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

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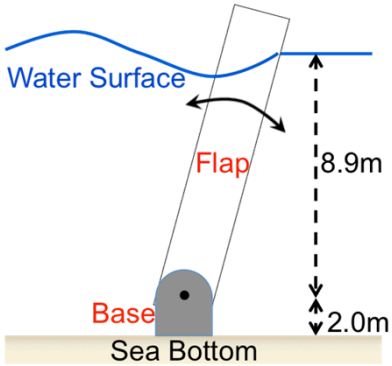
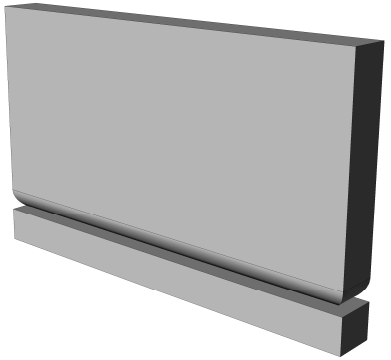
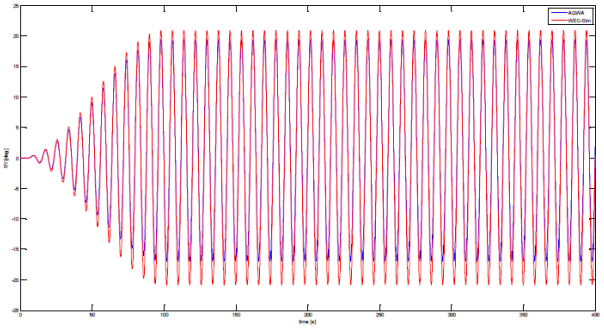
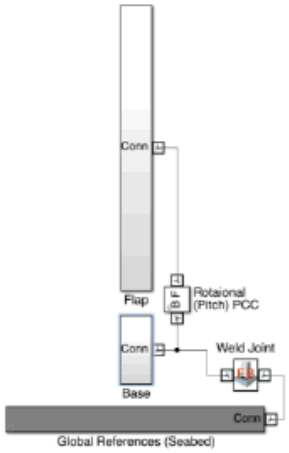
Introduction

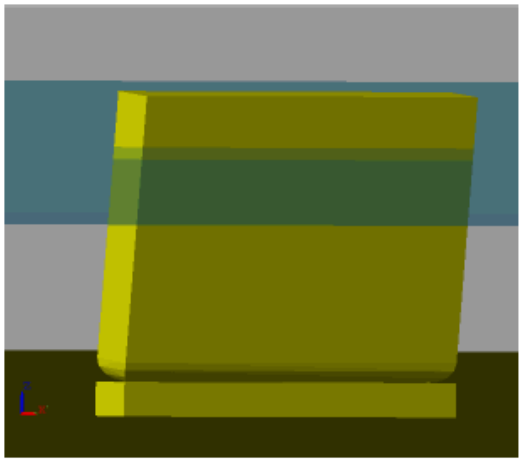
- WEC-Sim
  - Open-source WEC performance code
  - Linear PTO
- PTO-Sim
  - More realistic modelling of power conversion chain (PCC)
  - Library of common PTO components
  - Development and Application cases



