E-Truck Systems Definition and Modeling

PACCAR X **W**

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PACCAR/E-Truck Challenge
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INTRODUCTION

The E-Truck project is an exciting collaboration between PACCAR and the UW College of Engineering, aiming to innovate in the conversion of a diesel medium-duty truck into a battery electric vehicle over a period of four years. This project involves four capstone teams: Systems, Controls, Electrical, and Retrofit.

Problem Statement

The E-Truck Systems Team is dedicated to determining performance parameters for the converted truck and modeling the functional and physical architecture for the new system.

Vehicle Attributes

- Safety
- Vehicle Dynamics
- Package
- Reliability
- Thermal
- Aerodynamics
- Costs
- Performance and Drivability
- Customer Life Cycle
- Product and Process Complexity
- Energy Consumption

- Interior Climate Comfort
- Noise, Vibrations, and Harshness (NVH)
- Security
- Weight
- Ergonomics
- Communication and Entertainment
- Styling and Appearance
- Emissions

Highlighting Some Requirements

- 26,001-33,000 lbs: Class 7
- ~400 kWh of battery capacity
- Energy consumption 1.93 kWh/mi on urban roads and 2.90 kWh/mi on highways
- Charger selected: CCS1
- Rigid body resonance 10-25 Hz
- Exterior noise goal for 20kph (12.247 mph): 75 dB

