

CIM for Dynamics

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CIM U Track II
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CIM for Dynamics

- Topics
 - Introduction to Dynamics
 - Dynamics in the CIM
 - Status update

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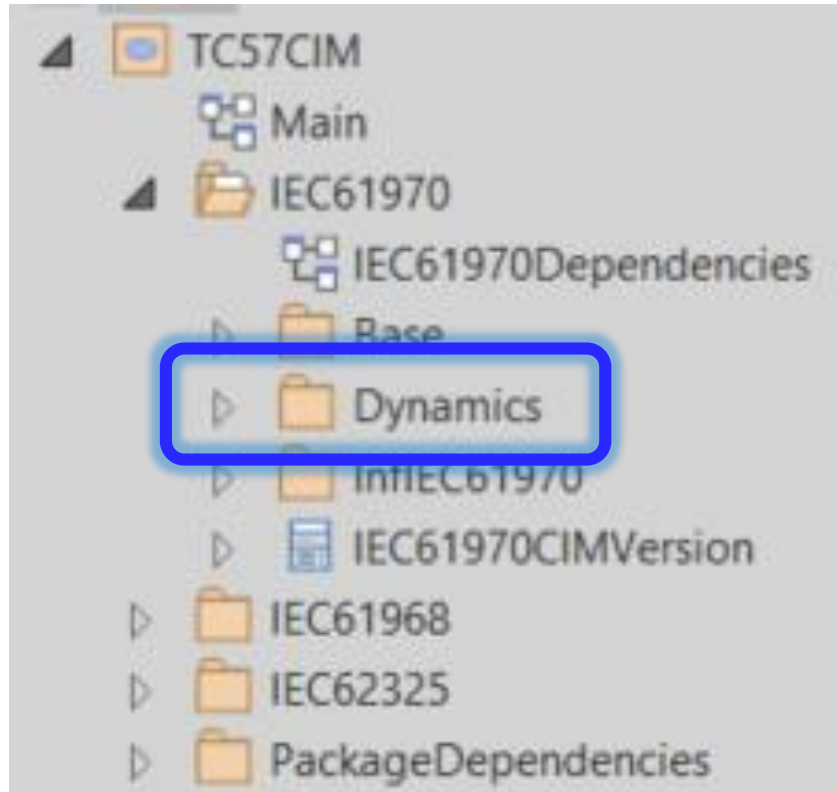
Introduction

- Dynamics simulates transient (sub-cycle) behavior of the grid
- Required data includes:
 - Individual dynamic behavior of each piece of equipment
 - Connectivity and steady state electrical characteristics (EQ)
 - Starting point steady state solution (TP, SV)
- Dynamics models are shared
 - Among transient analysis applications
 - Among TSOs and ISOs
- Background
 - Creation of standard behavior models started in mid-1960s
 - 100+ standard behavior models from IEEE and IEC
 - Multiple defacto standard models

