

A Roadmap for the Future: Enterprise Network Model Management at TenneT

CIGRE Grid of the Future

8 November, 2022
Chicago, Illinois

Pat Brown, CIMple Data



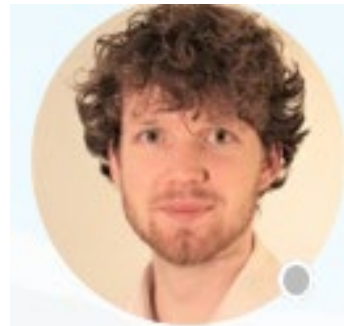
TenneT NMM Roadmap team



Richard de Groot
AMT



Pim Jacobs
SOP



Sjoerd Kop
SOP



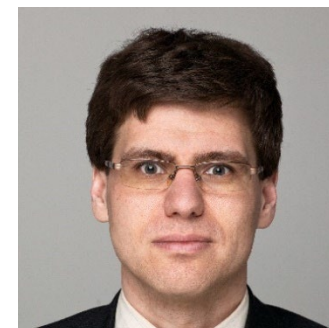
Pat Brown



Jay Britton



Scott Coe



Chavdar Ivanov



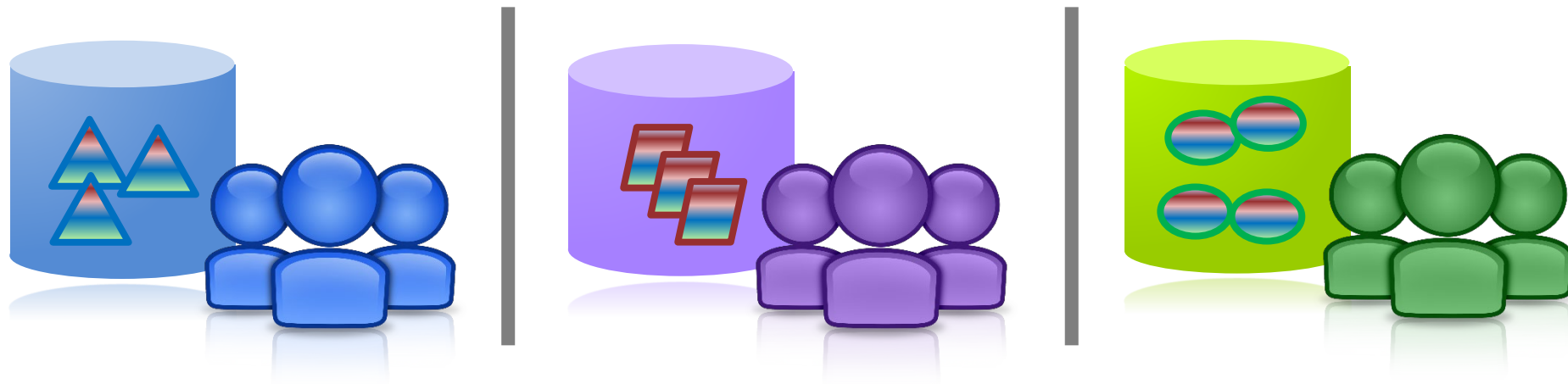
Project Context

Why TenneT's Interest in NMM?

- TenneT (like many other transmission utilities) is seeing
 - Need for more studies in Planning, Operations, Ops Planning, Protection
 - Increased data exchanges with outside entities
 - Interconnect coordinator (ENTSO-E)
 - Regional Security Coordinators (RSCs)
 - Neighboring Transmission System Operators (TSOs)
 - Distribution System Operators (DSOs))
- TenneT (like many other transmission utilities) has silo'd data management that thwarts its ability to easily meet those needs

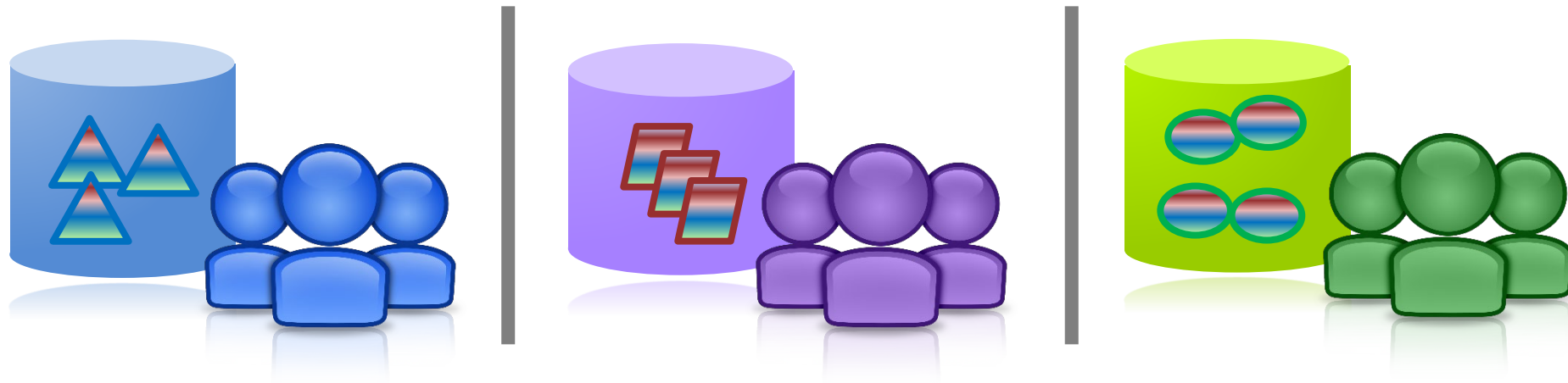
Why TenneT's Interest in NMM?

- The typical Transmission utility manages its network model data in silos
- And each silo has
 - Its own tool (or tools!), each with its own format
 - Its own community of users and maintainers
 - Its independent modelling approach
- Silos are reinforced by technical, organizational, and process-related factors



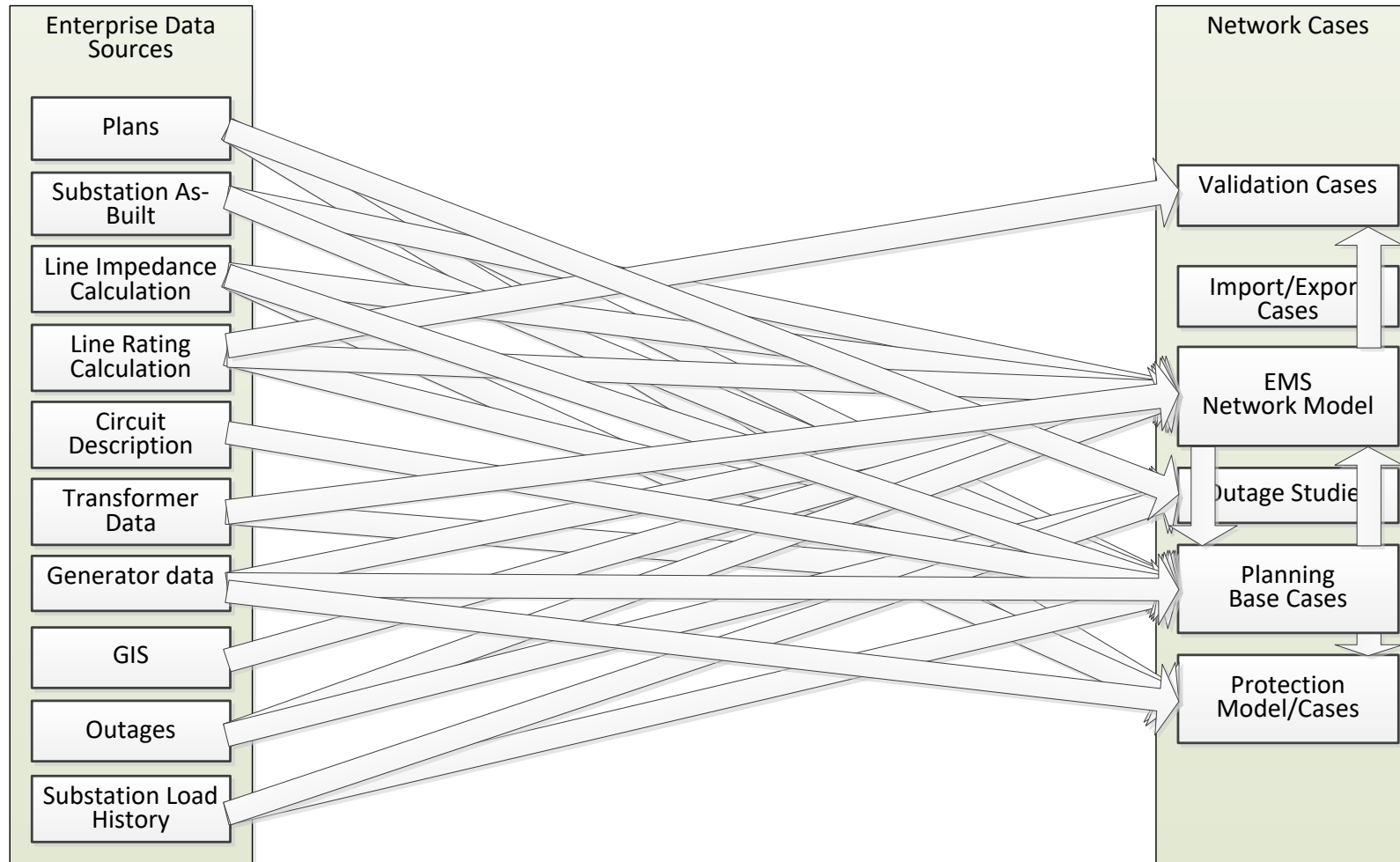
Why TenneT's Interest in NMM?

