



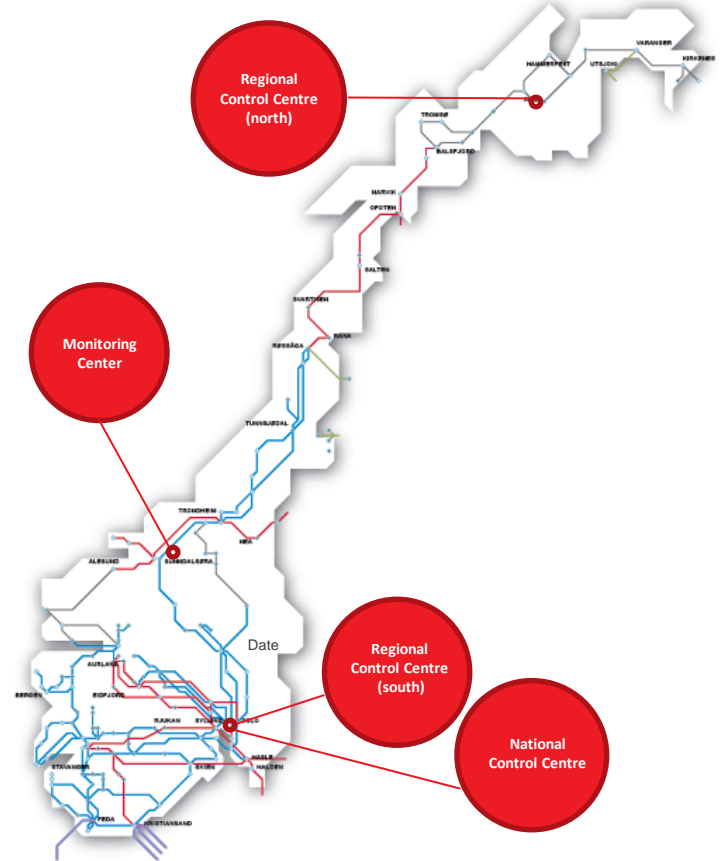
CIM for Generation Side

utilising CIM extensions to support effective power generation in a more varied and complex generation ecosystem

SmartGrid Forum CIM2022, 2022-03-22

This is Statnett

- Statnett SF is the Norwegian Transmission System Operator (TSO). Statnett SF own, operates and maintains the high voltage power grid in Norway.
- Statnett SF operates and owns about 11 000 km high voltage power line and 166 power transformation substation.
- Statnett SF has the responsible for the power interconnection to Sweden, Finland, Russia, Denmark, Germany, Great Britain and the Nederland's.
- Statnett SF has about 1300 employees and located all over Norway. Main office is in Nydalen, Oslo.
- Statnett is a state enterprise owned by the Norwegian state through the Ministry of Petroleum and Energy.
- Our mission is securing power supply through operations, monitoring and preparedness, facilitating the realisation of Norway's climate objectives, and facilitating creation of value for our customers and the society in general.



Generation information exchange

- Power System Analytic tools
- Asset Management
- Measurement
- Fault handling
- Operation Planning
- System Development Planning

The code families

Connection

Demand Connection Code
Requirements for Generators
High Voltage Direct Current Connections

Operations

Operations
Emergency and Restoration

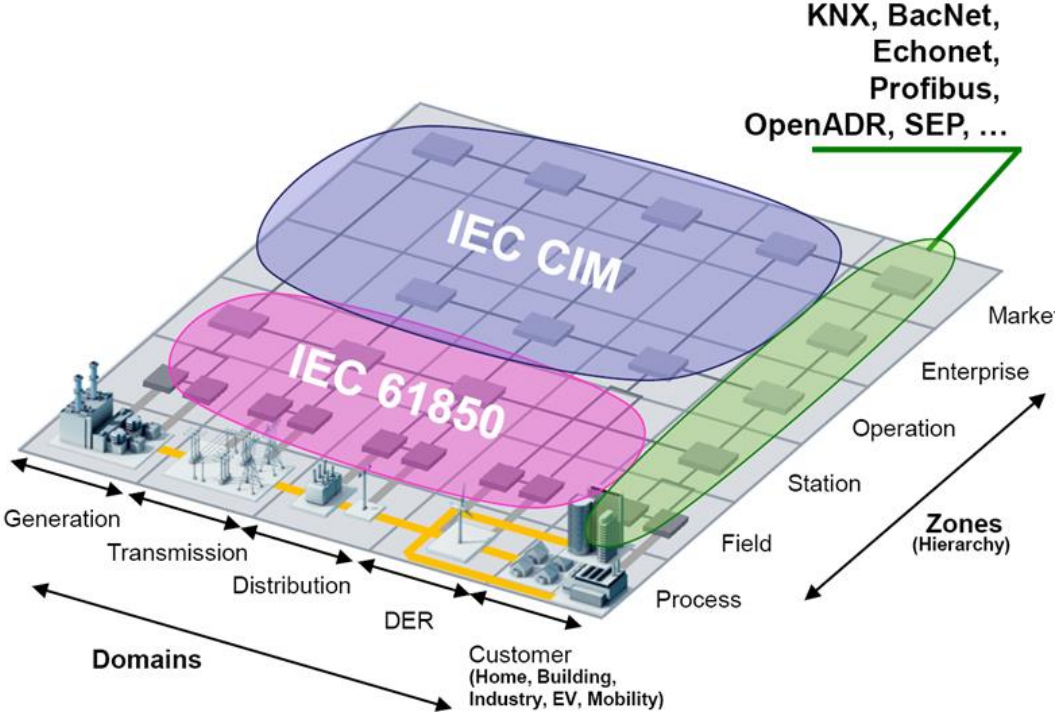
Market

Capacity Allocation & Congestion Management
Forward Capacity Allocation
Electricity Balancing

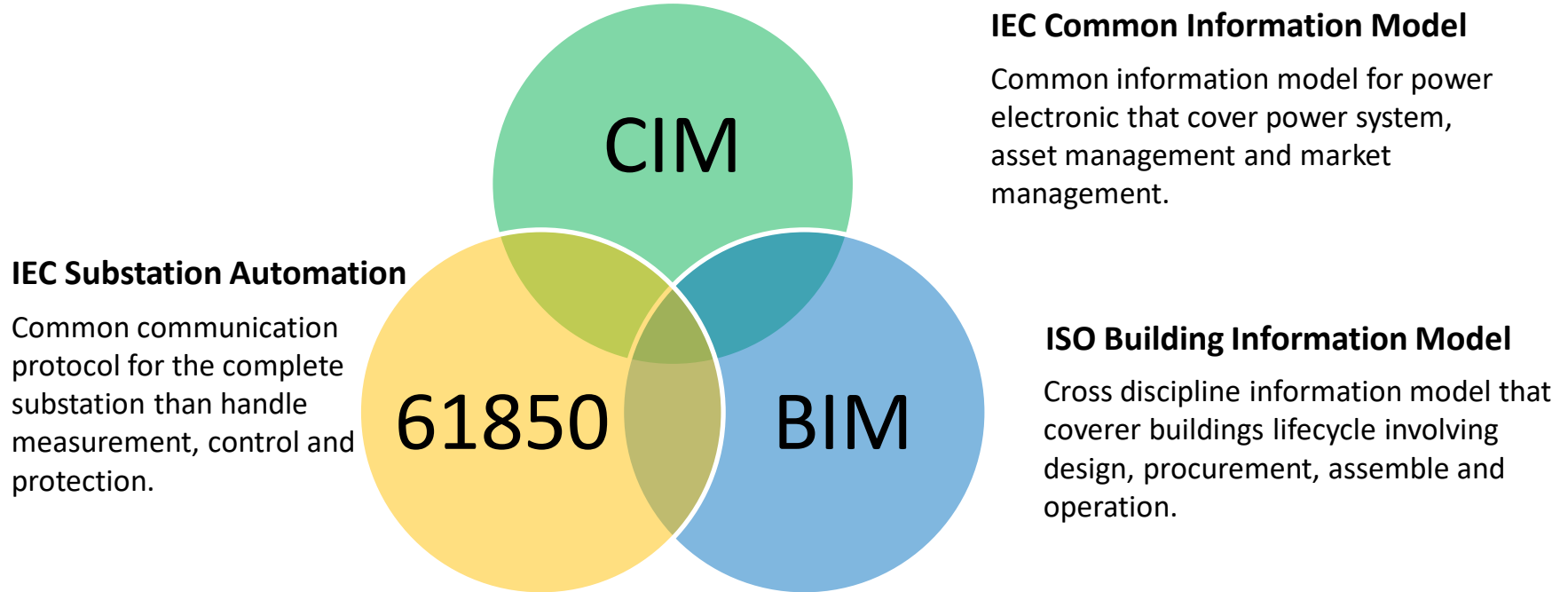
The IEC Common Information Model (CIM) -What Is It?