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Dynamics in the CIM

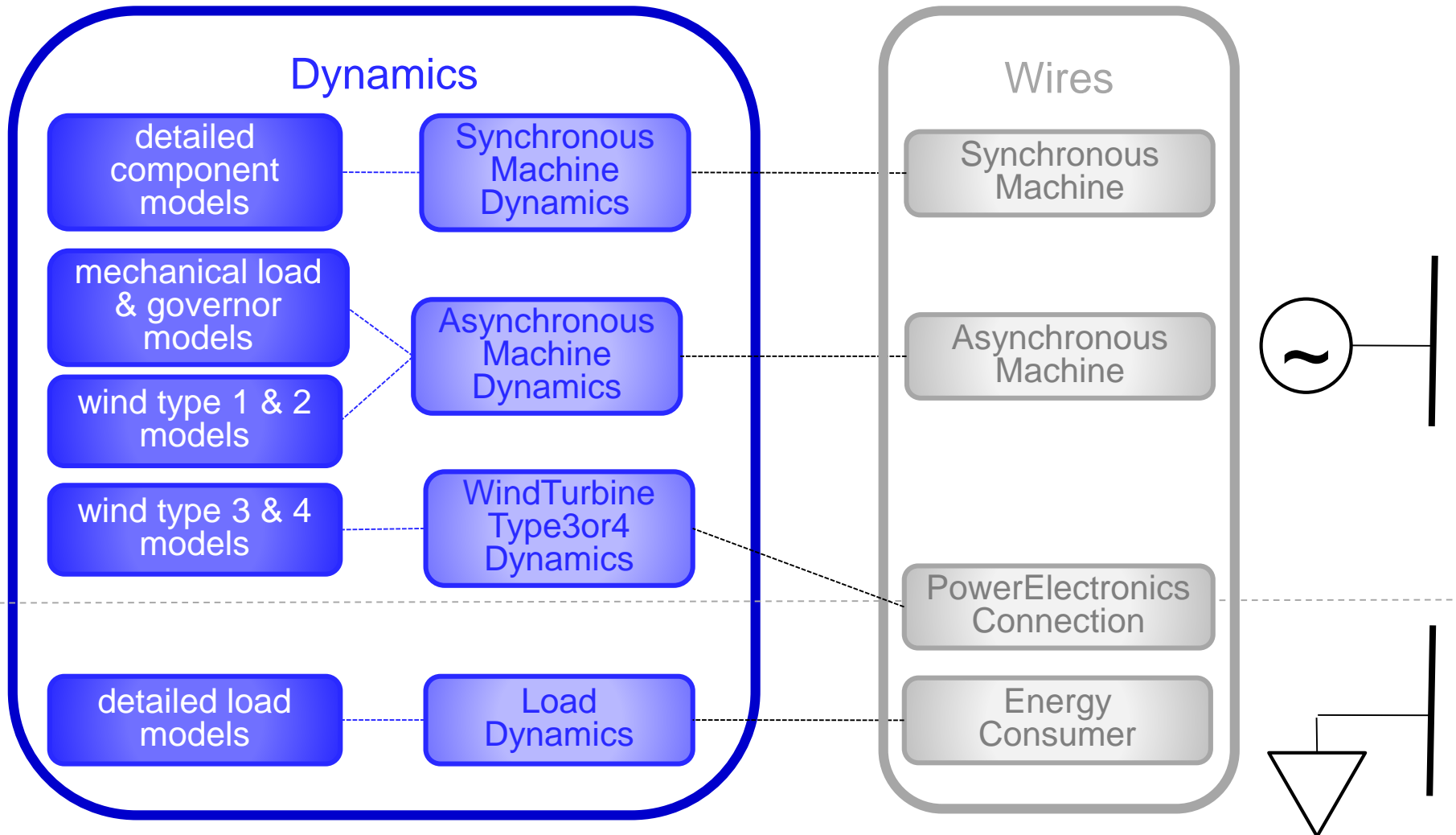
- Totally separate package



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Dynamics in the CIM

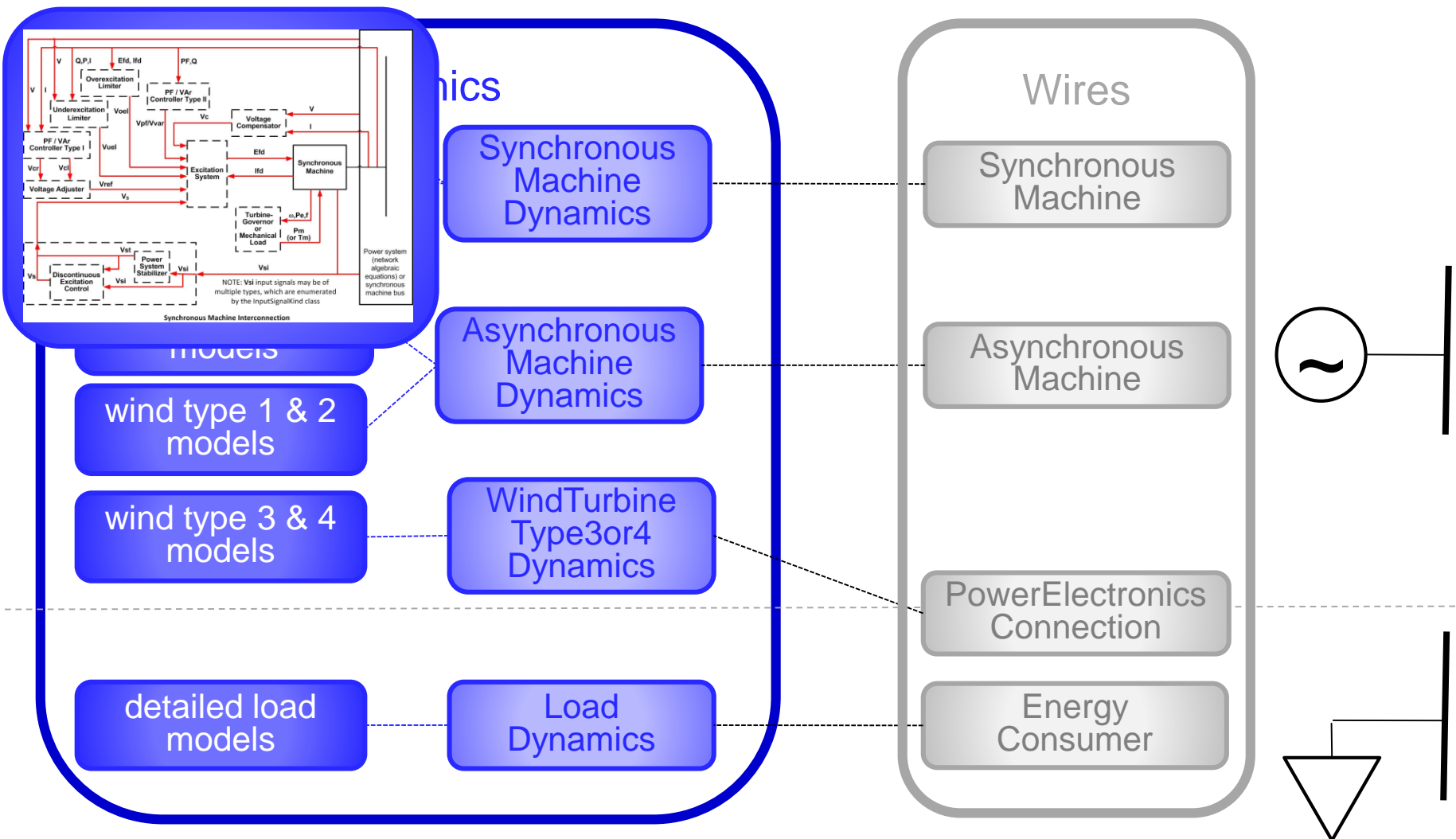
- Dynamics classes hook into classes in the Wires package



