



Development of PTO-Sim: A Power Performance Module for the Open-Source Wave Energy Converter Code WEC-Sim

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Ratanak So *

Asher Simmons

Ted Brekken

*School of Electrical Engineering and
Computer Science*

Oregon State University

Corvallis, Oregon USA

**Email: sor@onid.oregonstate.edu*

Kelley Ruehl

Carlos Michelen

*Water Power Department
Sandia National Laboratories
Albuquerque, NM USA*

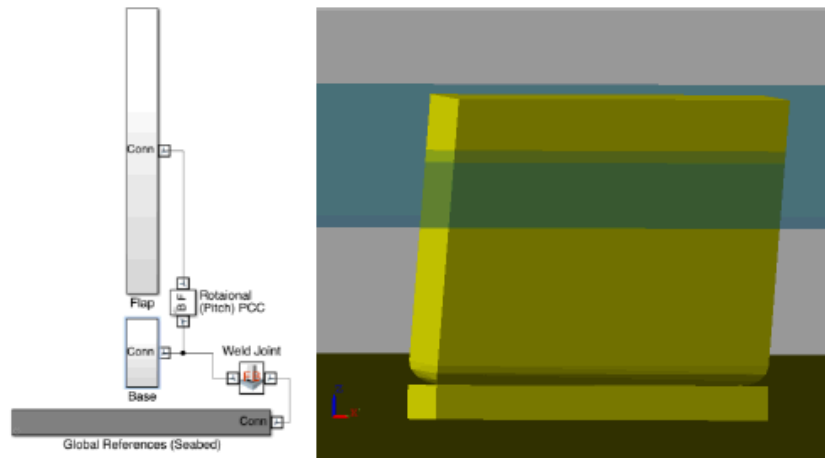
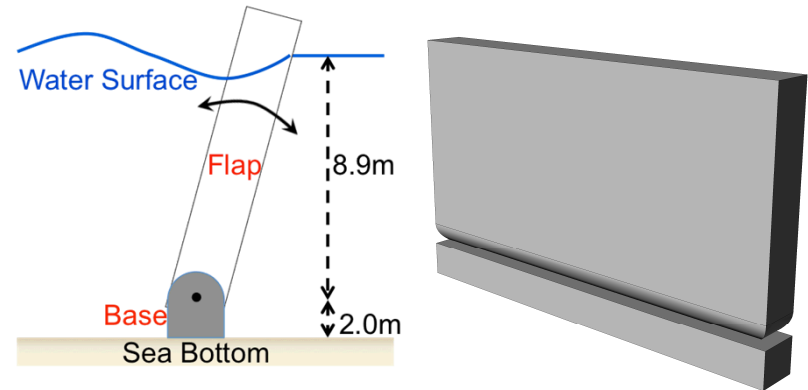
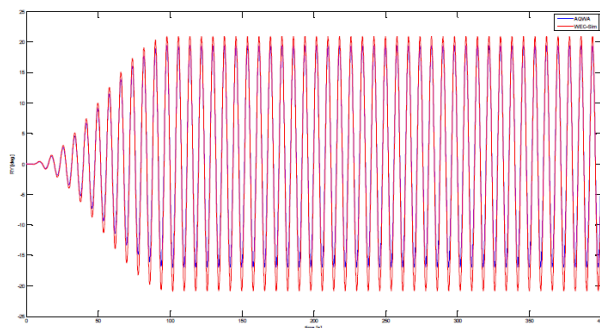


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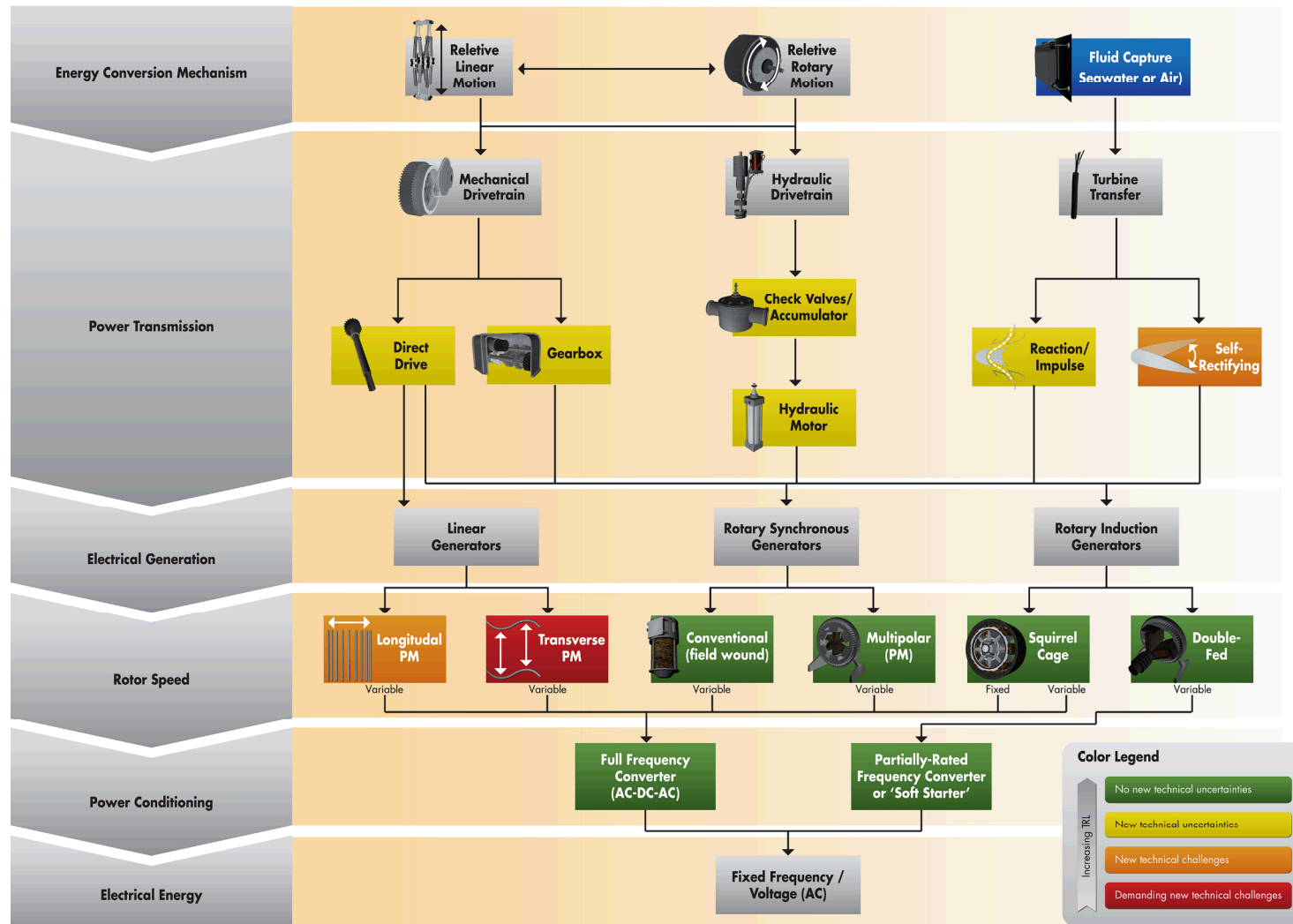
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Introduction

