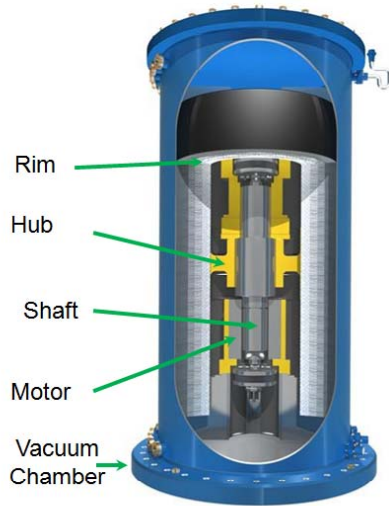


# Development of a 100 kWh/100 kW Flywheel Energy Storage Module

Current State of the Art Flywheel

High Speed, Low Cost, Composite Ring with Bore-Mounted Magnetics

25 KWh – 100KW



- Eliminate Shaft and Hub
- Levitate on Passive Magnetic Bearings
- Increase Rim Tip Speed
- Larger Diameter Thinner Rim Stores More Energy
- 4 X increase in Stored Energy with only 60% Increase in Weight



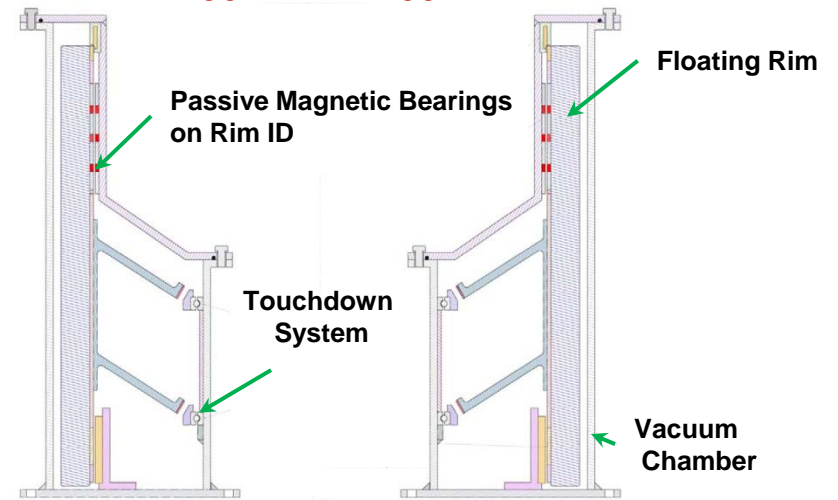
## Limitations of Existing Flywheel

- 15 Minutes of storage
- Limited to Frequency Regulation Application
- Rim Speed (Stored Energy) Limited by Hub Strain and Shaft Dynamics

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100 KWh – 100KW



## Program Challenges

- Development of flexible magnets on Rim ID
- Touchdown System for Earthquake Survival
- Process Development of larger Rim

## Program Objectives

- 1 Hour of Storage
- 1/8 the Cost per unit of Stored Energy
- Reduced Parasitic Losses
- Additional Applications Possible
  - ✓ Wind and Solar Ramping
  - ✓ Wind Firming
  - ✓ Peak Shaving – Demand Limiting