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Dynamics in the CIM

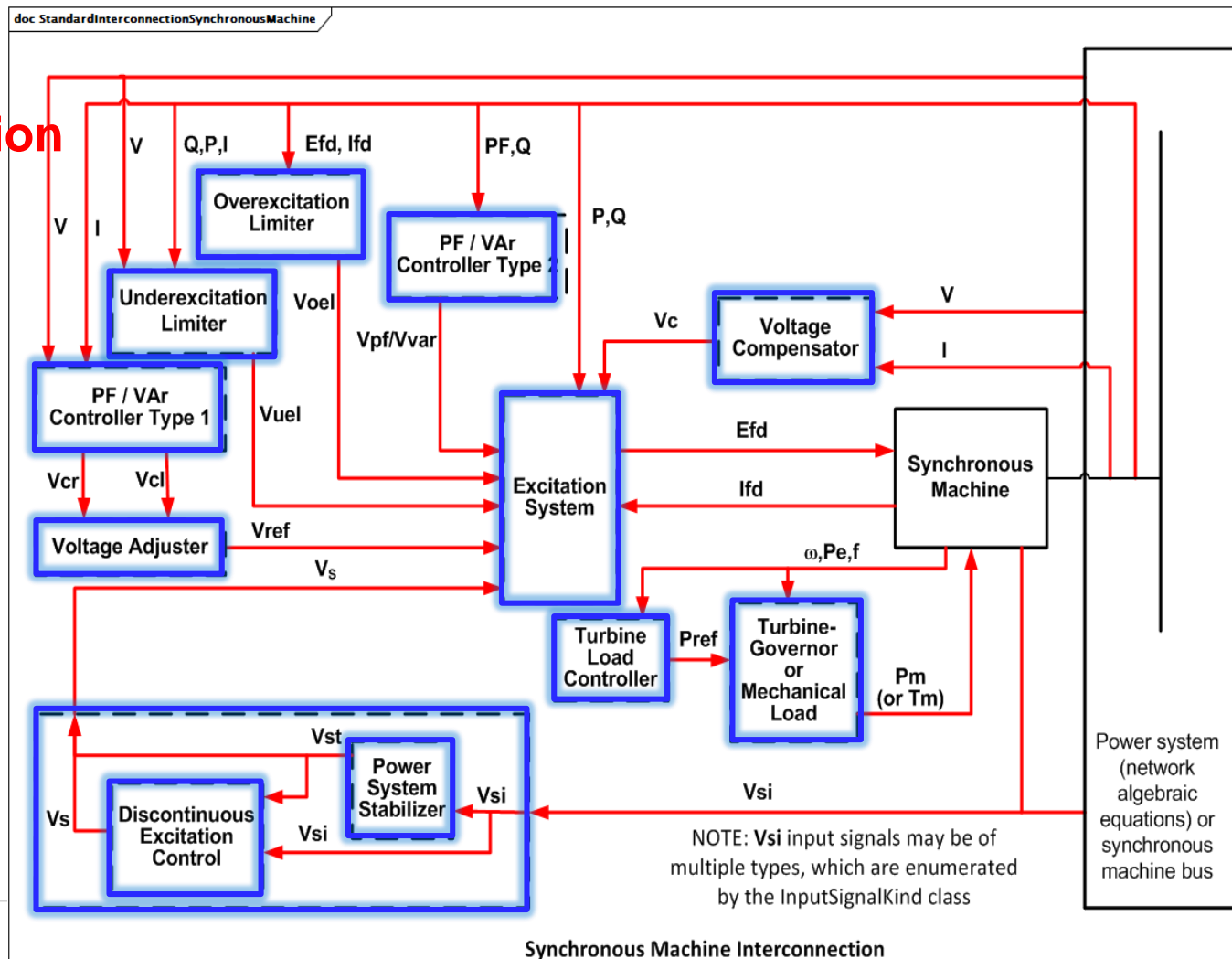
- Dynamics classes hook into classes in the Wires package



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Dynamics in the CIM