- WEC-Sim
 - Open-source WEC performance code
 - Linear PTO
- PTO-Sim
 - More realistic modelling of power conversion chain (PCC)
 - Library of common PTO components
 - Development and Application cases

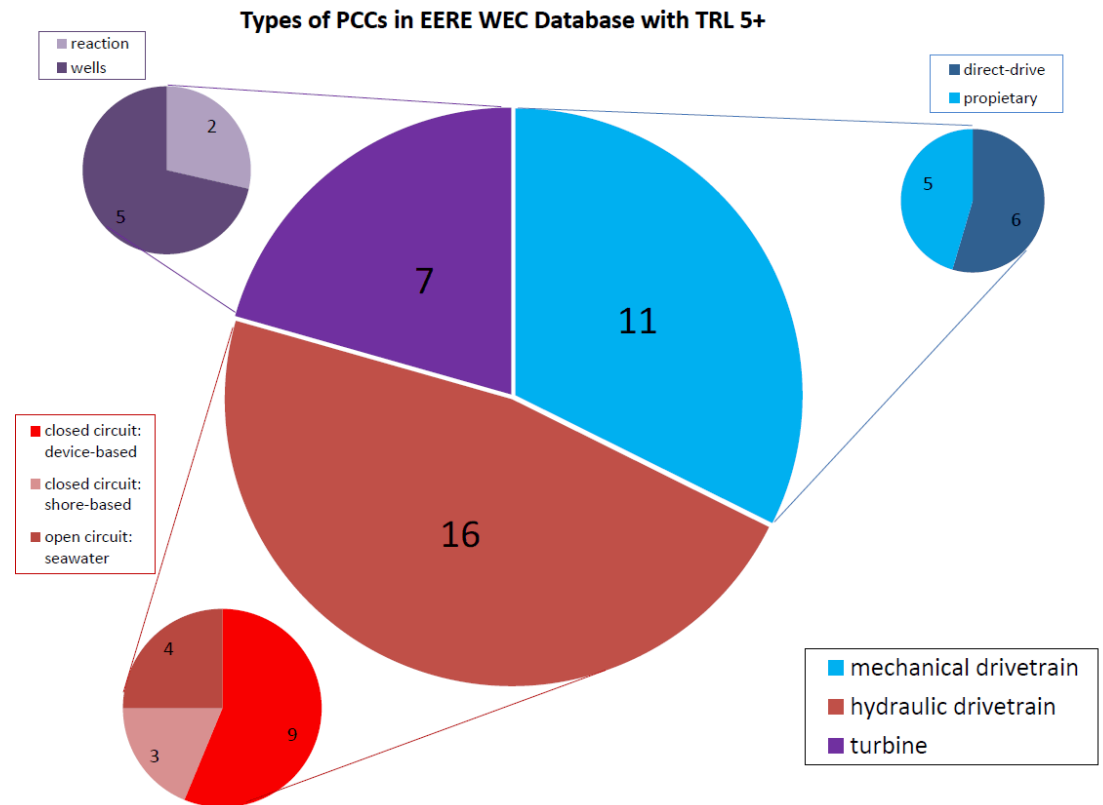


Power Conversion Chains (PCC)



