

McGill Electric Snowmobile Team



CLEAN SNOWMOBILE CHALLENGE™

Presented by Francis De Broux and Ali Najmabadi
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Design Overview

Charger: 120/220V,
15/30A, DC/DC converter
Electronics

Standard plug for charging
→ Replaces fuel cap



Cargo space

Motor: AC induction, 25kW max
Batteries: 20 cells, 72V, 3.24kWh

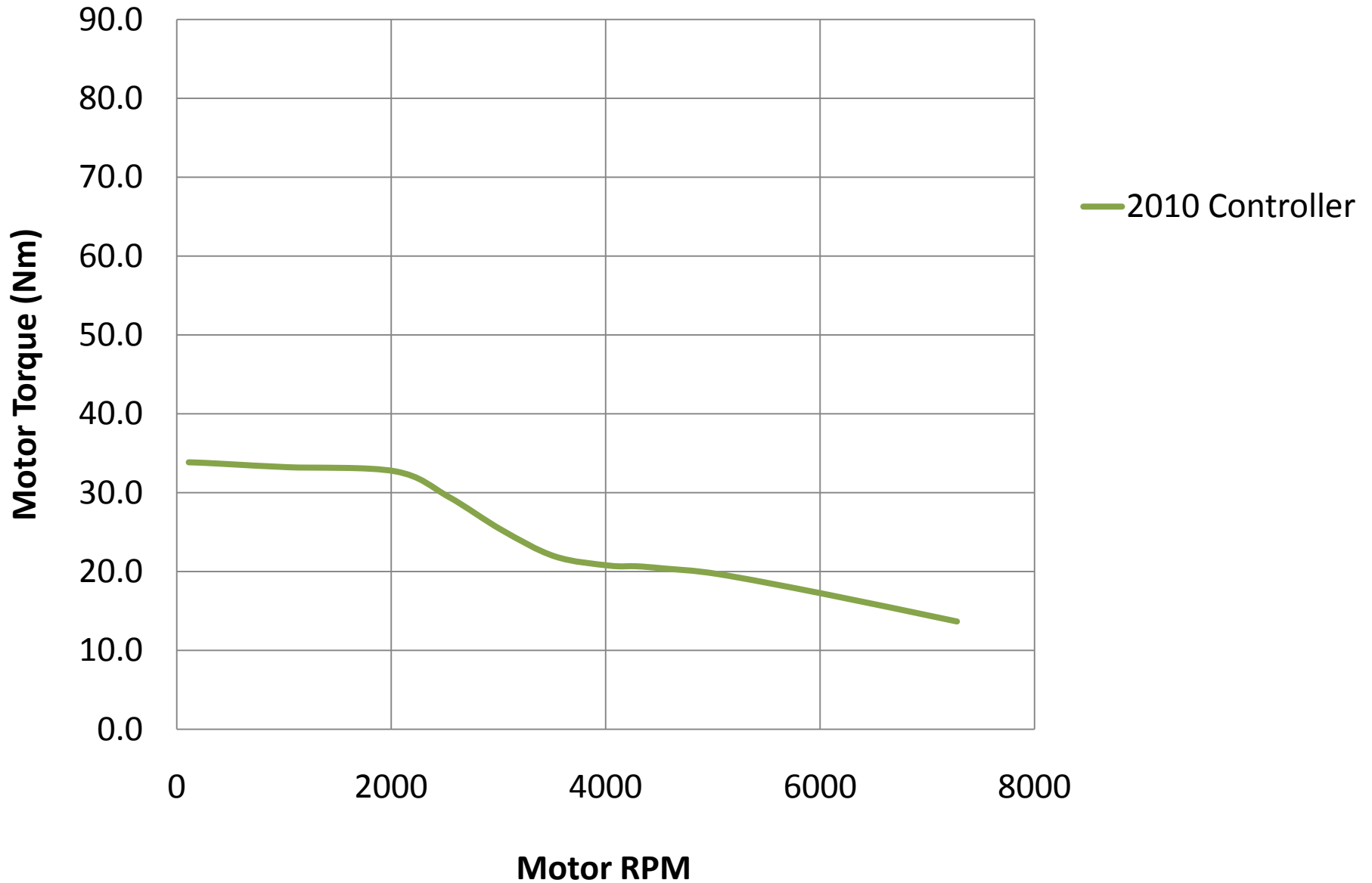
Motor controller: 550A rms max

Operator Perspective

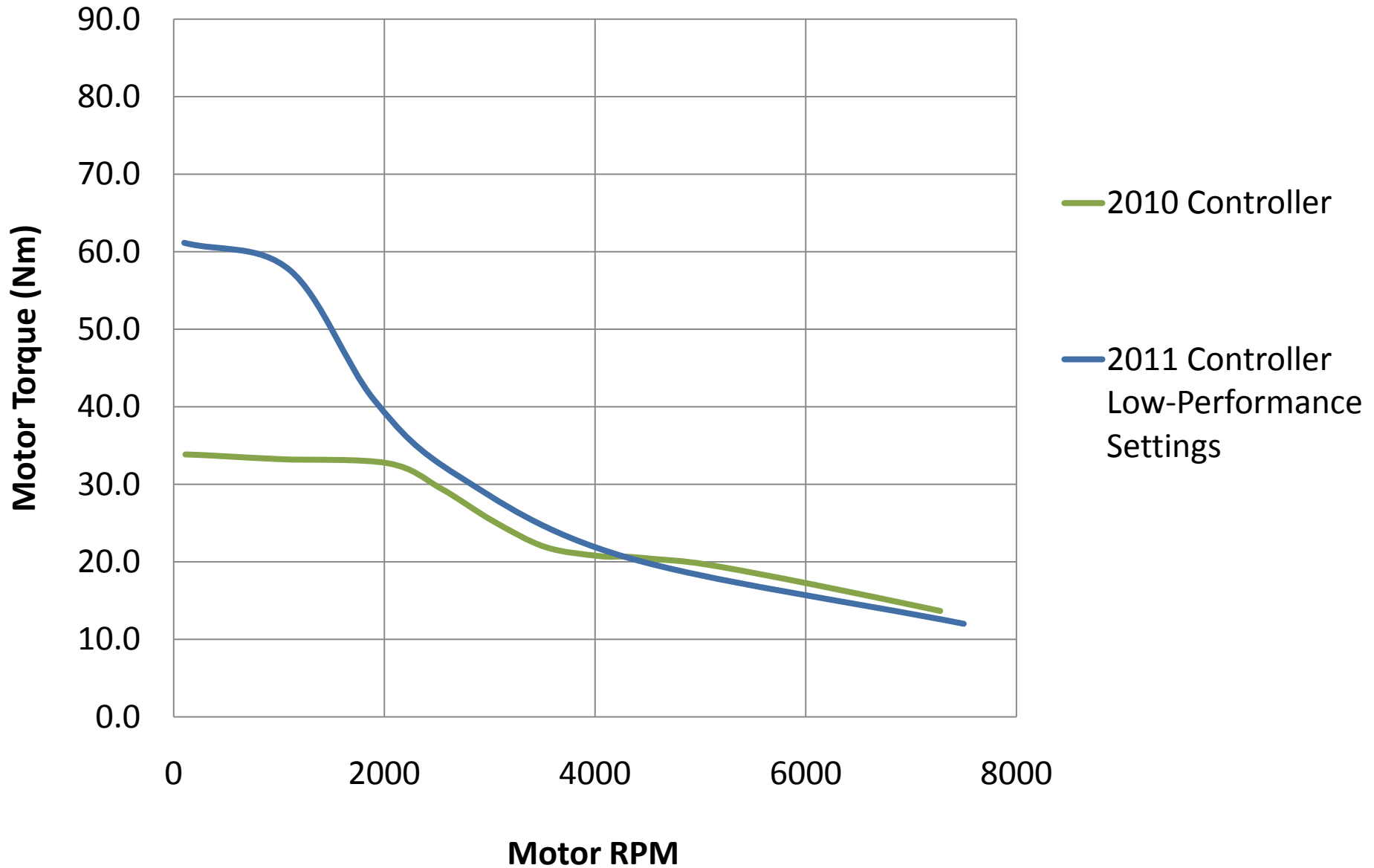
- Features:
 - Increased performance over previous prototype
 - Programmable performance settings
 - Proven battery durability
 - 12.5 km (7.8 miles) on heavily used 6 year old battery