Results/Validation

Speed (Mph)
Grade
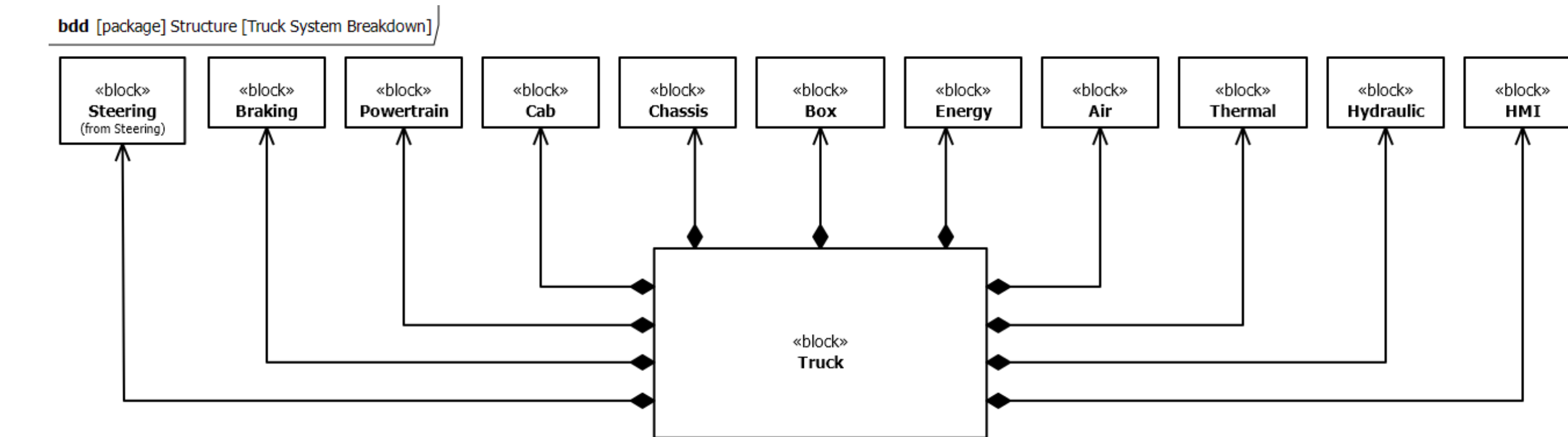Acceleration (ft/s^2)
Power (kW)
Torque (N*m)
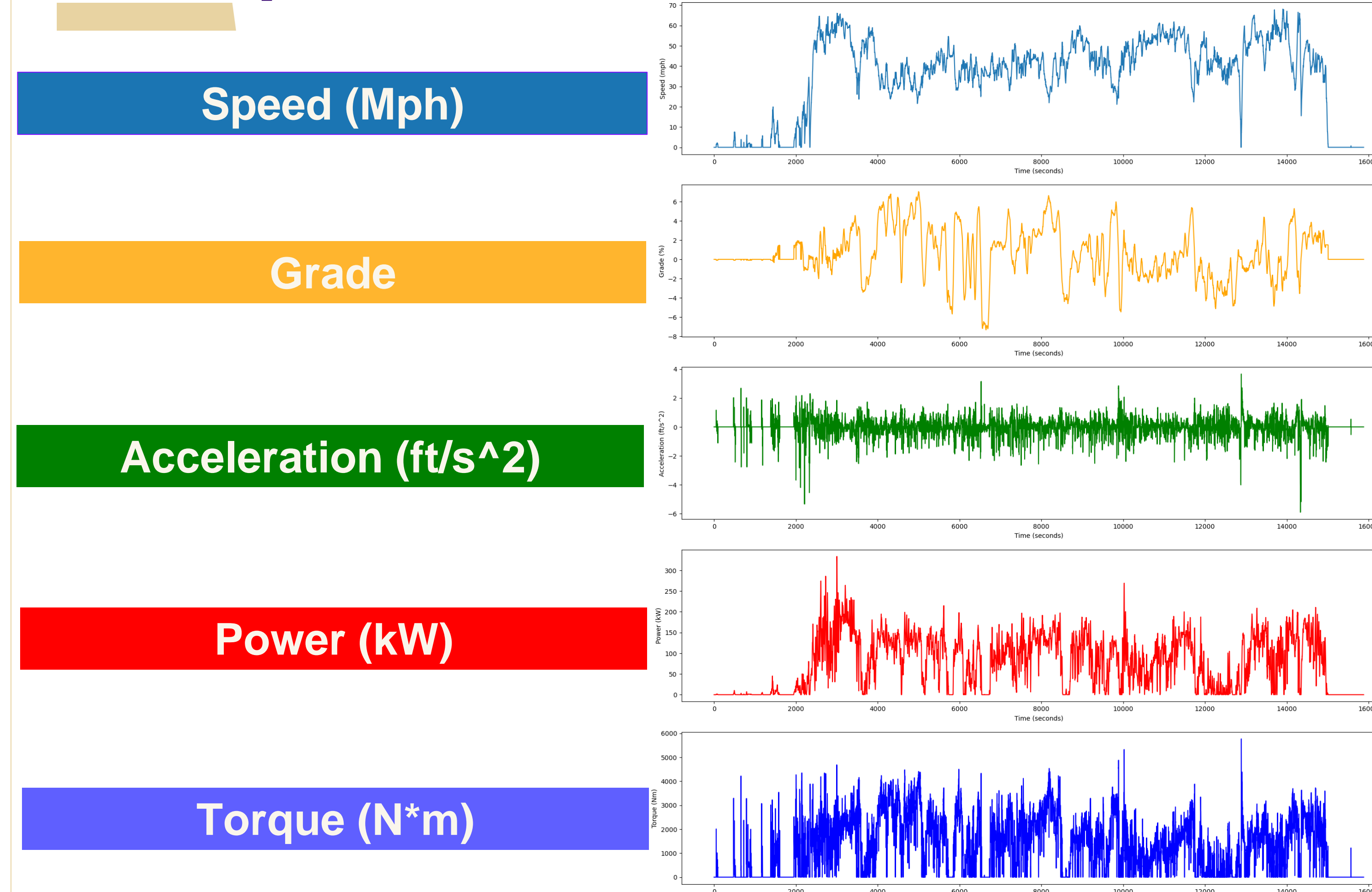
Drive cycle represents 70% of all local delivery trucks in the NREL Fleet DNA database.