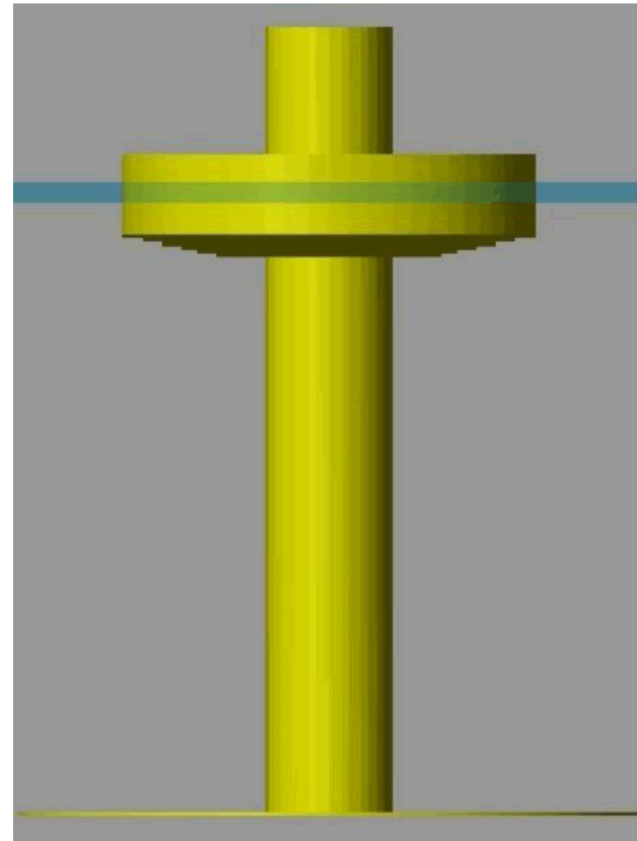
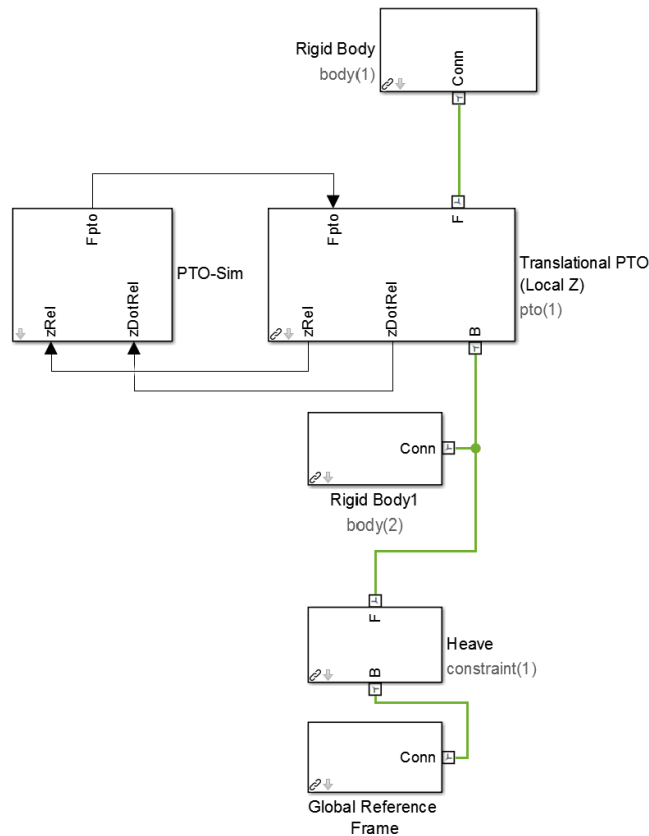
Application Cases