- A set of standards in enable system integration and information exchange based on a common information model
- A key differentiator: The CIM standards are based on a Unified Modeling Language (UML) based information model representing real-world objects and information entities exchanged within the value chain of the electric power industry
 - Provides common semantics for all information exchanges
 - Referred to as Model-Driven Integration (MDI)

Coverage by semantic standards



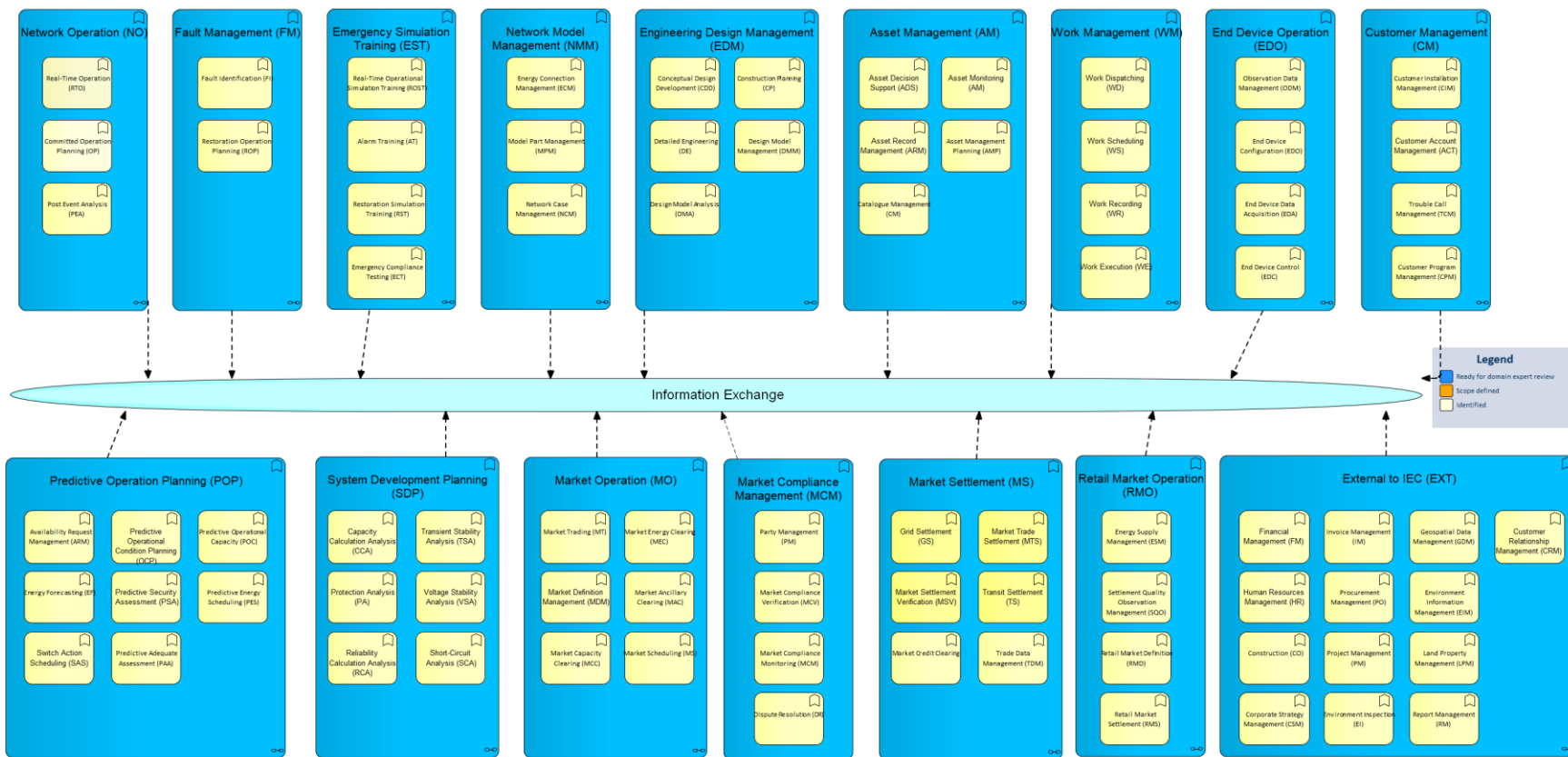
Standard interoperability

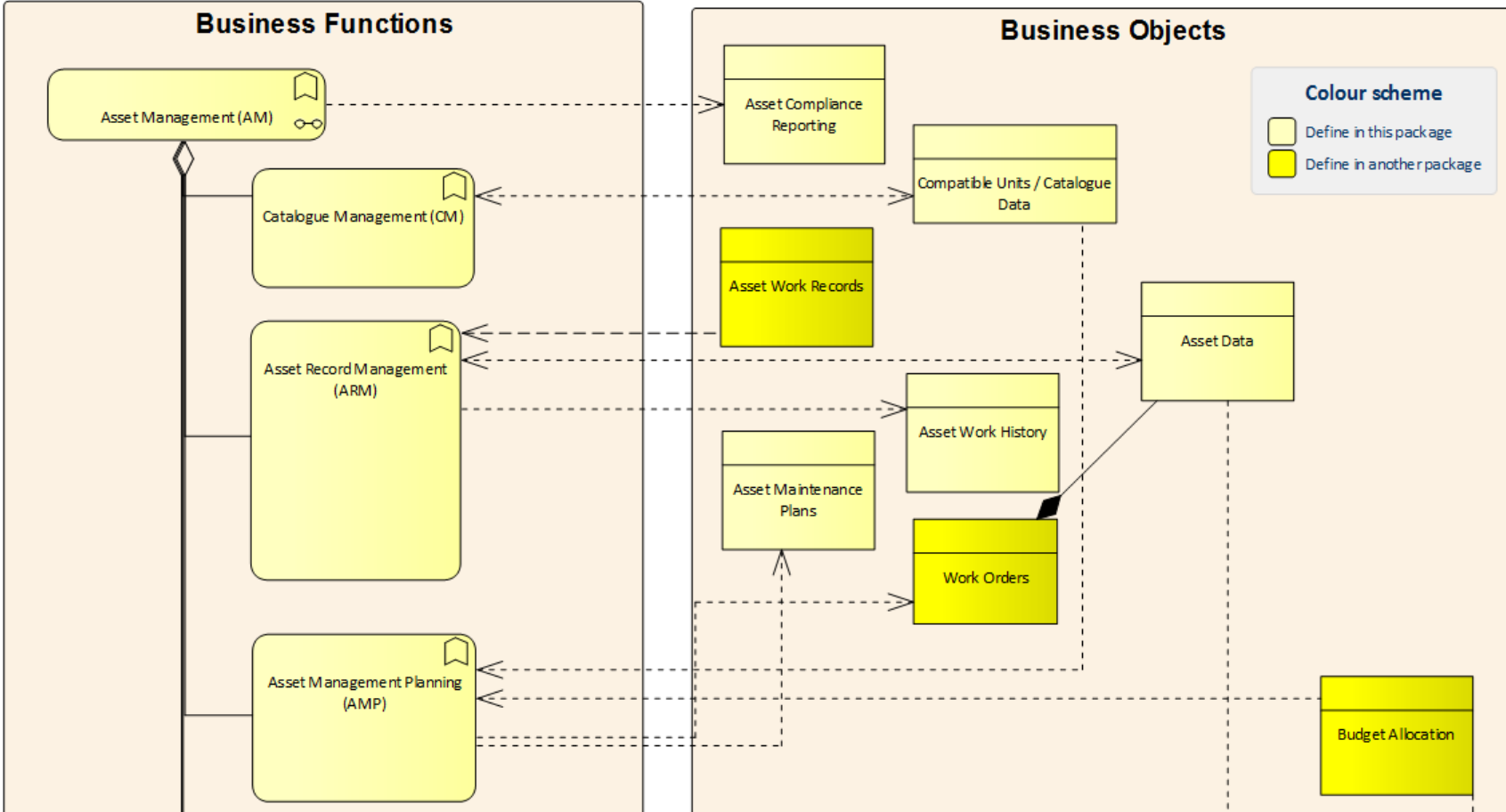


IEC CIM Interface Reference Model (IRM) - Business Functions

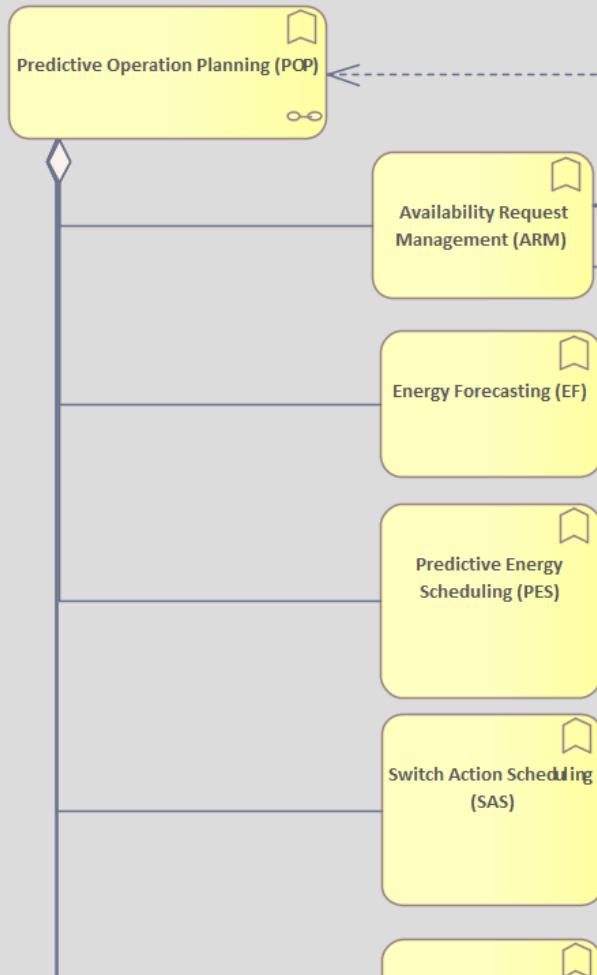
IEC 61968-1:2020

