

The energy reference model catalog – energy-rmc

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Energie
Energy



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Group „Interoperability and Standards“

▶ 2 Agenda

- ▶ Motivation
- ▶ The energy reference model catalog approach
- ▶ Summary and outlook

3 German energy sector is undergoing a process of structural changes

[Appelrath & Chamoni 07]

Regulation

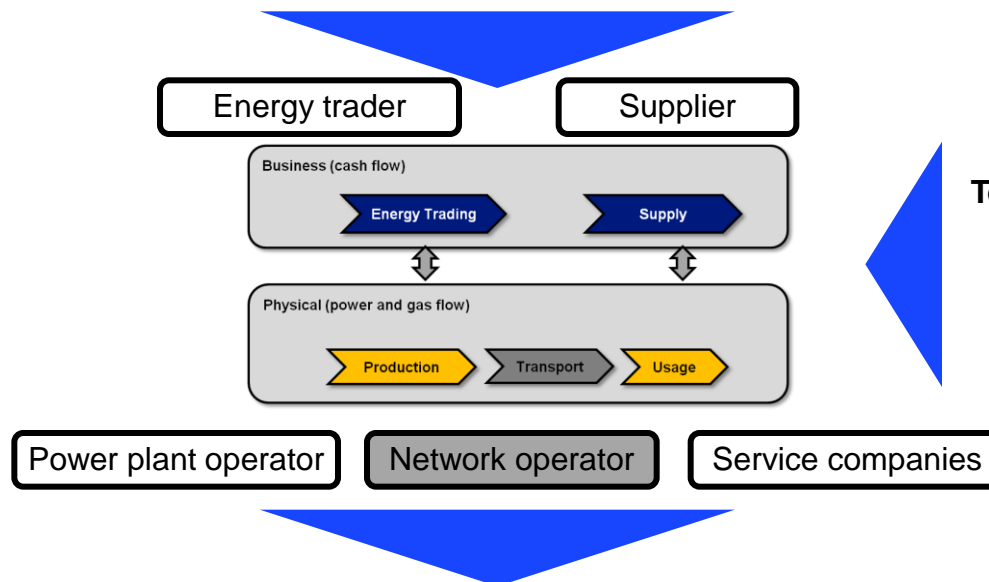
Unbundling (EnWG)

Price-Cap regulation of network charges (ARegV)

Fostering generation based on renewable energy resources (EEG)