- Two cases
- Device: RM3
- PTO
 - Hydraulic PTO
 - Direct Drive



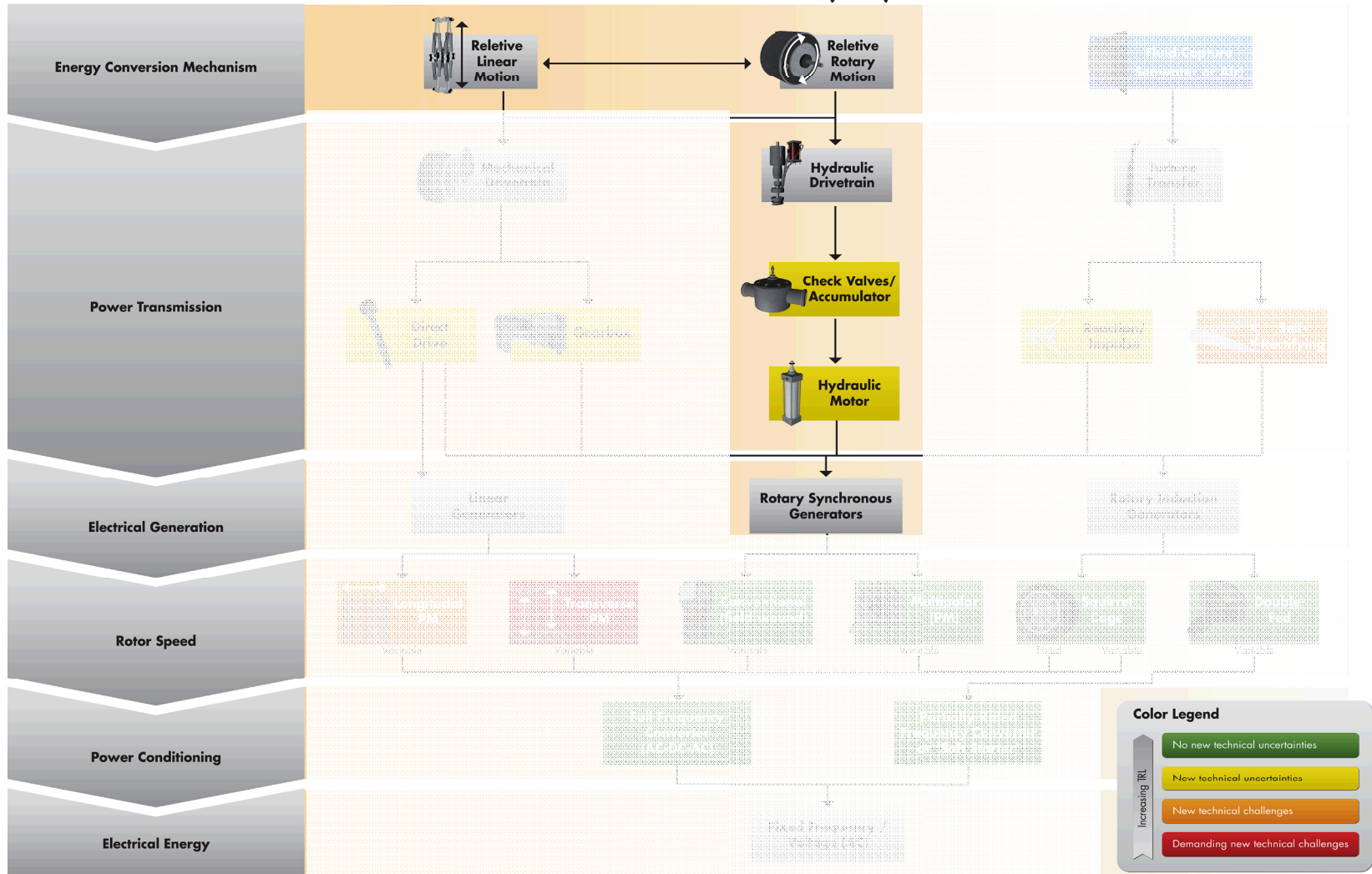
Application Cases

- Device: RM3
- WEC-Sim & PTO-Sim Coupling

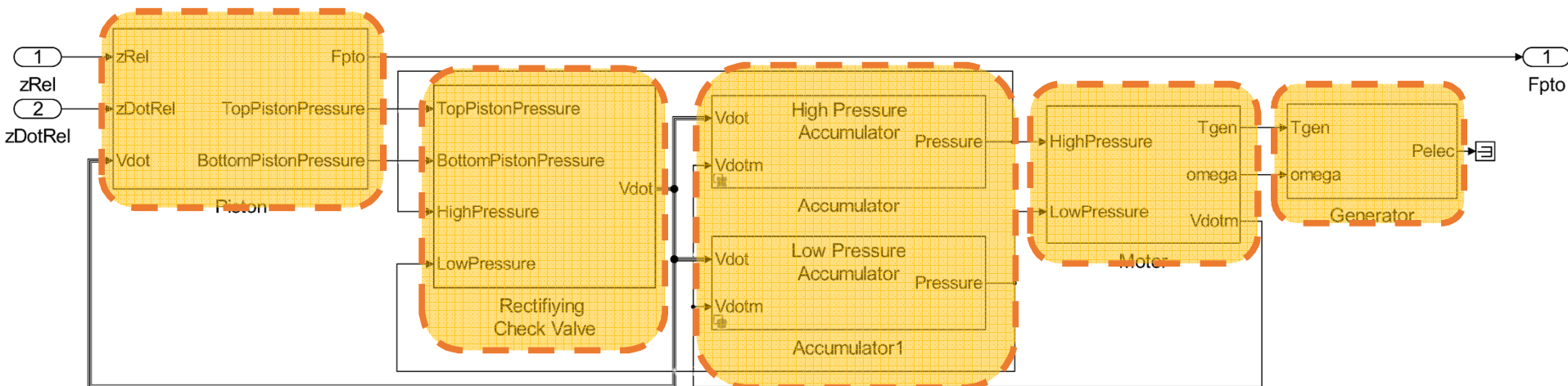
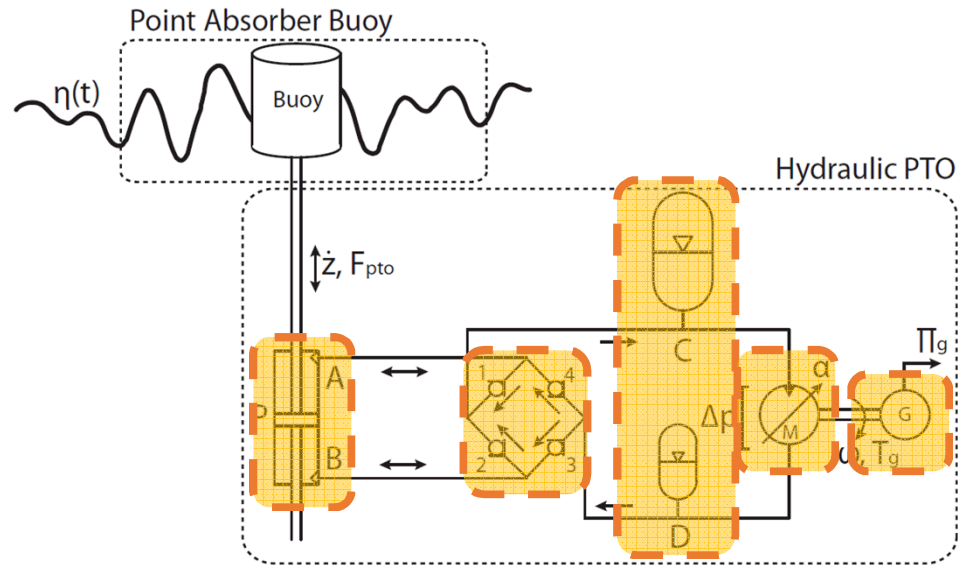