- These silos lead to
 - **Wasted effort** as population activity is duplicated, data is compared and rationalized and mismatching solutions investigated
 - **Trapped data** (of lots of varieties – future project definitions, load forecasts, outages, contingency definitions, solutions)
 - **Multiple versions of truth**
 - **Reduced ability to respond to future challenges**



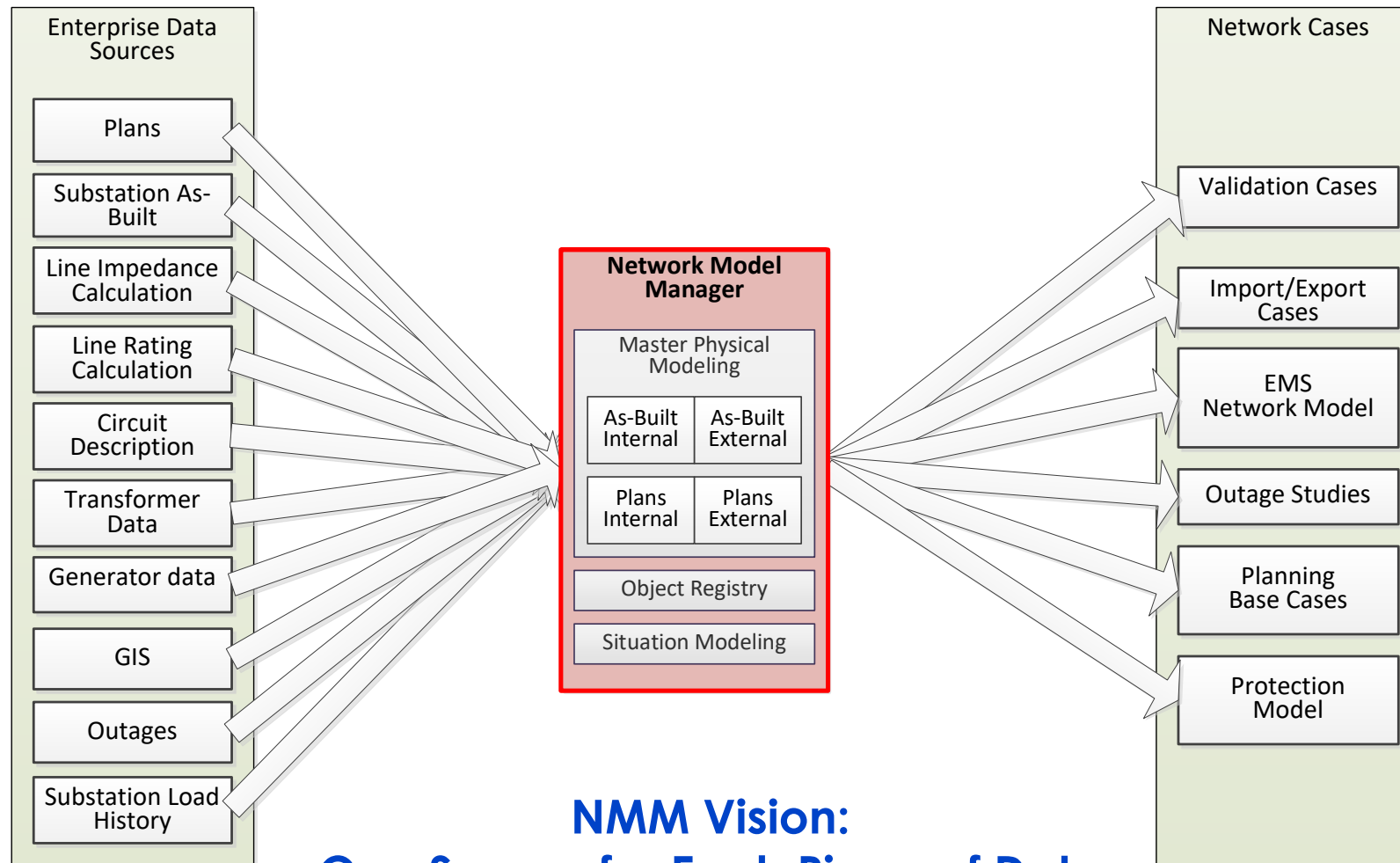
Why TennenT Worked with EPRI

- Based on an NMM approach that transforms the typical current picture



Why TennenT Worked with EPRI

- Into a 'single source of truth' cohesively managed solution

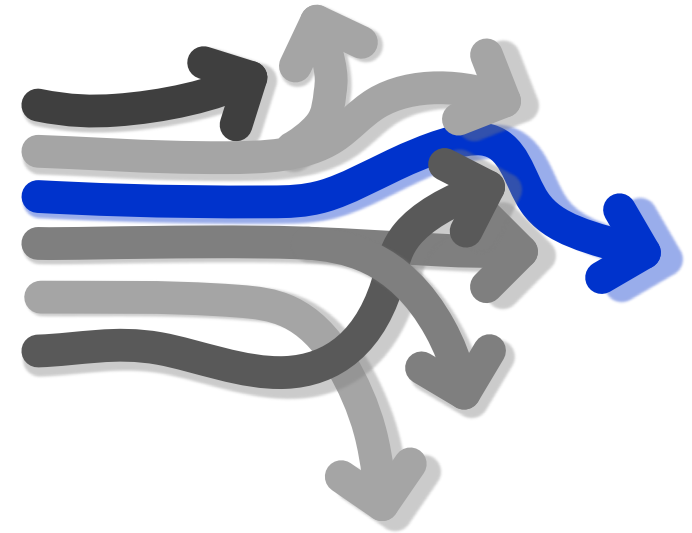


NMM Vision:
One Source for Each Piece of Data

So what has TenneT done?

- The NMM Roadmap Project

1. Understanding Existing TenneT Practices
2. Leveraging an Industry Approach
3. **NMM Roadmap: “Suggested Phases for Implementing Enterprise-Wide Network Model Data Management”**





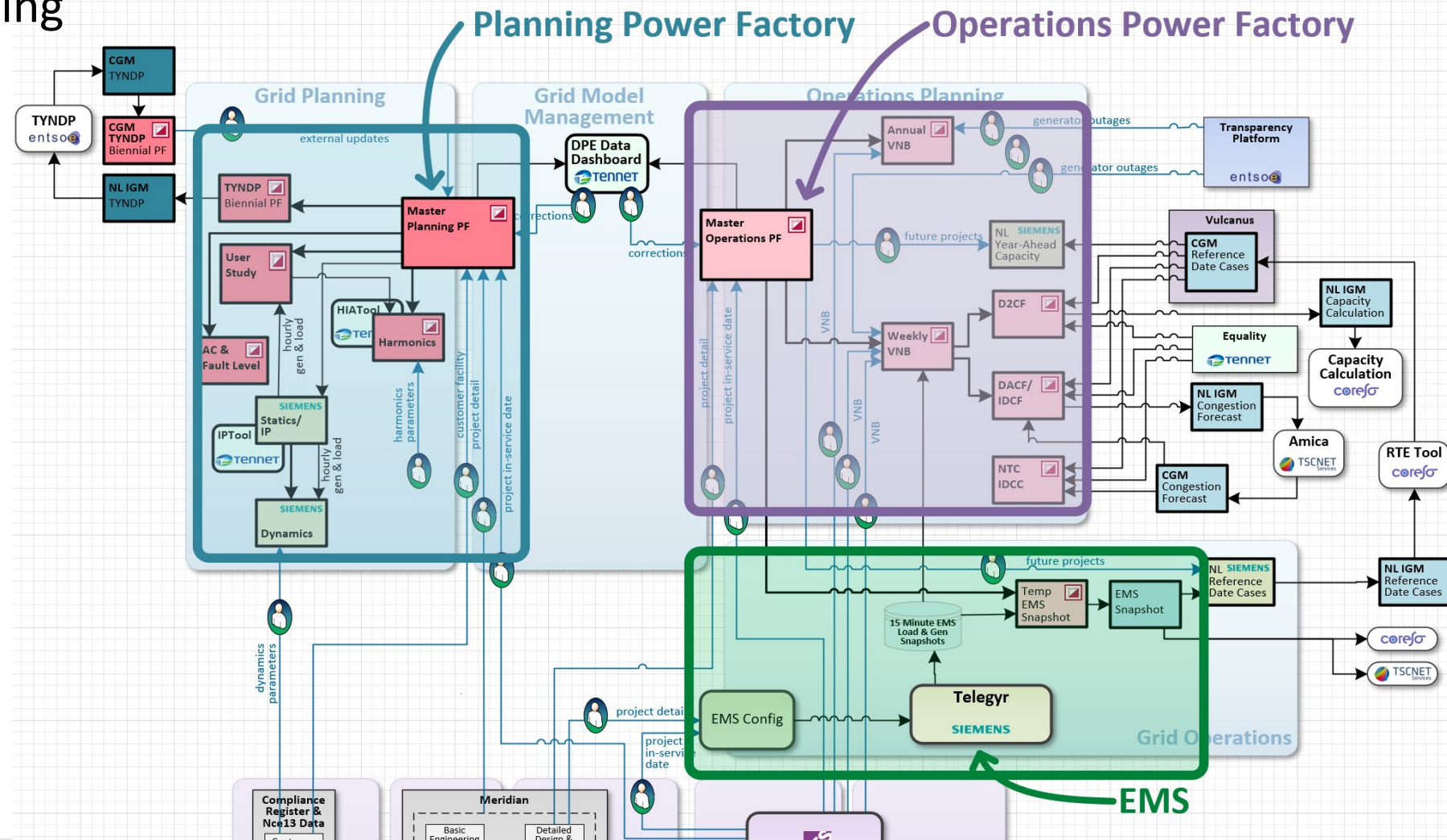
1. Understanding Existing TenneT Practices

Why Understand the 'As-Is'?

- Documents reality across the enterprise
- Builds cross-departmental shared understanding