Business IRM Overview - Status





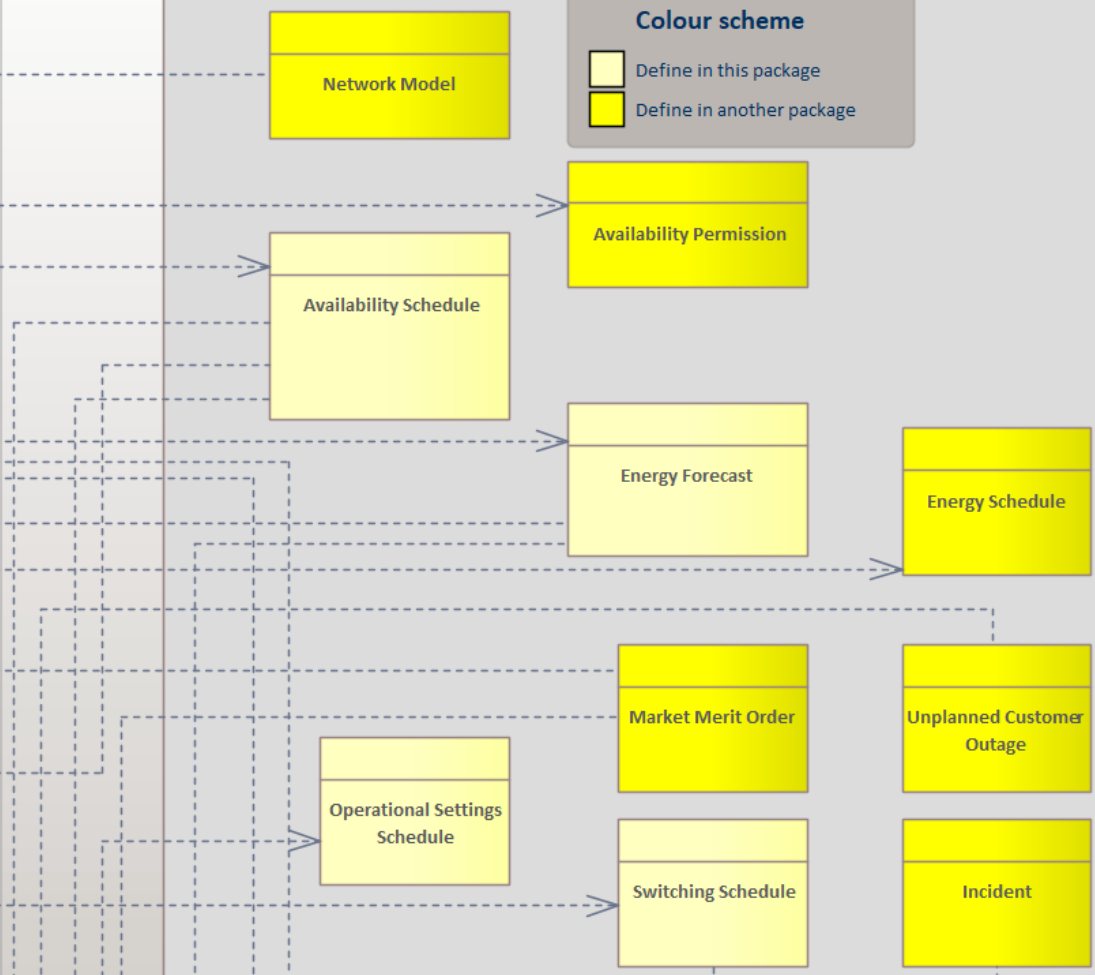
Business Functions



Business Objects

Colour scheme

- Define in this package
- Define in another package



Name vs Identifier

Core::IdentifiedObject	
+	aliasName: String [0..1]
+	description: String [0..1]
+	mRID: String [0..1]
+	name: String [0..1]

- mRID
 - Master resource identifier issued by a model authority. The mRID is unique within an exchange context. Global uniqueness is easily achieved by using a UUID, as specified in RFC 4122, for the mRID. The use of UUID is strongly recommended.

ebf62dd6-ee6e-4e2c-8ea4-43a9c7d24078

- name
 - The name is any free human readable and possibly non unique text naming the object.