Case 1 - Hydraulic PTO

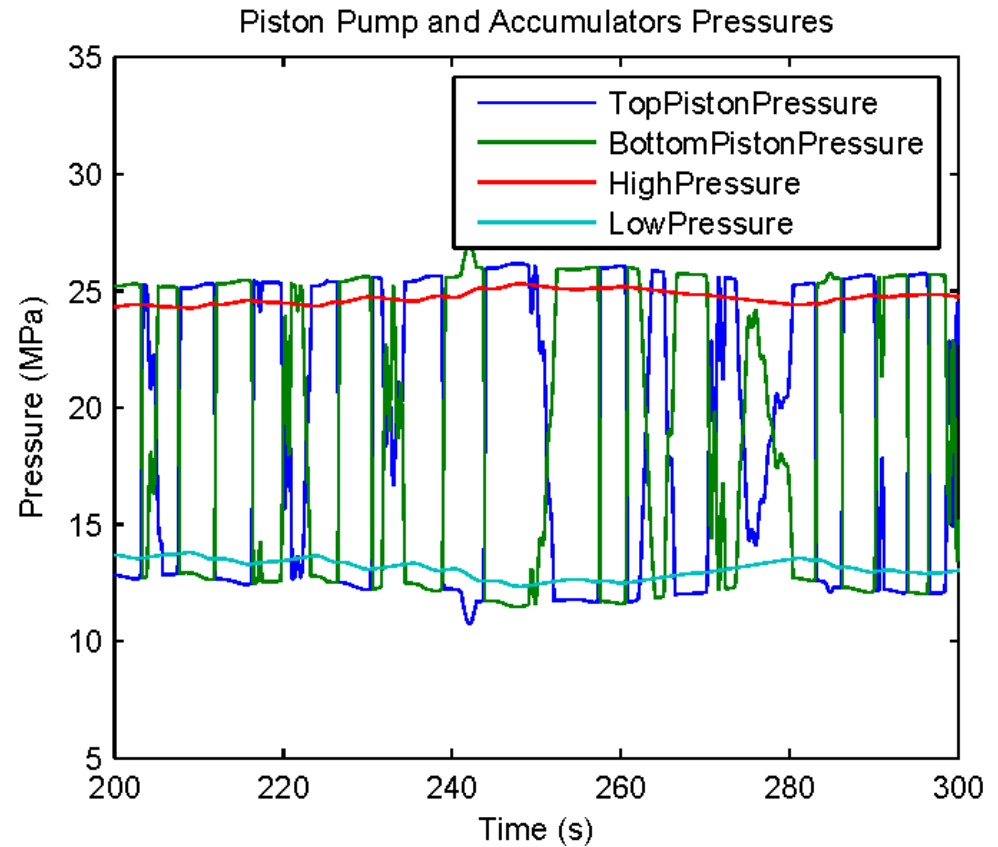
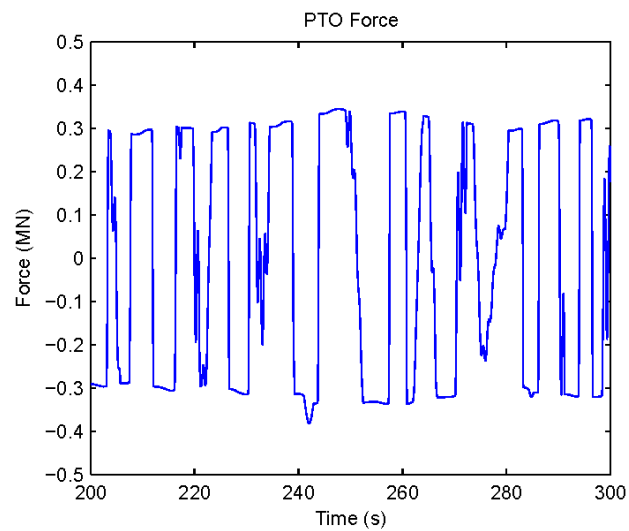
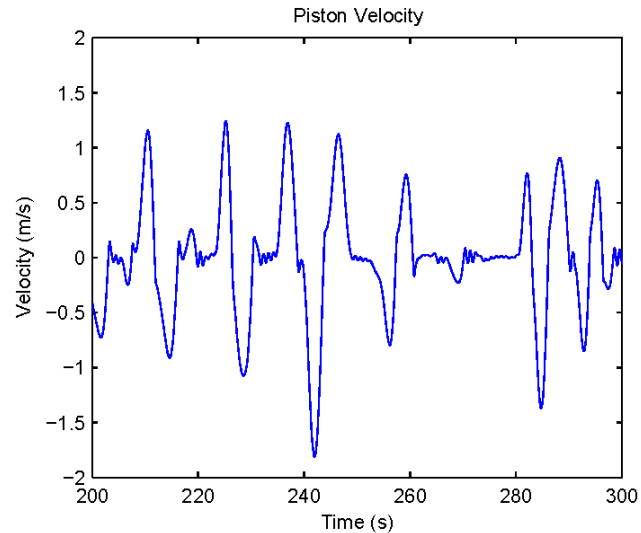
Power Conversion Chains (PCC)



