TC 57

TC 57
CIM Model Manager Report

CIMUg New Orleans, 24 October 2012

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CMM Responsibilities/Activities

- WG 13 issues discussions weekly
- Coordinate new CIM modeling
- Address issues for ENTSO-E
- Work with other Model Managers
  - Meeting of all Model Managers in Nuremberg and Interlaken
- Clean the model for “jCleanCIM” errors
- Maintaining issues list and change log
- Respond to email and CIMug questions

Modeling Issues Meetings

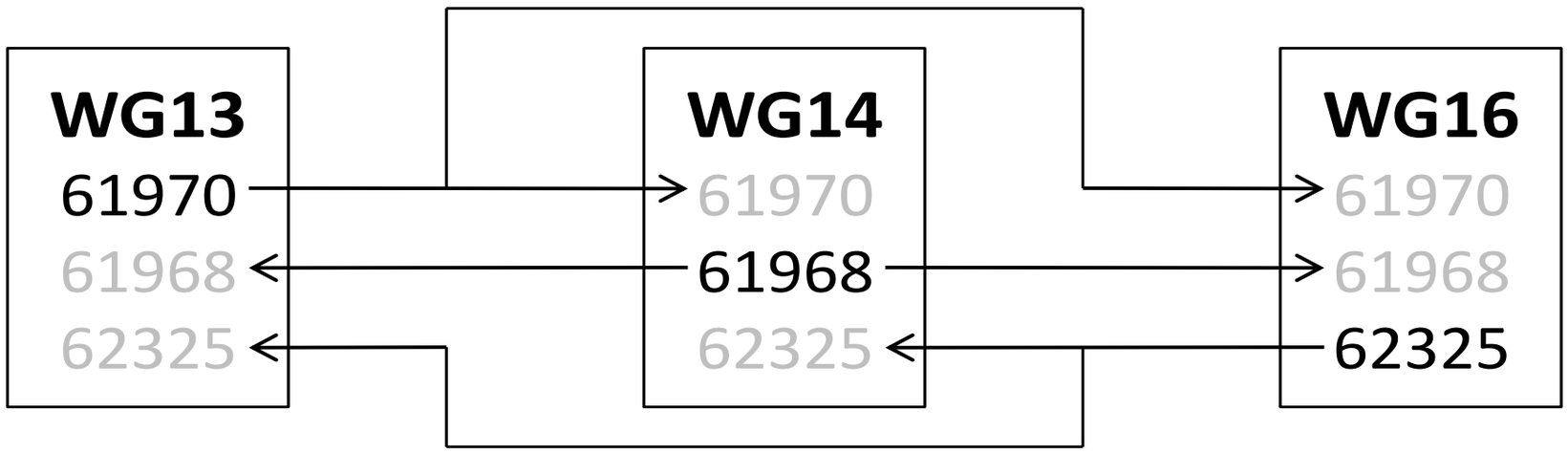
- Regular WG13 Issues web conferences
- Weekly meetings Wed 10 AM US Central time
- Typically 5 to 10 people attend
- Steady progress on ENTSO-E issues and HVDC
- Cross WG participation in meetings is really helping
- We now have sharepoint access across WG13,14,16

Issues summary counts

- WG13 issue counts
  - Open = 68
  - Review = 11
  - Closed = 860

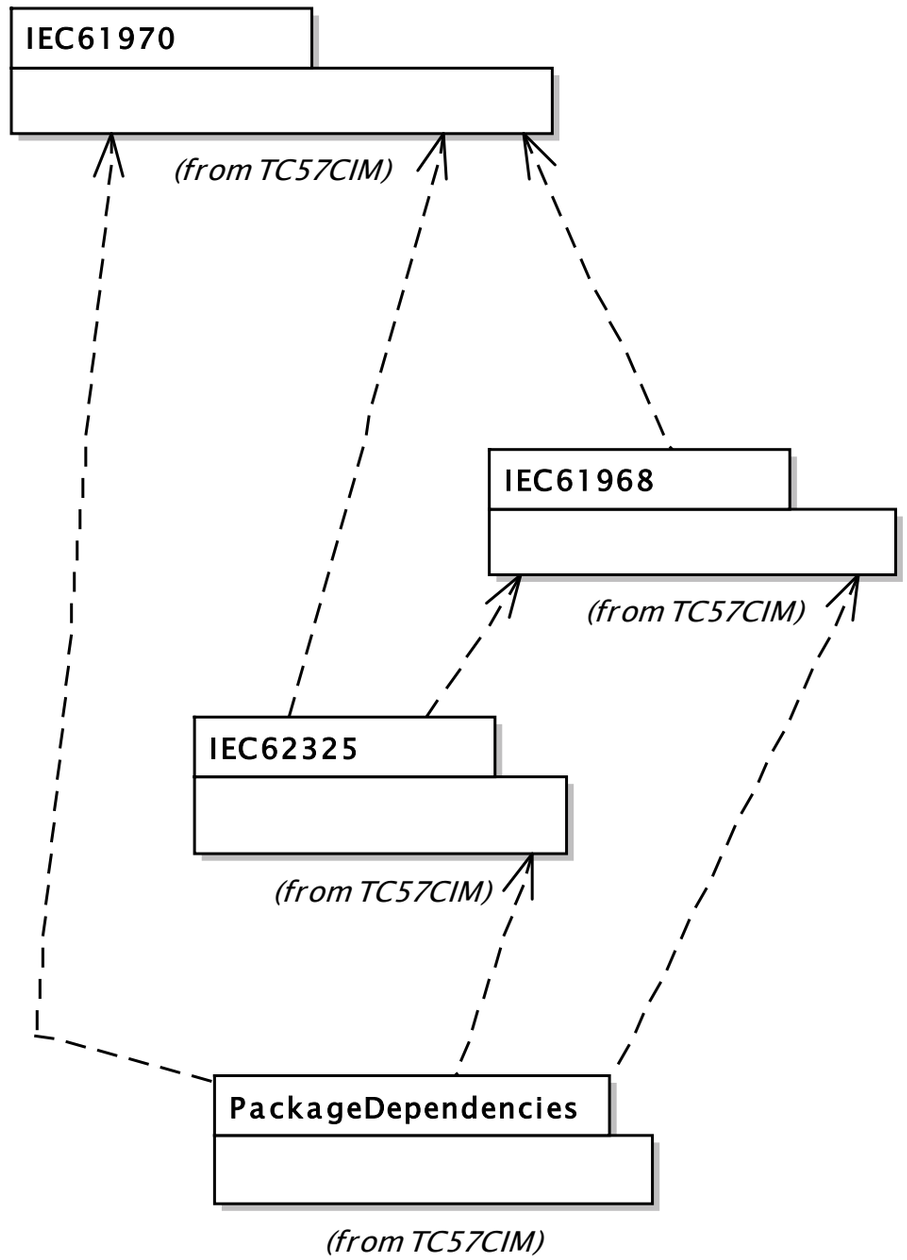
- Combined open issues
  - Open = 37
  - Review = 19
  - Closed = 132

Model Assembly from WG's



- 61970 Package (WG 13) is independent of other packages
- 61968 Package (WG 14) is dependent on 61970 package
- 62325 Package (WG 16) is dependent on 61970 and61968 packages