General

Increasing energy costs
Climate change



Technology

distributed generation
Modernization of the electrical network „Smart Grid“

New Requirements for companies

More competition / New Actors

Changes in processes / New interfaces

Increasing communication

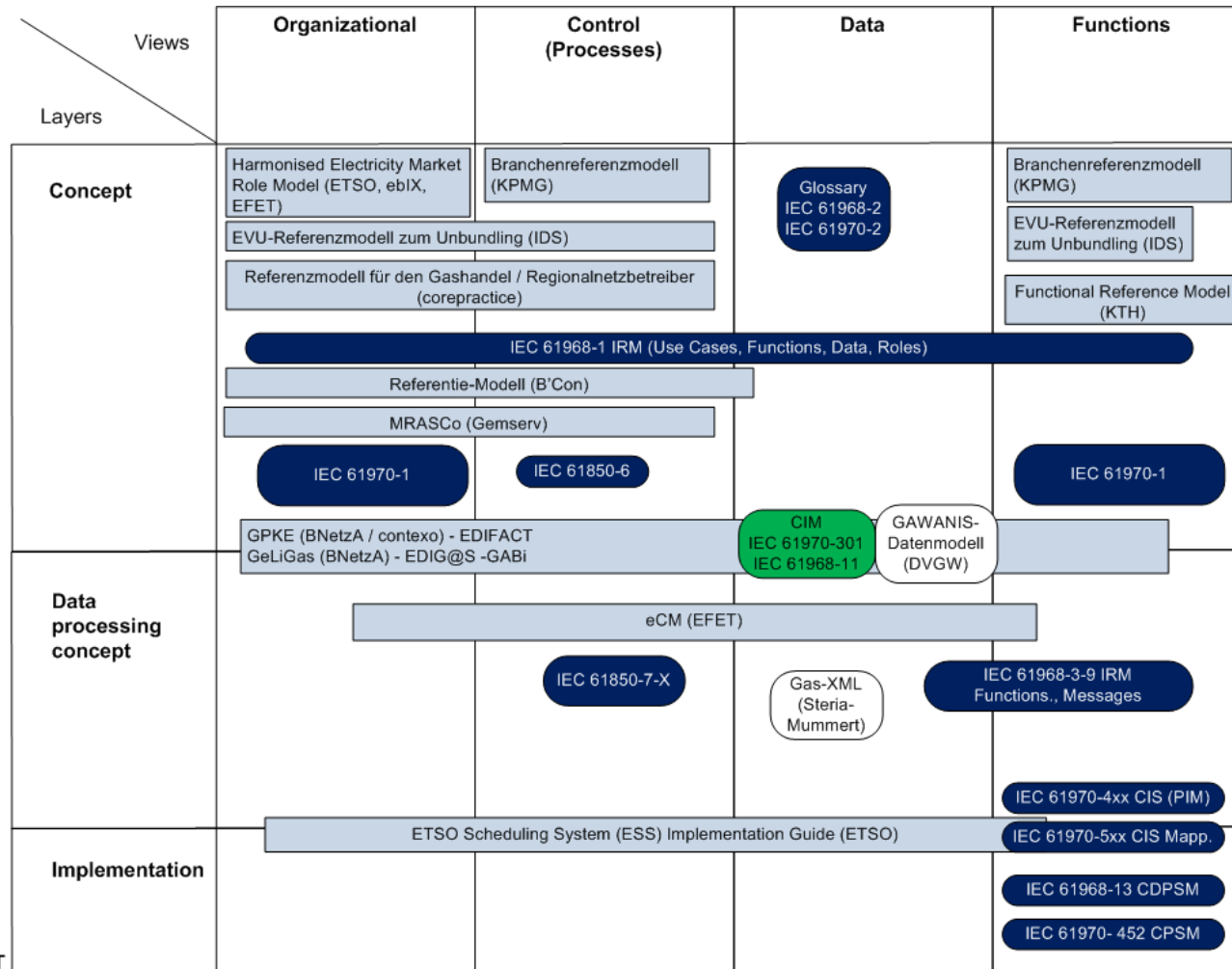
4 Challenges for informationsystems in the energy sector and solution

- ▶ Changing / new requirements
 - ▶ Enhancement / adoption of current and development of new functionality
 - ▶ High quality at low cost and quick time to market
 - ▶ Requirements analysis important but time consuming

- ▶ Possible solution
 - ▶ Usage of reference models and other sources during requirements analysis
 - ▶ *“A reference model is defined here as a conceptual model that can be used (or parts of it) as basis for the development of information systems.”*
 - ▶ Best practices / universal applicability / reusability

5 Models and IT-Standards in the energy sector (extract)

Classification based on the architecture of integrated informationsystems (ARIS)



Diversity of models
Several models (rectangle) and standards (rectangle with rounded edges) available

Coverage
Models and standards focus on different layers and Views

Problem
Selection of adequate sources

An overview on reference models in the energy sector is missing

Focus on IT

6 The energy reference model catalog project

Project Description

▶ Participants

- ▶ EWE R&D, EWE Strategic IT, BTC and OFFIS



▶ Goals

- ▶ Support development of information systems and information system landscapes, especially regarding requirements analysis
- ▶ Functional structuring of the energy sector (electricity and gas)
- ▶ Consideration of regulations, (reference) models and information technology standards as primary sources