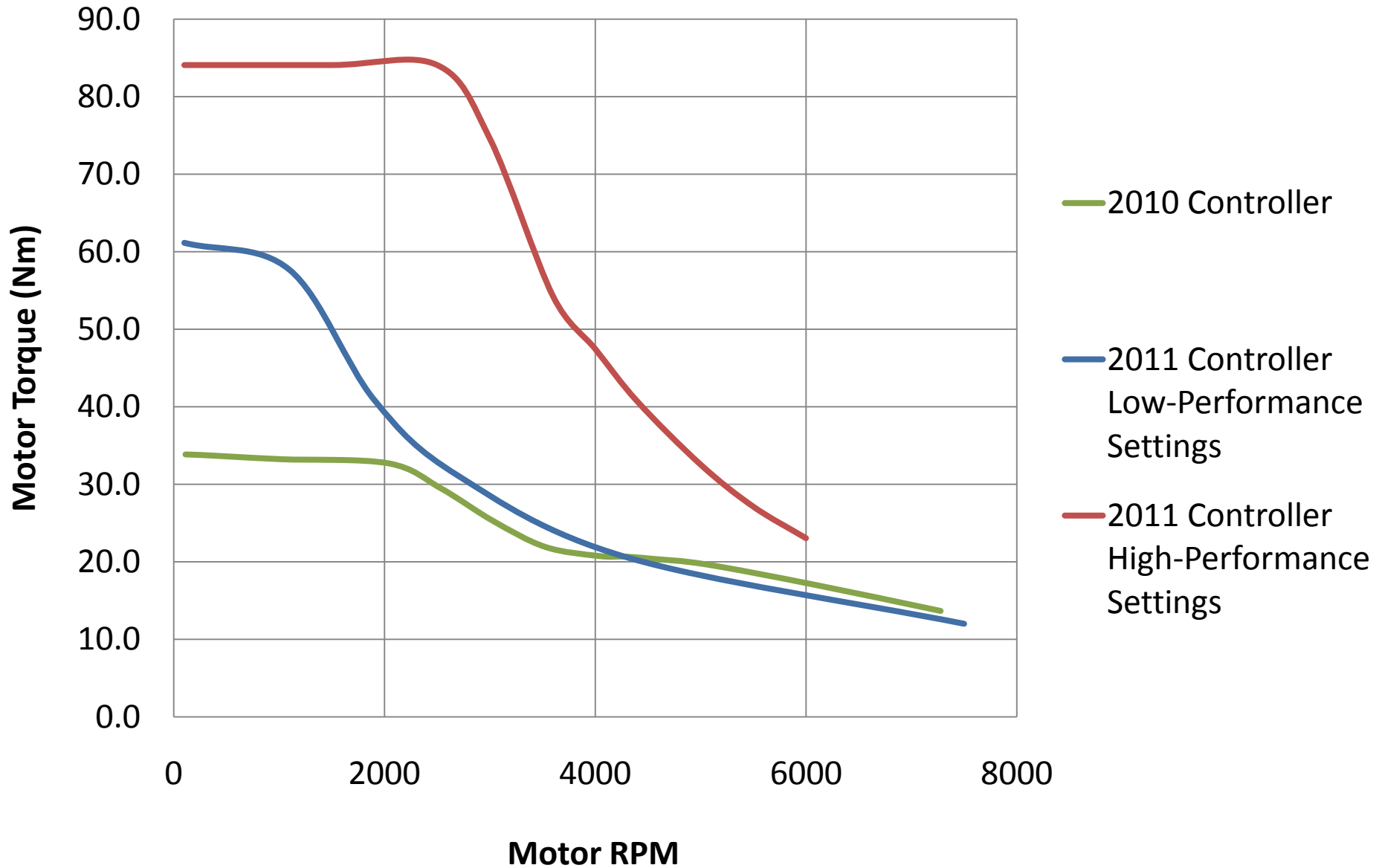
Torque vs RPM



Torque vs RPM



Torque vs RPM



Optimized Drive Ratio

Drive ratio	2.65	3	4.35	4.94	5.29	6
25 m accel	4.1	3.9	3.7	3.7	3.7	3.7
50 m accel	6.4	6.2	6	6	6.1	6.3
100 m accel	10.4	10.2	10.2	10.5	10.7	11.3
152 m accel	14.4	14.2	14.4	15	15.4	16.4