Model Assembly from WG's



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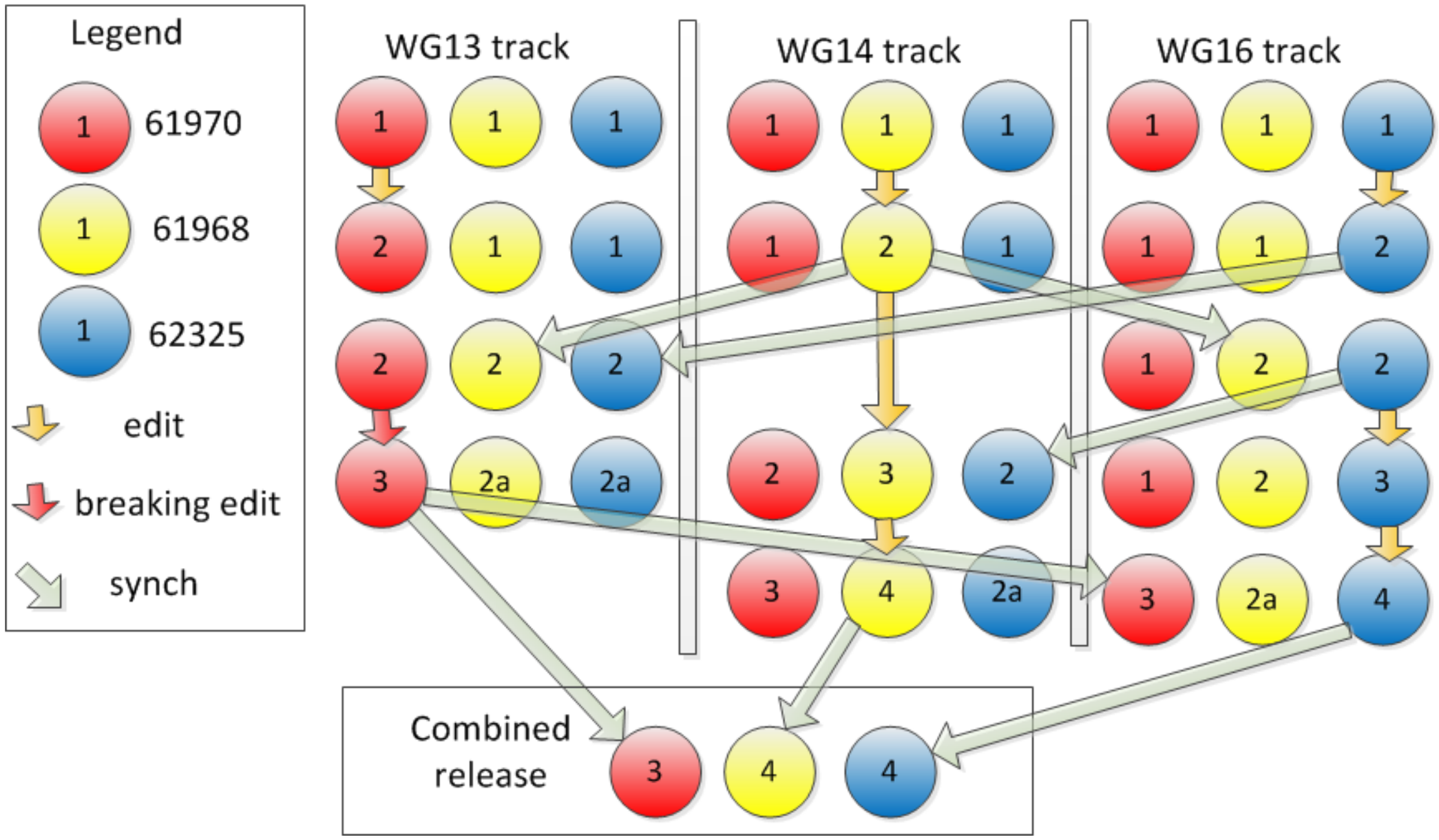
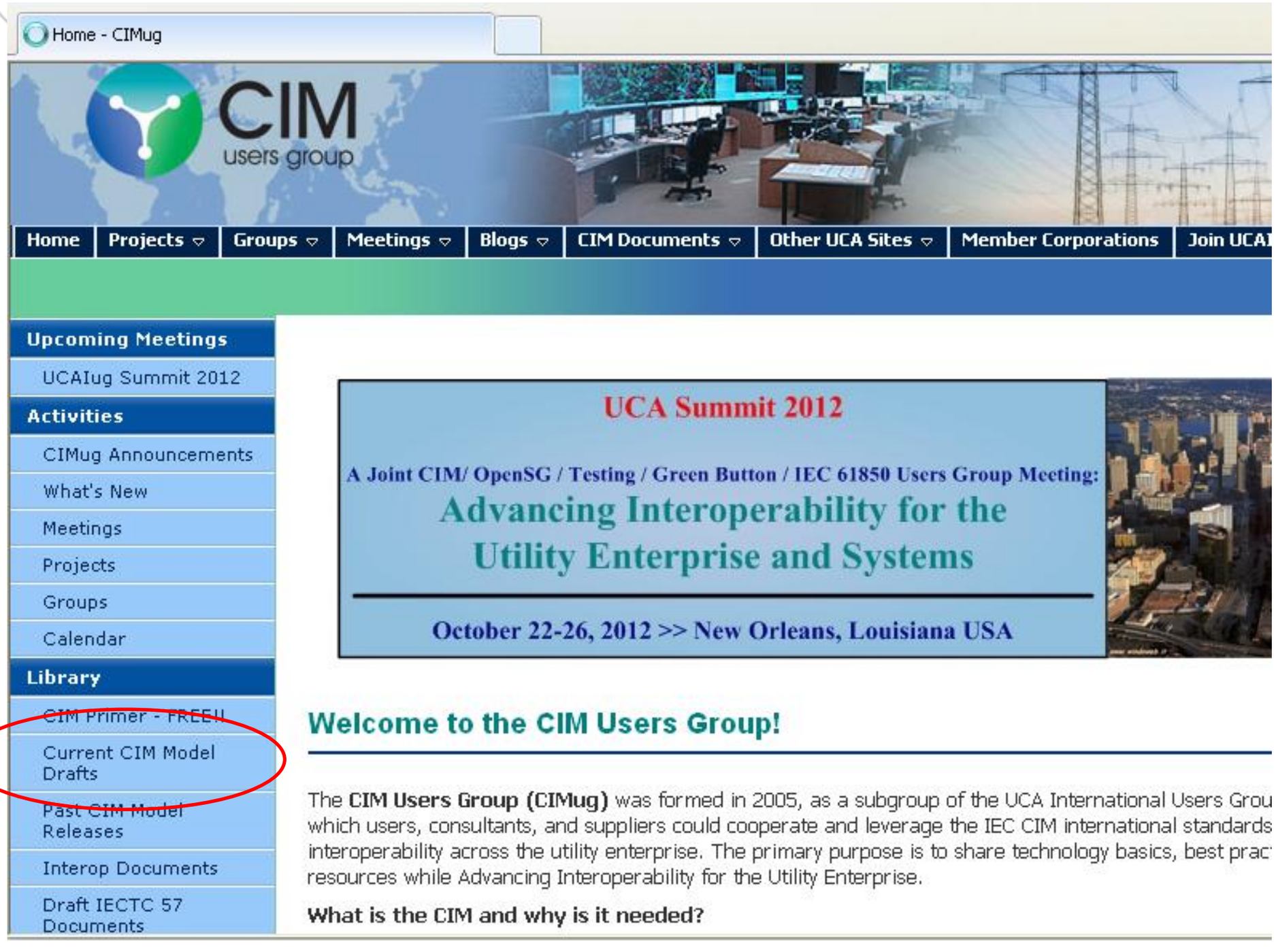
Model Assembly from WG's



CIM UML and Related Files



CIM UML and Related Files

CIM UML and Related Files

- Zip file of combined UML includes model and related documents from WG 13, WG 14, and WG 16.

- Model name includes model version from each WG

iec61970cim16v13_iec61968cim12v05_iec62325cim02v05

- 61970 CIM 16 version 13 (WG 13)
- 61968 CIM 12 version 5 (WG 14)
- 62325 CIM 2 version 5 (WG 16)

CIM UML and Related Files

General Files

- EA UML model

iec61970cim16v13_iec61968cim12v05_iec62325cim02v05.eap

- XMI formats exported from EA
  - XMI for CIMTool
  - XMI 1.1
  - XMI 2.1
- Combined Issues list

combined-CIM-issues-2012-10-17.xlsx

- jCleanCim Report

jCleanCim-iec61970cim16v13_iec61968cim12v05_iec62325cim02v05.log

CIM UML and Related Files

WG 13 Files

- WG 13 Issues List

  wg13-CIM-issues-2012-09-26.xlsx

- WG 13 Modeling and Issues Report

  wg13-cim16-report-2012-09-26.doc

- 61970 Change Log

iec61970cim16v13_iec61968cim12v05_iec62325cim02v05-changes.docx

CIM UML and Related Files

WG 14 Files

- WG 14 Issues List
  wg14-CIM-issues-2012-10-14.xlsx
- WG 134 Change Log
  wg14-change-log.txt

CIM UML and Related Files

WG 16 Files

- 62325 Release Notes
  iec62325cim02v05-changes.rtf
- 62325 Change Log
  IEC 62325 change log.xls

WG 13 Issues List

	A	B	C	D	E	F	
1	Issue No.	Authors / Contact info	Date Submitted	Clause/ Subclause/ Paragraph/ Figure/ Table	Description of Issue	Proposed Resolution	Decision
916	13_90	ENTSO-E	8/17/2011	Wires	**ENTSO-E 12 - SynchronousMachine PU** Some attributes need to be PU.i		
917	13_91	ENTSO-E	8/17/2011	Equivalents	**ENTSO-E 13 - EquivalentInjection support Ward** EquivalentInjeciton should be able to represent extended Ward.	Need to deterine the exact needs here.	
918	13_92	ENTSO-E	8/17/2011	Equivalents	**ENTSO-E 14 EquivalentNetwork-EquivalentEquipment optional** The association should be optional, thus allowing equivalents that are not contained in any specific EquivalentNetwork.		
919	13_93	ENTSO-E	8/17/2011	DiagramLayout	**ENTSO-E 15 Difference message header parallel** The header structure has changed since 2010, but the 552 does not provide the right format for the new header. According to IEC 61970-552, page 24, the header is embedded in the DifferenceModel statement. The IEC 61970-552 should be corrected so that header is parallel with the DifferenceModel statement.		Update 6197
920	13_94	ENTSO-E	8/17/2011	DiagramLayout	**ENTSO-E 16 DiagramObject rotation** The documentation of the DiagramObject.rotation should specify the meaning of zero degrees and the rotation direction (clockwise/counter clockwise)	Alan agreed this needs clarified. Alan to give documenation update for this	
921	13_95	ENTSO-E	8/17/2011	StateVariables	**ENTSO-E 17 SvShortCircuit is not useful** The class should be reconsidered. It is suggested to be deleted. It does not contain input data, only results, but it is unclear for which short-circuit settings the result values are given (single phase, 3-phase, etc.; max or min currents; short-circuit location, etc.).	This might warrant WG14 discussion also.	
	13_96	Kendall Demaree	8/18/2011	Topology	**BusNameMarker needs priority attribute** To use the name markers we need a priority when multiple names are connected into one bus. This is from Statnett.	Add new attribute to the UML model of BusNameMarker The suggestion it to use a priority number to define which cim:BusNameMarker should be used. Based on the	Used name 61970cim16 of CIMDatat

WG 13 Issues List

	F	G	H	I	J	K	L
	Proposed Resolution	**Decision**	**Status**	**Based on release**	**Solution (to be) applied to release**	**Solution applied date**	**Solution applied by**
			Open	61970cim15v28	61970cim16		
d	Need to deterine the exact needs here.		Open	61970cim15v28	61970cim16		
			Open	61970cim15v28	61970cim16		
		Update 61970-552.	Open	61970cim15v28	61970cim16		
w							
	Alan agreed this needs clarified. Alan to give documenation update for this		Open	61970cim15v28	61970cim16		
e							
	This might warrant WG14 discussion also.		Open	61970cim15v28	61970cim16		
to							
}-							
	Add new attribute to the UML model of BusNameMarker	Used name attribute simply "priority" in 61970cim16v01. Still need to discuss use of CIMDatatype for priority.	Closed	61970cim15v32	61970cim16v01	8/18/2011	KDD
s	The suggestion it to use a priority number to define which cim:BusNameMarker should be used. Based on the						

iec61970cim16v04_...-changes.docx (example)

iec61970cim16v04_iec61968cim12v01_iec62325cim01v07 release

2012-01-10

Includes new IEC61970 package.