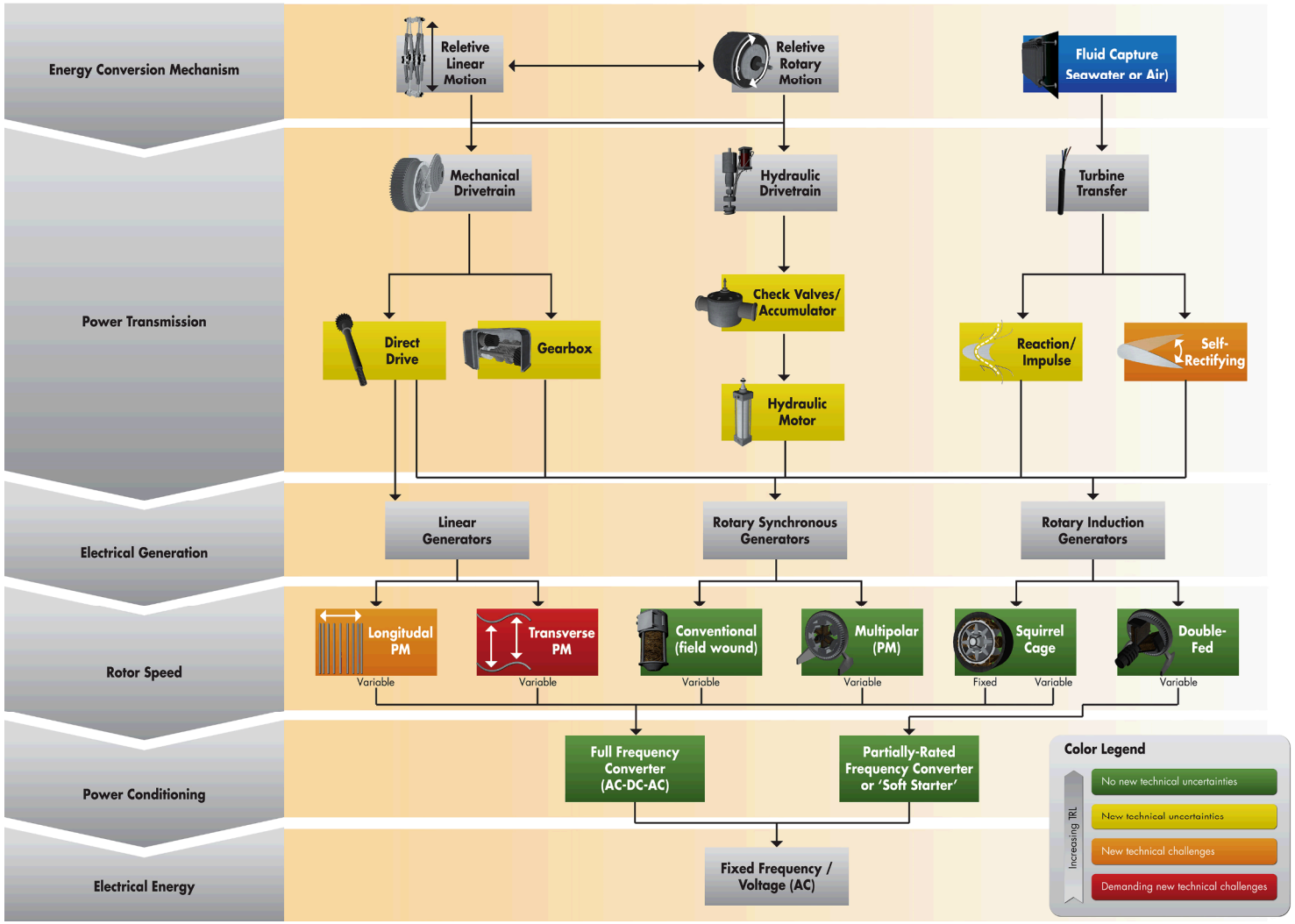






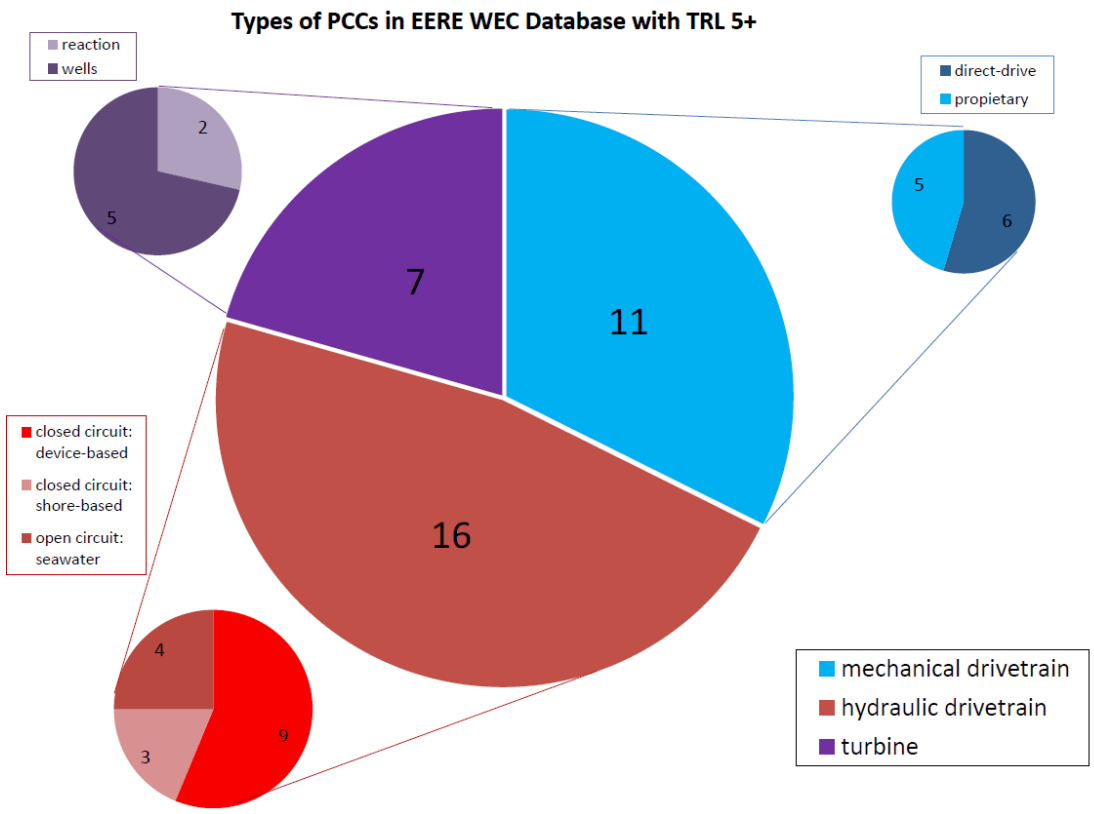


Power Conversion Chains (PCC)