- Synchronous machine dynamic models are comprised of:
 - dynamic function block diagrams
 - combined in **standard interconnection patterns** by output/input signals



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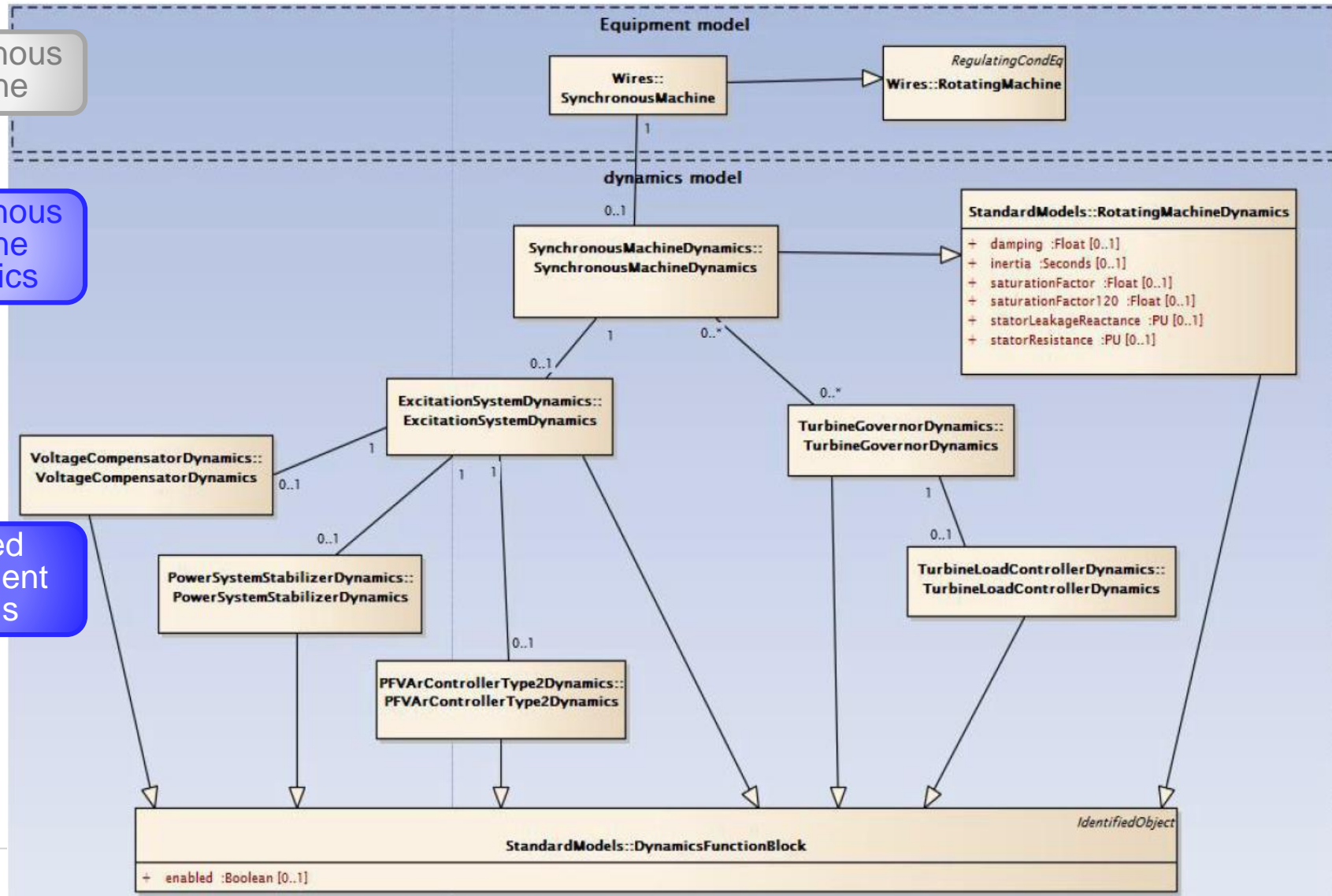
Dynamics in the CIM