Changes for iec61970cim16v04 package

List of breaking changes since cim15v33 are below:

- Changed name of class PhaseTapChangerAsymetrical and PhaseTapChangerSymetrical to include two m's. Changed to PhaseTapChangerAsymmetrical and PhaseTapChangerSymmetrical. Change made in cim16v02.

Added issue 13_108 – PotentialTransformer.ptClass attribute is ambiguous string

Change name of LineTrap to be WaveTrap

Statnett does not want LineTrap name after all and WaveTrap is better name which Statnett also prefers. So the recently closed issue 13_101 was updated and closed. Note this name change was made after we decided to keep the LineTrap name, but we had kept that name (only a week old) because we thought Statnett wanted it.

Add Petersen coil normalImpedance attribute

Added attribute.

Add PotentialTransformer type as inductive or capacitiveCoupling

Add new enumeration PotentialTransformerKind with enums of inductive and capacitiveCoupling.

Add new attribute to PotentialTransformer.type:PotentialTransformerKind.

Issue 13_102 change to ToClose.

Fixed spelling of positive in class SvShortCircuit attribute rPerX documentation.

Minor spelling correction in documentation. Issue 13_107 closed.

Status Summary

- 61970 CIM 15
  - 61970cim15v33 is “final” release – September 2011
  - 61970-301 Edition 5 to IEC – February 2012
- 61970 CIM 16
  - 61970cim16v10 tested at July 2012 ENTSO-E IOP
  - Testing included Short Circuit Calculations
  - Testing did **not** include HVDC or Dynamics

CIM 16 Roadmap

- Finalize HVDC Model by Feb. 2013
  - Will include Current Source Converter
  - May not include Voltage Source Converter yet
- Dynamics
  - Standard Models is complete
  - User Defined Models in progress
- 2013 ENTSO-E IOP
  - Test HVDC Model
  - Test Dynamics Standard Models

CIM 16 Roadmap

- Freeze CIM UML following ENTSO-E 2013 IOP
- Release 61970-301 Edition 6 to IEC

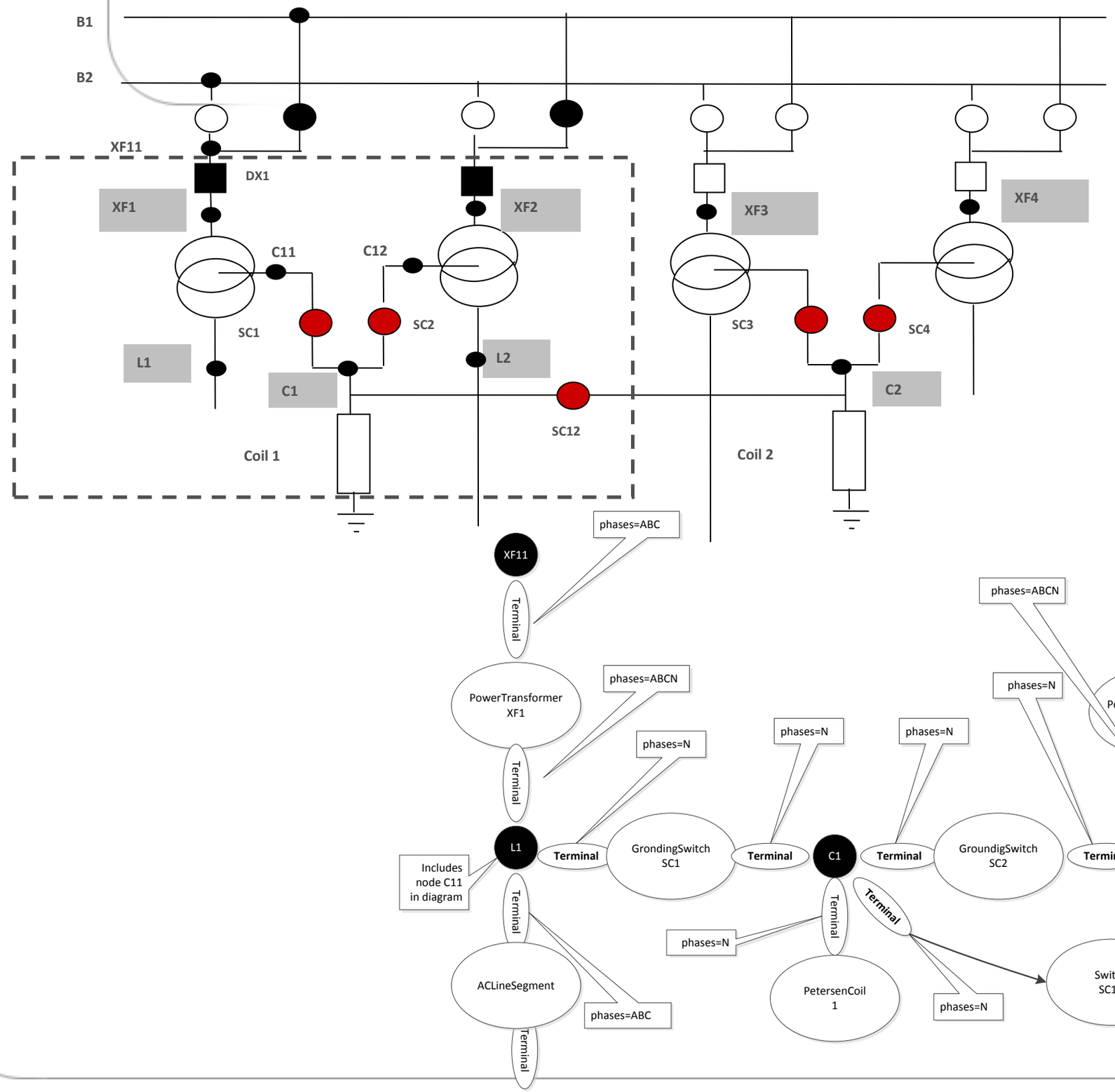
CIM16 Changes

- 61970 CIM16 model additions
  - Grounding models (Petersen coil and related models)
  - Short Circuit Parameters
  - HVDC
- Dynamics from EPRI project

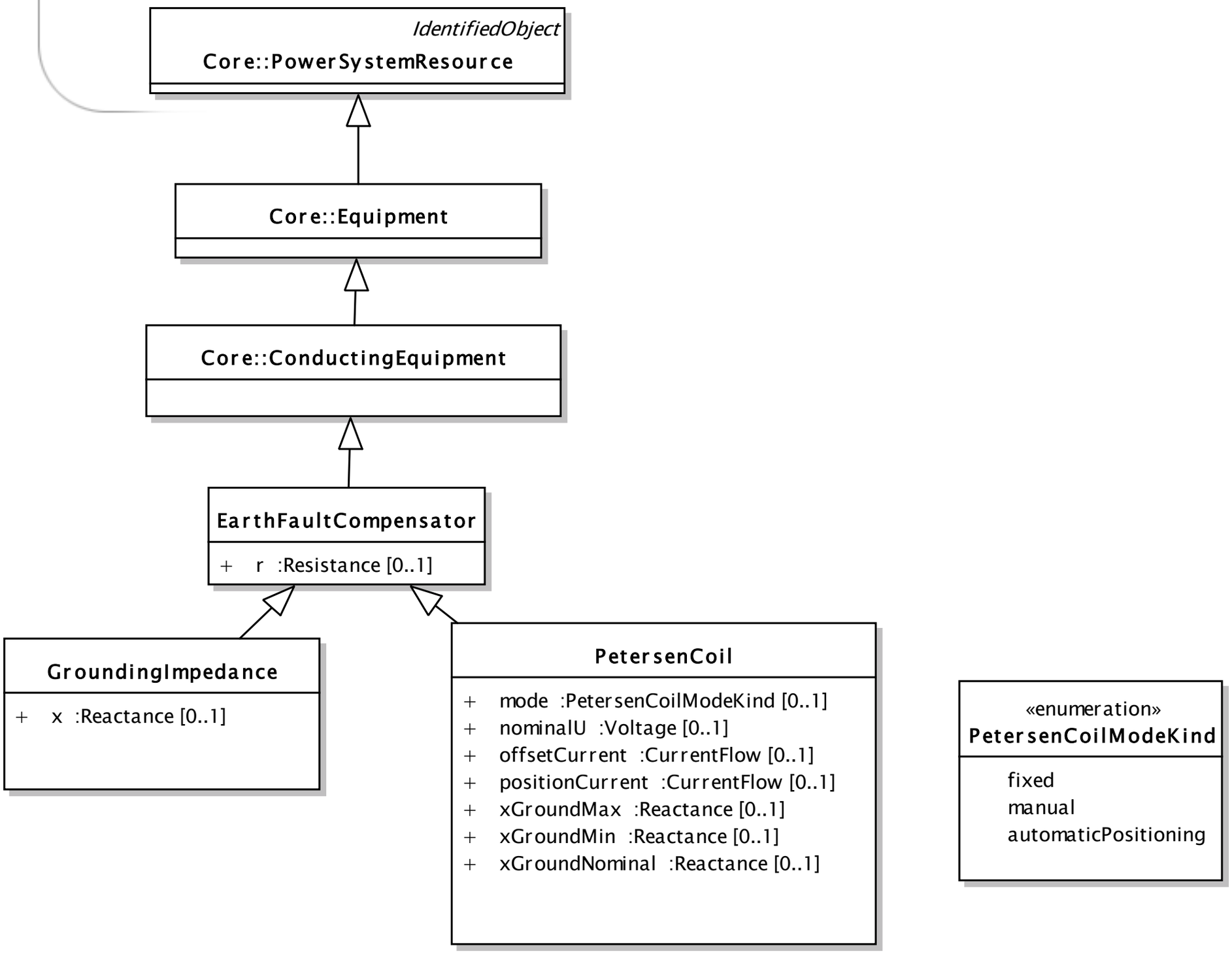
CIM16 Changes

- 61970 CIM16 New Topics
  - System Integrity Protection Schemes - SIPS (aka Remedial Action Schemes - RAS)
  - Operational limits enhancements
    - Most restrictive equipment
    - Environmental dependencies
  - Load model (combined #607, #1088)
  - Wind Generation

PetersenCoil and grounding



PetersenCoil and Grounding



ENTSO-E Issues

Additions made for ENTSO-E 2011 IOP, but not added to frozen CIM 15.