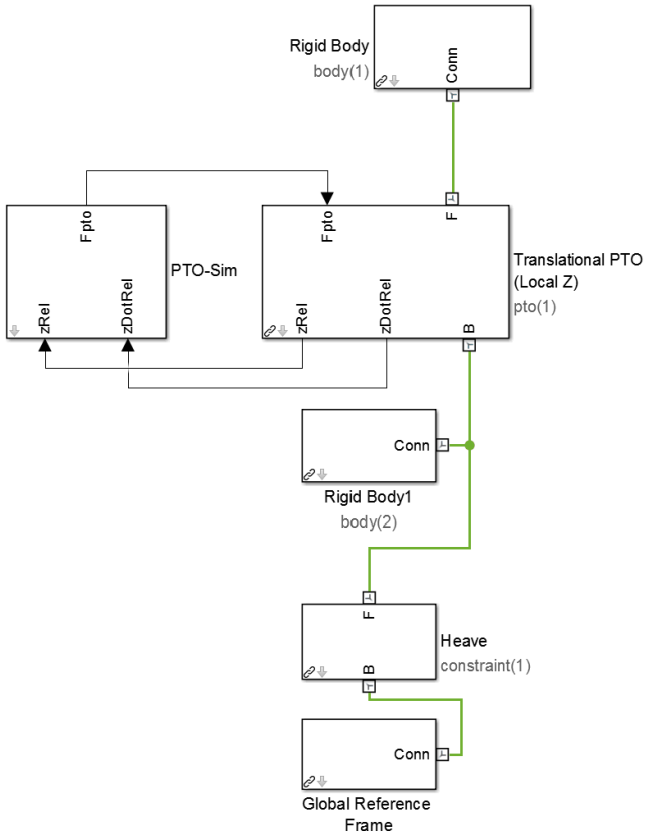
Application Cases

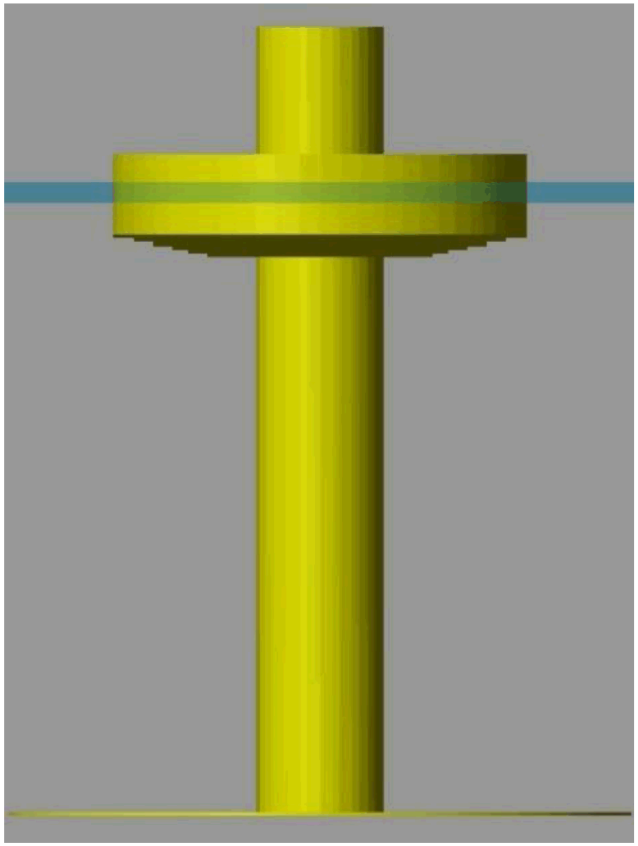
- Two cases
- Device: RM3
- PTO
  - Hydraulic PTO
  - Direct Drive