- Total Energy: 262 kWh
- Max Grade: 6.32 %
- Speed at Max Grade: 32 mph
- Continuous Power: 173 kW
- Peak Power (10 s): 280 kW
- Peak Instantaneous Power: 439 kW
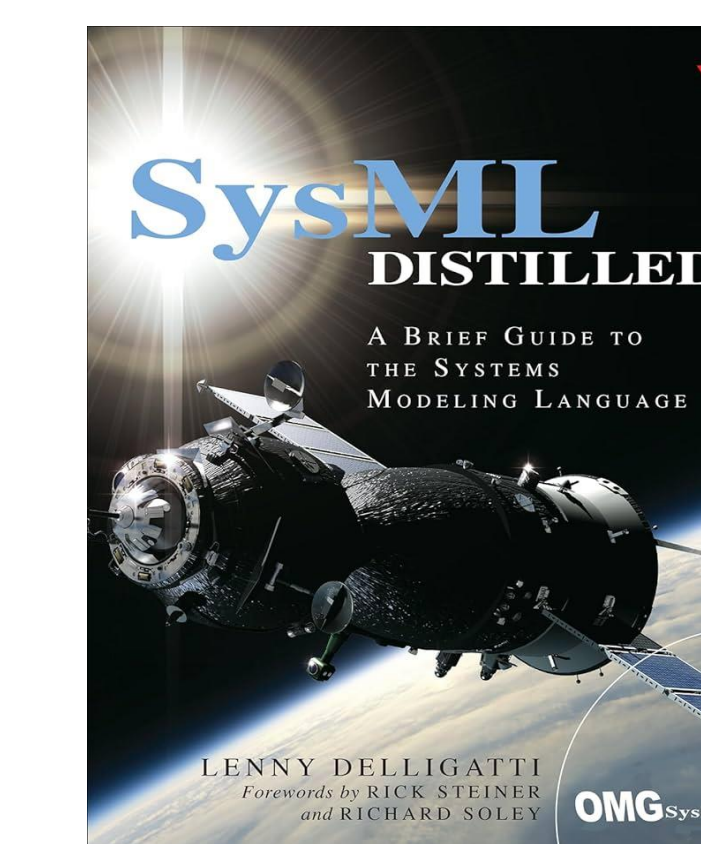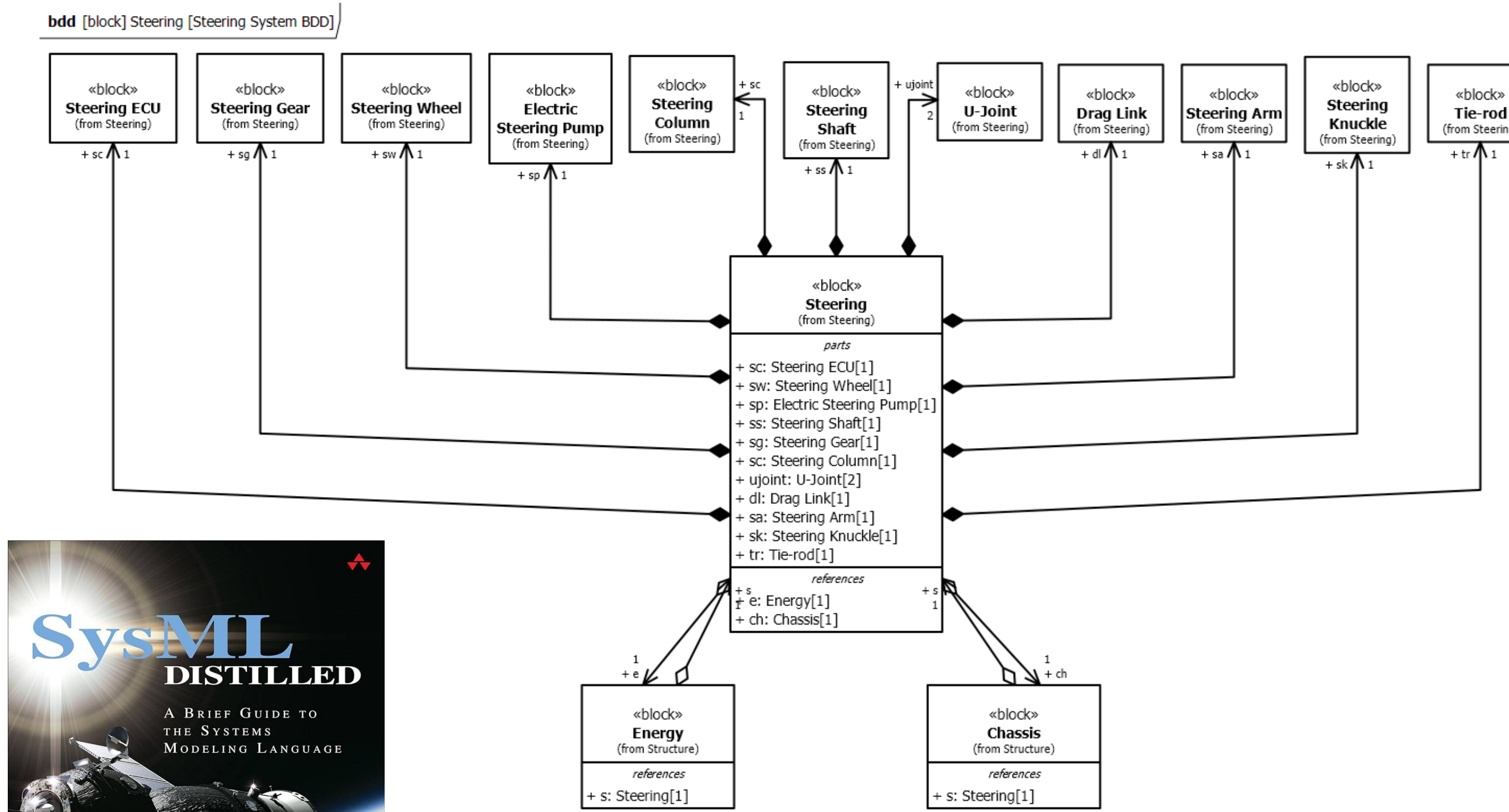- Continuous Torque: 3800 Nm