ISO/IEC 81346

Industrial systems, installations and equipment and industrial products —
Structuring principles and reference designations

RDS

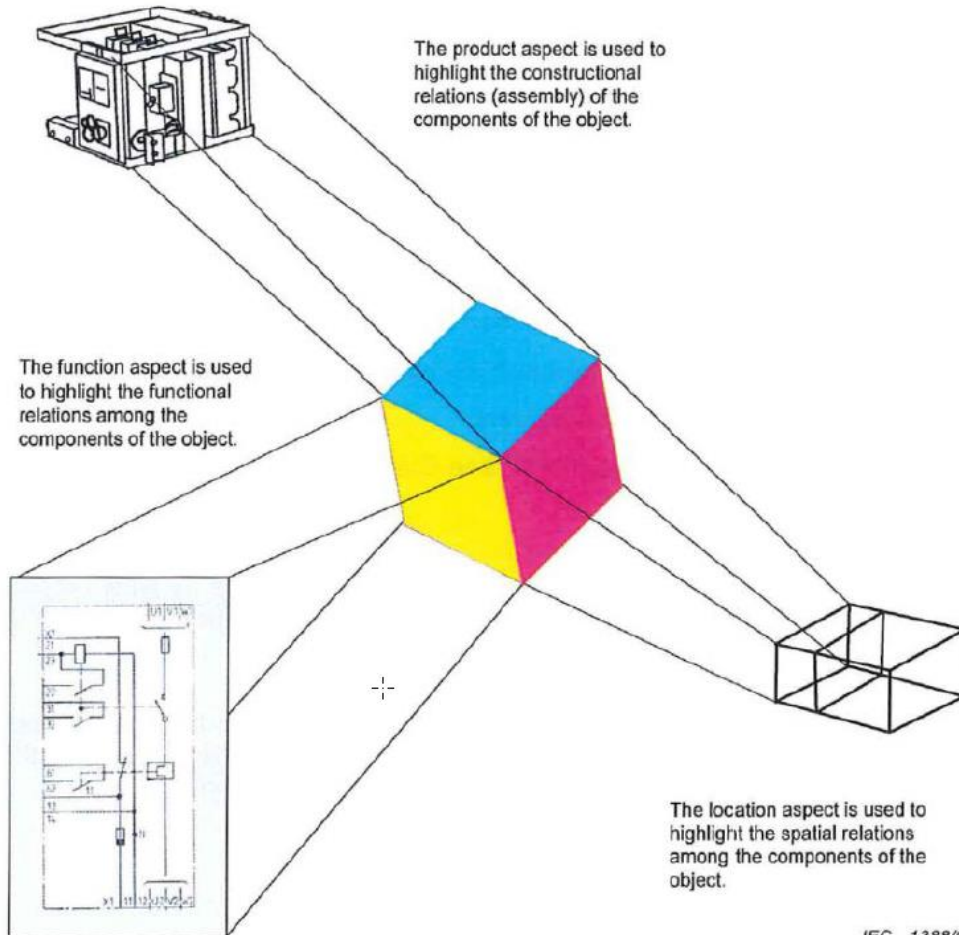
Reference Designation System

The standard is often shortened to “RDS”. In its most simple form it is used to label (tag) systems within systems.

(Note that the exception is RDS-pp who is NOT supported by IEC/ISO it is not a part of this series).

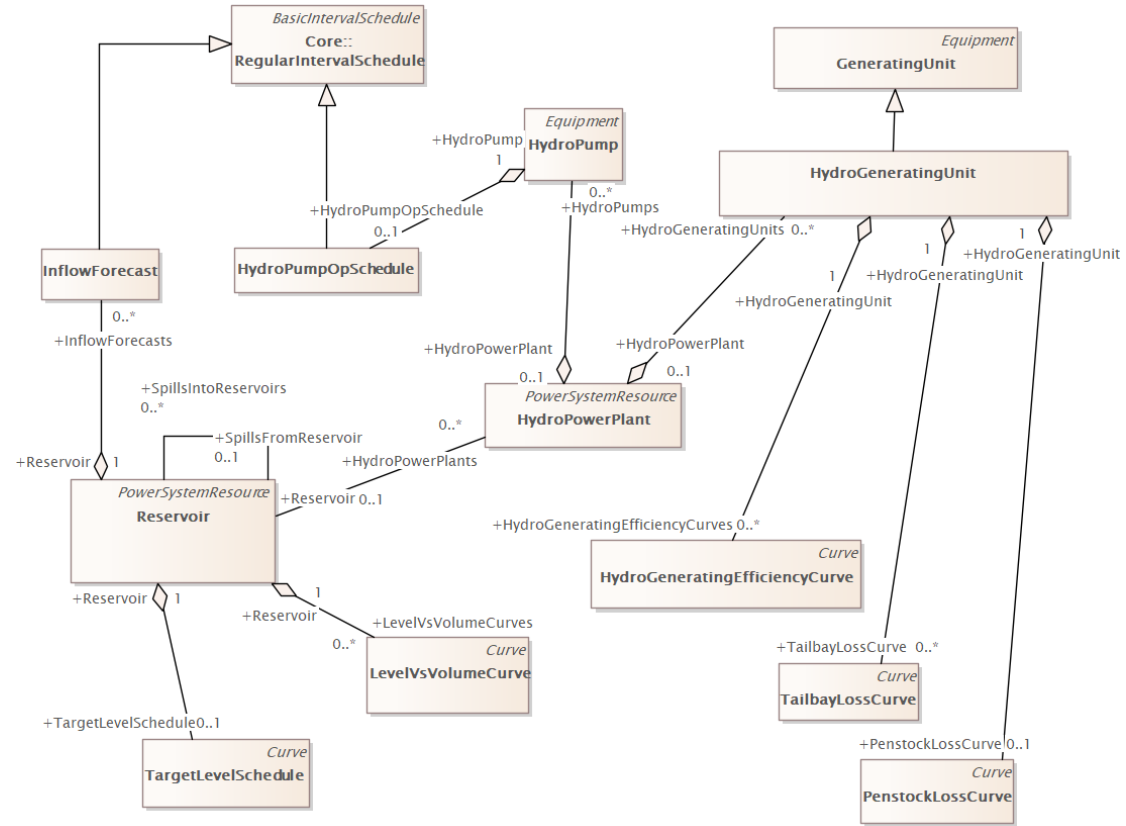
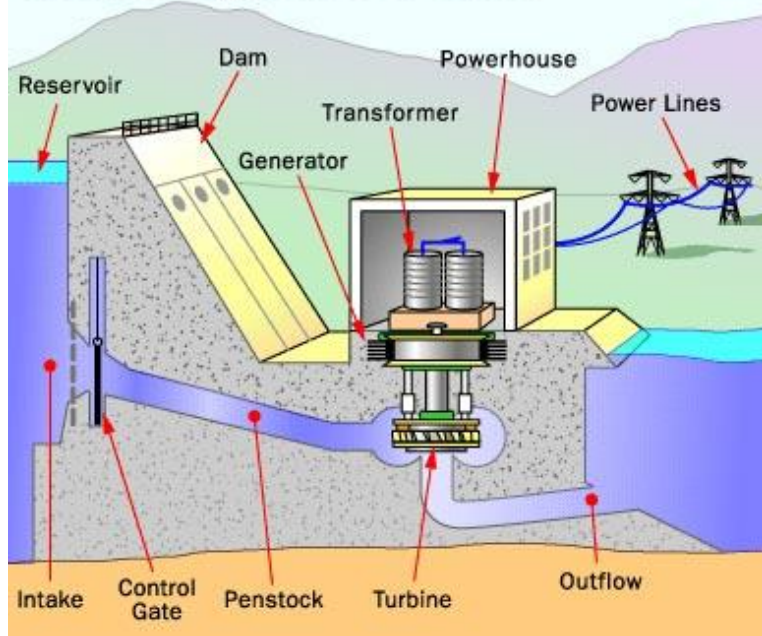


Core concept 1: Only view one aspect of an object at the time.