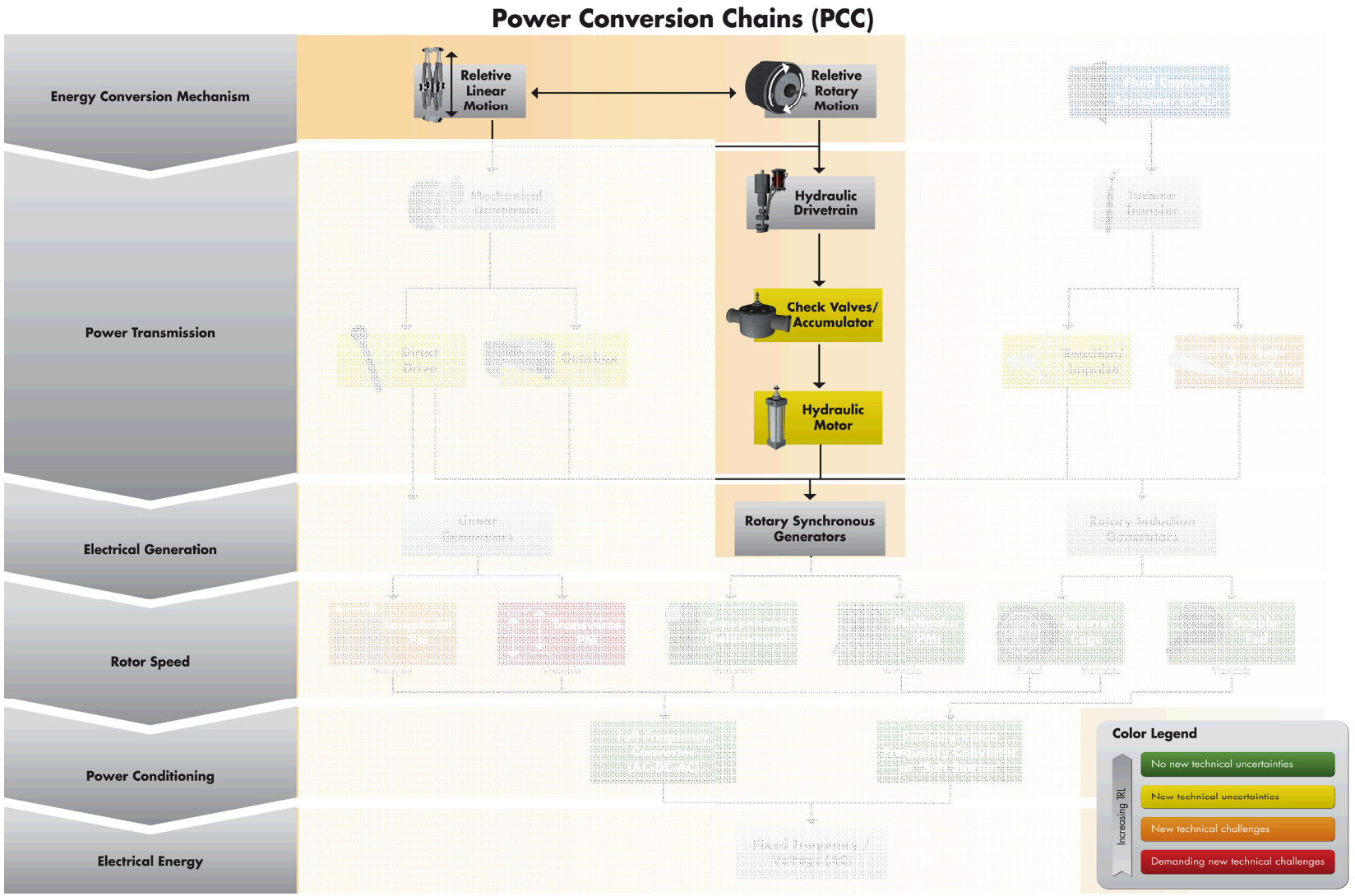
Application Cases

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





Case 1 - Hydraulic PTO



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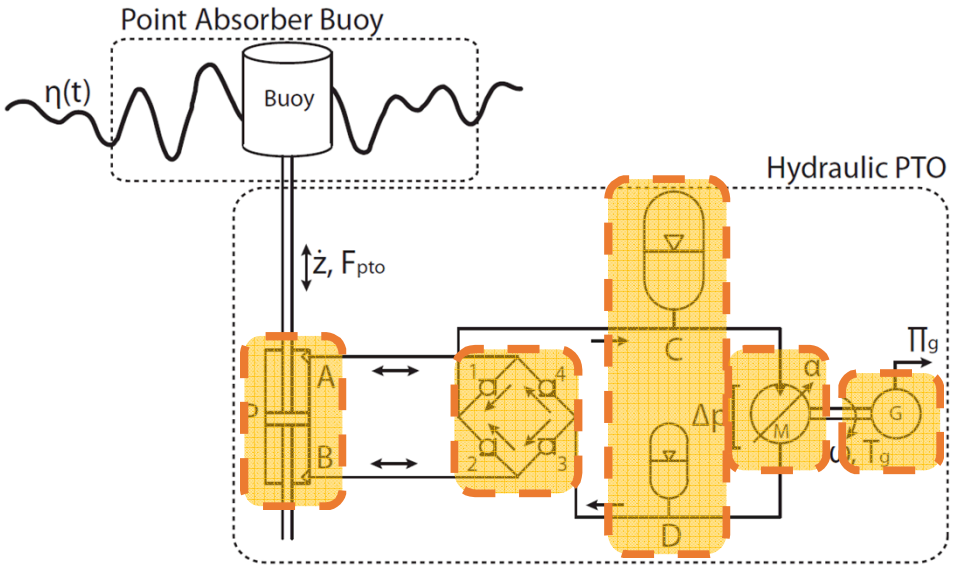

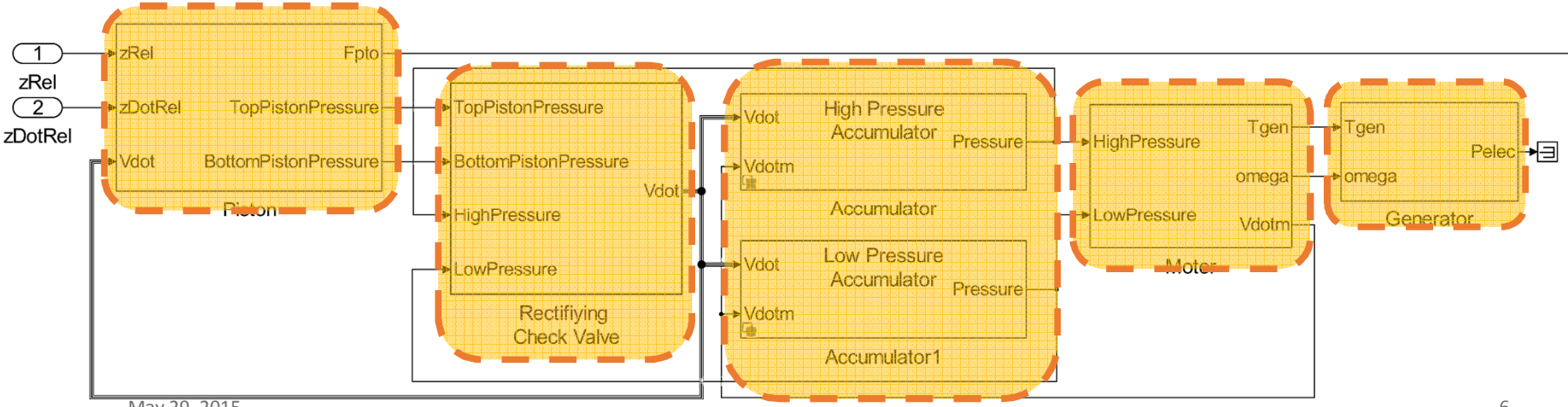

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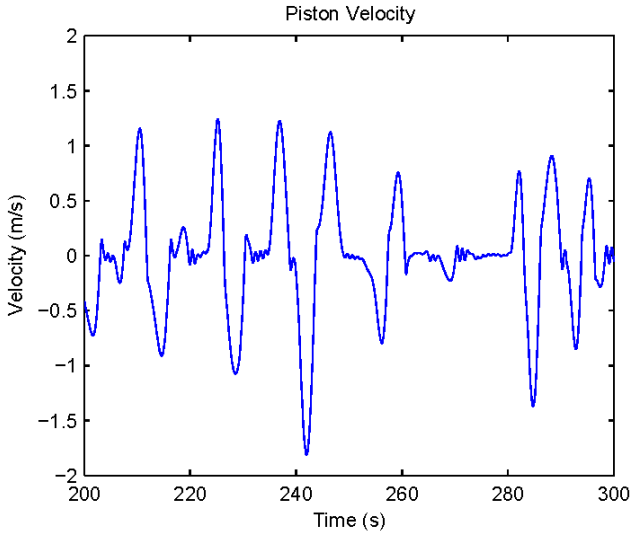