- ExternalNetworkInjection (new class)
  - Subtype of RegulatingCondEquip
  - Previously called ExternalNetwork for IOP
  - Used for Short Circuit calculations (IEC 60909)

ENTSO-E Issues

Added attribute BusbarSection.ipMax

- Maximum allowable peak short-circuit current (IEC 60909)

Added attribute RotatingMachine.ratedPowerFactor

- Power factor (nameplate data)
- Used primarily for short-circuit (IEC 60909)

Added attribute RotatingMachine.ratedU

- Rated voltage (nameplate data)
- Used primarily for short-circuit (IEC 60909)

ENTSO-E Issues

Added attribute ACLineSegment.
shortCircuitEndTemperature

- Maximum permitted temperature at the end of SC for the calculation of minimum short-circuit currents.

Added attributes added to PowerTransformer

- **beforeShCircuitHighestOperatingCurrent** - highest operating current (Ib in the IEC 60909-0) before short circuit
- **beforeShCircuitHighestOperatingVoltage** - highest operating voltage (Ub in the IEC 60909-0) before short circuit

ENTSO-E Issues

Attributes added to PowerTransformer (cont'd)

- **beforeShortCircuitAnglePf** - angle of power factor before short circuit (phib in the IEC 60909-0)
- **highSideMinOperatingU** - The minimum operating voltage (uQmin in the IEC 60909-0) at the high voltage side (Q side) of the unit transformer of the power station unit
- **isPartOfGeneratorUnit** - Indicates whether the machine is part of a power station unit (IEC 60909)
- **operationalValuesConsidered** - used to define if the data (other attributes related to short circuit data exchange) defines long term operational conditions or not

ENTSO-E Issues

Attributes added to SynchronousMachine

- **earthing** - Indicates whether or not the generator is earthed
- **earthingStarPoint**R - Generator star point earthing resistance
- **earthingStarPointX** - Generator star point earthing reactance
- **equivalentResistance** - Equivalent resistance of generator
- **ikk** - Steady-state short-circuit current of generator with compound excitation during 3-phase short circuit
- **mu** - Factor to calculate the breaking current (Section 4.5.2.1 in the IEC 60909-0)

ENTSO-E Issues

Attributes added to EquivalentInjection

- **minQ and maxQ** - Used for modeling of infeed for load flow exchange. Not used for short circuit modeling.
- **r** - Positive sequence resistance, used to represent Extended-Ward (IEC 60909)
- **r0** - Zero sequence resistance (IEC 60909)
- **r2** - Negative sequence resistance (IEC 60909)
- **x** - Positive sequence reactance (IEC 60909)
- **x0** - Zero sequence reactance (IEC 60909)
- **x2** - Negative sequence reactance (IEC 60909)

Also added association to ReactiveCapabilityCurve

ENTSO-E Issues

Attributes added to EquivalentBranch (cont'd)

- **positiveR12** - Positive sequence series resistance from terminal 1 to terminal 2. (IEC 60909)
- **positiveR21** - Positive sequence series resistance from terminal 2 to terminal 1. (IEC 60909)
- **positiveX12** - Positive sequence series reactance from terminal 1 to terminal 2. (IEC 60909)
- **positiveX21** - Positive sequence series reactance from terminal 2 to terminal 1. (IEC 60909)
- Similarly added negativeR12, negativeR21, negativeX12, negativeX21, zeroR12, zeroR21, zeroX12, and zeroX21.

ENTSO-E Issues

For EquivalentEquipment

- Changed association to EquivalentNetwork to 0..1 in CIM UML

- EquivalentEquipment (EquivalentInjection, EquivalentBranch, etc.) no longer requires association to an EquivalentNetwork

ENTSO-E Issues

For ControlArea

- Changed association to EnergyArea to 0..1 in CIM UML
- ControlArea no longer requires an associated EnergyArea (LoadArea or SubLoadArea)

ENTSO-E Issues

For PhaseTapChangerNonLinear

- ENTSO-E IOP had used “xMedian to be considered as xMin - the reactance at the minimum tap step.“
- Replaced attribute xMedian with xMin.

ENTSO-E Issues

Attribute Switch.retained

- Originally used to specify switches retained in planning models
- In EMS context flows on retained switches would normally be computed in power flow
- Attribute will be changed to required in the Equipment Profile (61970-452)

ENTSO-E Issues

Attribute DiagramObject.rotation

- Description in UML clarified to indicate that zero degrees is pointing to the top of the diagram and rotation is always clockwise

Class SvShortCircuit

- Removed from State Variables Profile (61970-456) and from CIM UML

ENTSO-E Issues

For TapChanger

- Attributes highStep, lowStep, neutralStep, and normalStep will be changed to required in the Equipment Profile (61970-452)

ENTSO-E Issues

Changes for Generating Unit Subtype Issue

- For enumeration FuelType added “hardCoal” and “oilShale” and clarified description of “gas” to specify natural gas.
- Added attribute “totalEfficiency” to GeneratingUnit to model the efficiency of energy transfer from the initial fuel source to electrical energy.
- Added new attribute windGenUnitType to WindGeneratingUnit to specify “offshore” or “onshore”.

ENTSO-E 2012 IOP Issues

Updated descriptions on:

- SynchronousMachine.r
- ExternalNetworkInjection.governorSCD, minP, and maxP
- SynchronousMachine.satDirectTransX and shortCircuitRotorType

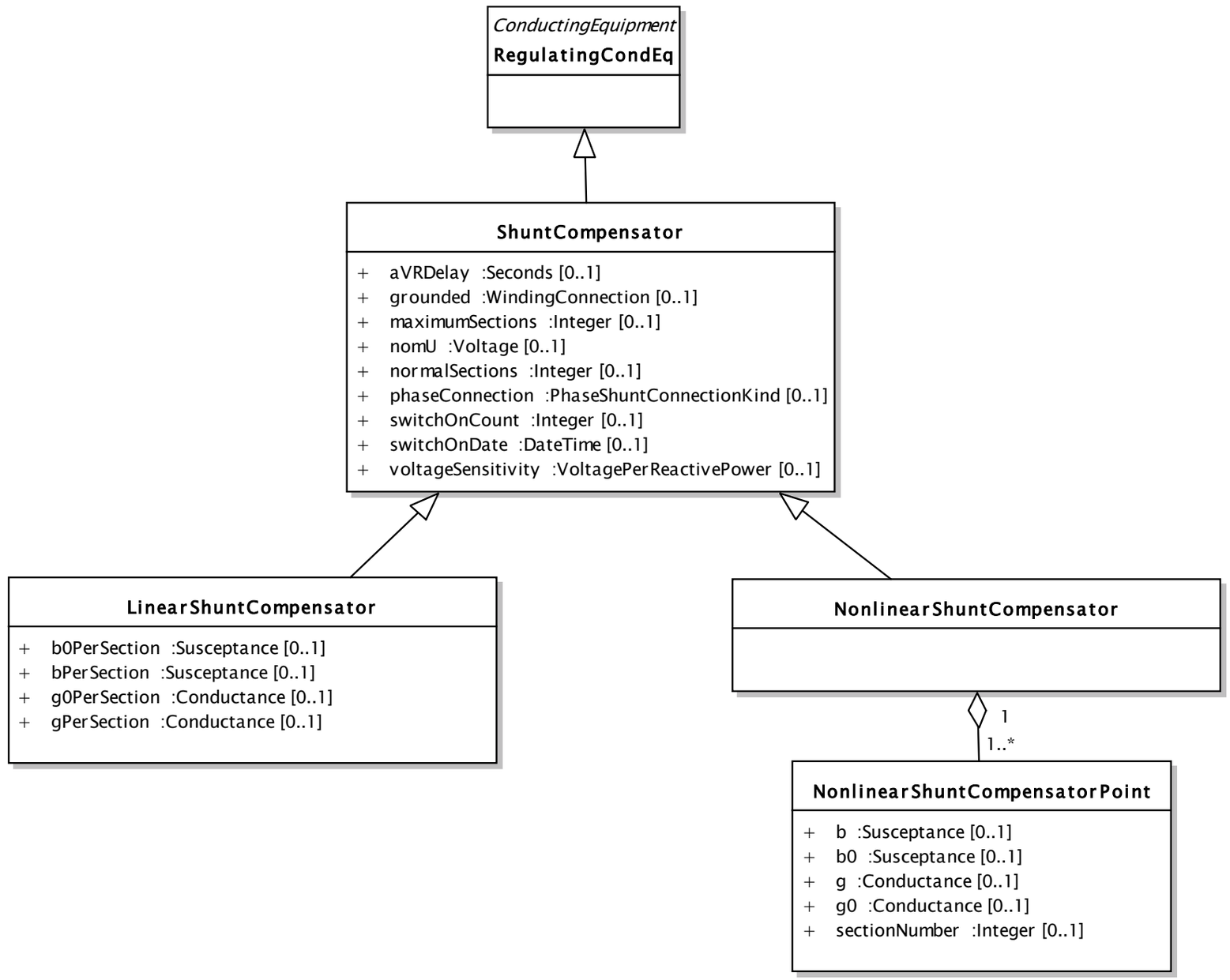
ENTSO-E 2012 IOP Issues

Tentatively agreed to add attribute “type” to EnergySource with values:

- Unspecified
- Photovoltaic
- MarineUnspecified
- MarineTidal
- MarineWave
- MarineCurrents
- MarinePressure

ENTSO-E 2012 IOP Issues

Tentatively agreed to add NonlinearShuntCompensator model:



Remaining ENTSO-E Issues

Exchange of Operating State

- Some values in Equipment Profile change frequently
  - CurrentLimit.value
  - RegulatingControl.value
  - RegulatingControl.mode
- Exchange of Equipment Profile for just these values
- Considering addition of an Operating State profile specifically for input values

HVDC Draft Model

Goals:

- HVDC model that is sufficient for EMS applications and planning
- Model that can be built upon for use with dynamic studies
- Model that can grow as HVDC technology evolves
- Modeling for transient studies is not in scope

HVDC Draft Model

- Initial draft of HVDC model produced by Lars-Ola Osterlund
- Model includes representations for both Current Source Converter and Voltage Source Converter
- Model includes topology modeling for meshed DC networks
- Initial draft of HVDC model added to IEC61970cim16v07 at the end of April
- Modifications and clean-up continue

HVDC Draft Model

CIM Nomenclature

DCBridge

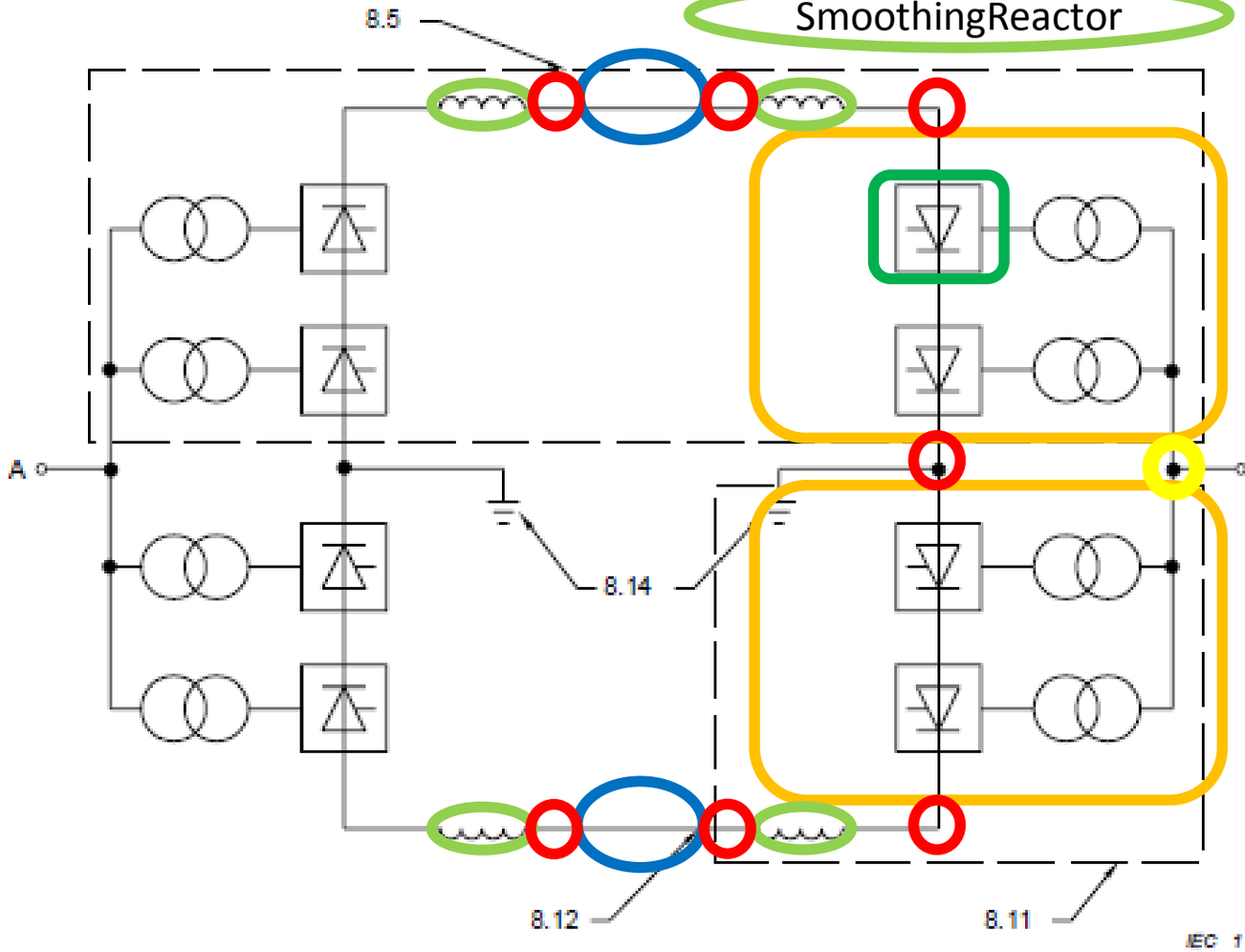
DCPole

DCLineSegment

ConnectivityNode

DCNode

SmoothingReactor



Point of Common Coupling (PCC)

IEC 60633 Nomenclature

Key

A AC system
8.5 HVDC system pole
8.11 Substation pole
8.12 HVDC transmission line
8.14 Earth electrodes

HVDC Draft Model

- The DCPole in CIM is identical with IEC 60633 Substation Pole.
- The old CIM RectifierInverter is identical with the CIM DCPole.
- DCPole is associated with a DCPoleAC for connection to AC network.
- DCPoleACComposite is a subtype of DCPoleAC for simplified modeling.
- Bridge is a subtype of DCPoleAC for detailed modeling.
- DCPoleCSC and DCPoleVSC are subtypes of DCPole to represent Current Source Converter and Voltage Source Converter respectively.

HVDC Draft Model

HVDC Draft CIM Model

- To avoid accidentally mixing DC and AC components in the same grid separate classes are used to define for DC and AC connectivity.
- The characteristics of Terminals and Nodes also differs between AC and DC