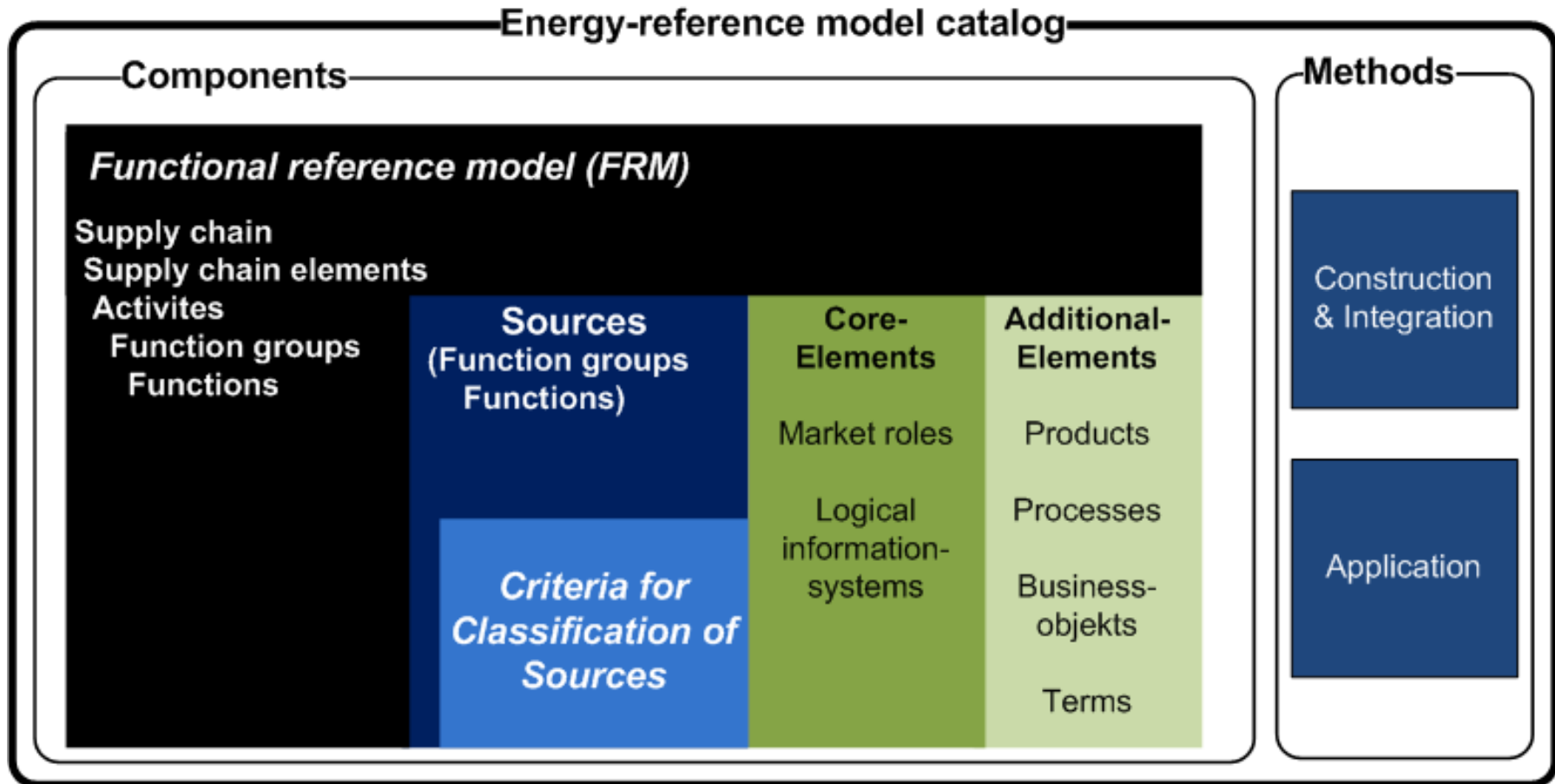
▶ Approach

- ▶ Developing a reference model catalog for the energy sector

„A reference model catalog allows the systematic access to an amount of (reference) models.“