- Dynamics classes hook into classes in the Wires package

Synchronous Machine

Synchronous Machine Dynamics

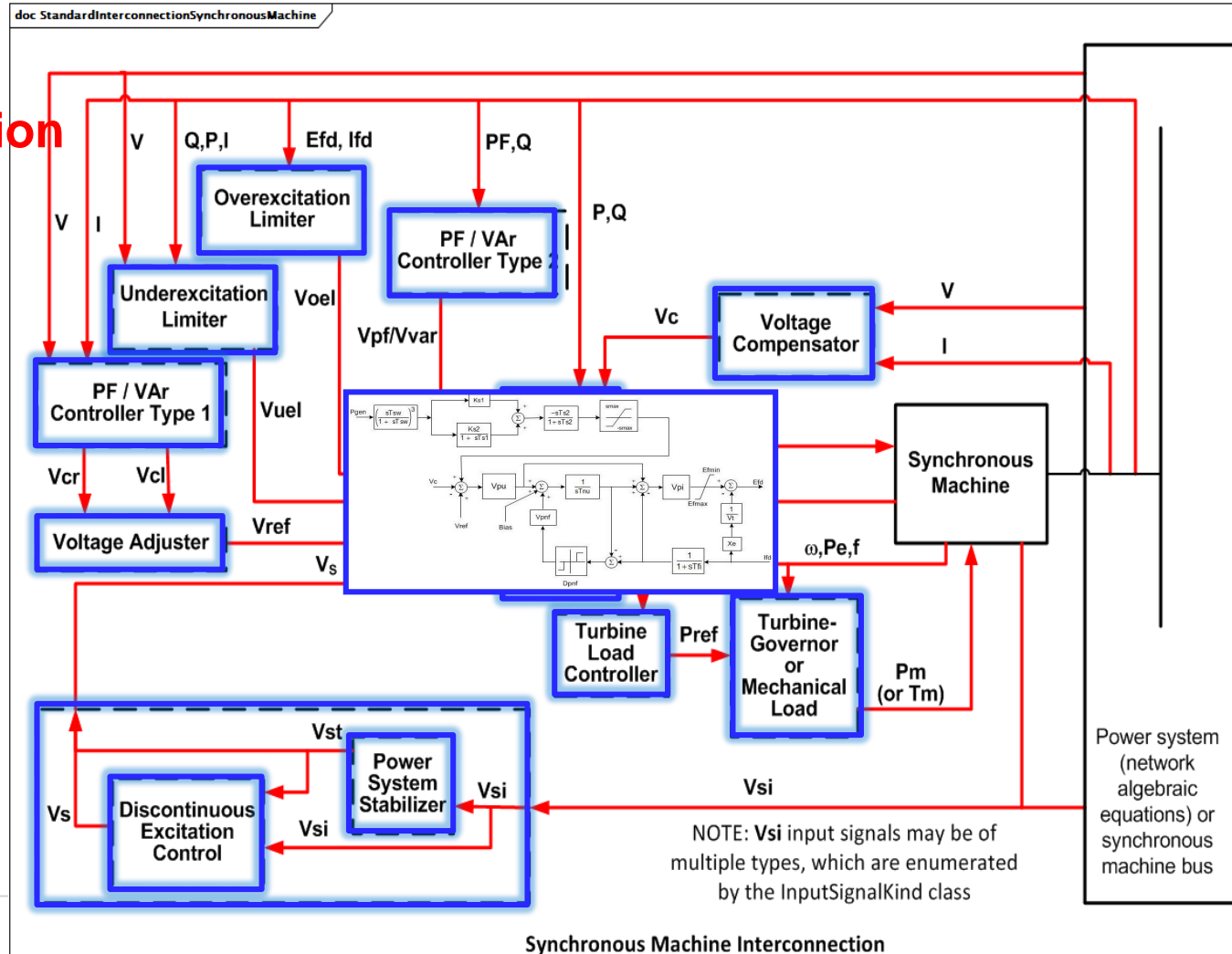
detailed component models



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Dynamics in the CIM

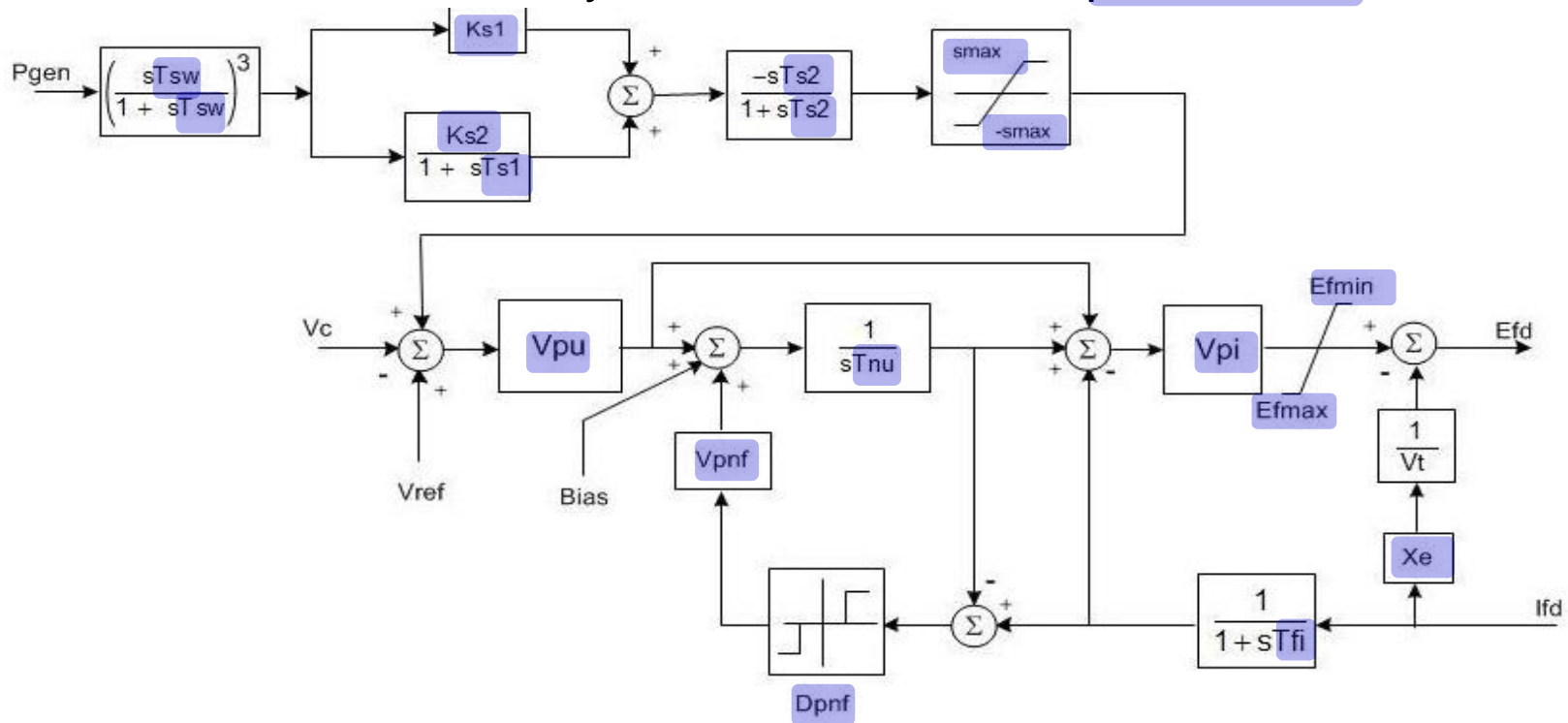
- Synchronous machine dynamic models are comprised of:
 - dynamic function block diagrams
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Dynamics in the CIM

- Function block diagrams – represent ‘chunk’ of self-contained dynamic behavior
 - Many standard models of a given type
 - Behavior described by function blocks with parameters