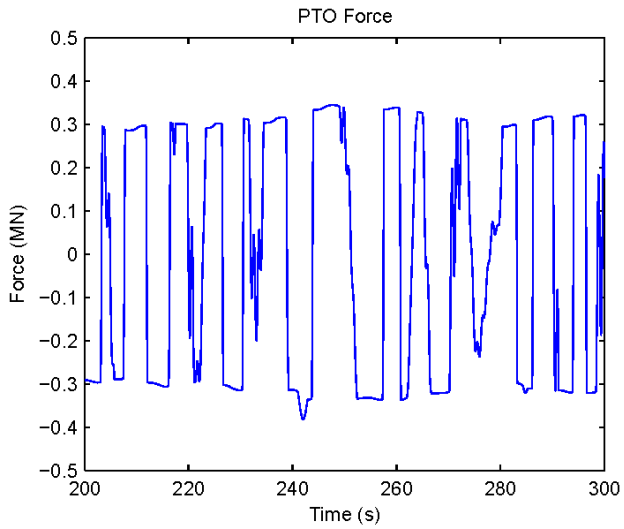

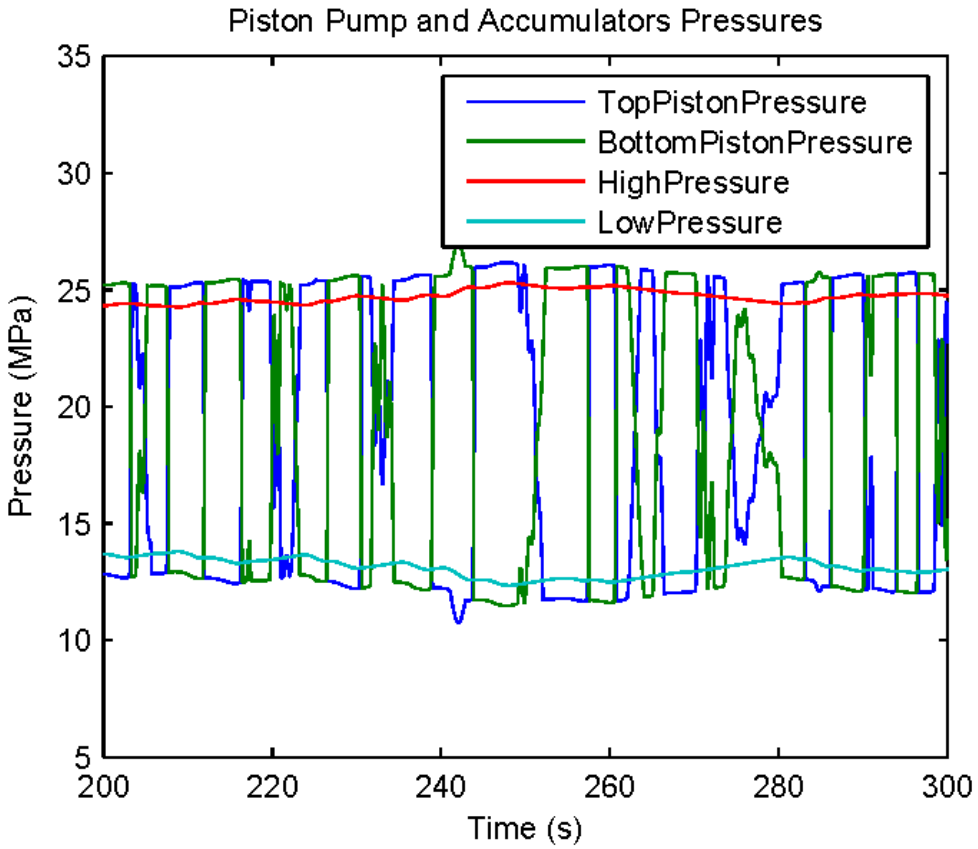

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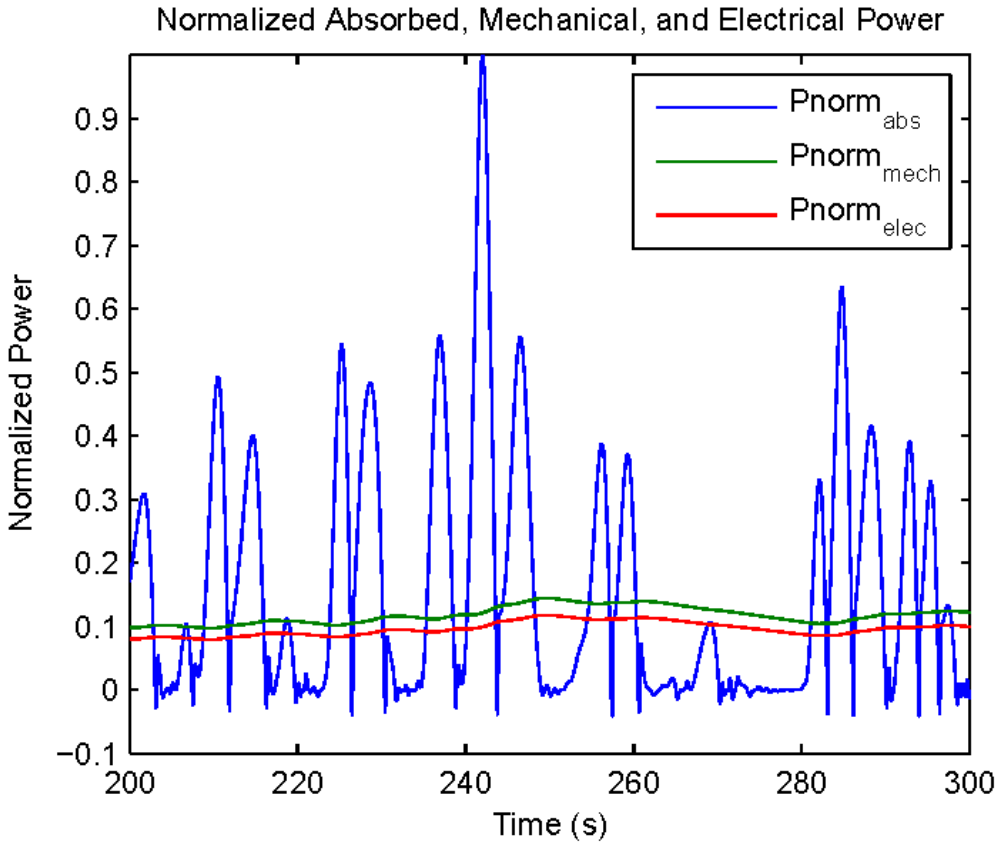
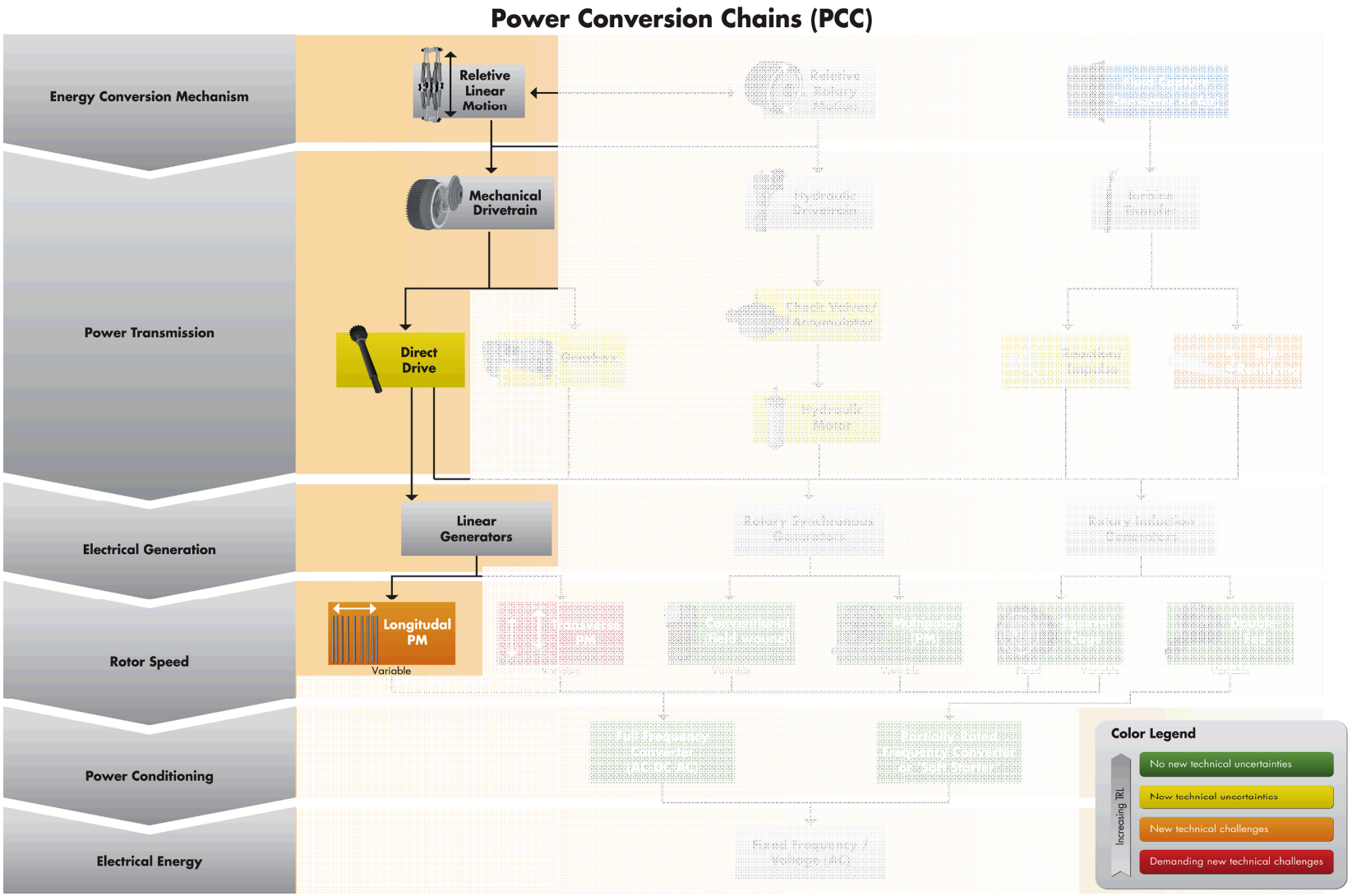