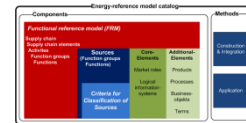
7 The energy reference model catalog

Components

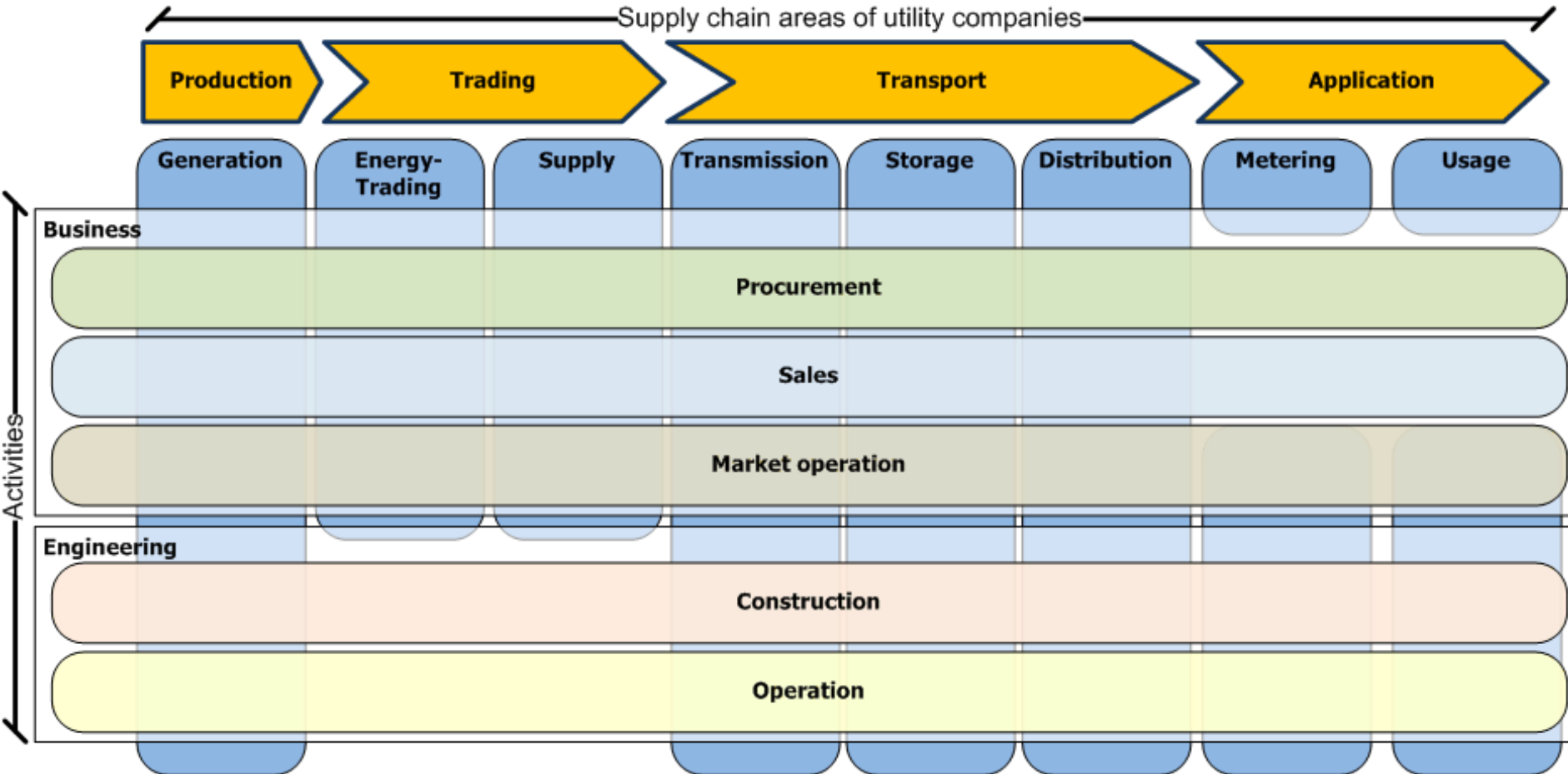


