impact and lower risk!
"… High effort & costs when multiple monolithic systems to be integrated and engineered at one single point in time… "		Integration and engineering effort in elation to incremental deliveries – small and continuous steps!
"…all requirements described at the beginning – hoping to know what is really needed in x years…"		Fundamental requirements are clear and base for development or purchasing – further improvements based on early customer feedback!
"…multiple data maintenance and (manual) synchronisations very problematic…"		Single source of truth – many data consumers (modules) get equal data!
Multiple Applications – all with individual user interface, different behaviour… "		One centralised and integrated user interface –optimised for business processes and following a comprehensive style guide – less training effort for system operators
"…Vendor lock-in…"		Independent modules & functions can be integrated or replaced one by one – multiple vendors participation possible

Why do we do it?

Why can we not continue with the current control center system?

The current control center system does not allow us to realize our strategy „60 to 100“ by 2032, because it is not even able to implement all current business requirements, not to mention future business requirements.

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What does the product vision look like?

“We don‘t build a system for yesterday and NOT ONLY for today, but ALSO for the FUTURE!”

ITrategy

50hertz Strategy “60 to 100 by 2032”

MCCS Business Vision

- MCCS does serve 50hertz as new control center system (primary focus) and does enable further use cases
- MCCS is able to integrate external delivered capabilities into 50hertz processes
- MCCS is a capability statement of 50hertz
- MCCS is a reference project of a technology driven cultural change for modern TSOs

MCCS Technological Vision

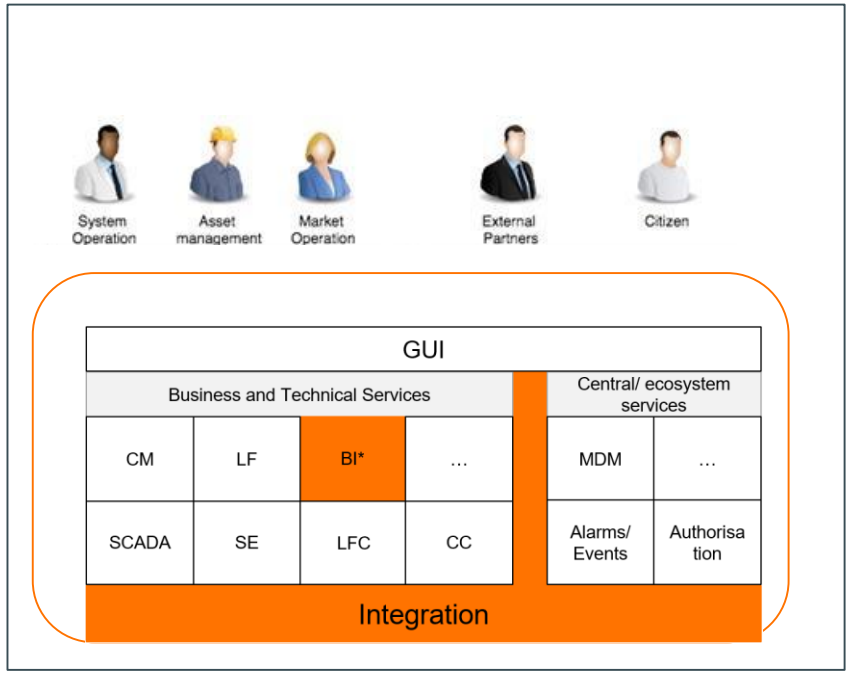
- MCCS is based on a disruptive target picture – this is the only way to reach the REQUIRED solution, the MCCS ecosystem
- MCCS can be adjusted easily to respond to any possible – current and future – requirements and is able to implement them flexibly and rapidly (“60 to 100 by 2032”)
- MCCS does fulfill OT requirements using IT technology

Elia Group Strategy

BUrategy

What is the product?
Focus on 50Hertz‘ MCCS Eco-System, but we are open for other use cases

Modular Control Center System (50Hertz‘ MCCS Eco-System)



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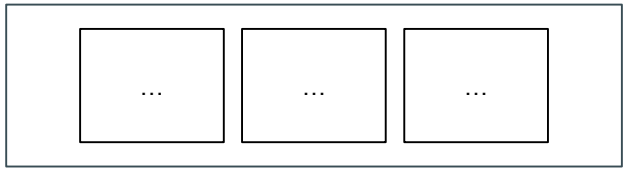
Other applications