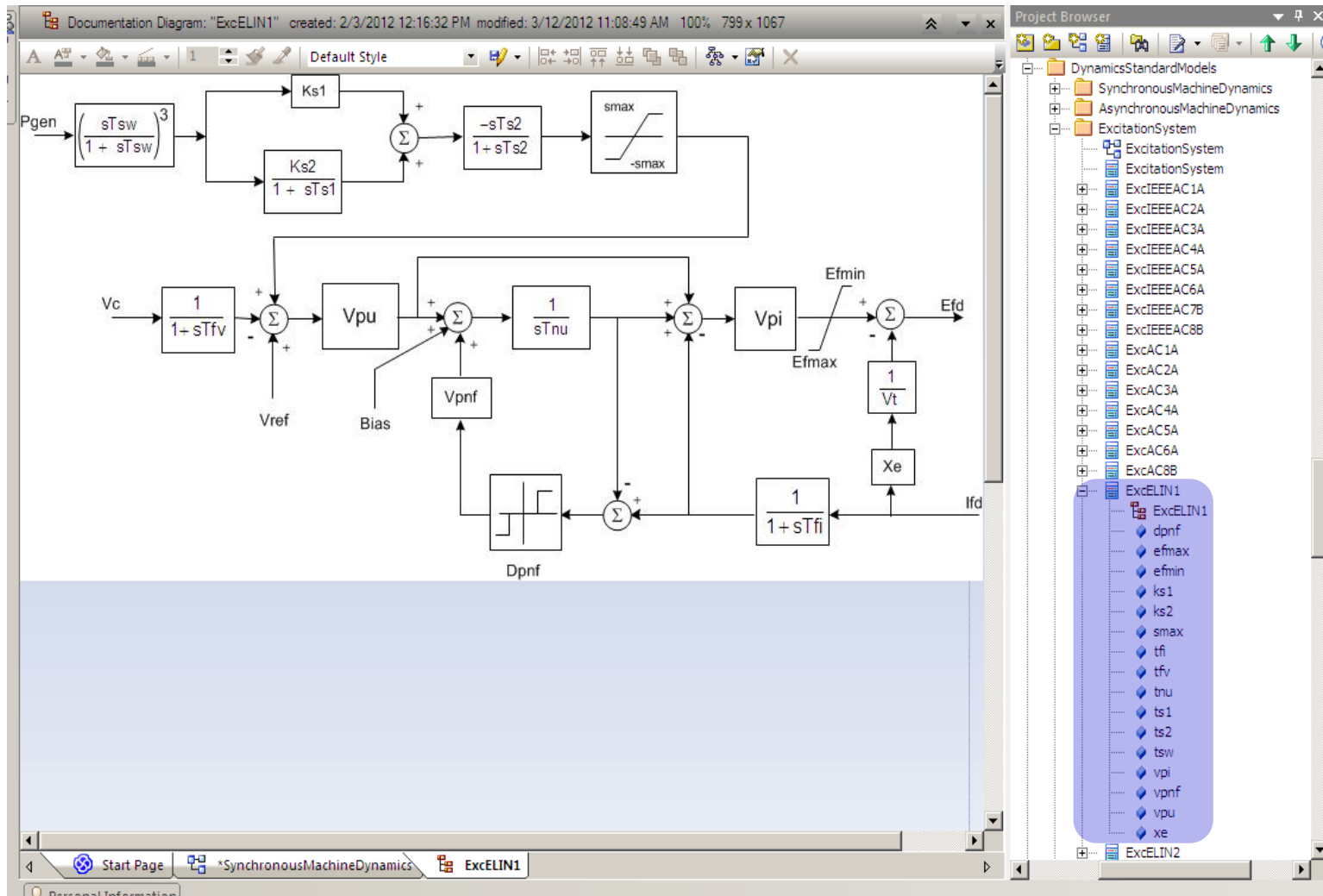


Excitation System model ExcLIN1

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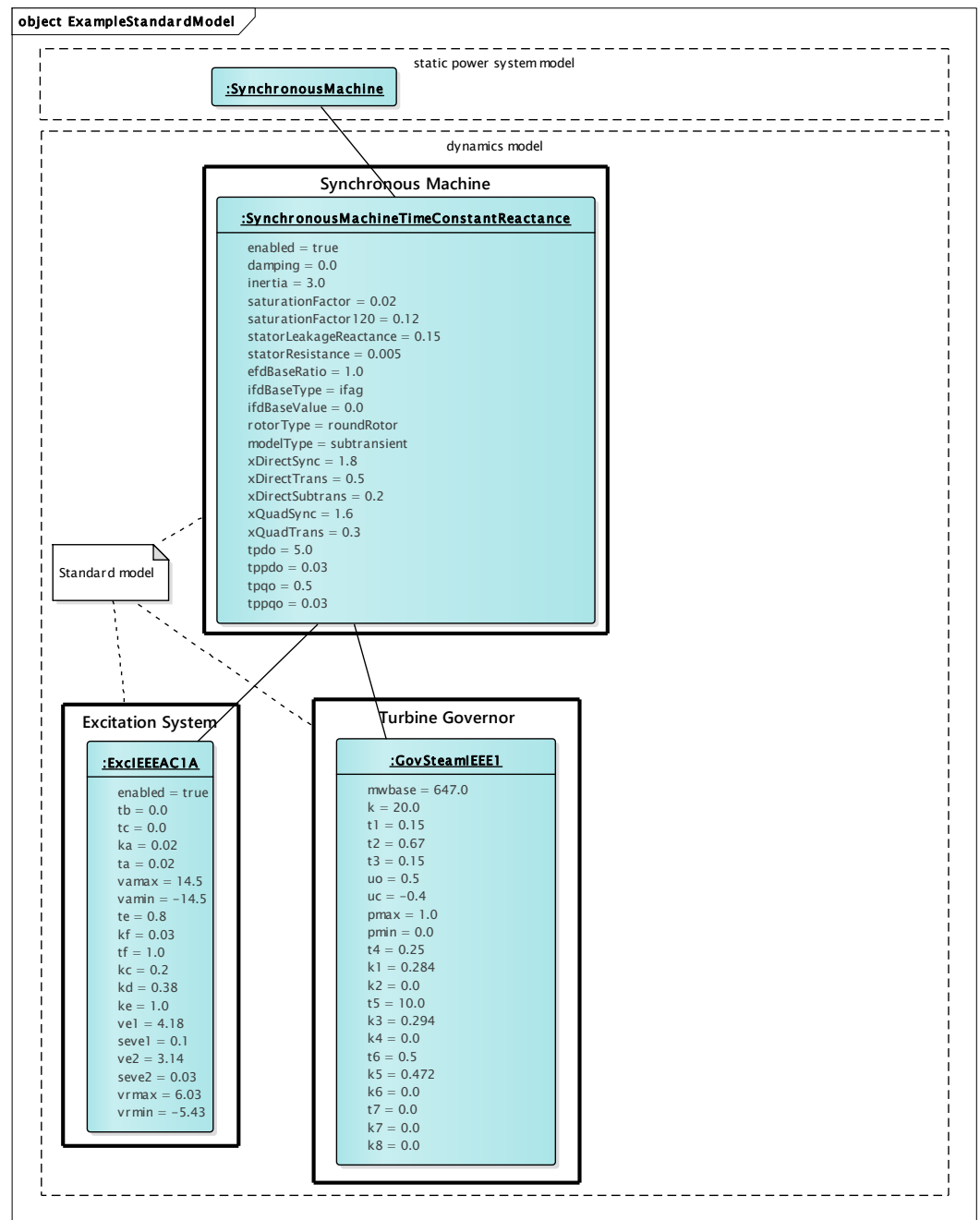
- Parameter values are class attributes