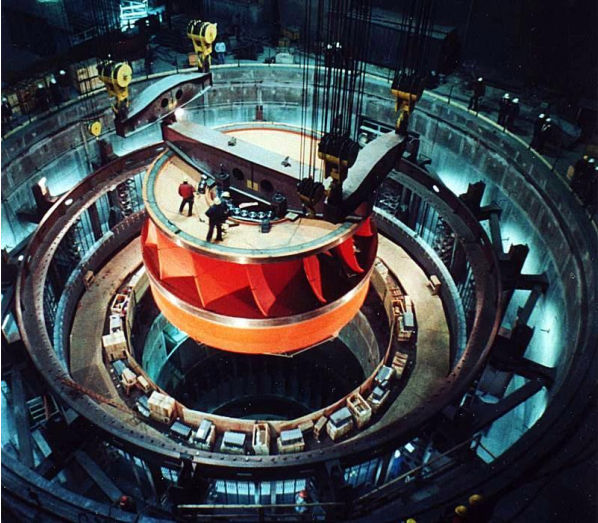


- Product Aspect
- = Functional Aspect
- + Location Aspect
- % Type Aspect

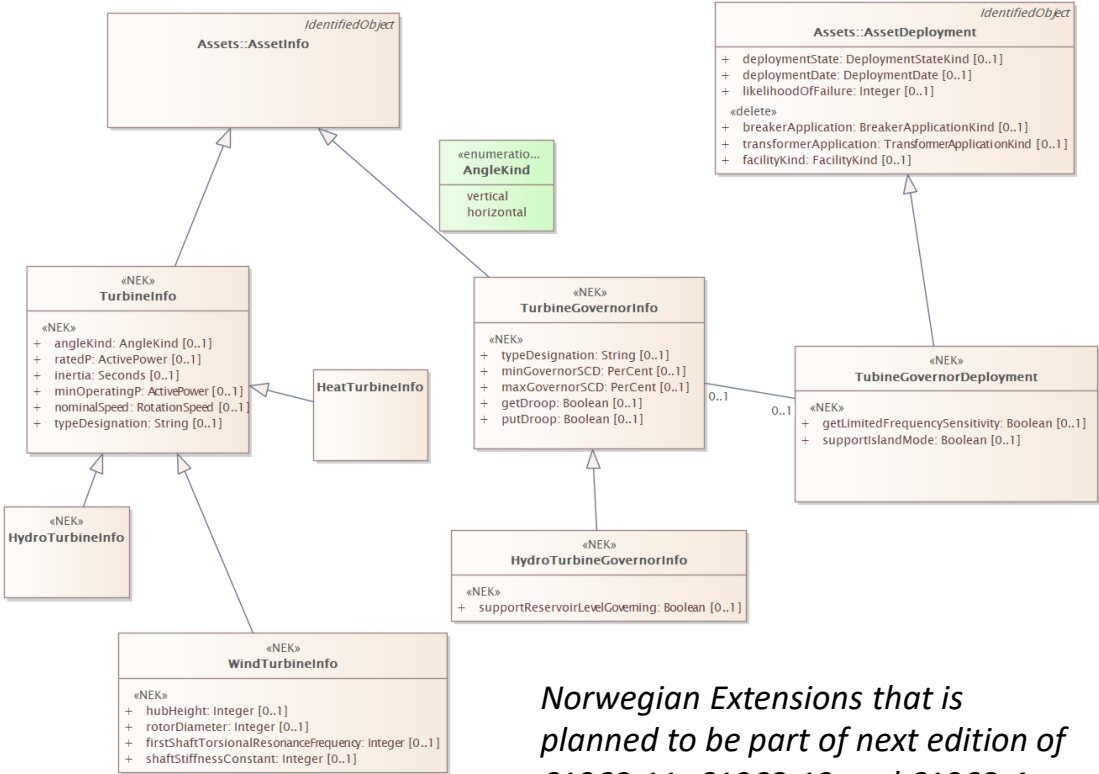
Inside a Hydropower Plant



UML description a Hydro Turbine

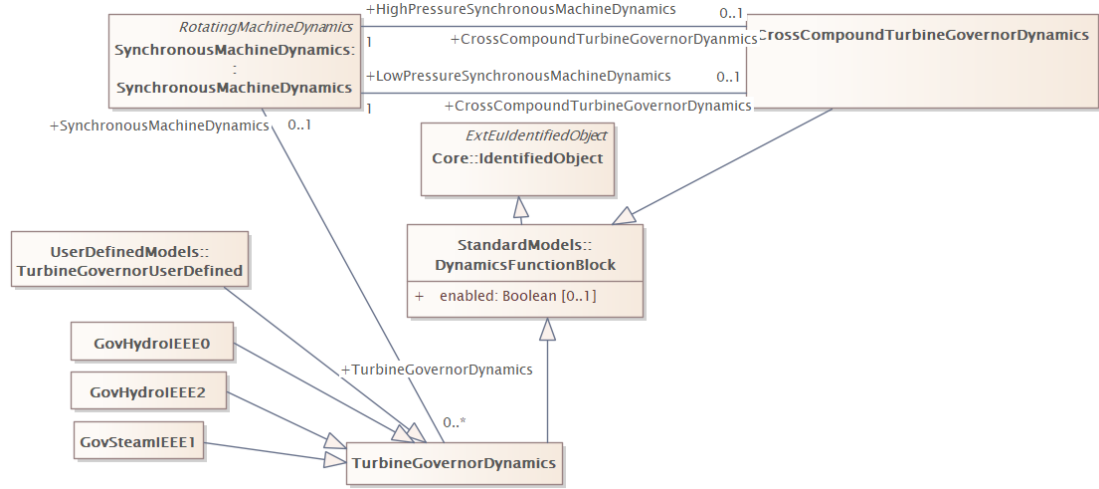
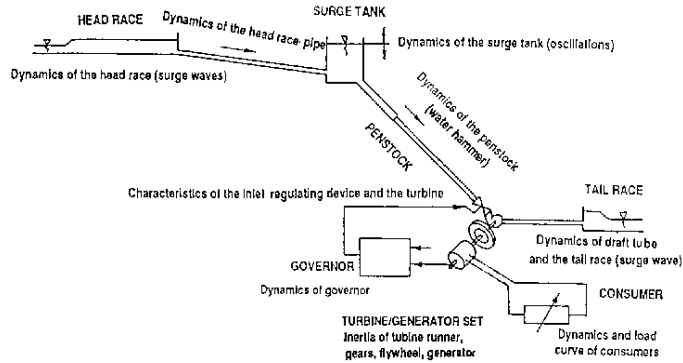


By U.S. Bureau of Reclamation

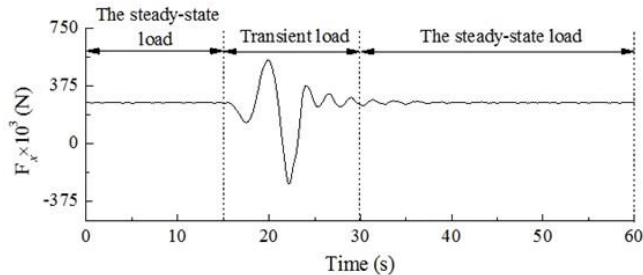


Norwegian Extensions that is planned to be part of next edition of 61968-11, 61968-13 and 61968-4