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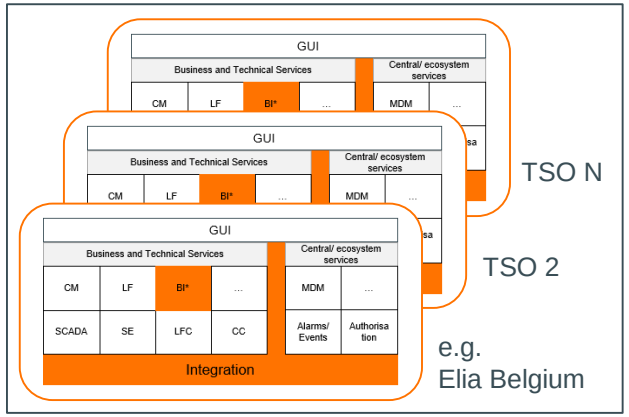
Other ambitions



Legend:

- Control Center (Eco-System) : 100% Know How for Orchestration & Operation 50Hertz
- Integration Platform & 50Hertz modules: 100% property & Know How 50Hertz
- Services developed by 50Hertz or bought from multiple 3rd-party suppliers (make or buy-decision)

(*BI- possibly future 50hertz Business Intelligence service / SE - State Estimator, LF – Load Flow, LFC – Load-frequency Control/ Netzregler, CM – Congestion Management, CC – Capacity Calculation, MDM – Master Data Management)

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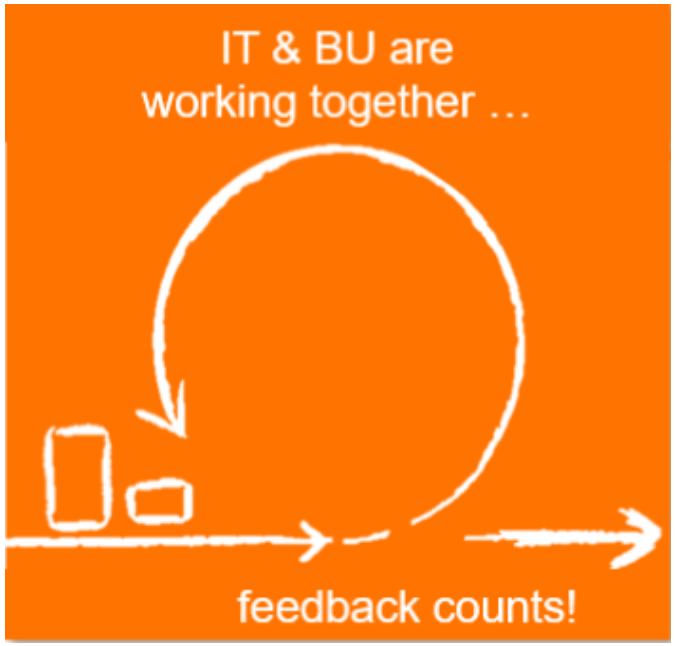
Approach & Setup

Iterative & customer-centric to check disruptive target scenario

Key aspects

- **Disruptive** target scenario
- **Iterative** process with fast deliveries
- **Feedback-driven** with regular customer feedback (sounding boards, product result & technology demonstrations, etc.)
- **Continuous improvement**
- **Adaptive** to complex and changing environment
- **Interdisciplinary** across all teams



Lessons learned past projects

- **Too many** requirements for one vendor
- **Mismatch** in requirement understanding
- **Flexible framework** (modules) necessary to be able to implement new requirements
- **Vendor dependency** blocks idea of ecosystem & increases costs

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Approach & Setup

Increments lead the way (Checkpoint21, Checkpoint22-Q1, …)