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Dynamics in the CIM

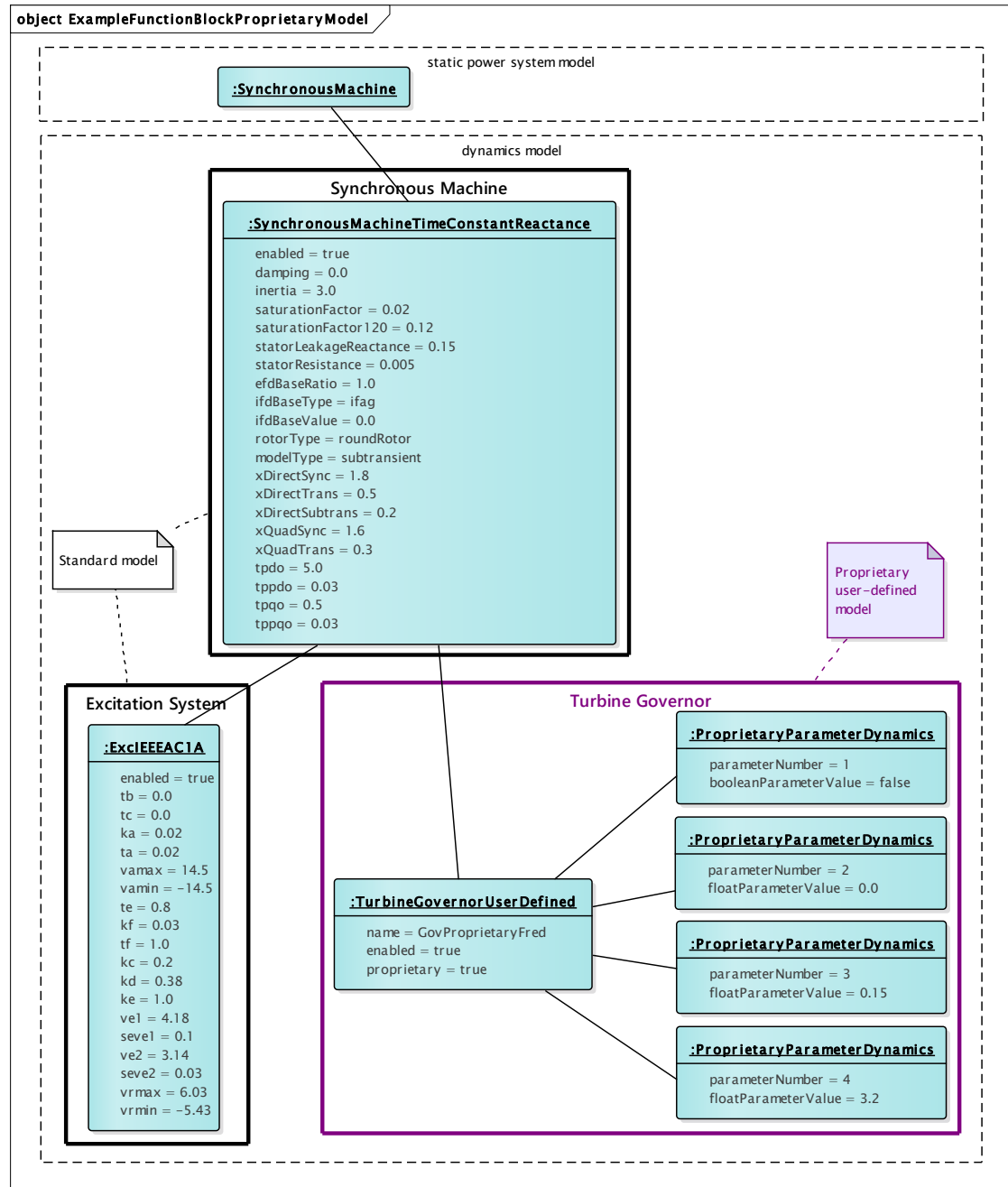
- Simple generator model using standard dynamics models



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Dynamics in the CIM

- Simple generator model using **proprietary model** for turbine-governor



CIM for Dynamics – Status Update

- IEC standards – Edition 1
 - **61970-302** (canonical) - International Standard as of April 12, 2018
 - **61970-457** (profile) – CD (Committee Draft) in next few months
- Edition 2
 - HVDC, static VAR compensators, shunt compensators, relays, FACTS, composite load...
- ENTSO-E Interoperability testing
 - Weekly ongoing calls
 - Participants
 - Eurostag
 - DigSILENT (PowerFactory)
 - Siemens PTI (PSSE)
 - Neplan
 - Netomac
 - SICRE
 - Testing data exchange and interpretation of standard dynamic models