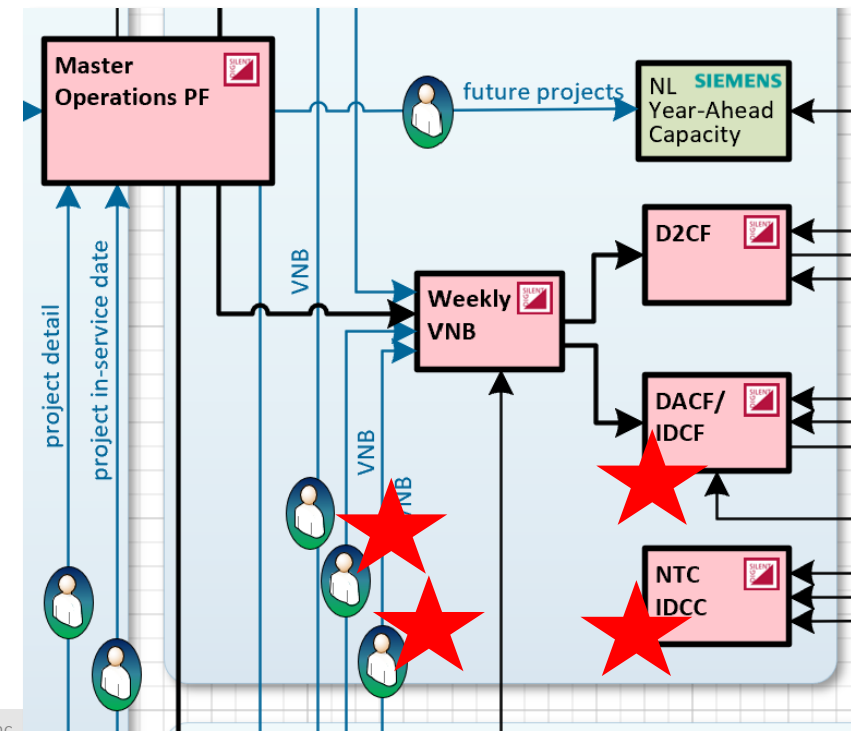
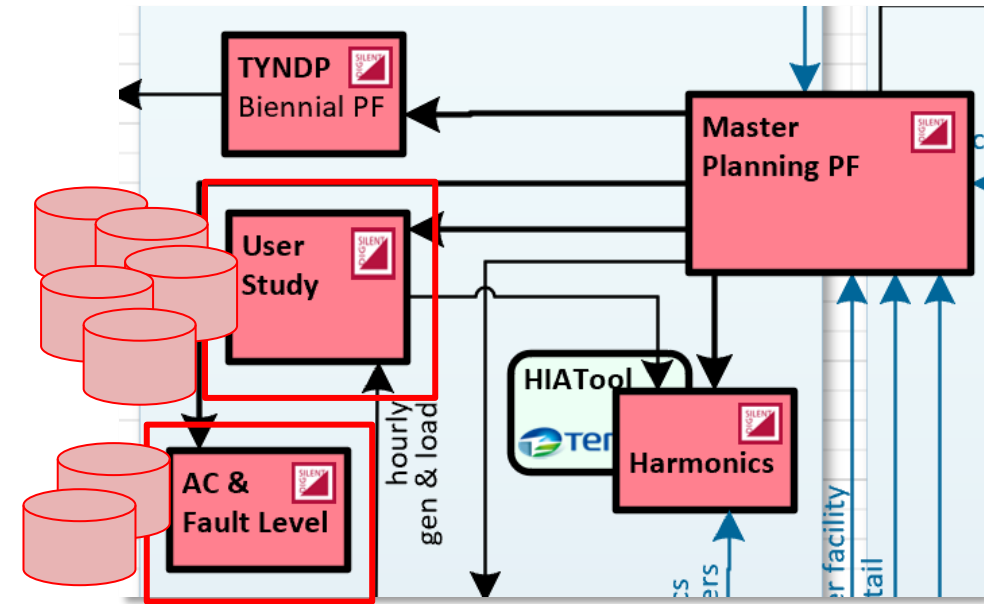
As-Is Key Finding #1

- Three independent modeling silos:
 - Planning
 - Operations Planning
 - EMS



As-Is Key Finding #2

- Copying of PowerFactory models:
 - Powerful
 - Constraining
- Stranded 'downstream' **copies** in Planning
- Duplicative★ data entry in Operations





As-Is Key Finding #3

- Multiple model transformations
 - PowerFactory model -> PSS/E .raw
 - PowerFactory model + EMS data -> UCTE case
 - UCTE case -> PSS/E
 - PowerFactory -> CGMES
 - PowerFactory -> UCTE
 - UCTE case -> PowerFactory model (DigSILENT 'project')
 - CGMES case -> PowerFactory model

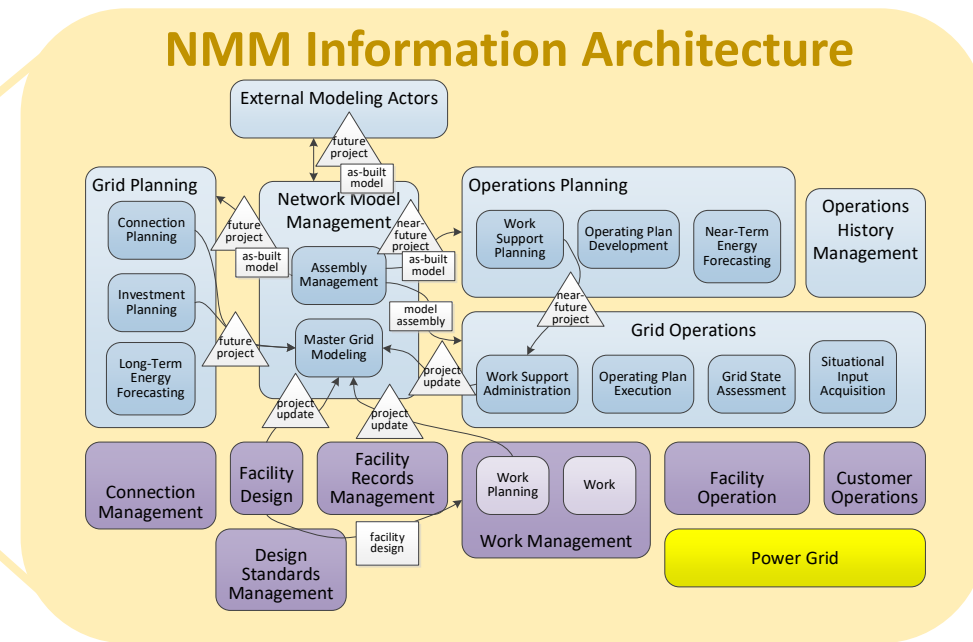
- Transformations are 'expensive' to create and maintain



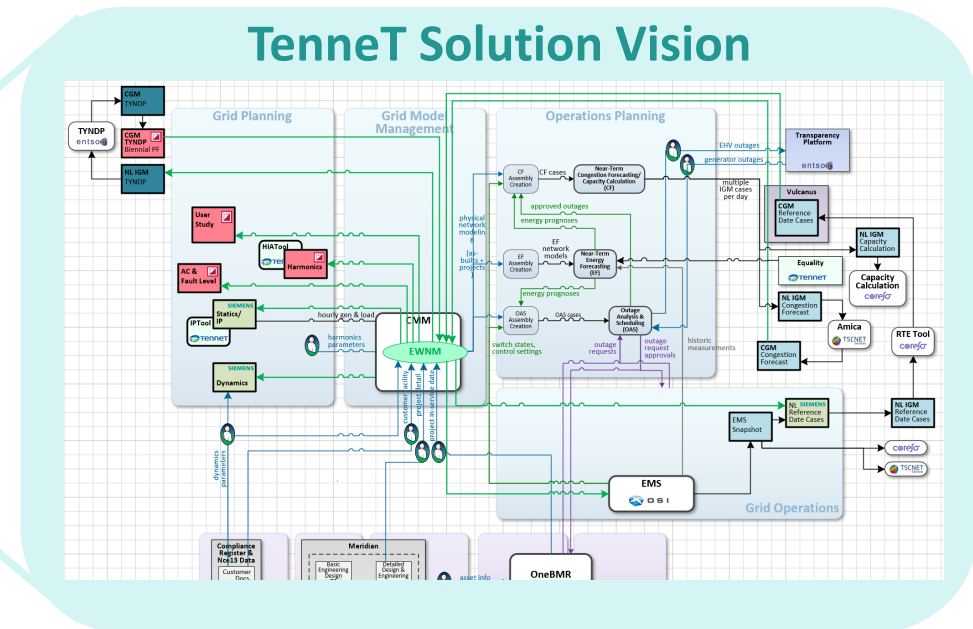
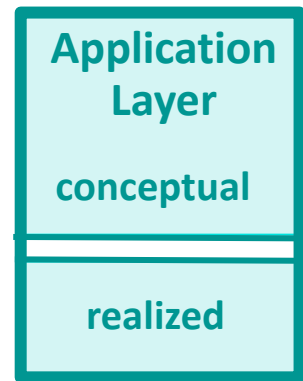
2. Leveraging an Industry Approach

NMM Information Architecture

- TenneT used the EPRI NMM information architecture (industry insight at the **business layer**)