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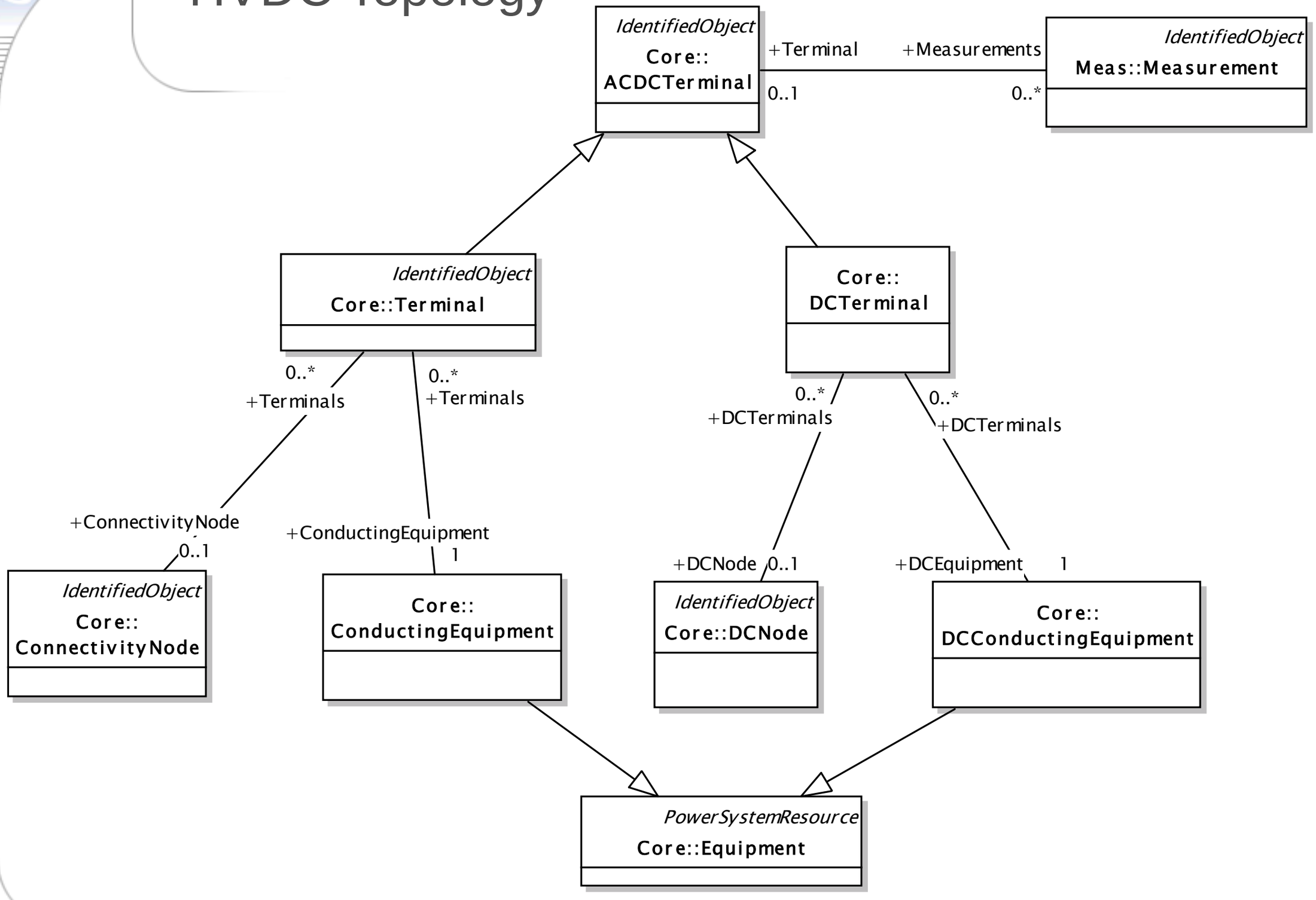
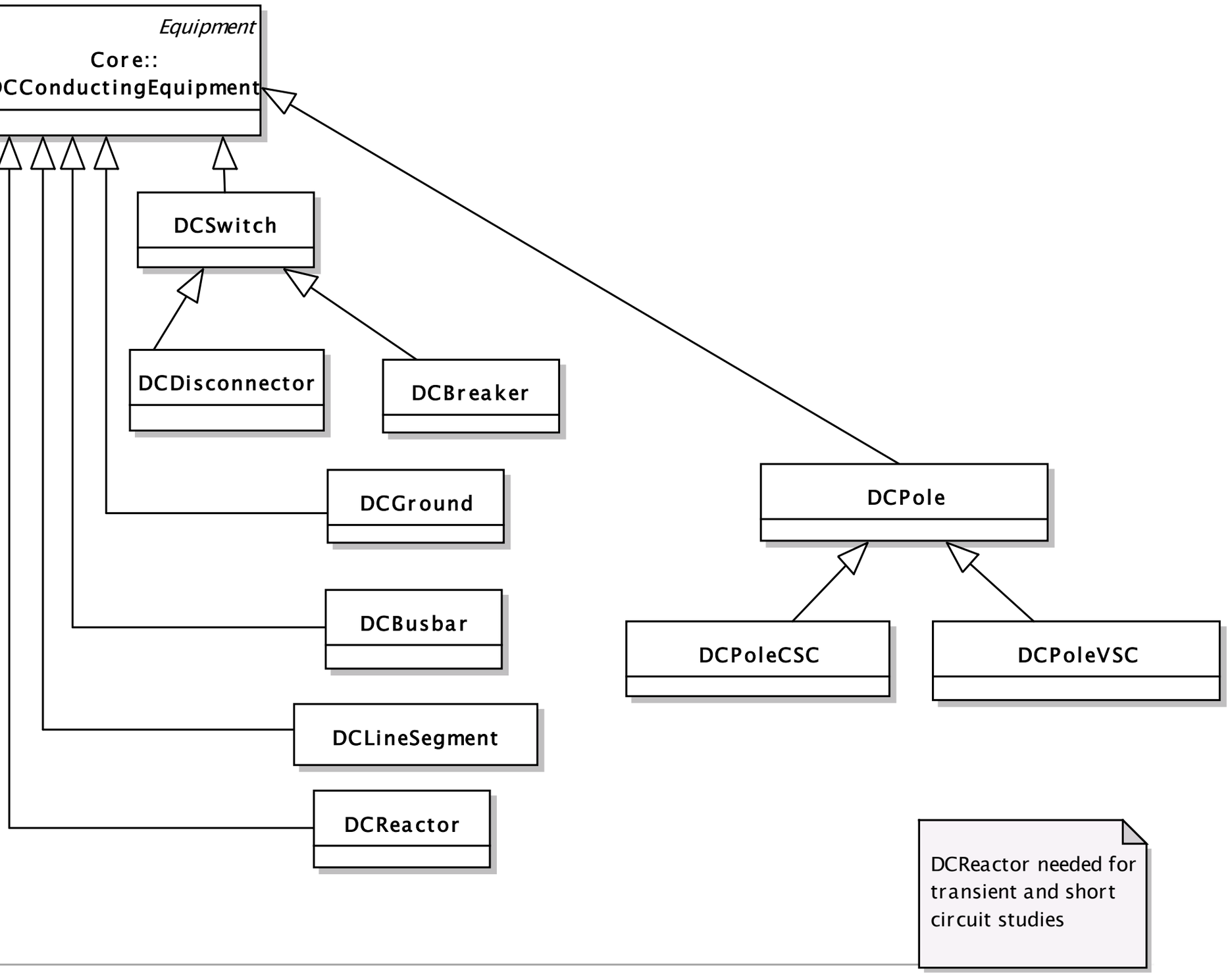
HVDC Draft Model