Preparation and Feasibility Phase

Strategy

Project scope, alignment and deliverable definition

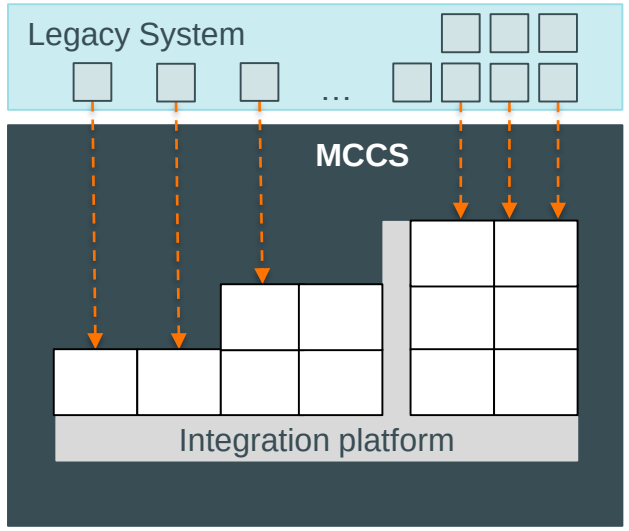
Architecture

- Domain Architecture
- MCCS ecosystem feasibility
- Business capability

Project Operating Model

- Agile org. set-up
- Crew
- Workstreams & Dev. Team

Dev. and Implementation Phase



1 Sprint cycle of 3 weeks

2 Continuous deployment

3 Updates & releases

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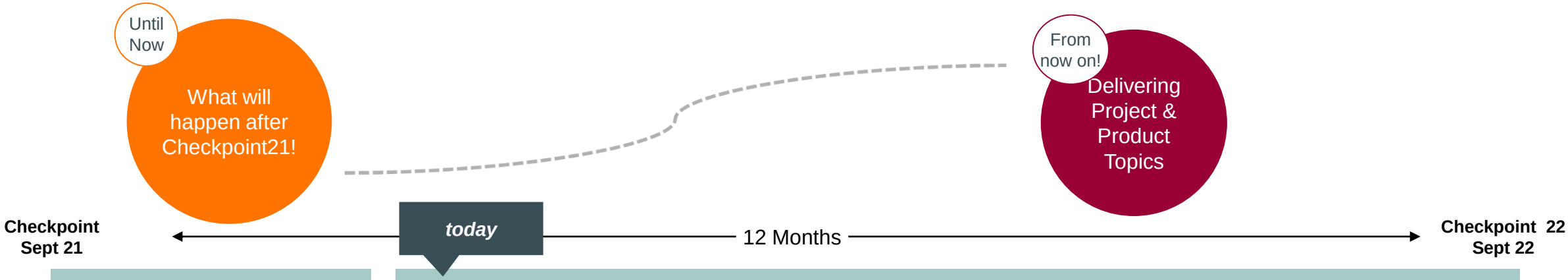
Service by Service is transferred to the target system to finally replace the entire legacy landscape.
No "Big Bang" – all in transparent increments with early customer feedback.

In order to deliver value for CP22, we follow a two-phase approach

After having set a plan, we are on our journey towards CP22



Roadmap Planning
(ca. 6 weeks)

Roadmap CP 22 Execution
(46 weeks)

Scope

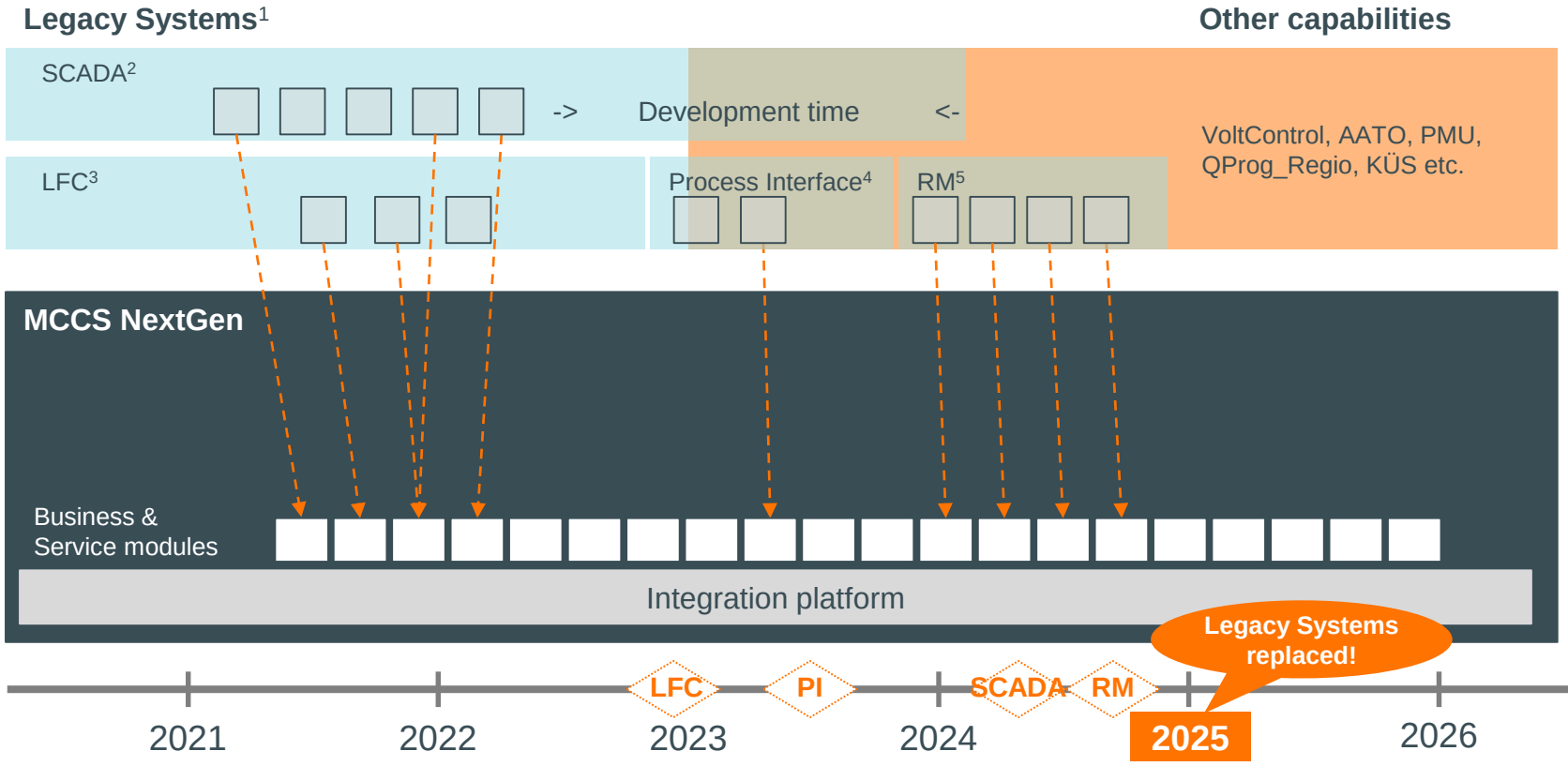
- Initial planning phase after CP 21 for CP 22
- Identification and definition of objectives
- First operational actions and deliverables