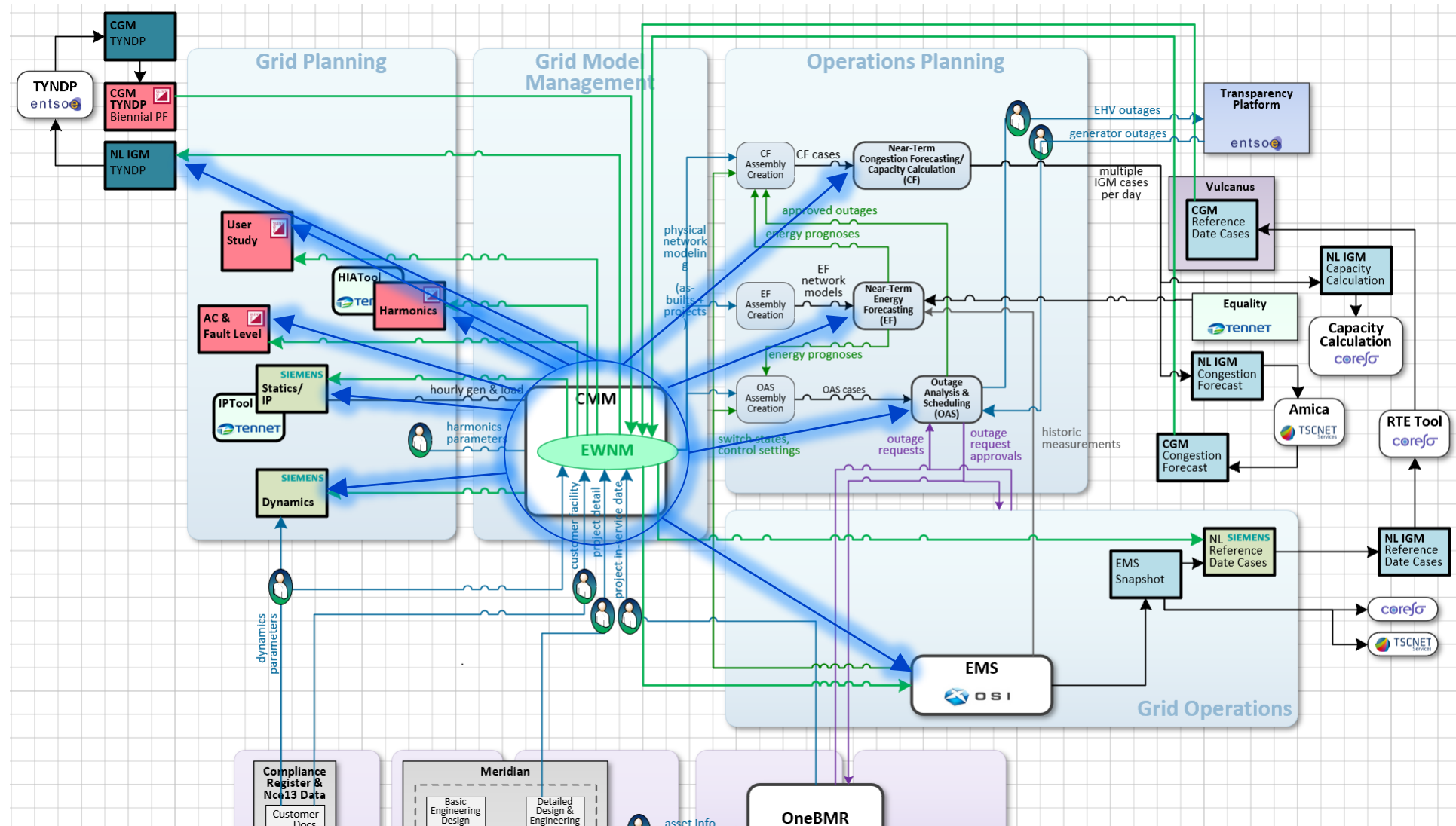


as a foundation for
designing its
application layer
vision



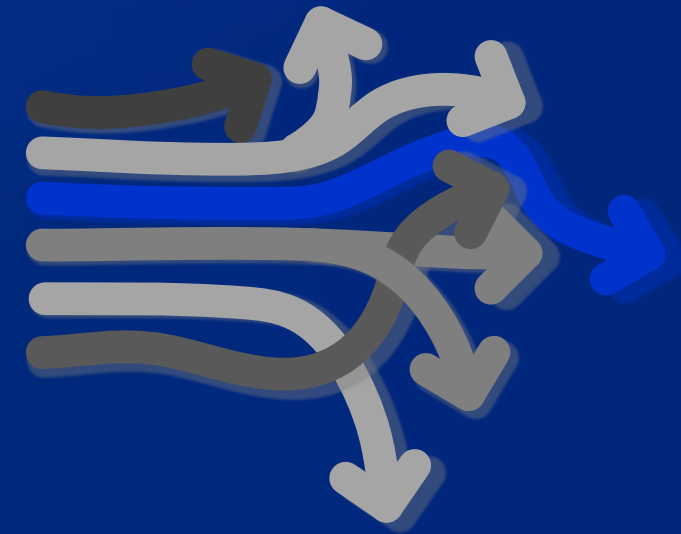
TenneT Solution Vision

- A single Enterprise-Wide Network Model (**EWNM**) managed in a Configuration & Model Management (**CMM**) tool
- Serving network analysis tools in Grid Planning, Operations Planning, Grid Operations



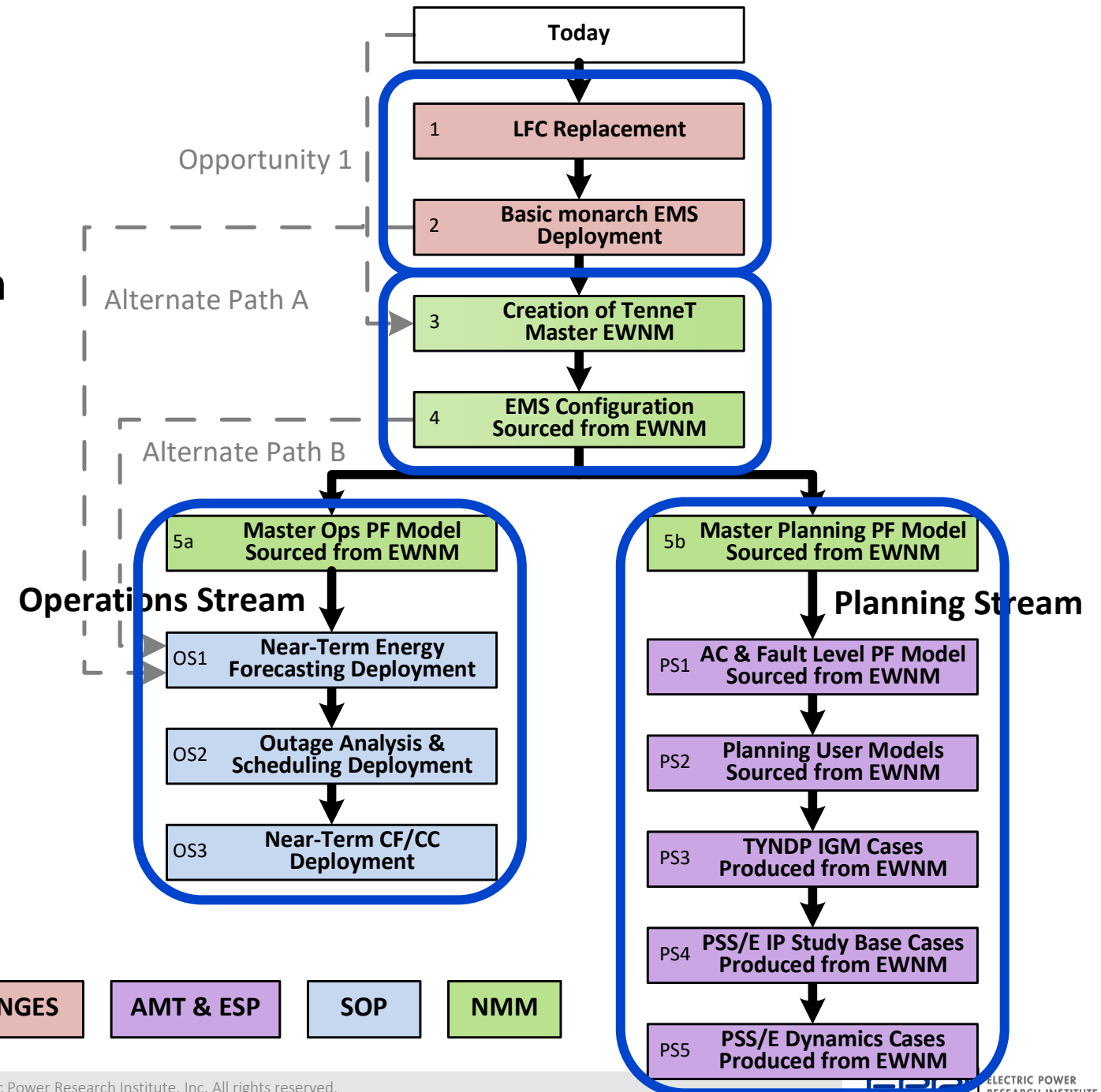
3. TenneT NMM Roadmap

NMM Roadmap: “Suggested Phases for Implementing Enterprise-Wide Network Model Data Management”



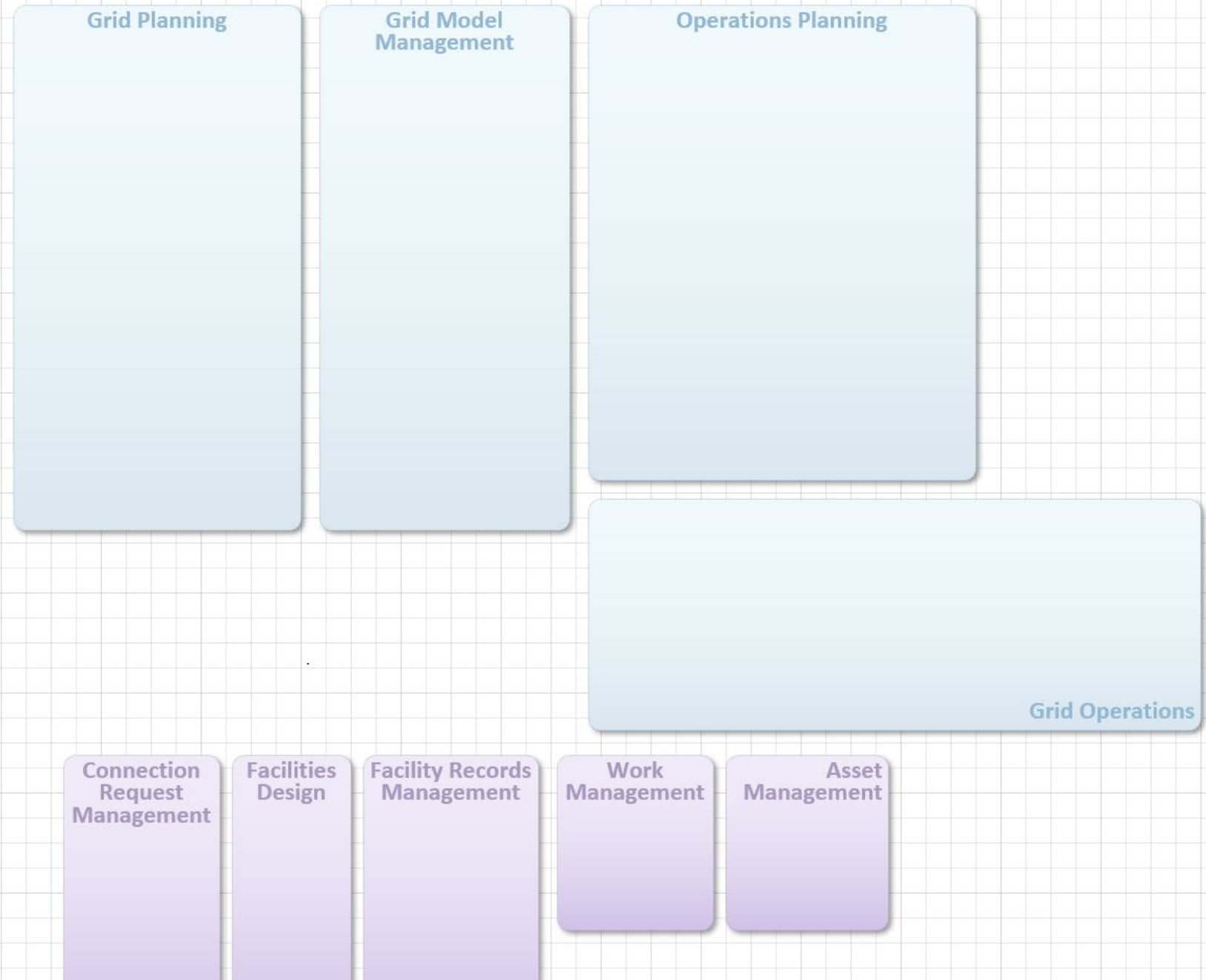
NMM Roadmap

- A series of phases
 - Focuses first on EMS deployment
 - Then on enterprise model creation
 - Then on local Operations and Planning improvements