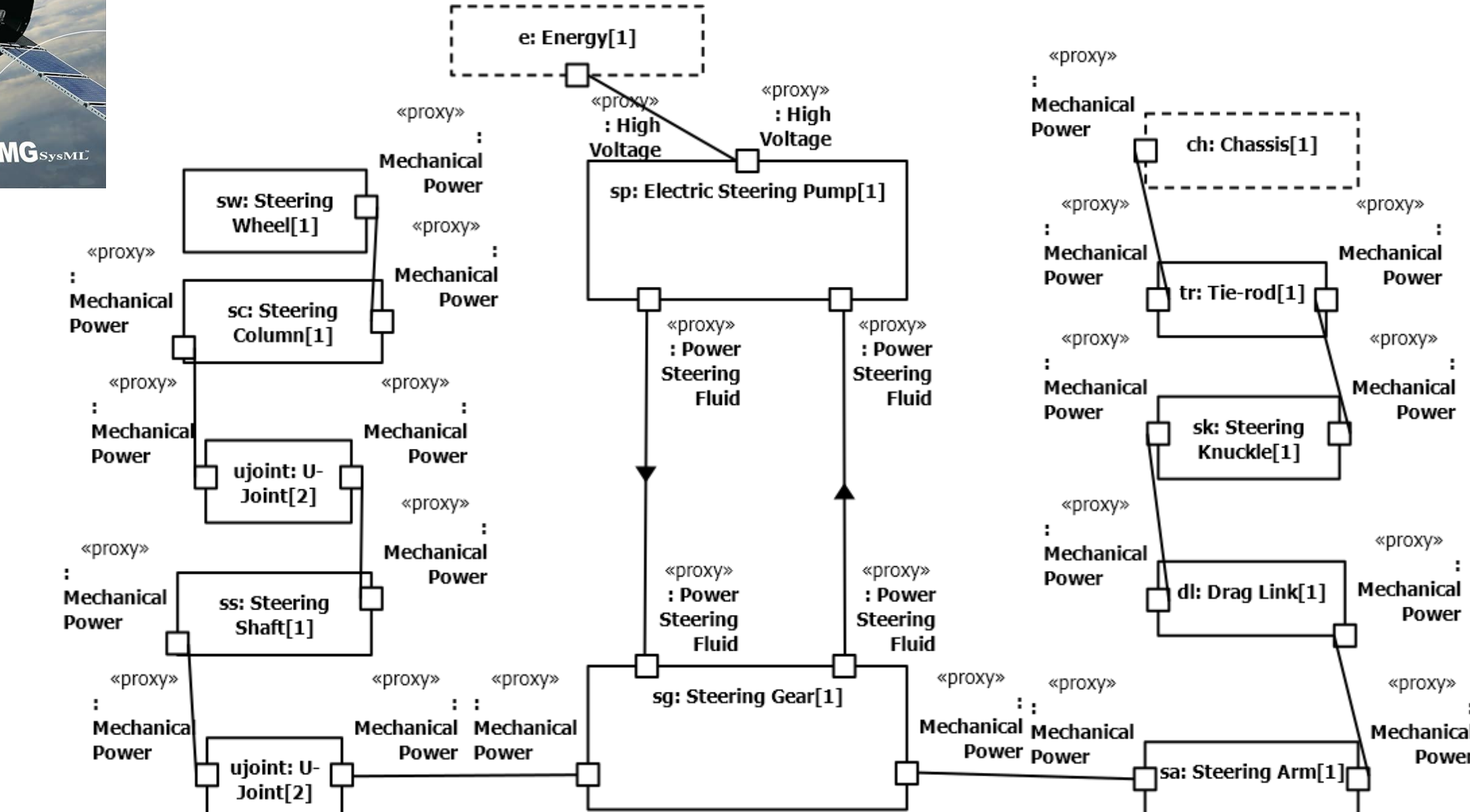- Peak Torque (10 s): 8400 Nm

SysML Models

Truck System (BDD)

Steering (BDD)

Electronic Steering Pump (IBD)

Software's Used

Gaphor UML/SysML Modeling   **Windchill**   **codebeamer**

Acknowledgements

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