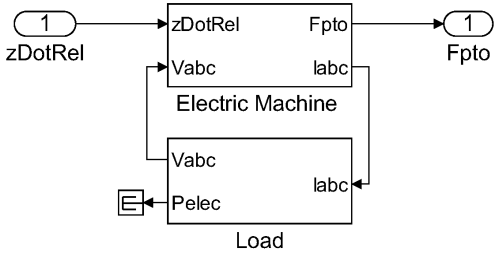


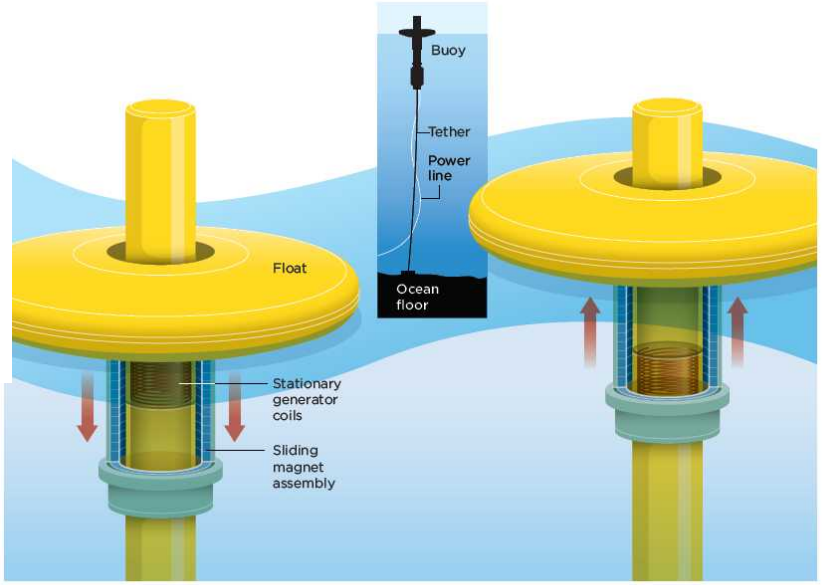
P_{abs} is the power absorbed at the piston
P_{mech} is the power at the axle connecting the motor and generator
P_{elec} is the electrical power at the output of the generator