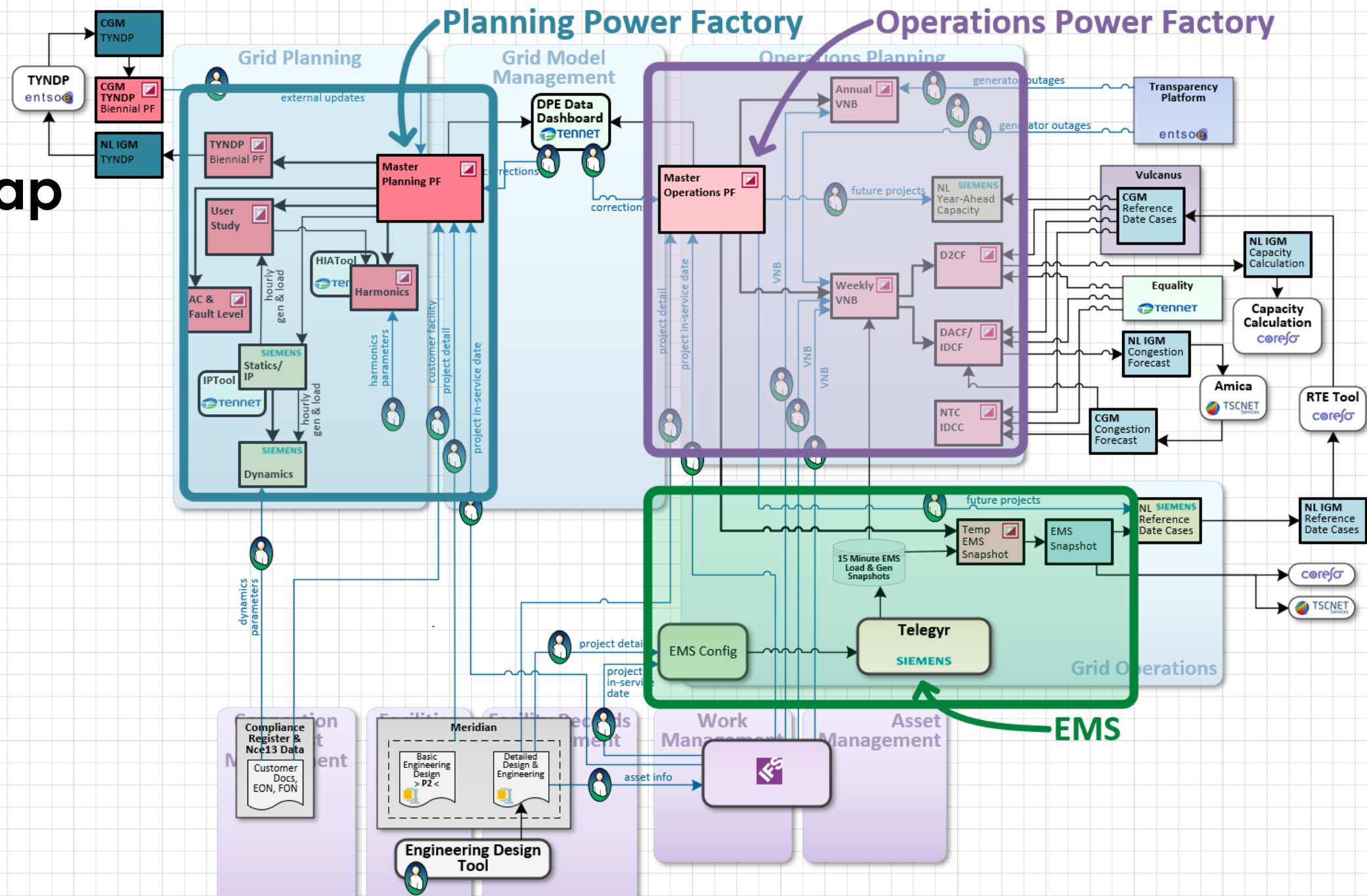
NMM Roadmap

Business
Function
framework



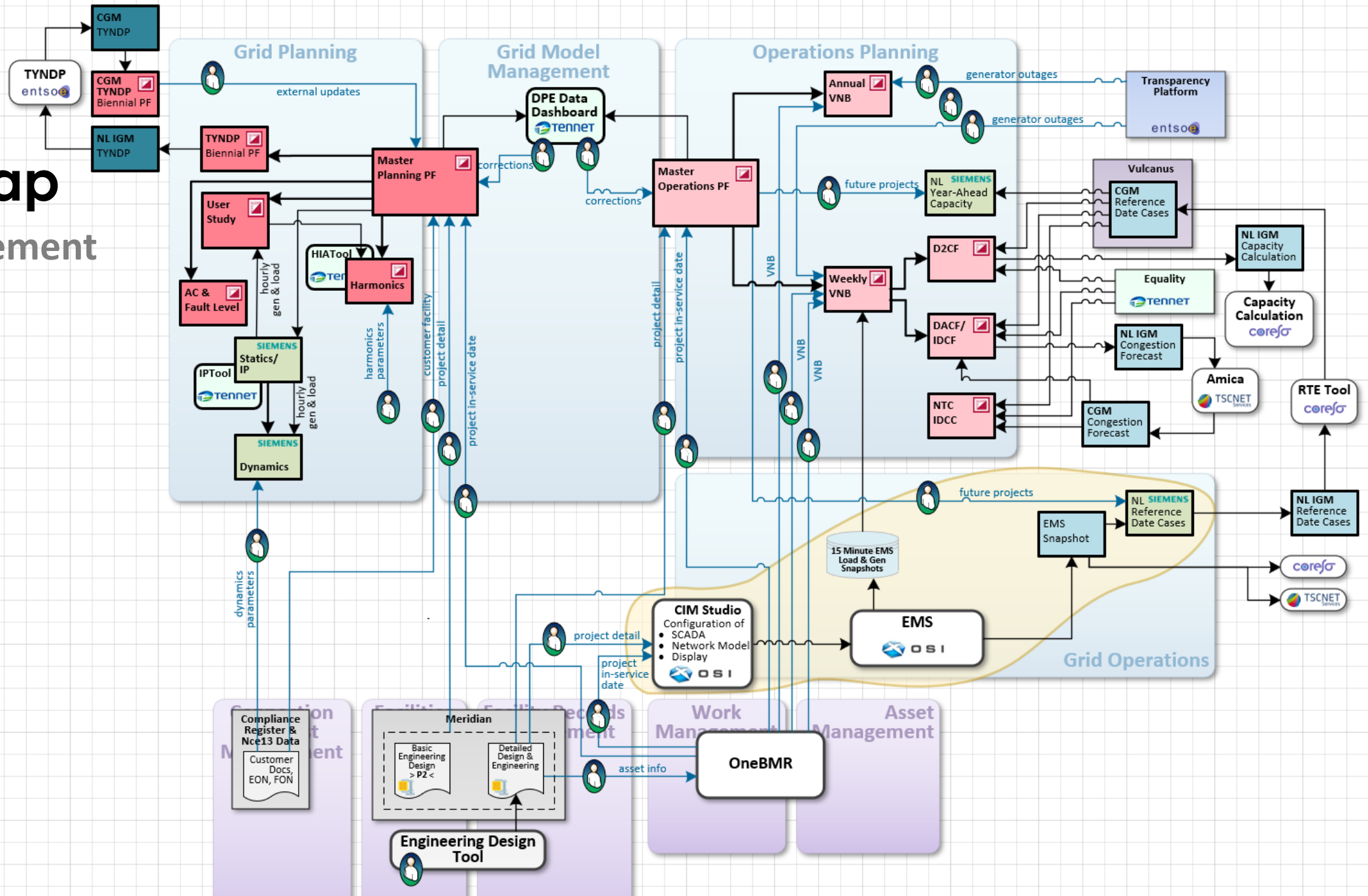
NMM Roadmap

Existing



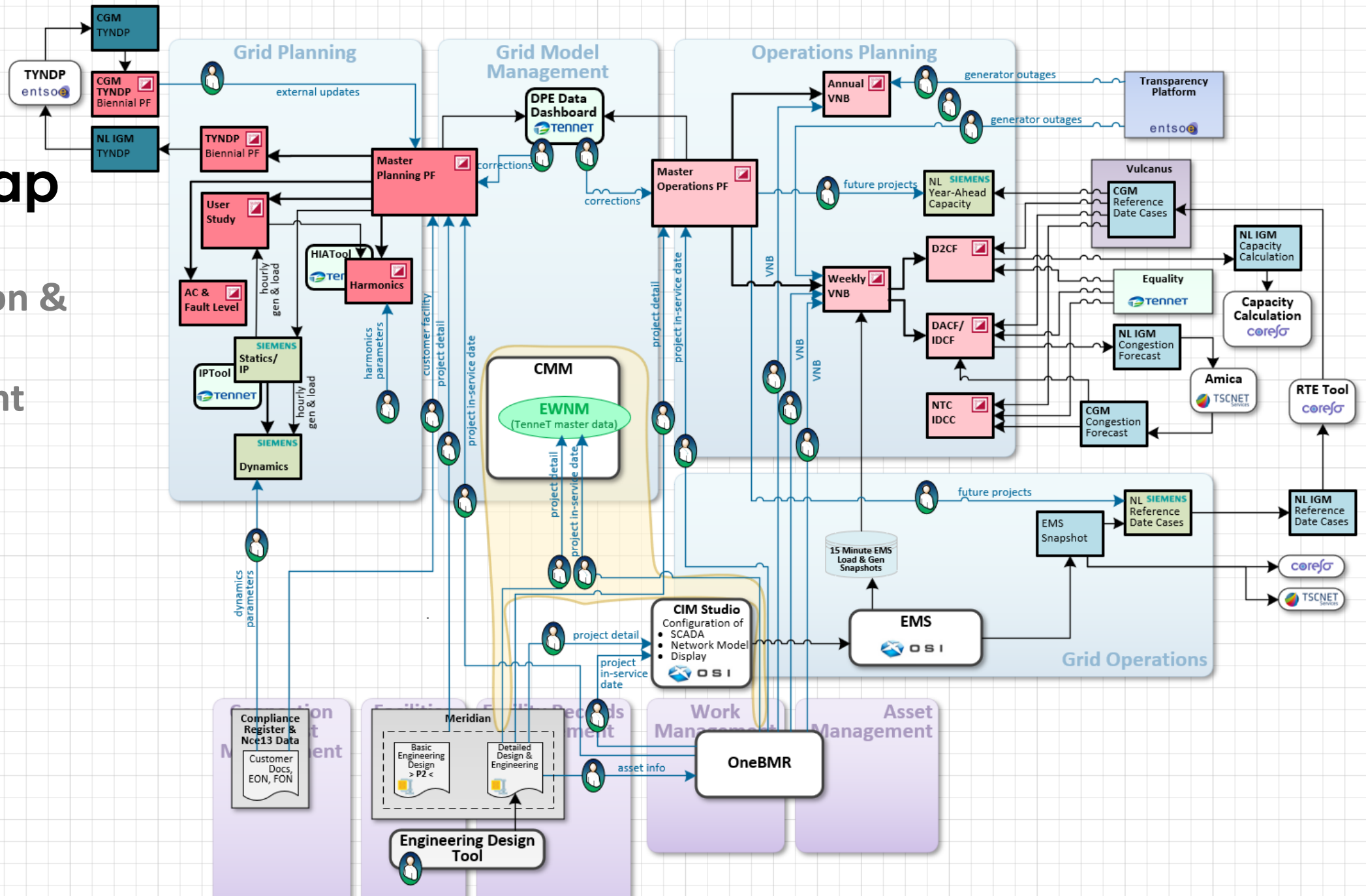
NMM Roadmap

EMS replacement



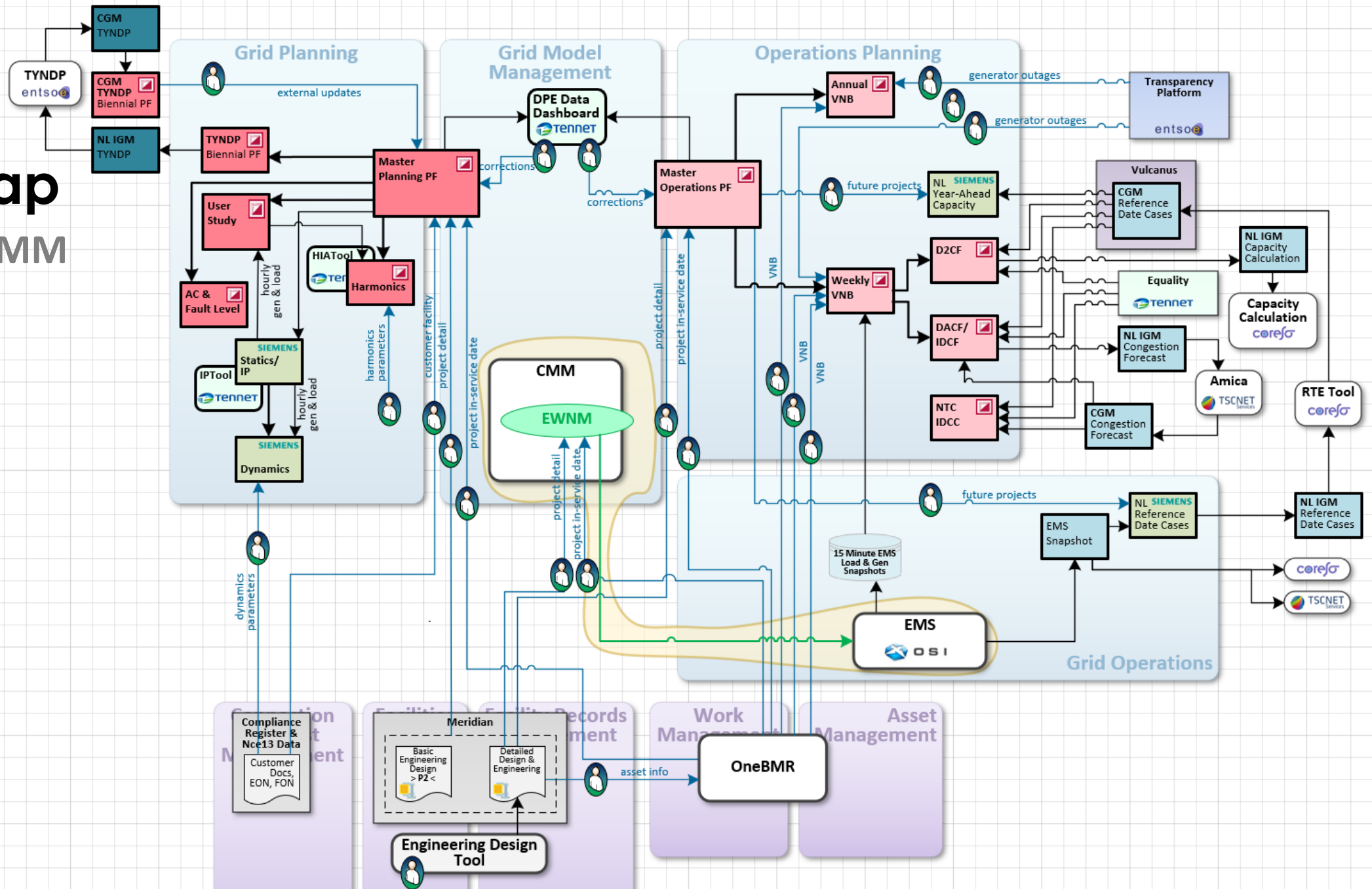
NMM Roadmap

Initial Configuration & Model Management (CMM)