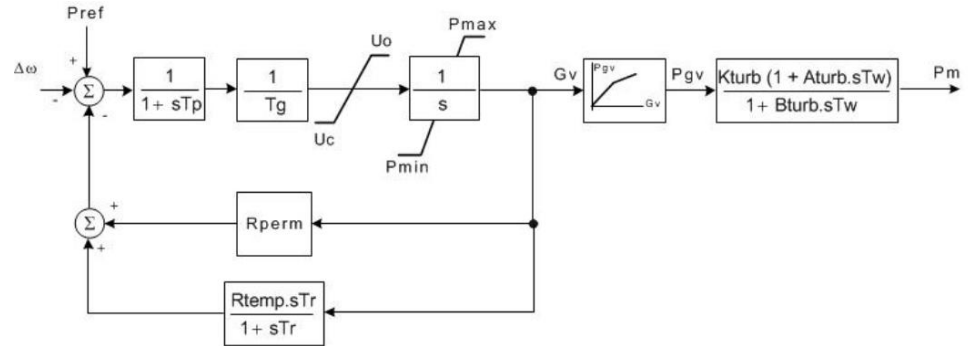
UML description a turbine dynamic stability



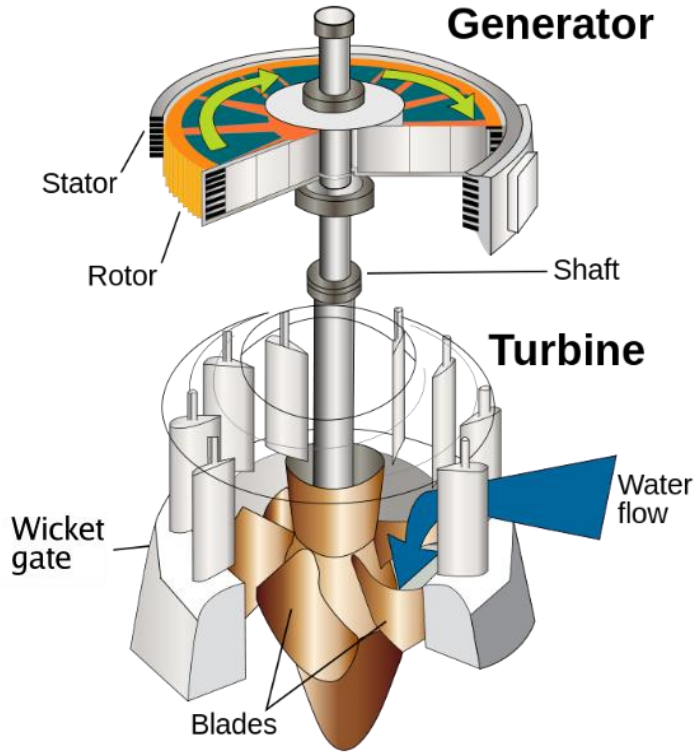
<http://www.nzdl.org/>



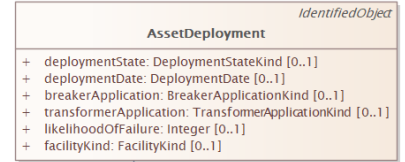
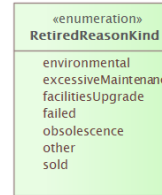
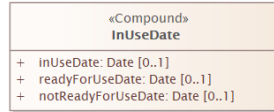
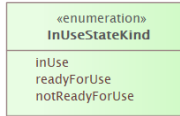
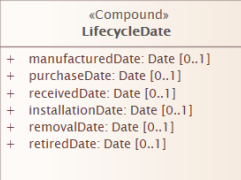
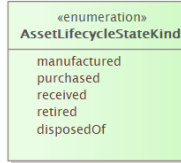
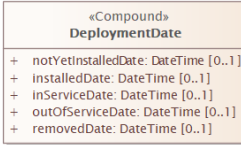
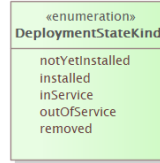
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UML description a hydro turbine as asset

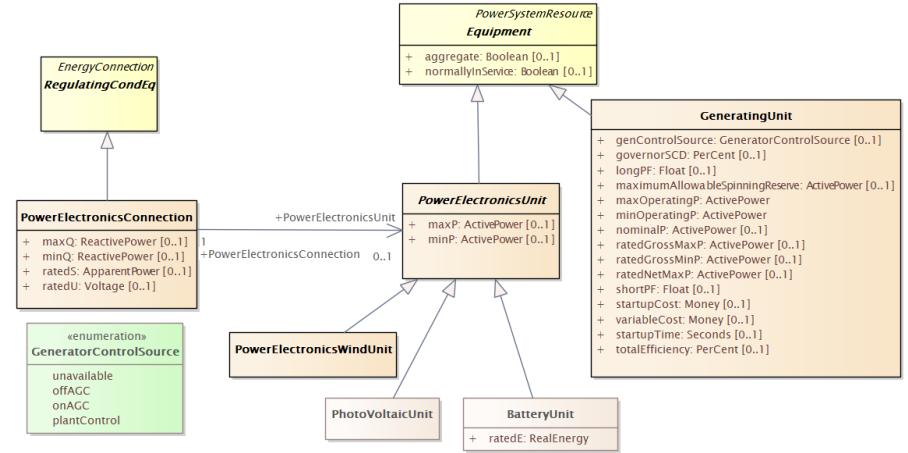
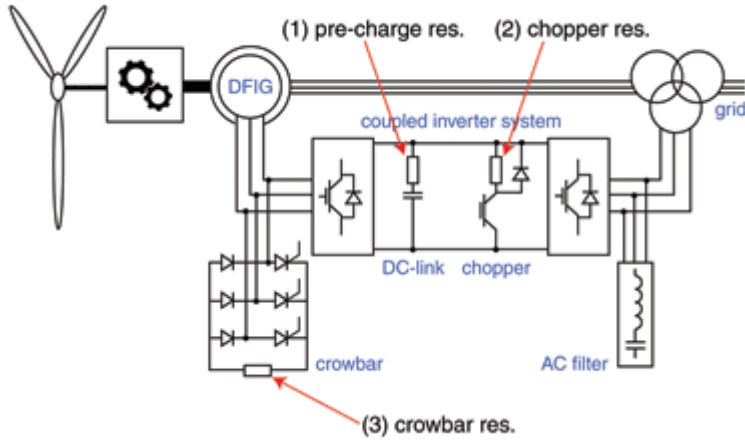


[Fil:Water turbine \(en 2\).svg – Wikipedia](#)



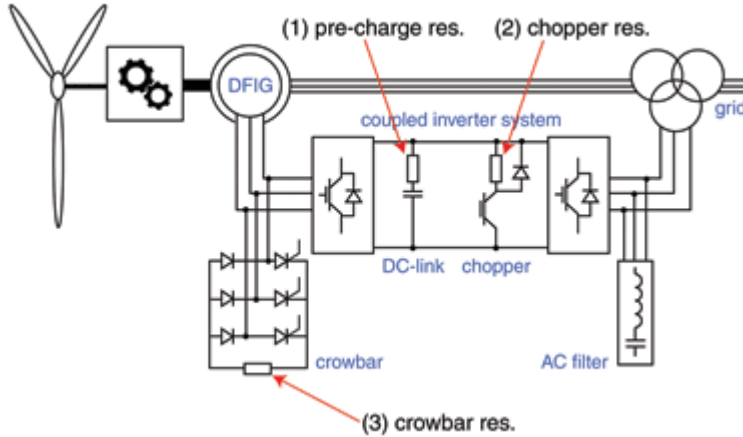
UML description a Wind unit impact on the Power System