8 Functional reference model (FRM)

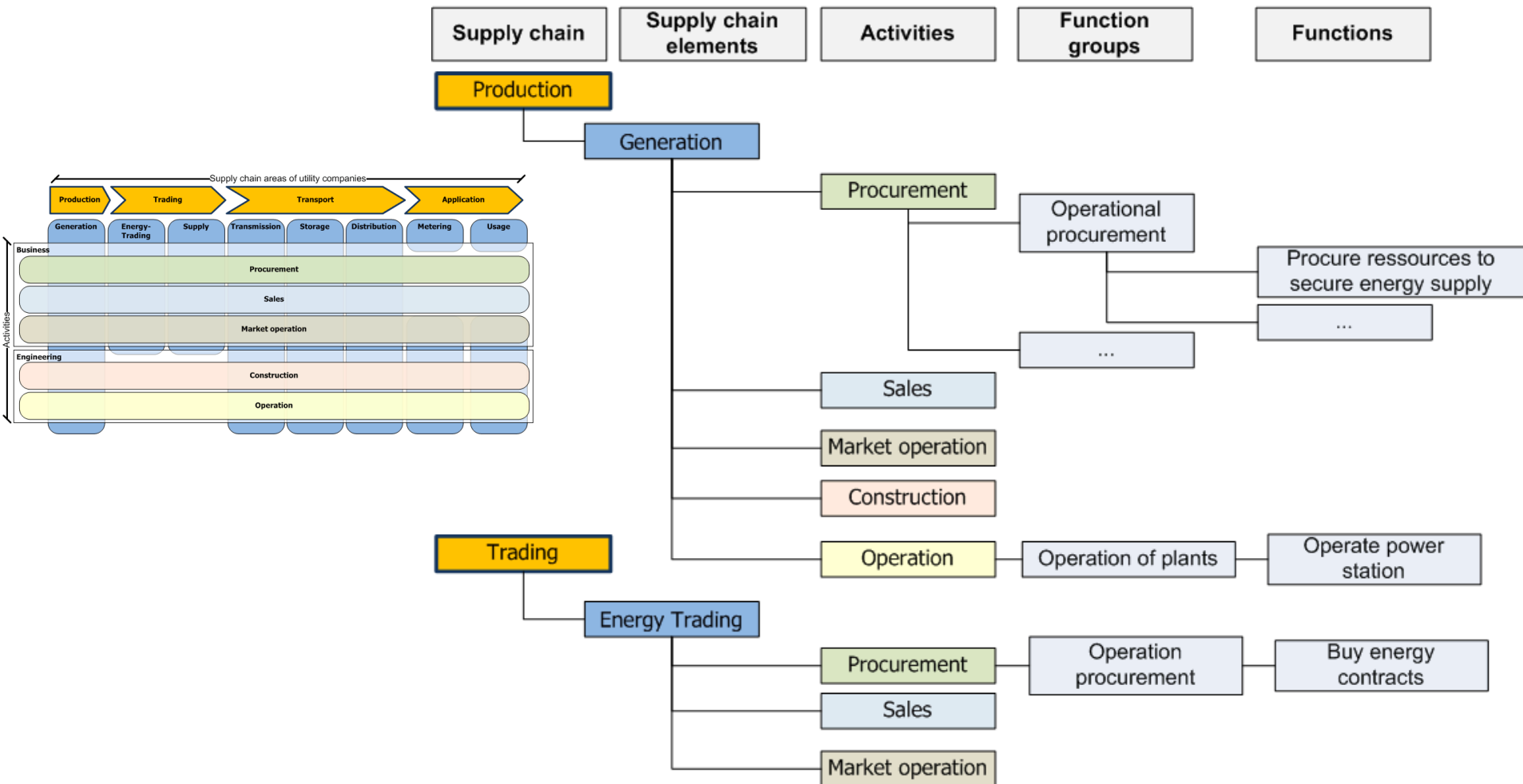
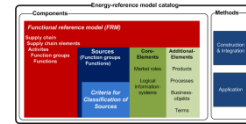
Overview