CIM for Dynamics – Status Update

Charts: Test Case 2
Response of terminal voltage of the generator

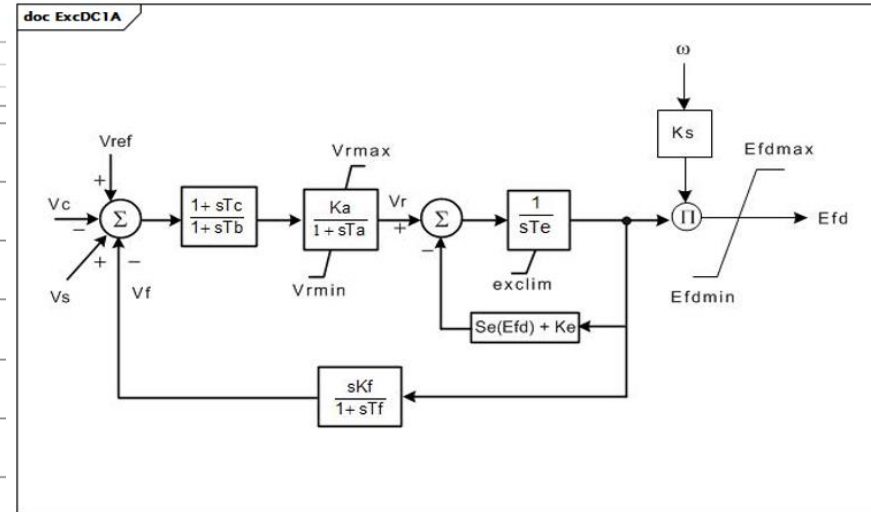
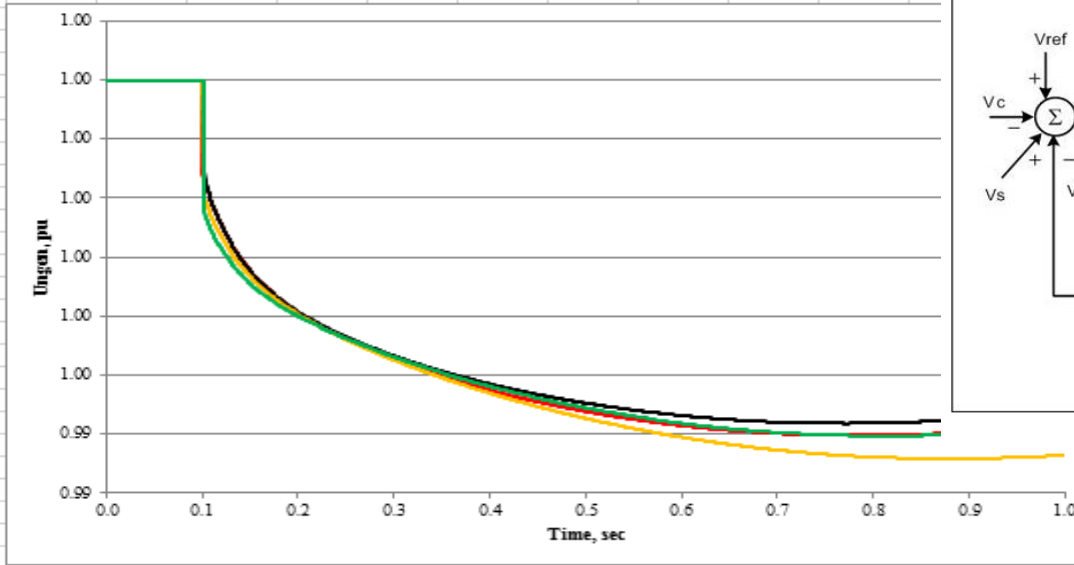
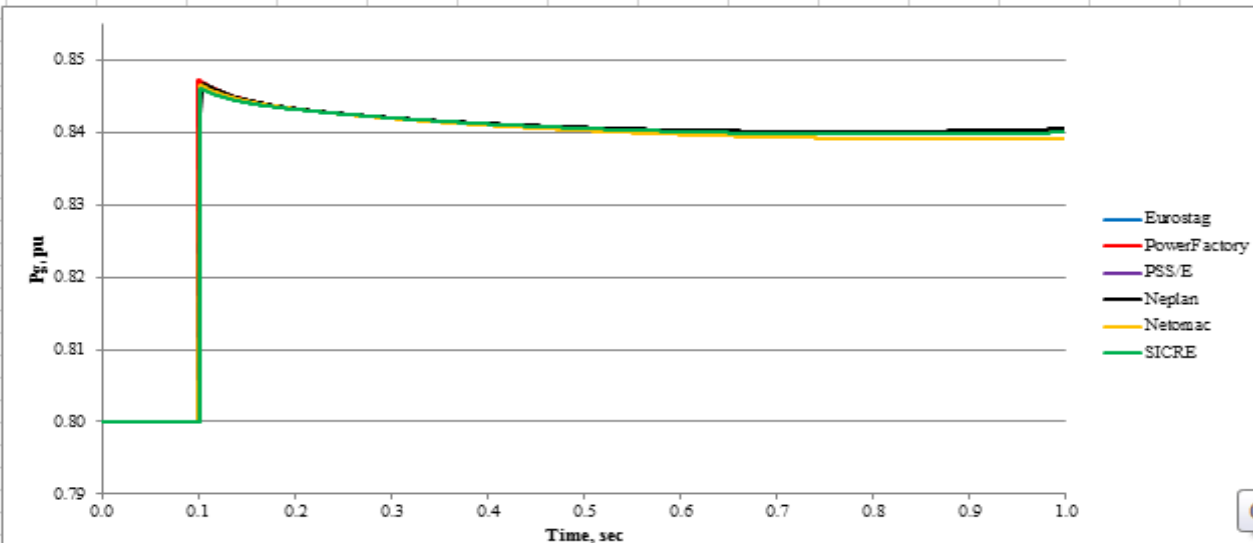


Figure 5-105 – ExcDC1A

Response of active power of the generator



Test results
ExcDC1A

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- Questions?



- For more information, contact
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