Results obtained from PSAT

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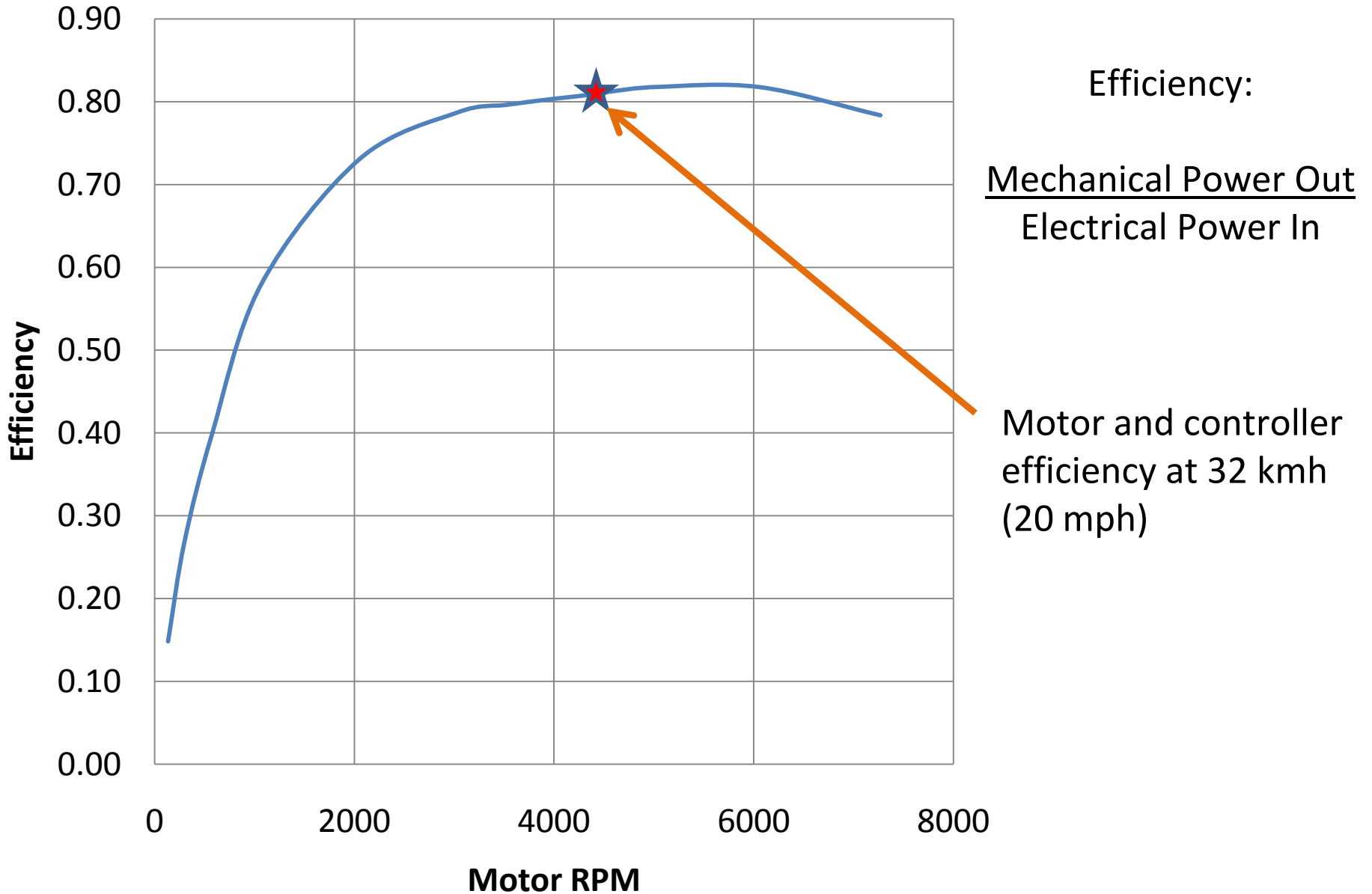
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Results obtained from PSAT

Efficiency vs Motor RPM



Ergonomics and Other Features

- On-board charger
 - Works for 120 and 220V outlets
- Stock driver position maintained
- Progressive throttle response
- Reverse switch
- Regenerative braking
- Cargo space
- 514 lbs
 - Lightest ZE sled at CSC



Outfitter Perspective

- *ZERO-EMISSION, ZERO-MAINTENANCE!*
 - No maintenance on electrical system
- Simple conversion
 - Stock drivetrain components (jackshaft to track)
 - No chassis or body modifications

Outfitter Perspective

- Low cost conversion
 - \$6,000 + accumulator cost
- Current battery pack: LTC 3.24 kWh
 - Still very functional after 6 years
 - Range results: 12.5 km (7.8 miles) with 2.1 kWh

Energy Consumption

Year	Wh/Km	Wh/Miles
2010	220	352
2011	167	267

- 25% energy reduction
 - Optimized gear ratio
 - Motor controller tuning

Low Noise

- Low noise satisfaction guarantee (68dB, SAE J1161)



Suitable for North / South Pole?

- Range: 12.5 km with 6 year old battery
 - 20 km projected with fresh battery
- Over 600 lbs towing force
- Zero electrical maintenance
- Low conversion cost
 - \$6,000 + Batteries
- 6+ years battery life
- Low noise
 - 68 dB

Questions

- Range: 12.5 km with 6 year old battery
 - 20 km projected with new battery
- 600 lbs towing capacity
- Zero electrical maintenance
- Low conversion cost
 - \$6,000 + Batteries
- 6+ years battery life
- Low noise
 - 68 dB