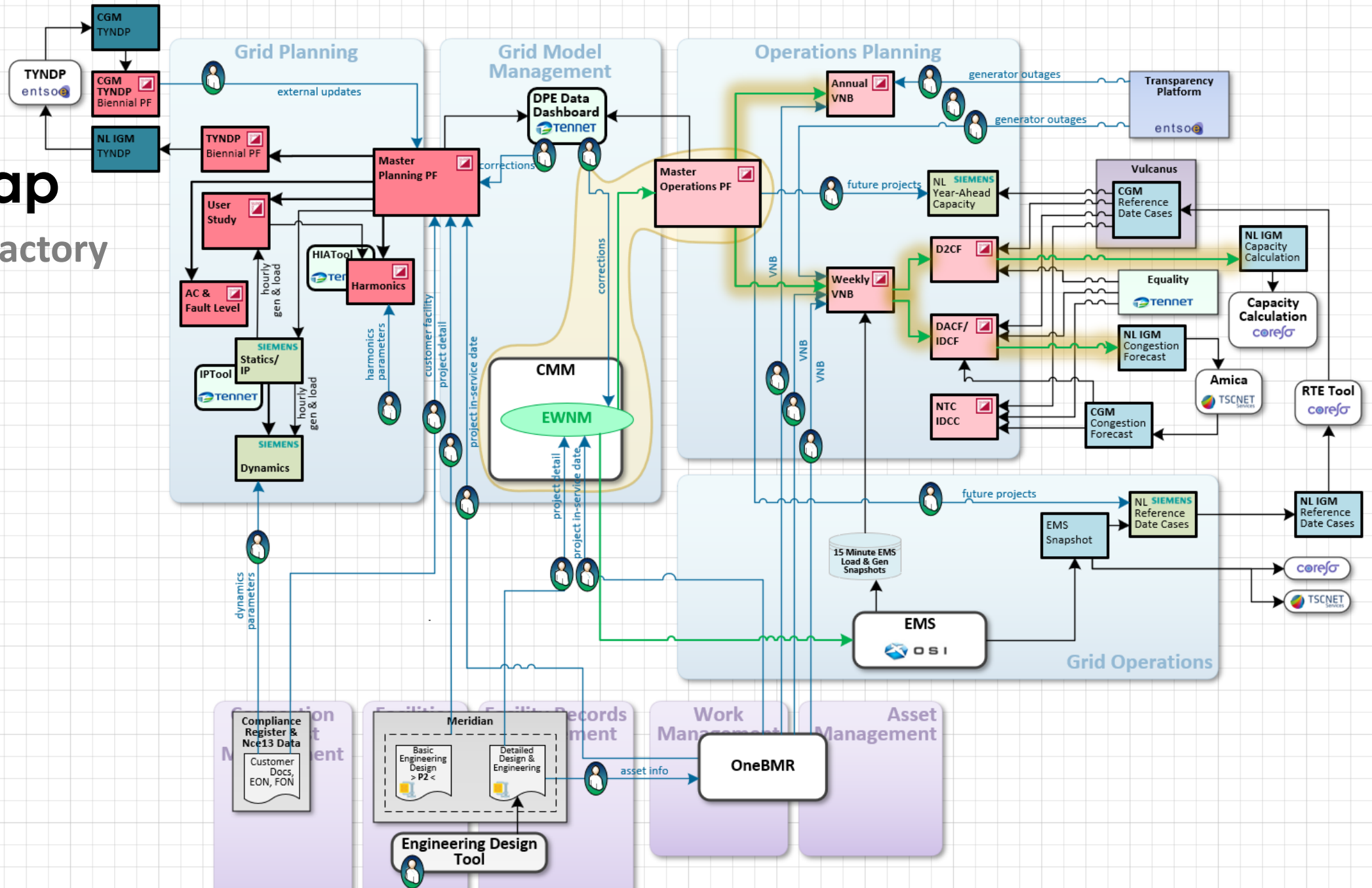
NMM Roadmap

EMS from CMM



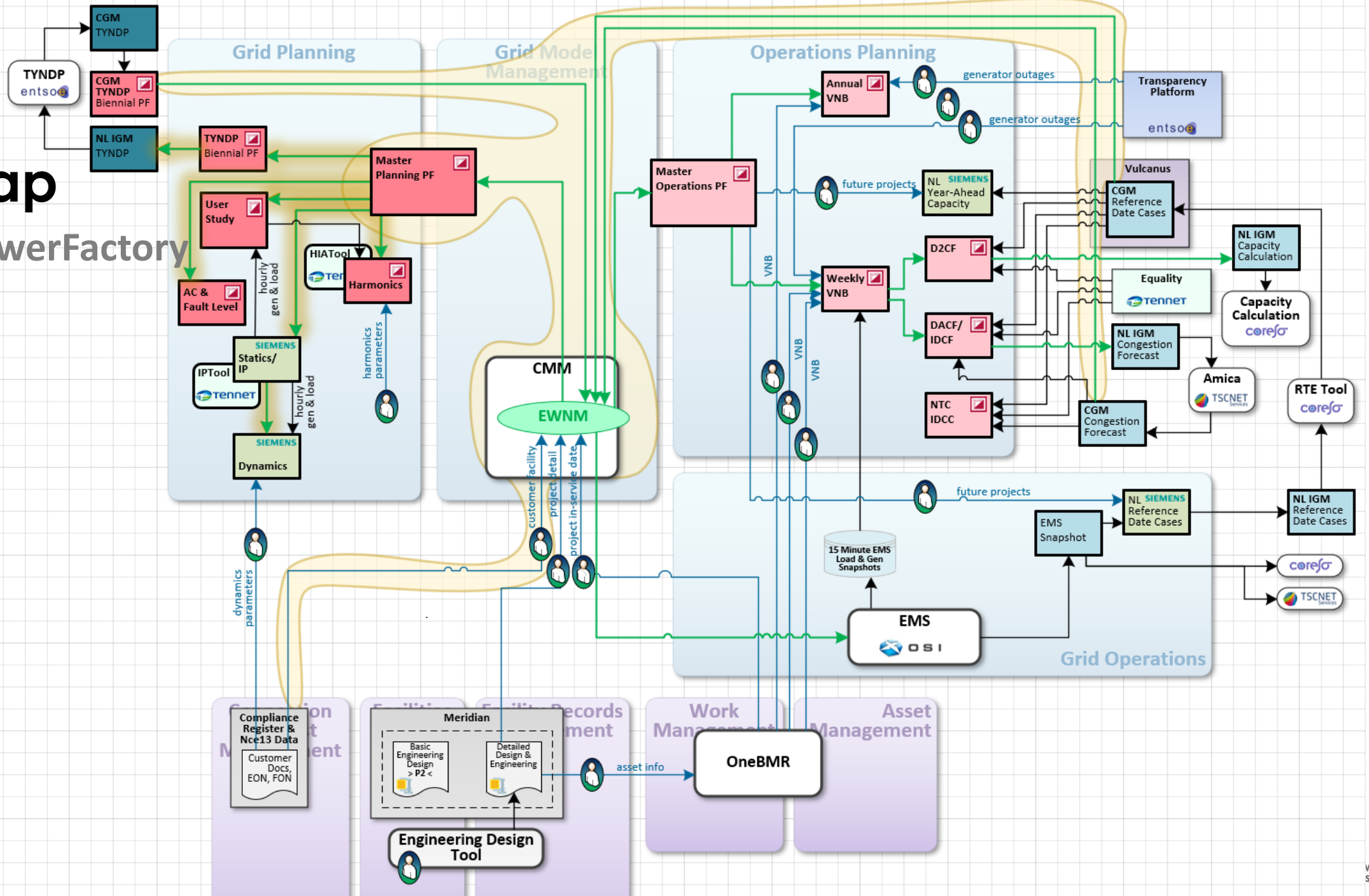
NMM Roadmap

Ops PowerFactory
from CMM



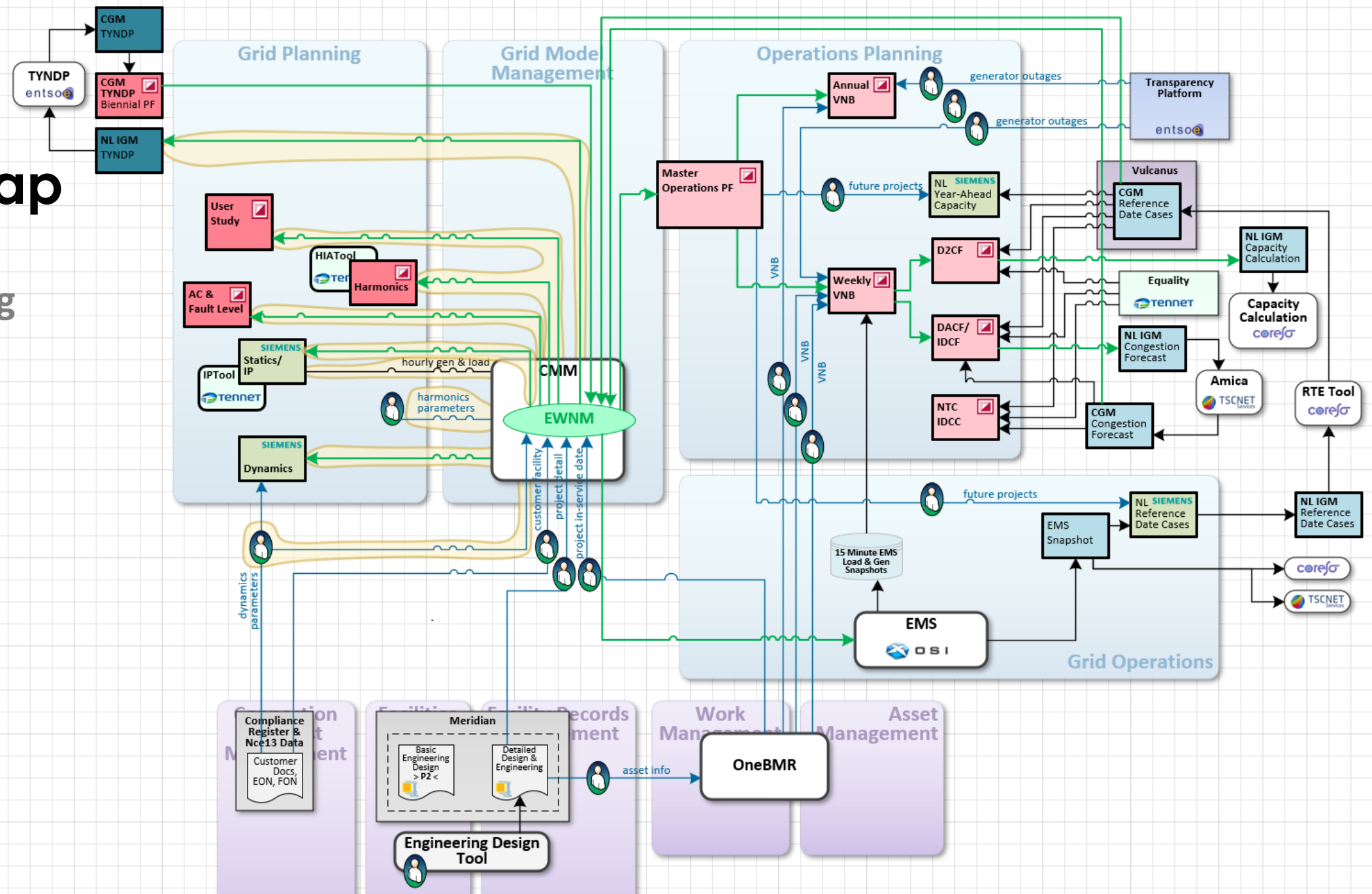
NMM Roadmap

Planning PowerFactory from CMM



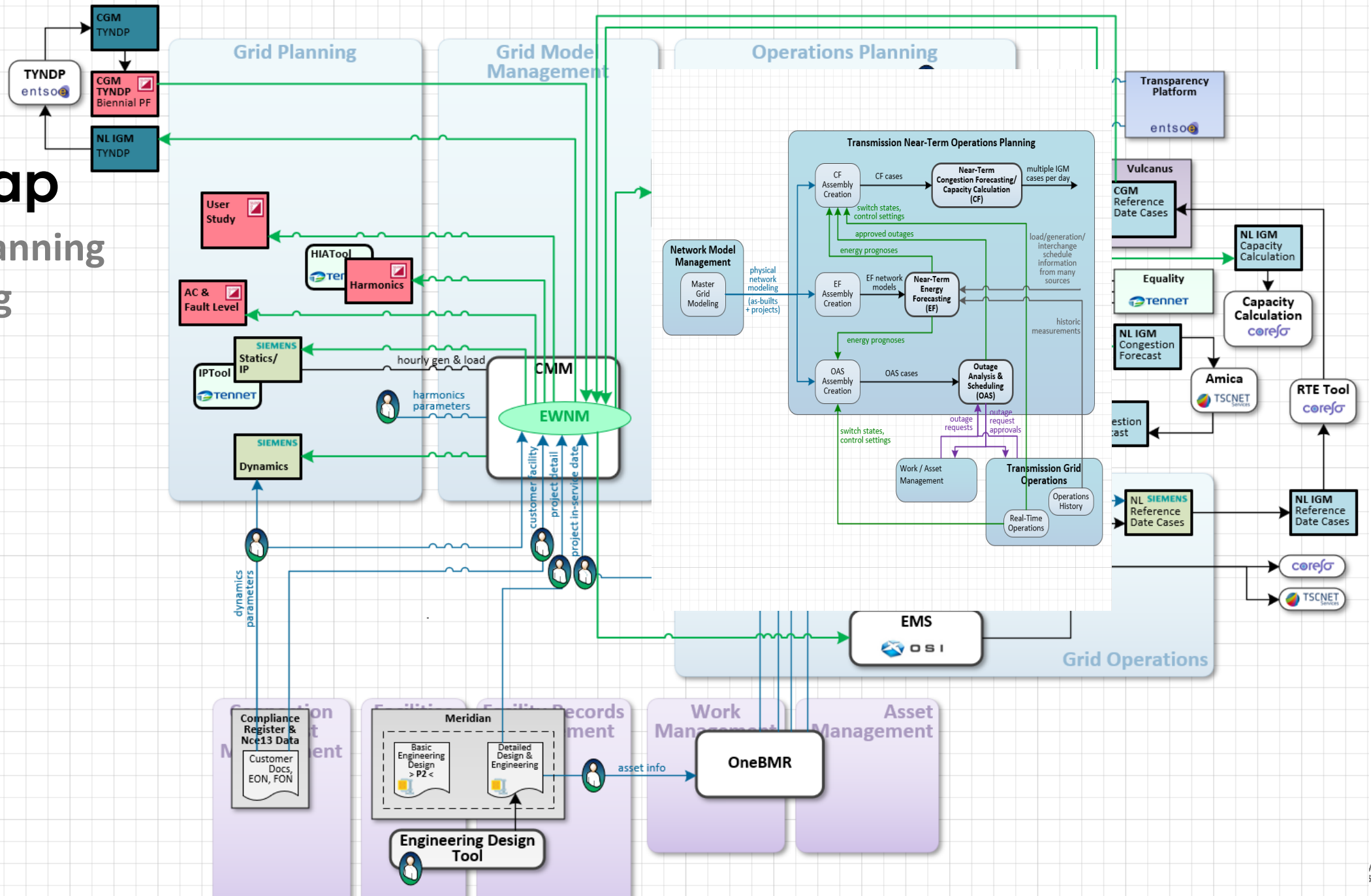
NMM Roadmap

Planning Streamlining



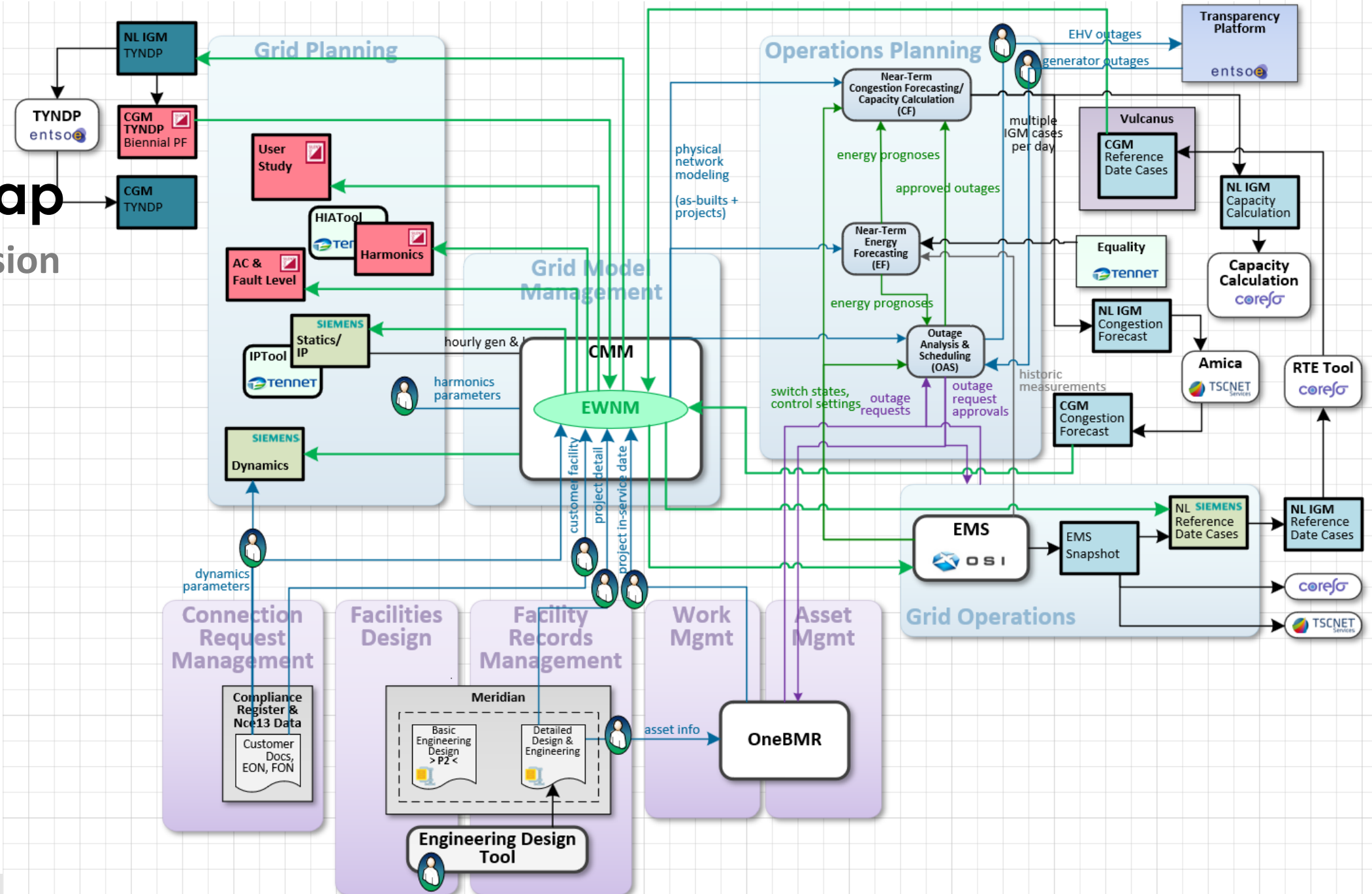
NMM Roadmap

Ops/Ops Planning Streamlining



NMM Roadmap

Ultimate vision



NMM Roadmap: Typical Phase Description

'Ops PowerFactory from CMM' Phase

When complete:

CMM

- Contains: master Modelling (as-built and **year-ahead projects**) for TenneT footprint, EMS external Modelling