HVDC Topology



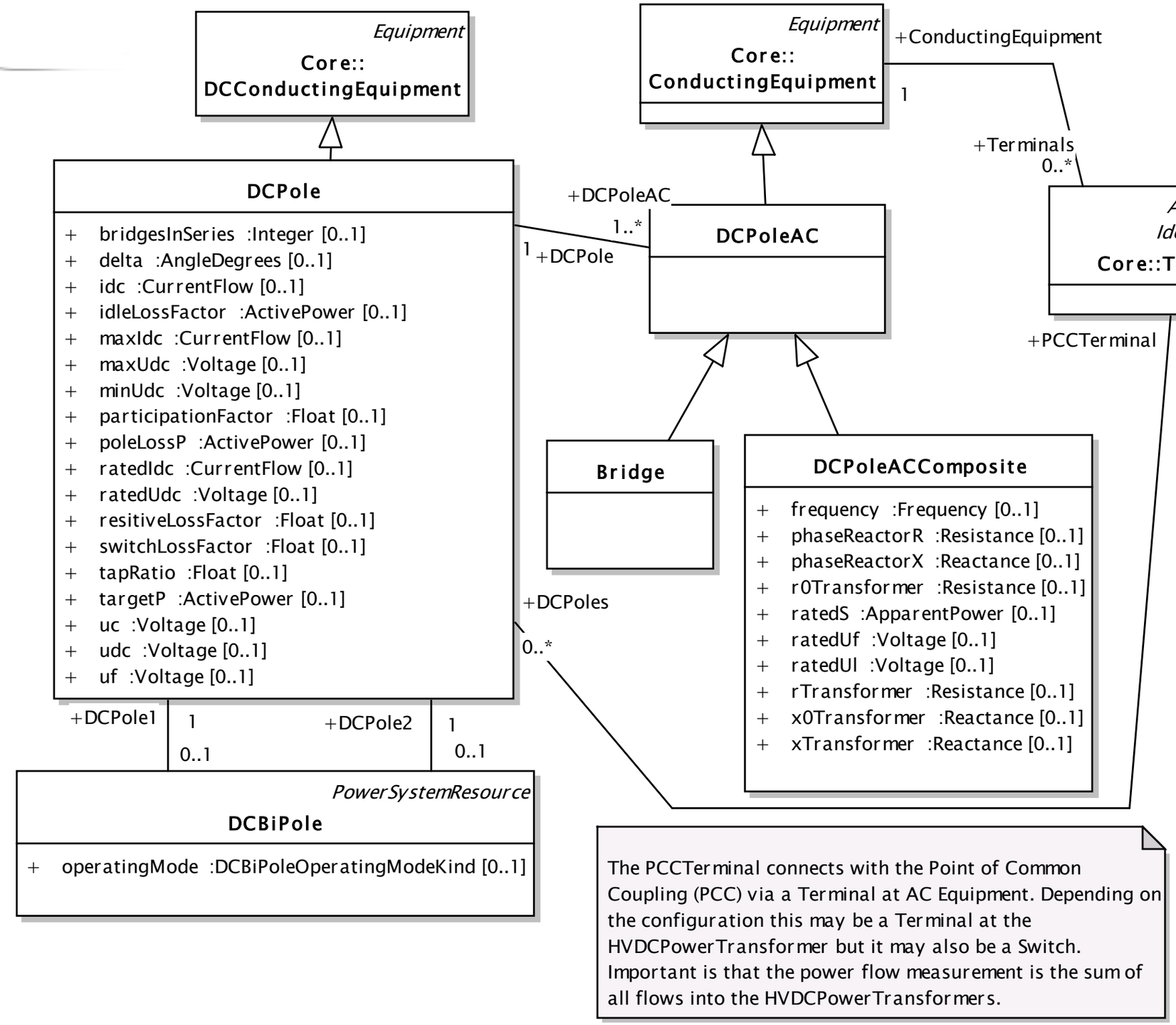
HVDC Draft Model

HVDC Equipment



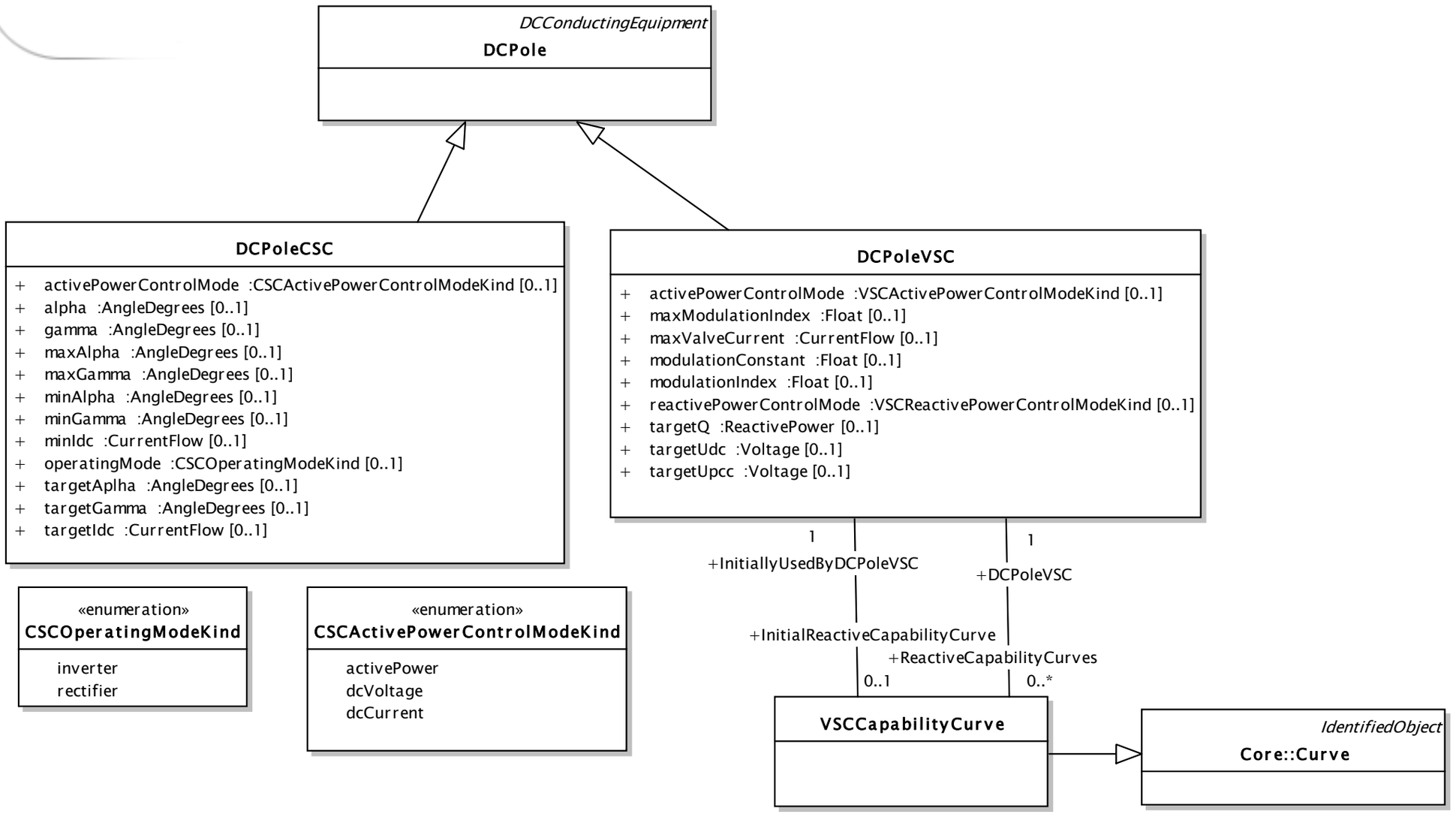
HVDC Draft Model

HVDC Pole Overview



HVDC Draft Model

HVDC Converter Overview



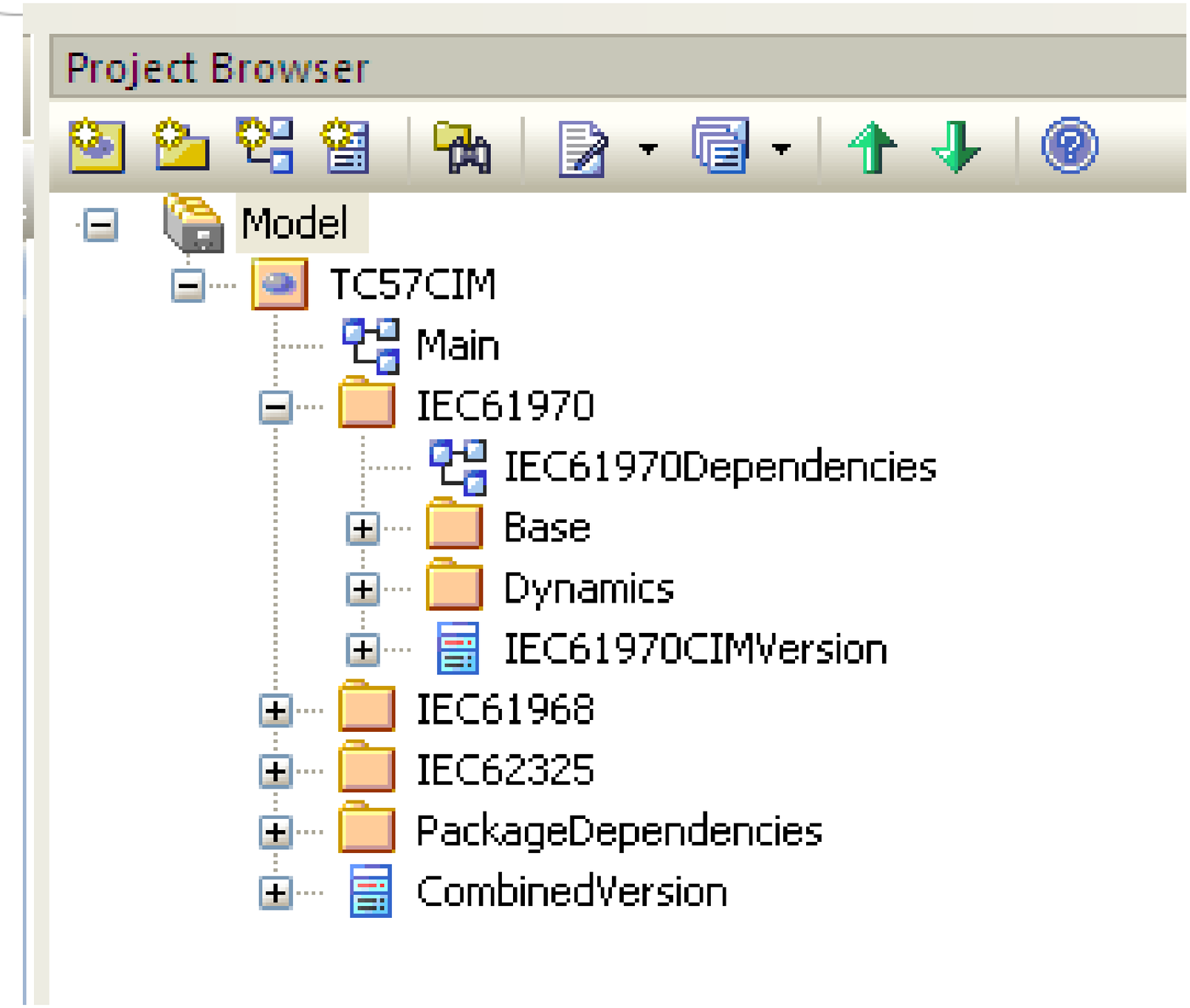
Dynamics

- Dynamics Package in CIM UML was informative in CIM 15

- Modified 61970 Package structure for inclusion of Dynamics in CIM 16

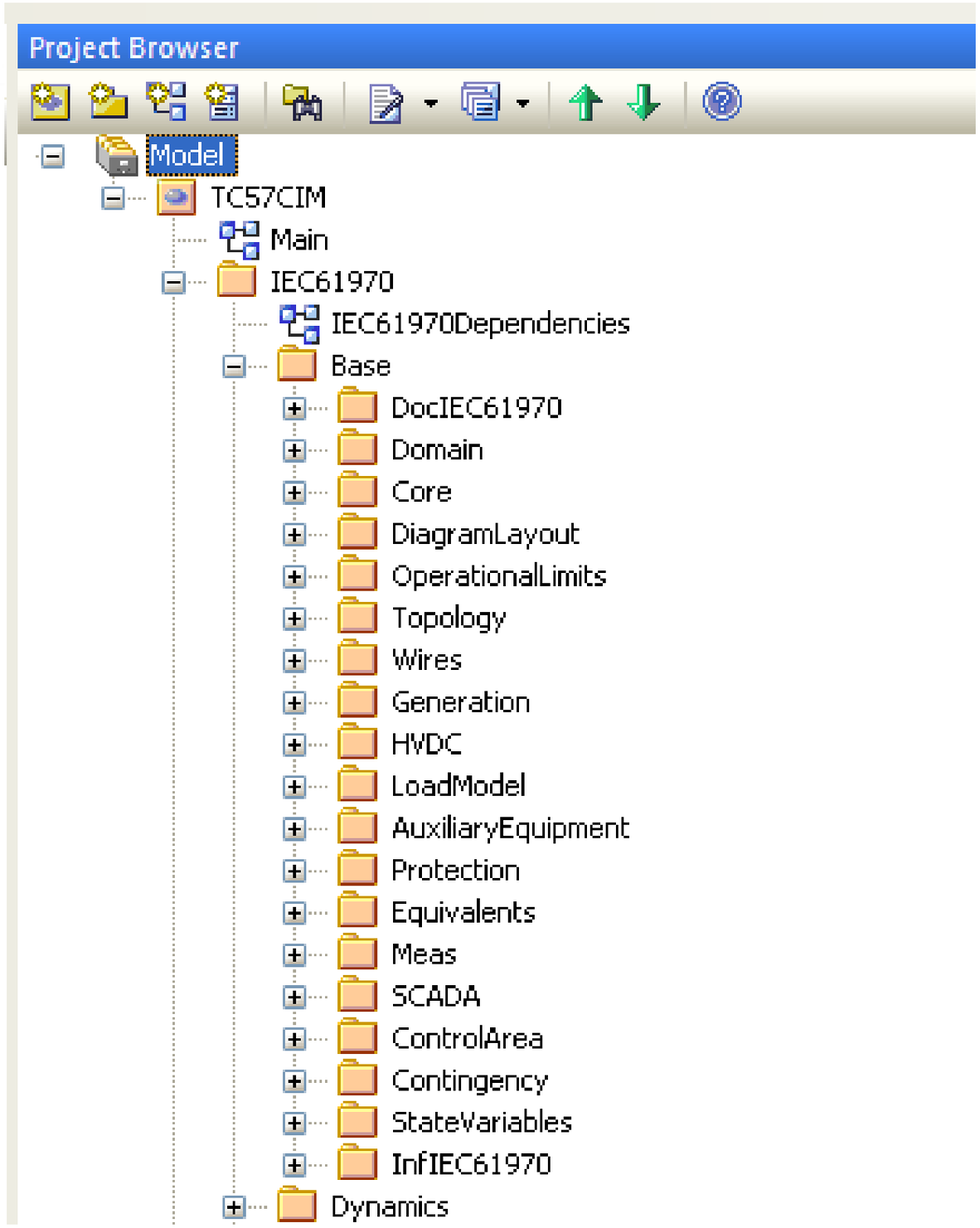
Dynamics

Overview of 61970 Packages



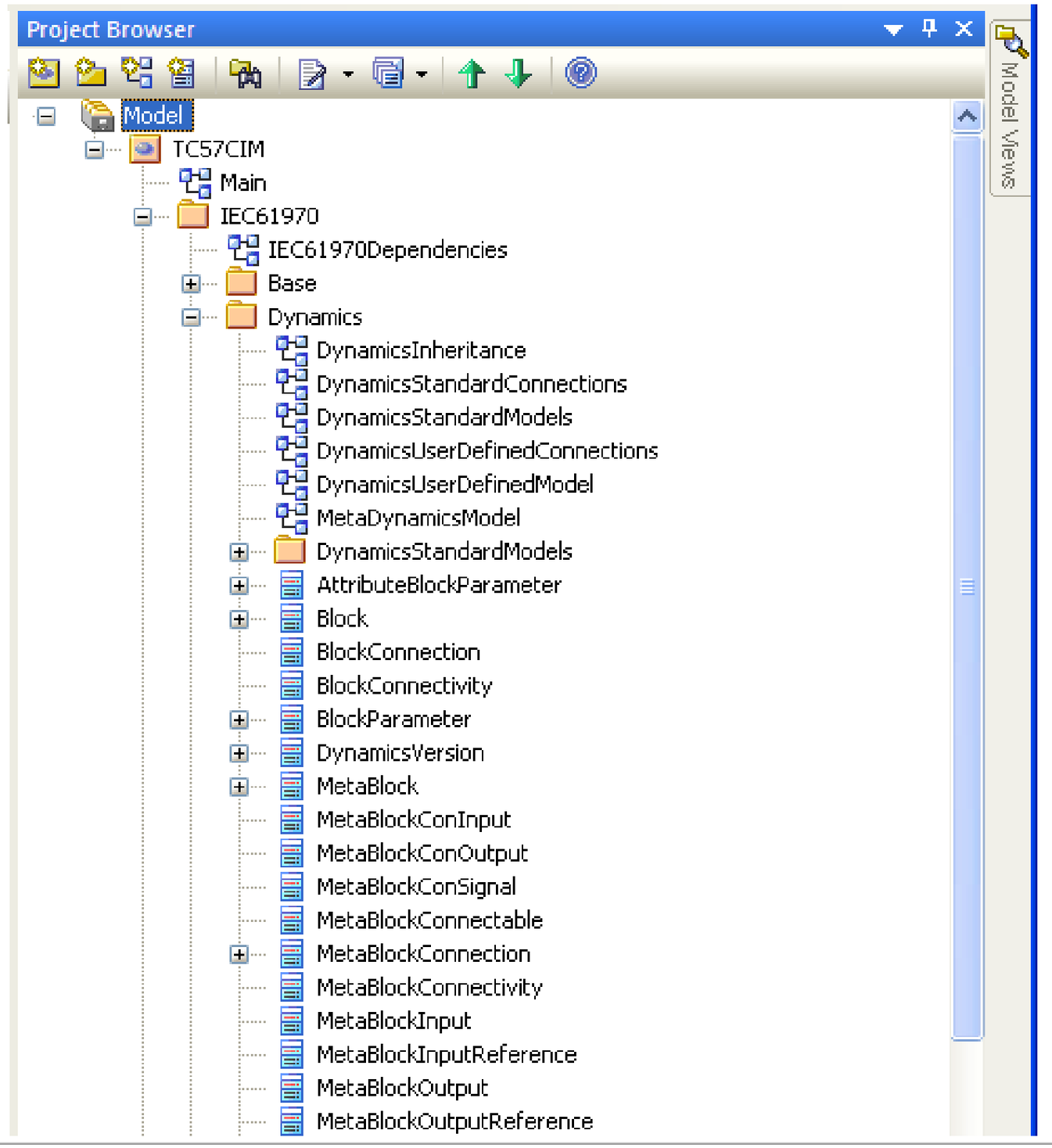
Dynamics

Overview of 61970 Base Packages



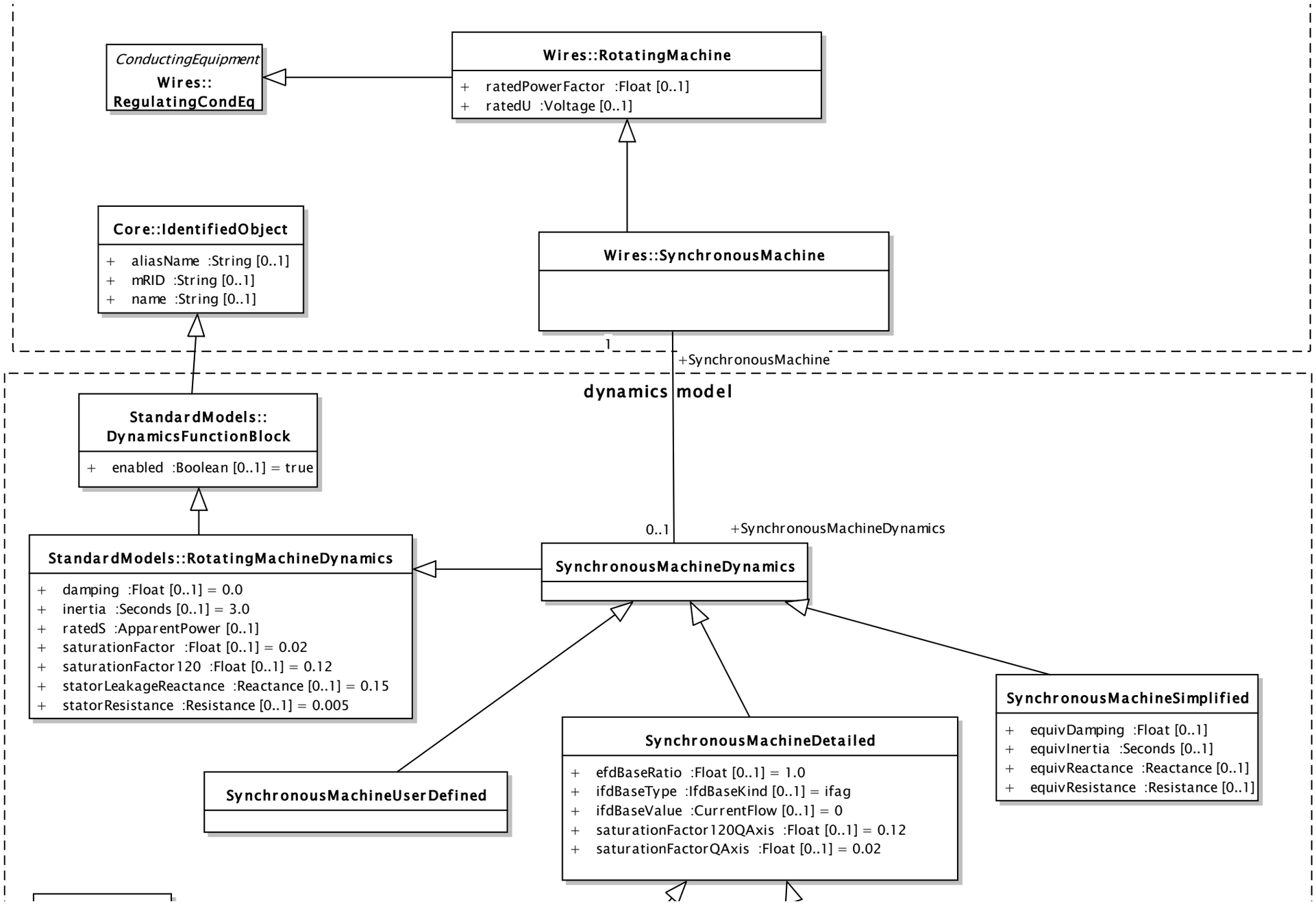
Dynamics

Overview of 61970 Dynamics Packages



Dynamics

Links between Wires and Dynamics Packages



Dynamics

Links between Wires and Dynamics Packages

- SynchronousMachine (Wires) and SynchronousMachineDynamics (Dynamics)
- ASynchronousMachine (Wires) and ASynchronousMachineDynamics (Dynamics)
- EnergyConsumer (Wires) and LoadDynamics (Dynamics)

Summary

- 61970cim15v33 out on sharepoint “final”
- 61970cim16v13 in progress with goals
  - ENTSO-E Issues
  - HVDC
  - Dynamics
- Release of CIM 16 will follow 2013 ENTSO-E IOP
- 61968 and 62325 iterating coordinated in parallel