Enabler	Project Topics	Product Topics
Precondition for product development	*Contribution & preparation for further product development*	*Real product development*
Deliverables ▪ Processes ▪ Infrastructure ▪ Organisational set up	**Deliverables** ▪ Feasibility check ▪ Market Sounding ▪ Roadmap	**Deliverables** ▪ Product (Backbone&Modules) ▪ Epics/Stories Writing ▪ Backlog / Sprintlog Selection ▪ Infrastructure requirements ▪ Make / Buy (tender process)

PLM=Product Lifecycle Manager

Migration Roadmap & Development Plan

Incremental development in product-mode and flexible releases in alignment with CC



Development steps

1. Cut into business functions (capabilities)
2. Make or Buy & execution of decision results in integrated modules
3. Migration flow
4. Substitution (old application)

Legend:

1. Legacy Systems are secured until ~2026 via Retrofit measures!

2. SCADA
   - SCADA RT Monitoring
   - SCADA Alarm
   - Data Acquisition & MDM
   - SCADA Control

3. LFC
   - Data Acquisition
   - LFC Alarms
   - LFC Control

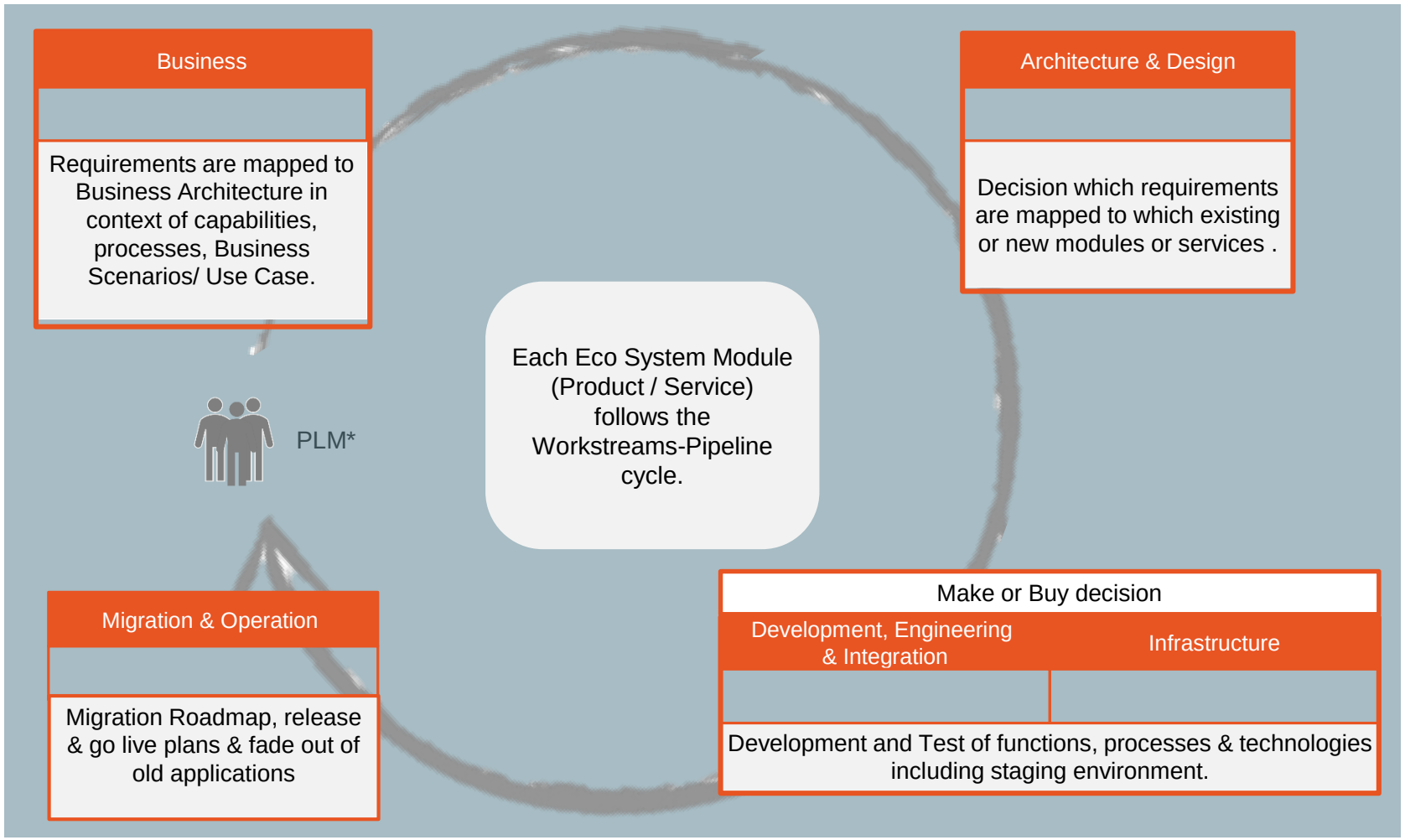
4. Process Interface
   - Gateway(s)

5. RechenModul
   - Model
   - Power Flow
   - Export
   - Optimisation

Introduction of the crew setup

MCCS NextGen I 50Hertz Project with Workstream Structure

50Hertz Solution development



Project Management

- Scope
- Organisation
- Communication
- Cooperation
- Risk & Quality

Productisation

- Scope
- Product Catalogue
- Legal & Compliance
- Communication
- Cooperation
- Marketing

*PLM= Product Lifecycle Management

Workstream

MCCS Goals

Goals of MCCS

Primary goal: to create a new **ecosystem** for modular Control Center services and replacing ALL 50hertz OT legacy systems, NOT ONLY *"LFC, Process Interface, SCADA."*

Secondary goal: to contribute to several strategic goals of Elia Group by…