Supply chain areas of utility companies

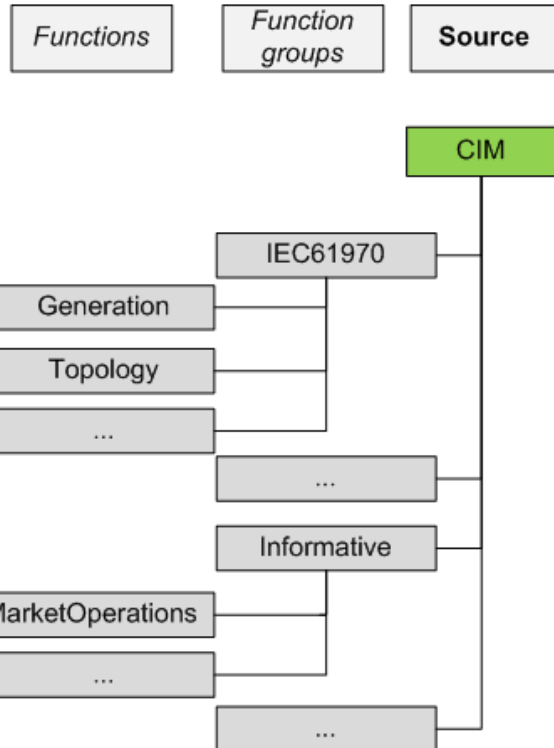
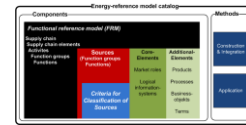


9 Functional reference model (FRM) Overview



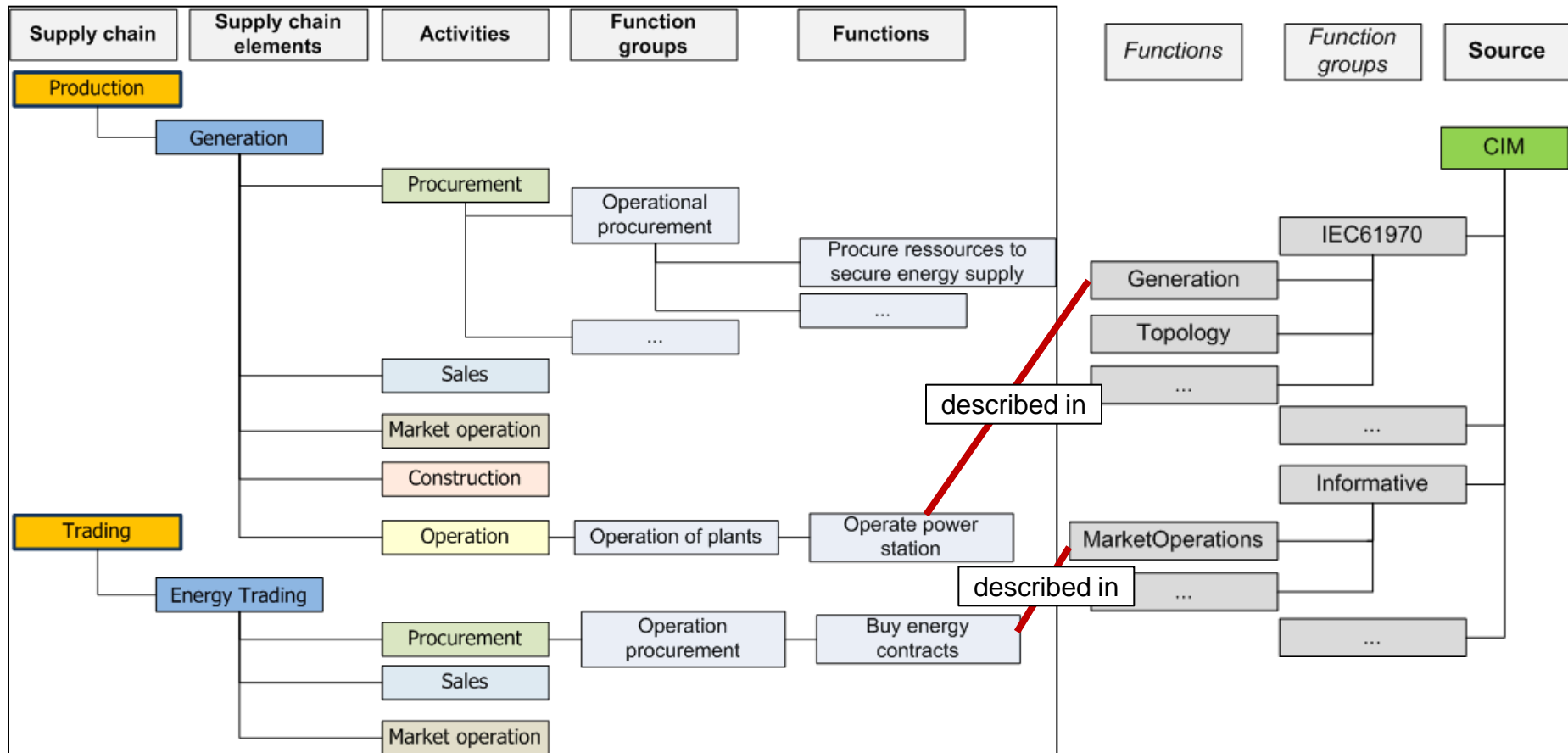
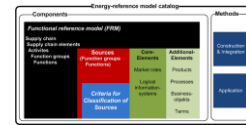
10 Formalization of sources and link to the frm