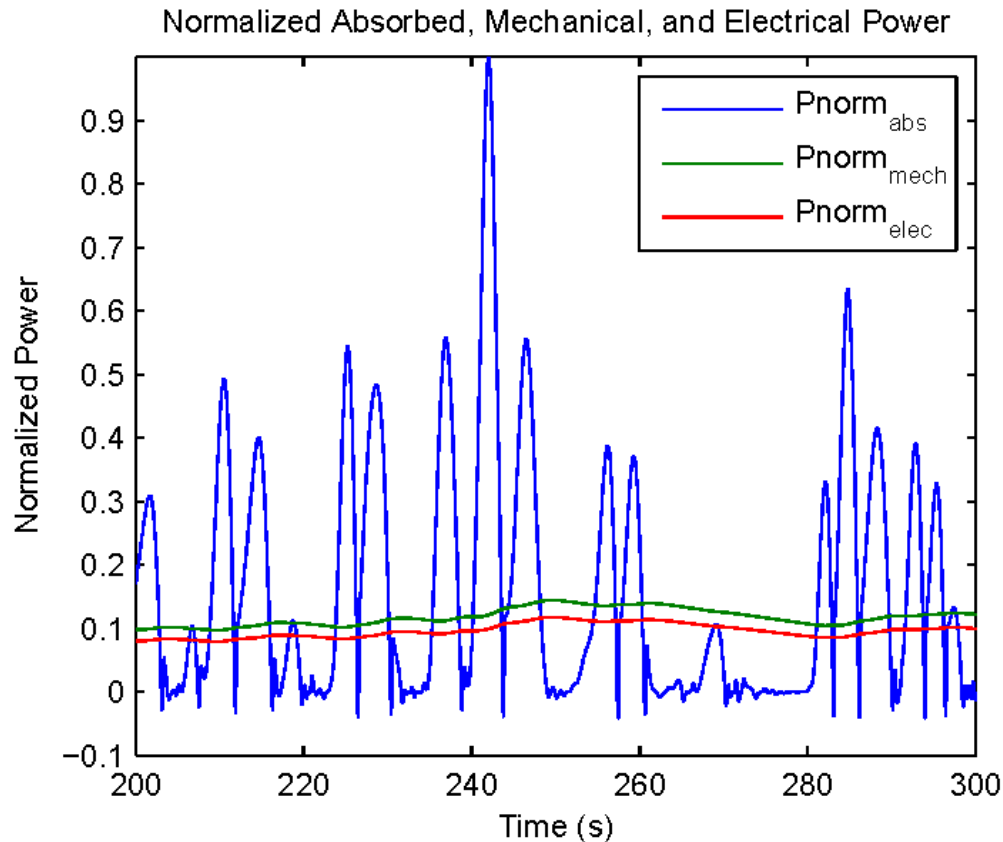
Case 1 - Hydraulic PTO



Case 1 - Hydraulic PTO



Case 1 - Hydraulic PTO



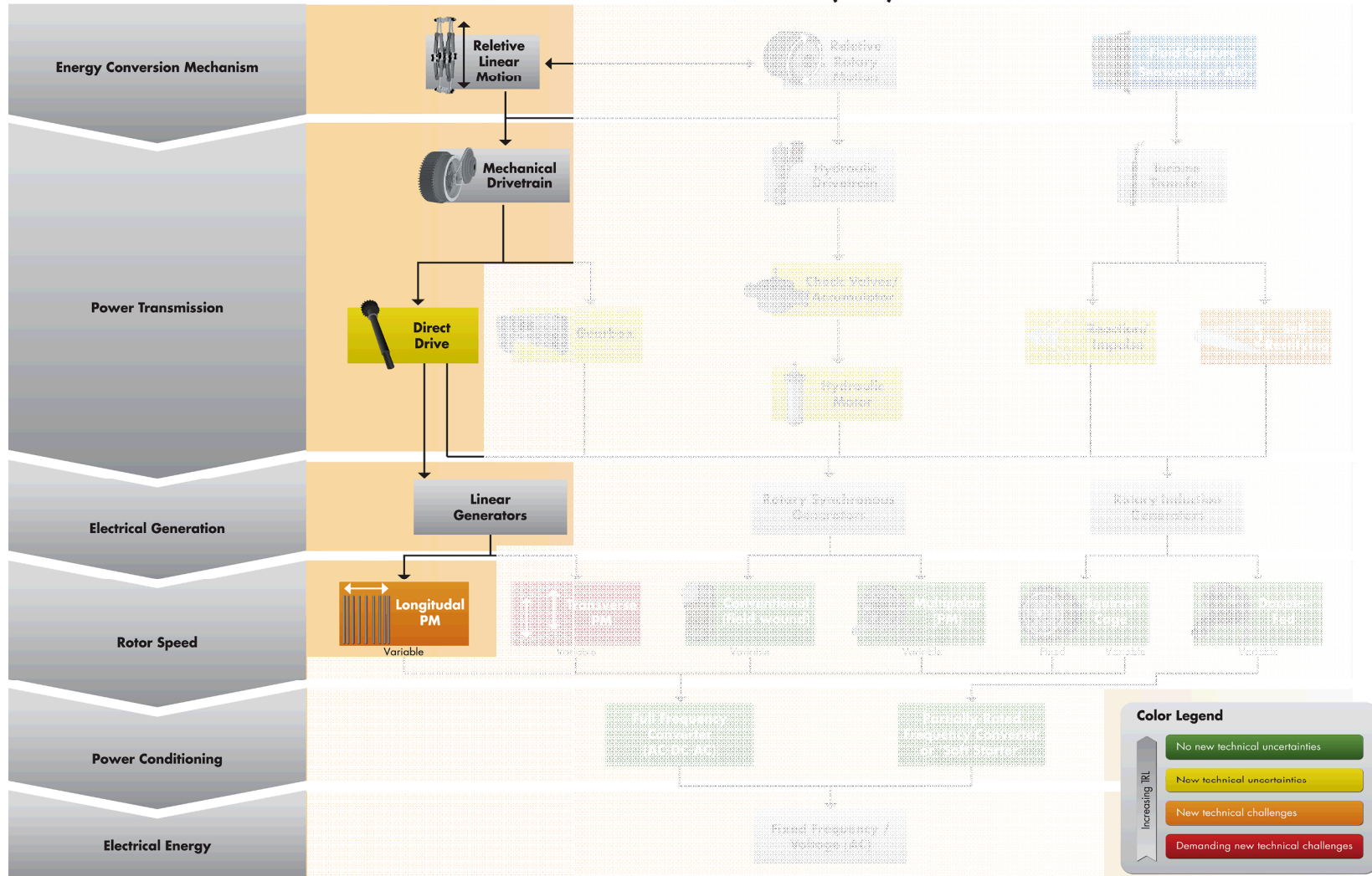
P_{abs} is the power absorbed at the piston

P_{mech} is the power at the axle connecting the motor and generator

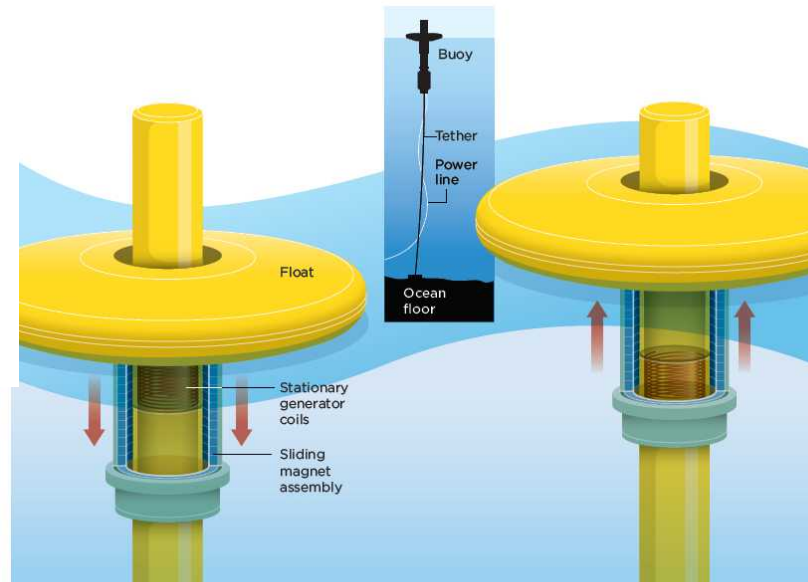
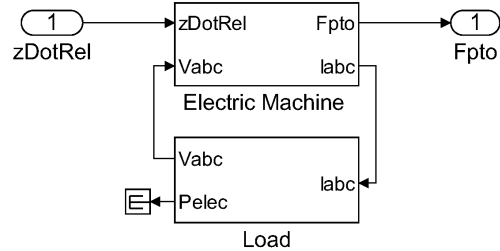
P_{elec} is the electrical power at the output of the generator