- … working with product / productization
- … improving project modes
- … implementing organizational change

In addition, it promotes:

- Interest of society by leading an innovative world-wide community & collaboration
- Increasing flexibility and decreasing TCO*

„*Checkpoint21*" – Evaluation milestone

with clearly defined goals reached in September 2021

Outcomes demonstrate that MCCS has already contributed to several strategic Elia Group goals

1	**Product (MVP)** Functionality Integration Platform Infrastructure	✓ Development (BY OURSELVES): **Platform & multiple modules (UI, Alarm, LFC & MDM)** ✓ First 3rd party integration of market module ✓ Architectural setup allows for easy adaptation by others
2	**Project** Crew Set-up Methods	✓ Project setup as a development factory ✓ Process for know-how acquisition via externals
3	**Organisation** Performance Resources Know-How Processes	✓ Network and collaboration across the whole organisation

*Total Cost of Ownership

Next steps

Improvement of product, project & organisation to the next level required, otherwise we slowdown the journey to strategic Elia Group goals

1 Product

… to continue to build MCCS as a **product**

… to **establish** & develop cooperation with other market players in general

… to **arrange** cooperation agreements with first partners & TSOs

2 Project

… to switch from classical project to **product-mode**

3 Organisation

… to **transform** MCCS into **product organisation** that enables **fulltime resources**

Join our Vision

Get in touch with us and TSOs, DSOs, Vendors or other interested groups

Mirko Pracht,
Director, Digitalization in System Operations, Program Lead & Initiator for MCCS
Ralf Heisig
Product Manager MCCS NextGen, 50Hertz

Contact our PMO via Email