Example for the CIM



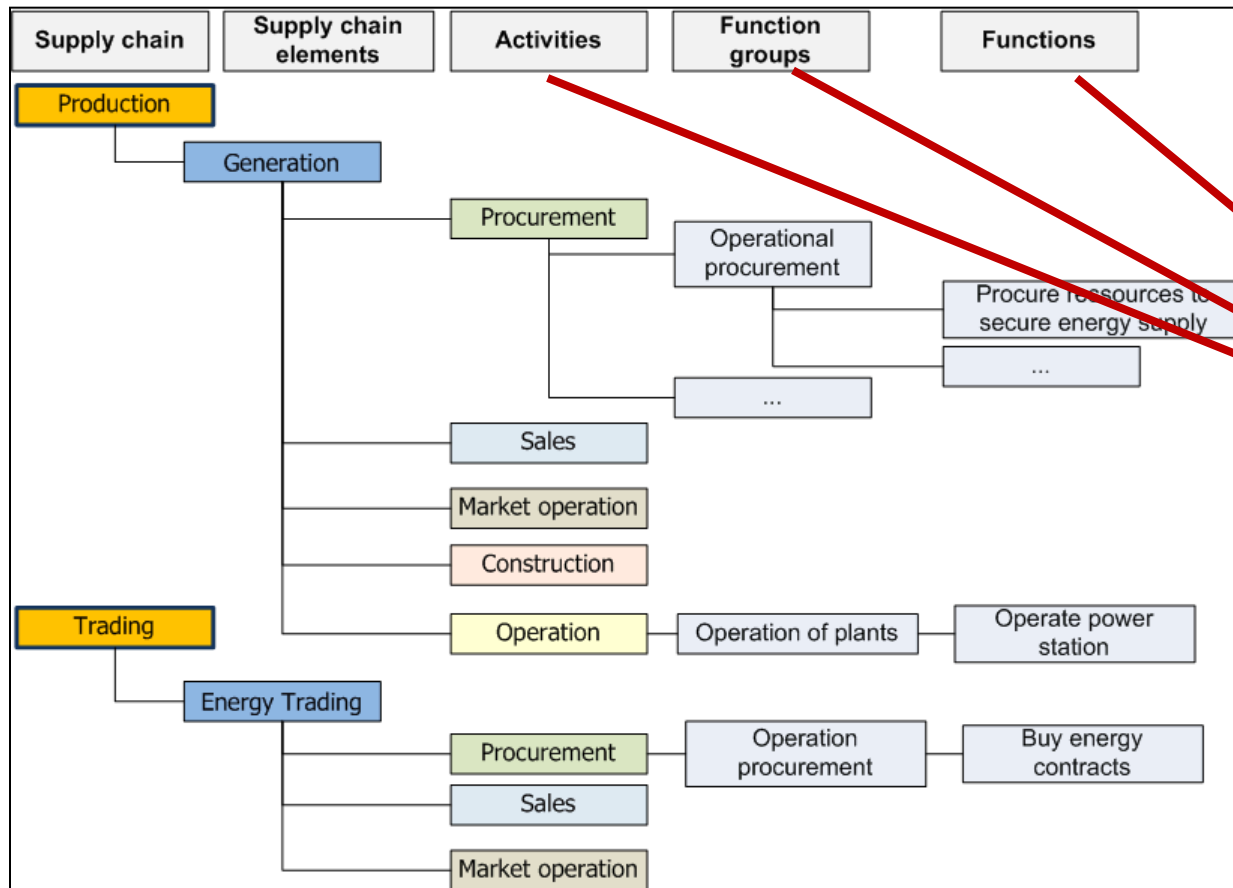
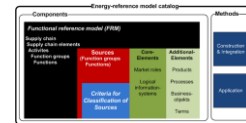
11 Formalization of sources and link to the frm