Figure 1

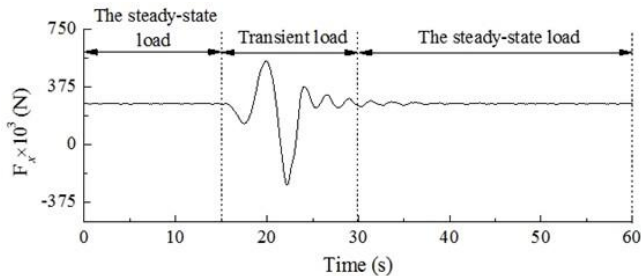


UML description a Wind unit dynamic stability

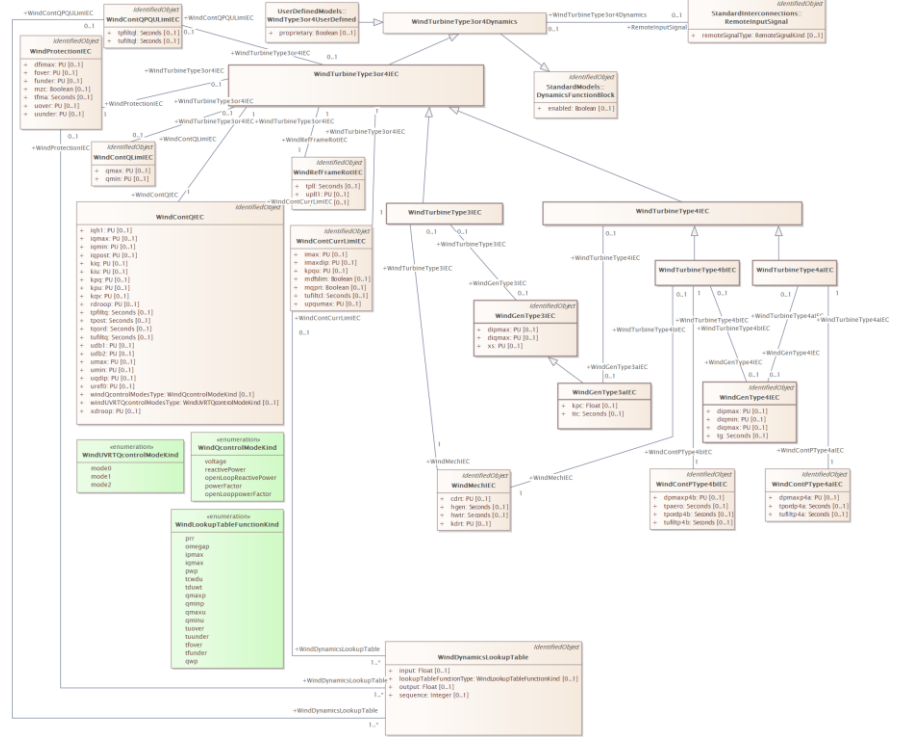
Figure 1



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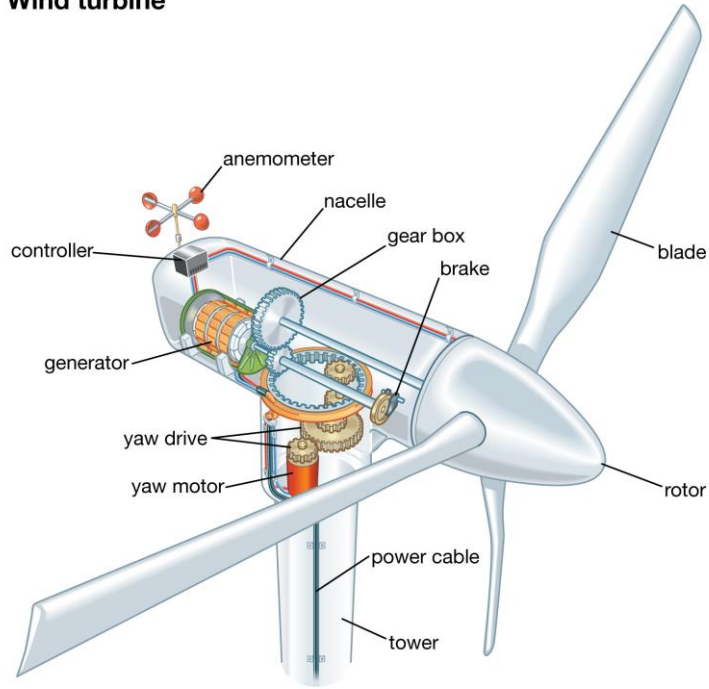


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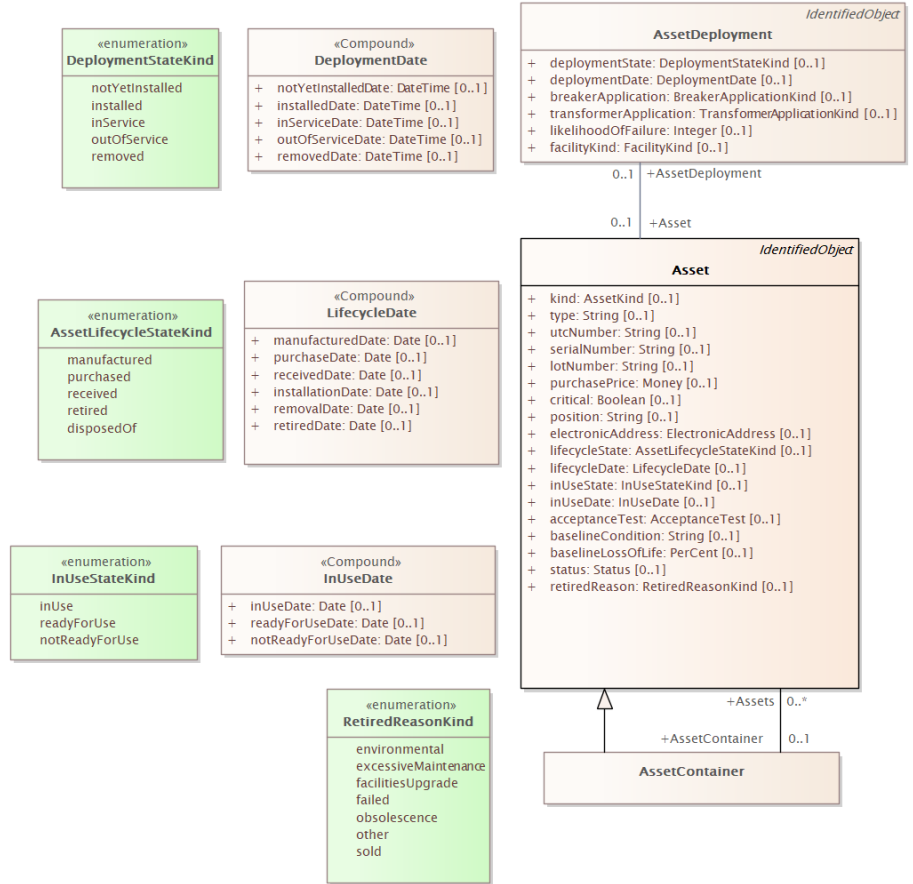


UML description a Wind turbine as asset

Wind turbine



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Energy System (ES) CIM Data sharing interfaces