Case 2 - Direct Drive PTO

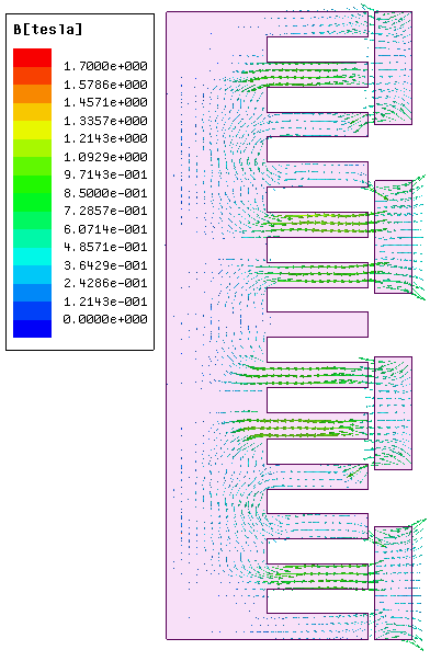


Case 2 - Direct Drive PTO





[Smithsonian]



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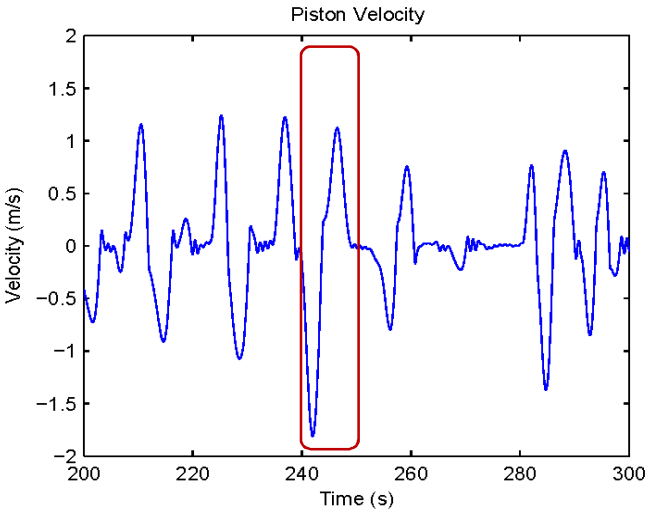