Case 2 - Direct Drive PTO

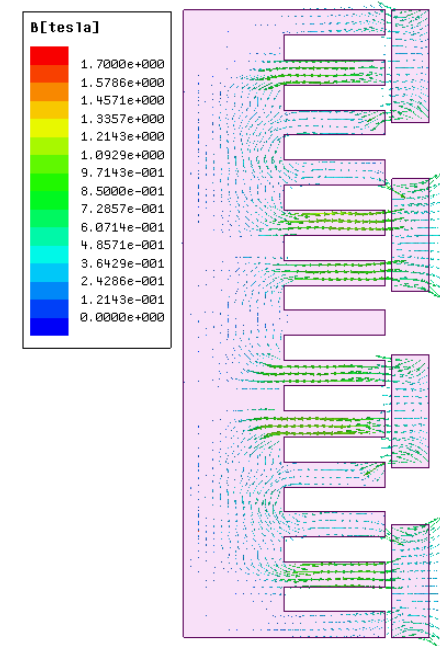
Power Conversion Chains (PCC)



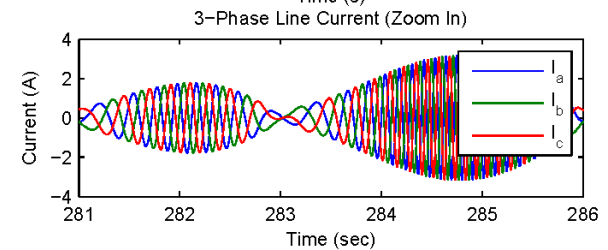
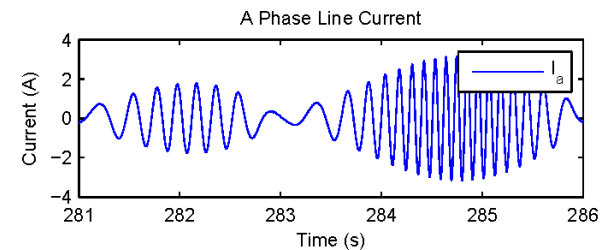
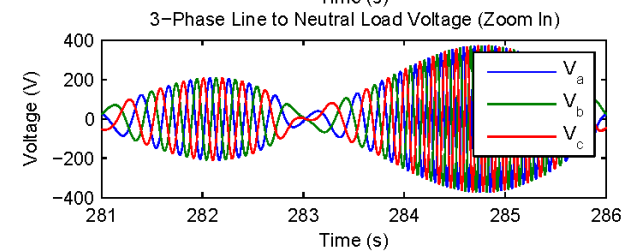
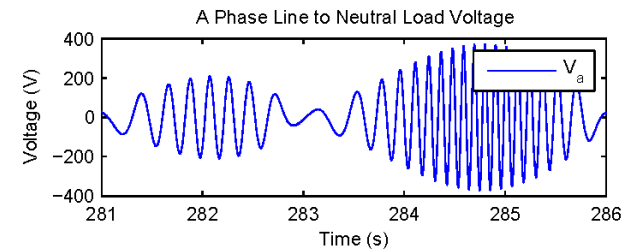
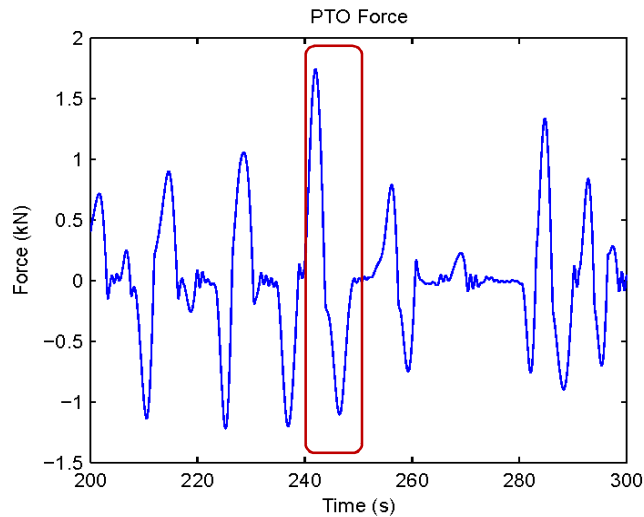
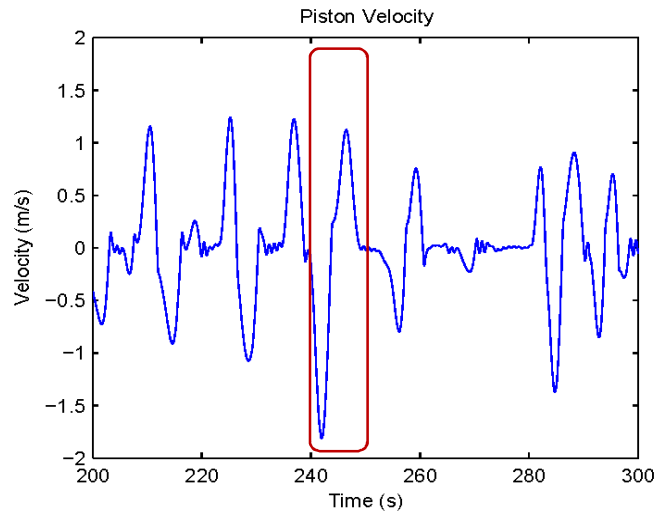
Case 2 - Direct Drive PTO