EWNM

- Used by: EMS, **Master Operations PF**

Benefits

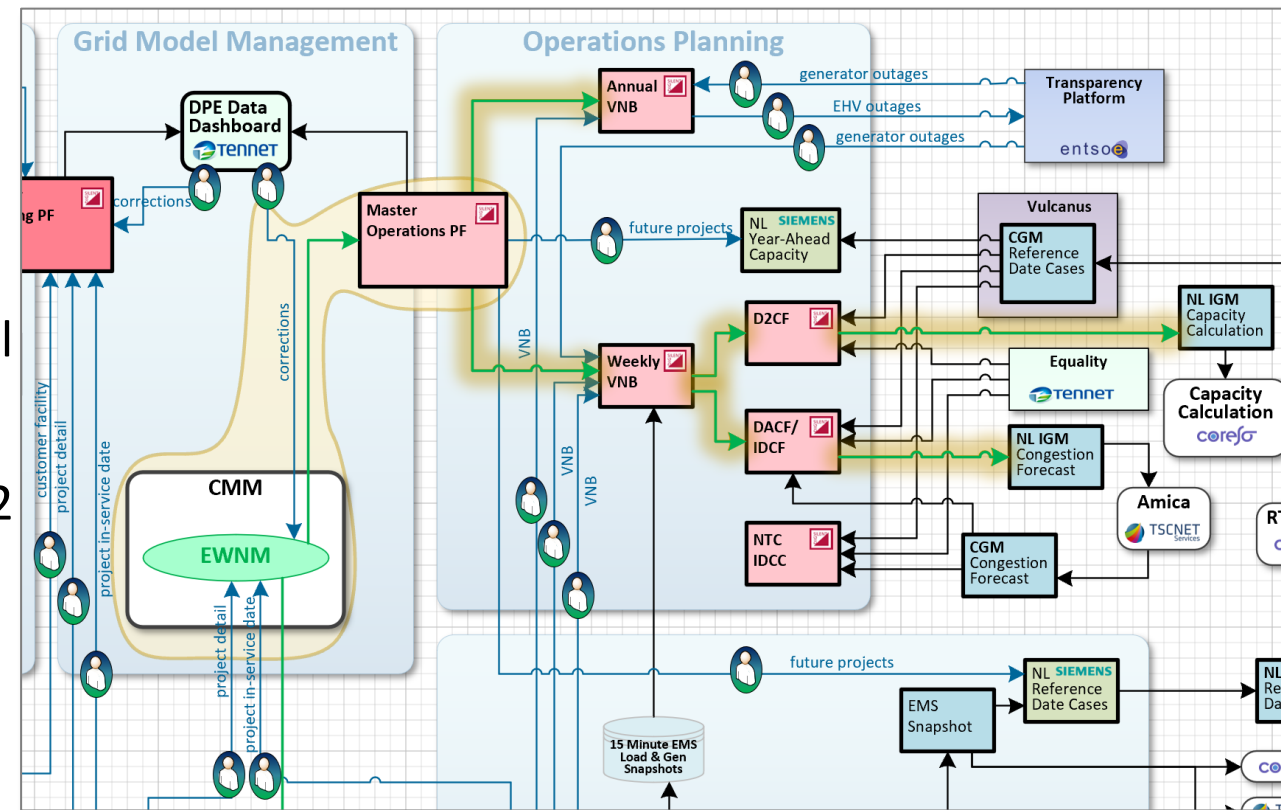
- Operations PowerFactory model and EMS model based on same master Modelling – equipment IDs are common
- Master Modelling processes reduced from 3 to 2

Activities

- Interfaces: DIgSILENT import interface deployment
- Data preparation: Add 1 year future projects
- New business process: EWNM maintenance, Ops PF maintenance

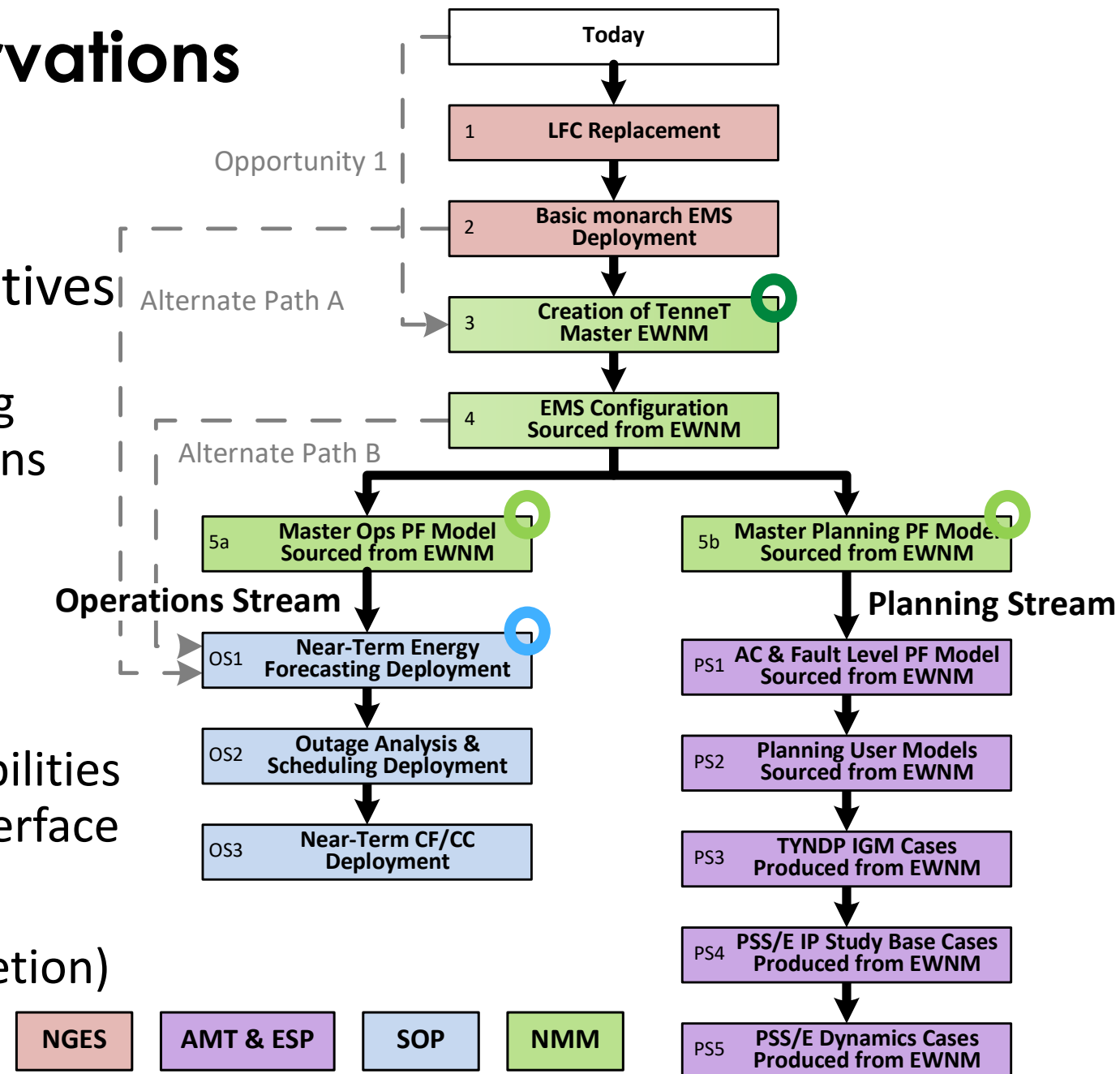
Comments

- Requires DIgSILENT interface development
- Next Phase could start concurrently with this Phase



Roadmap Strategy: Observations

- This is just one possible path
- There are opportunities & alternatives
 - Start early on Phase 3
 - Implement new Operations Planning solutions earlier and retire Operations Master Power Factory earlier
- Several decision points driven by vendor tool capabilities
 - ⊖ Phase 3 – OSI NMM capabilities
 - ⊖ Phase OS1 – OSI Ops Planning capabilities
 - ⊖ Phases 5a/5b – DIgSILENT NMM interface
- The roadmap should be revisited routinely (at least every Phase completion)





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