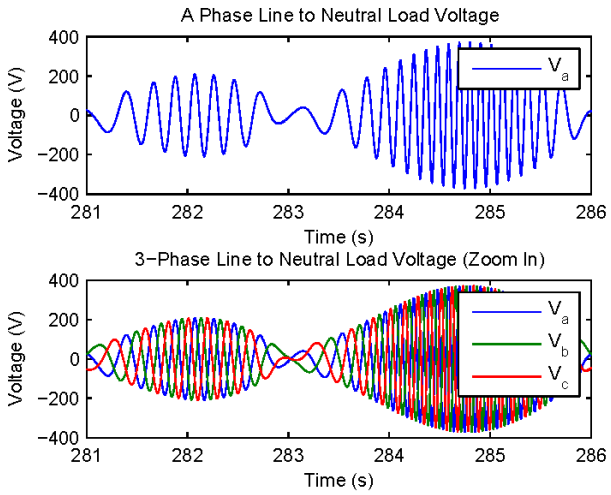

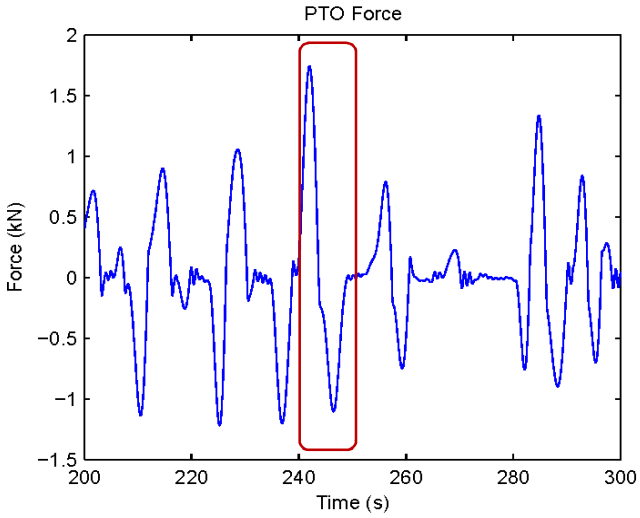

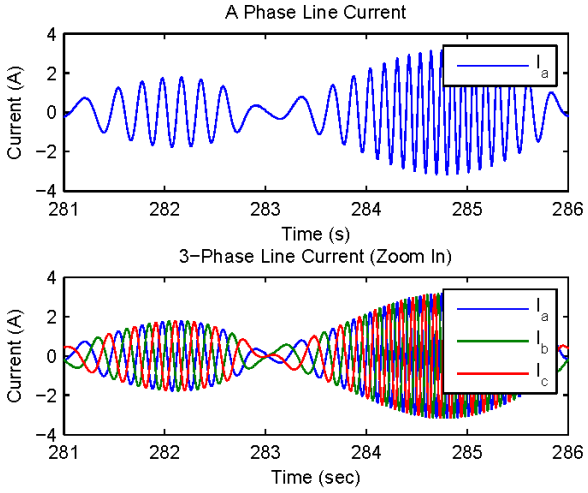

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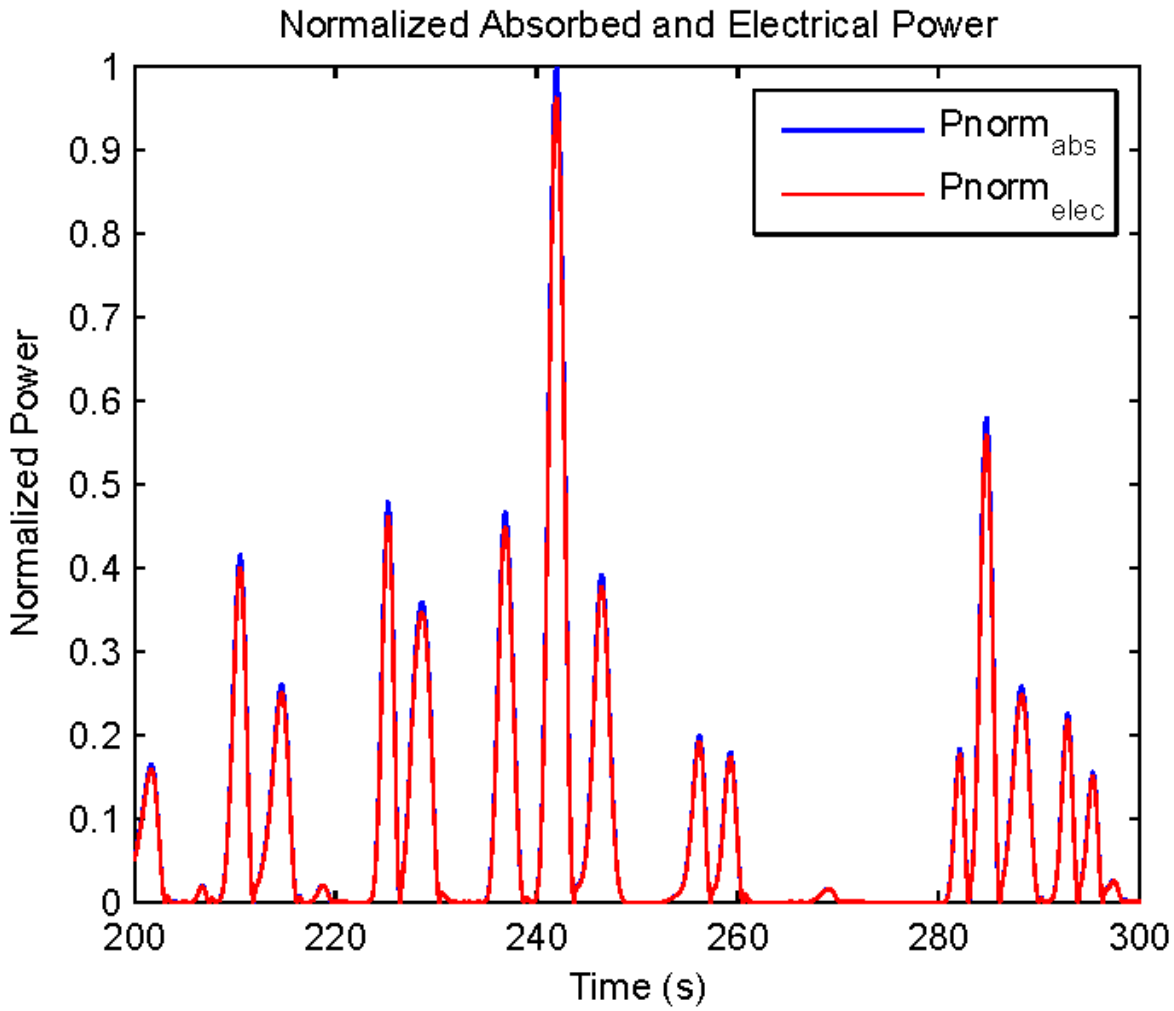
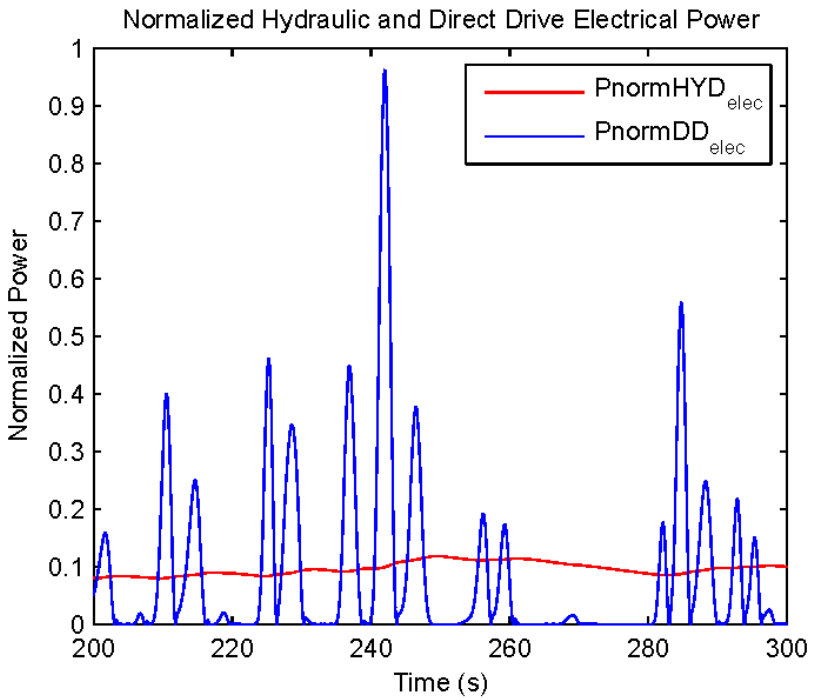


Comparison

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



Questions?

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