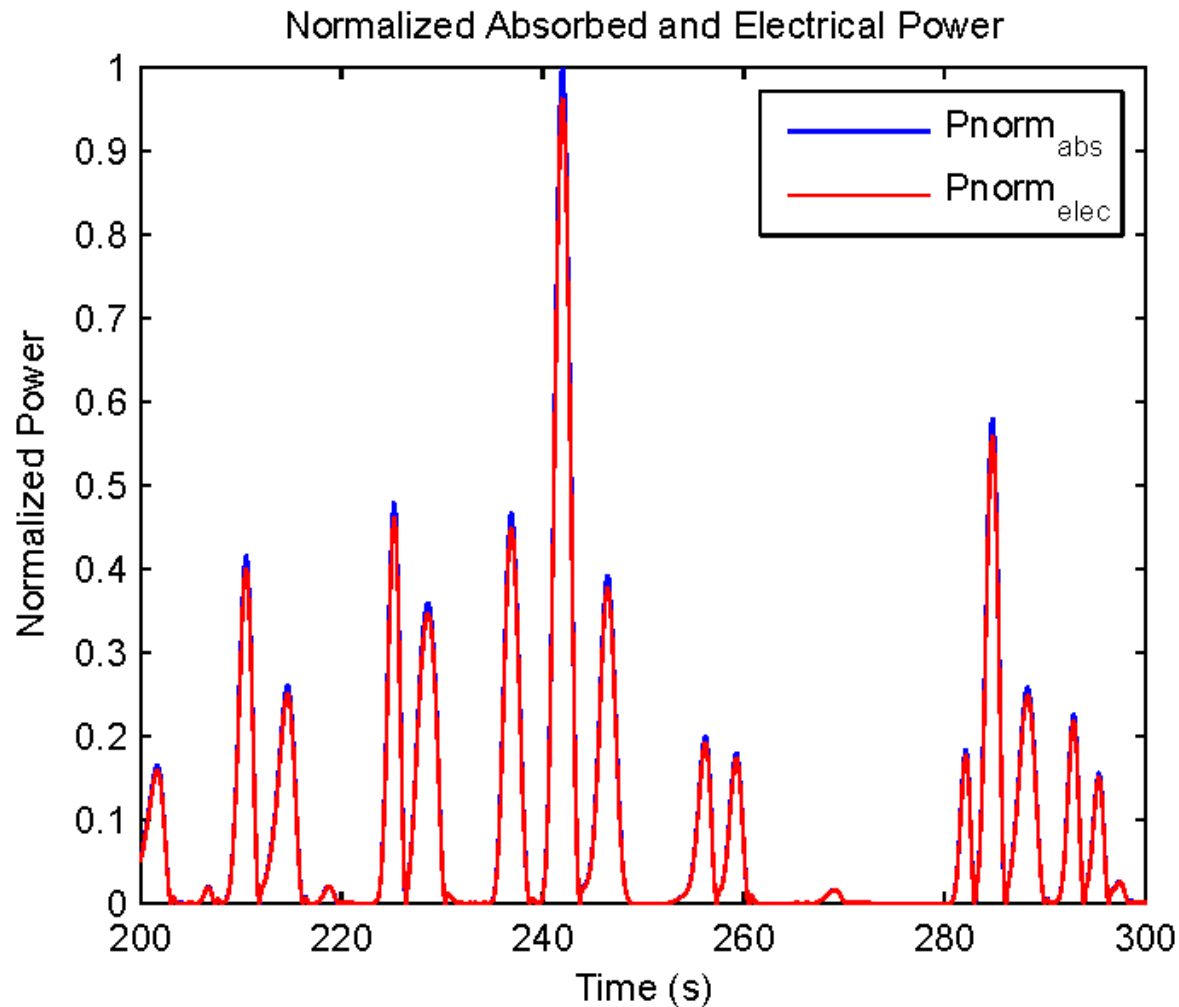
[Smithsonian]



Case 2 - Direct Drive PTO

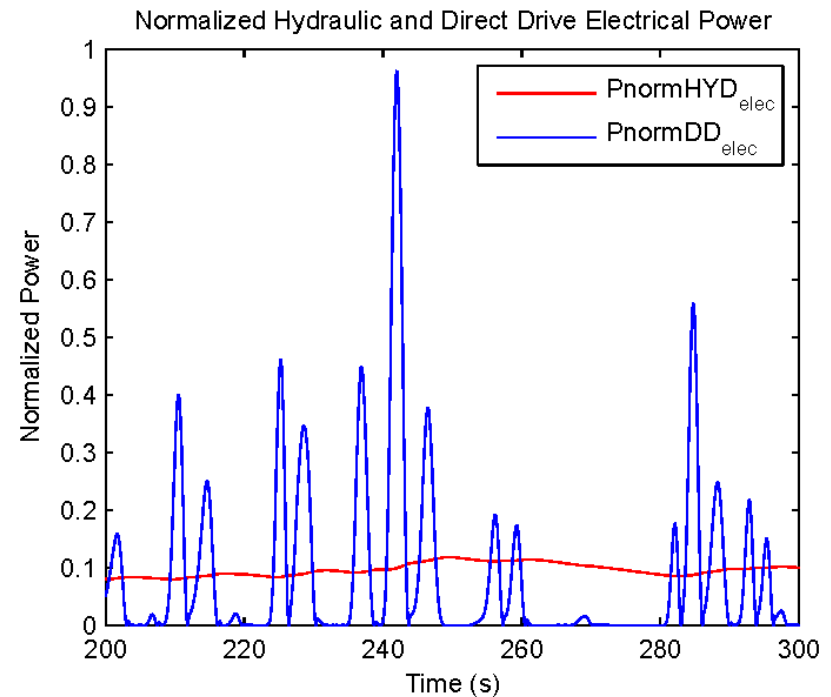


Case 2 - Direct Drive PTO



Comparison

- Hydraulic PTO
 - Power storage
 - Smooth power output
- Direct Drive PTO
 - Power output follows input motion
 - High efficiency
- Benefits of PTO-Sim



Questions?

Contact: Ratanak So
Email: sor@onid.oregonstate.edu