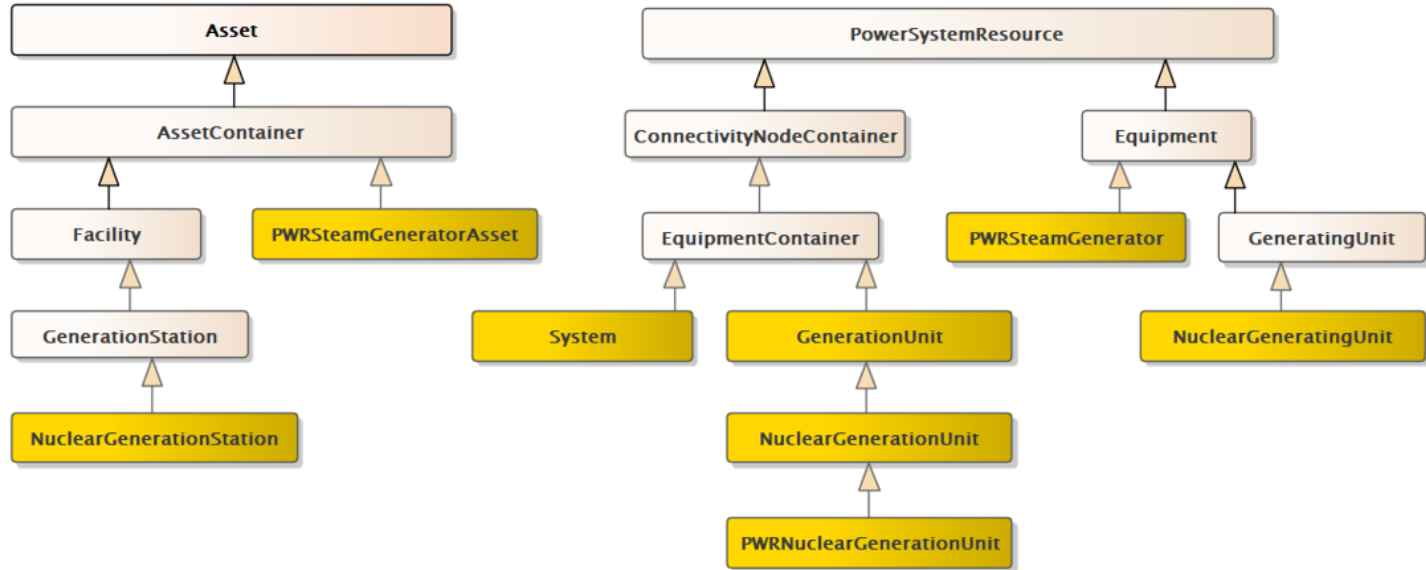


ES-CIM Software Artifacts

<https://github.com/epri-dev/ES-CIM/tree/main/Software%20Artifacts>

ES-CIM Extensions for Power Generation

business Power Generation CIM Extensions

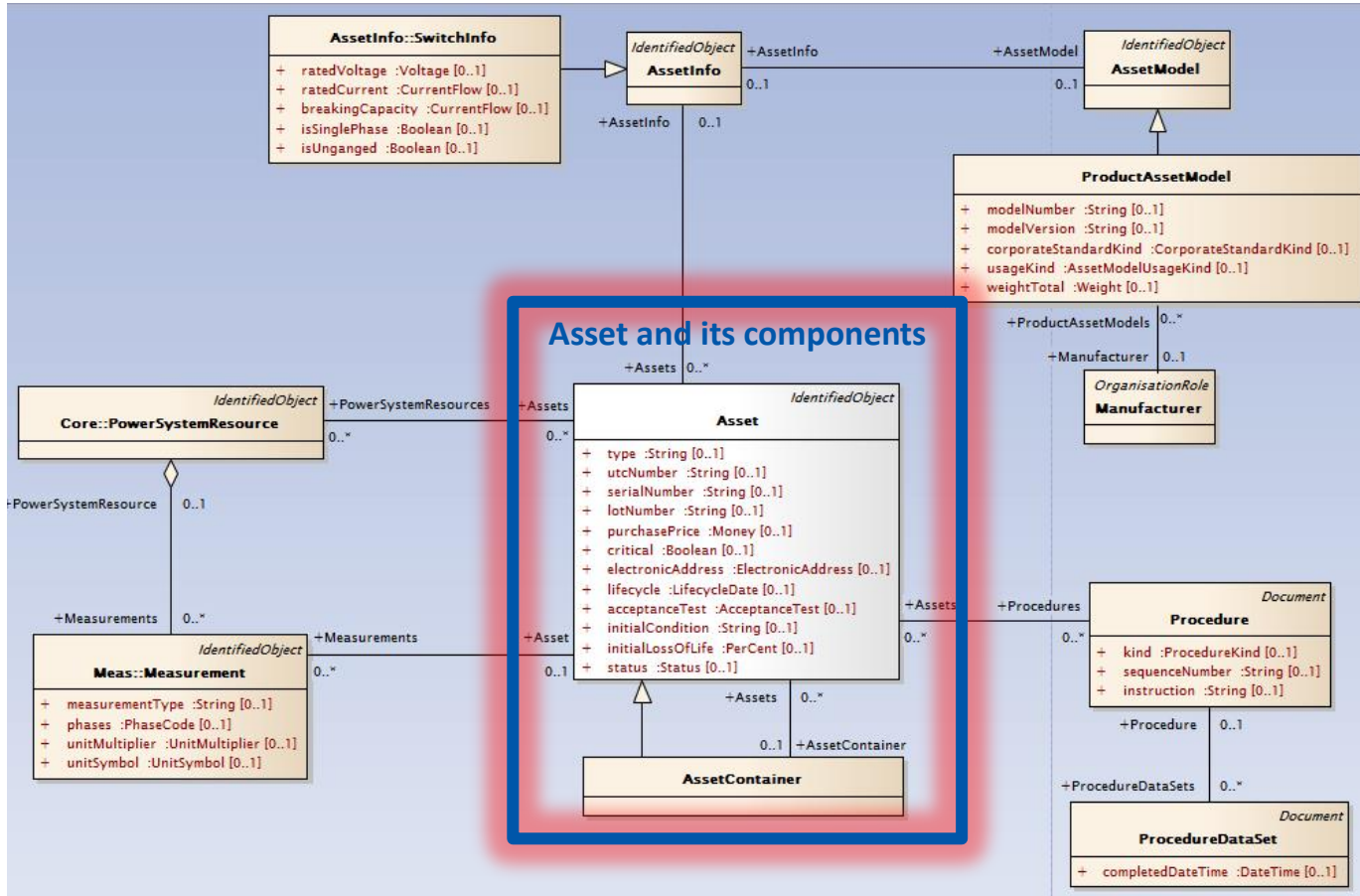


For more details contact Justin Thibault (jthibault@epri.com) or Sean Crimmins (scrimmins@epri.com)

CIM Support for Asset Health Information

- The skeleton is there
 - **Asset and its components** - [Asset](#) and [AssetContainer](#) classes, and their children
 - **Nameplate** – [AssetInfo](#) child classes
 - **Model/Manufacturer** – [ProductAssetModel](#) and [Manufacturer](#) classes
 - **Test/Inspection/Maintanance Results** – [ProcedureDataSet](#) child classes
 - **Network model role** – [PowerSystemResource](#) child classes
 - **Measurements** – [Measurment](#) and [MeasurementValue](#) child classes

CIM Support for Asset Health Information



Benefit of adapting IEC Common Information Model (CIM)

- Business Capabilities
 - System Development Planning (SDP)
 - System Operation (SO)
 - Market Participation
- Study and Simulation
 - Steady-State Power Flow analysis
 - Transient Stability analysis
- Application Services
 - Power System Analytic tools
 - Asset Management
 - Asset health
 - Fault handling