Example for the CIM



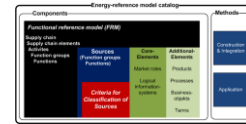
12 Formalization of sources and link to the frm

Example for the CIM



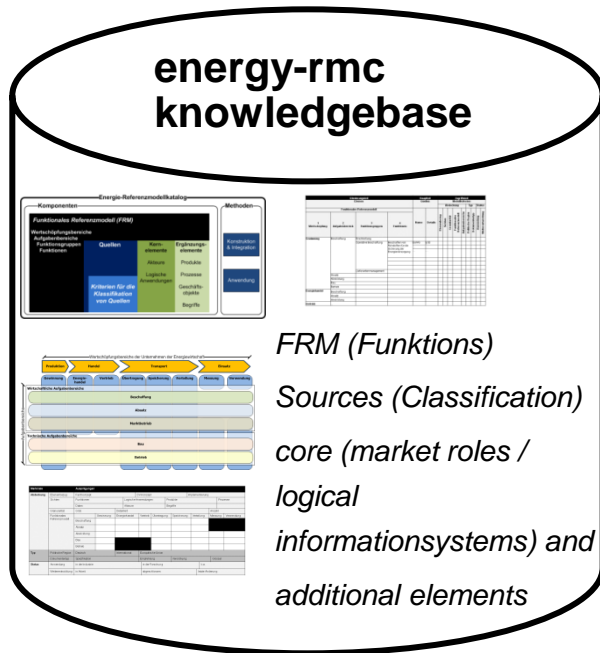
\$\$\$, IEC,
other models
...

► 13 Classification criteria for sources and exemplary classification of the IEC CIM (extract)



Main characteristics		Sub characteristics								
Coverage	Layer addressed	Business			Design			Implementation		
	Viewpoints	Functions		Logical Applications		Products		Processes		
		Data		Actors		Terms				
	Granularity	Rough		Detail				Case count		
	TC 57 Reference Architecture	Integration of business partners		Integration of applications		Integration of devices and plants		Data management security		
	Functional Reference Model		Generation	Energy trading	Supply	Transmission	Storage	Distribution	Metering	Usage
		Procurement								
		Sales								
		Market Operation								
		Construction								
Operation										
Type	Political Region	Germany		International		European Union				
	Document type	Specification		Standard		Recommendation		Regulation	Glossary	
Status	Usage	in industry			in academia			n.a.		
	Development	On going			Finished			Last Update		

▶ 14 Structure and formalization of the energie-rmc



Formalization as ontology in OWL and query e.g. through SPARQL

- ▶ Structure
 - ▶ Focus on conceptual level and functions
 - ▶ The rmc contains a functional reference model
 - ▶ Enhancing of the catalog through core and additional elements
- ▶ Formalization
 - ▶ Ontology in OWL
 - ▶ Flexible formalization
 - ▶ Allowing query of the knowledgebase (through SPARQL, SQWRL)
 - ▶ Deriving new knowledge (reasoning)
 - ▶ Integration of sources
 - ▶ Easy provisioning
- ▶ Tool
 - ▶ Protégé editor and custom development for import, export and visualization

▶ 16 Summary and Future Work

▶ Results

- ▶ Several sources (reference models and standards) identified
- ▶ First formal representation in OWL using Protégé editor (open source)
- ▶ Classification of sources by the energy-rmc
- ▶ Enhancement and adoption of the rmc concept

▶ Future Work

- ▶ Improvement and enhancement of the energy-rmc
 - ▶ Sources, methods, tool support
- ▶ Further application of rules and patterns for improving model quality
- ▶ Evaluation of the energy-rmc
- ▶ Usage of the energy-rmc in different scenarios

► 17 Thank you for your attention!

Questions?



Contact

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