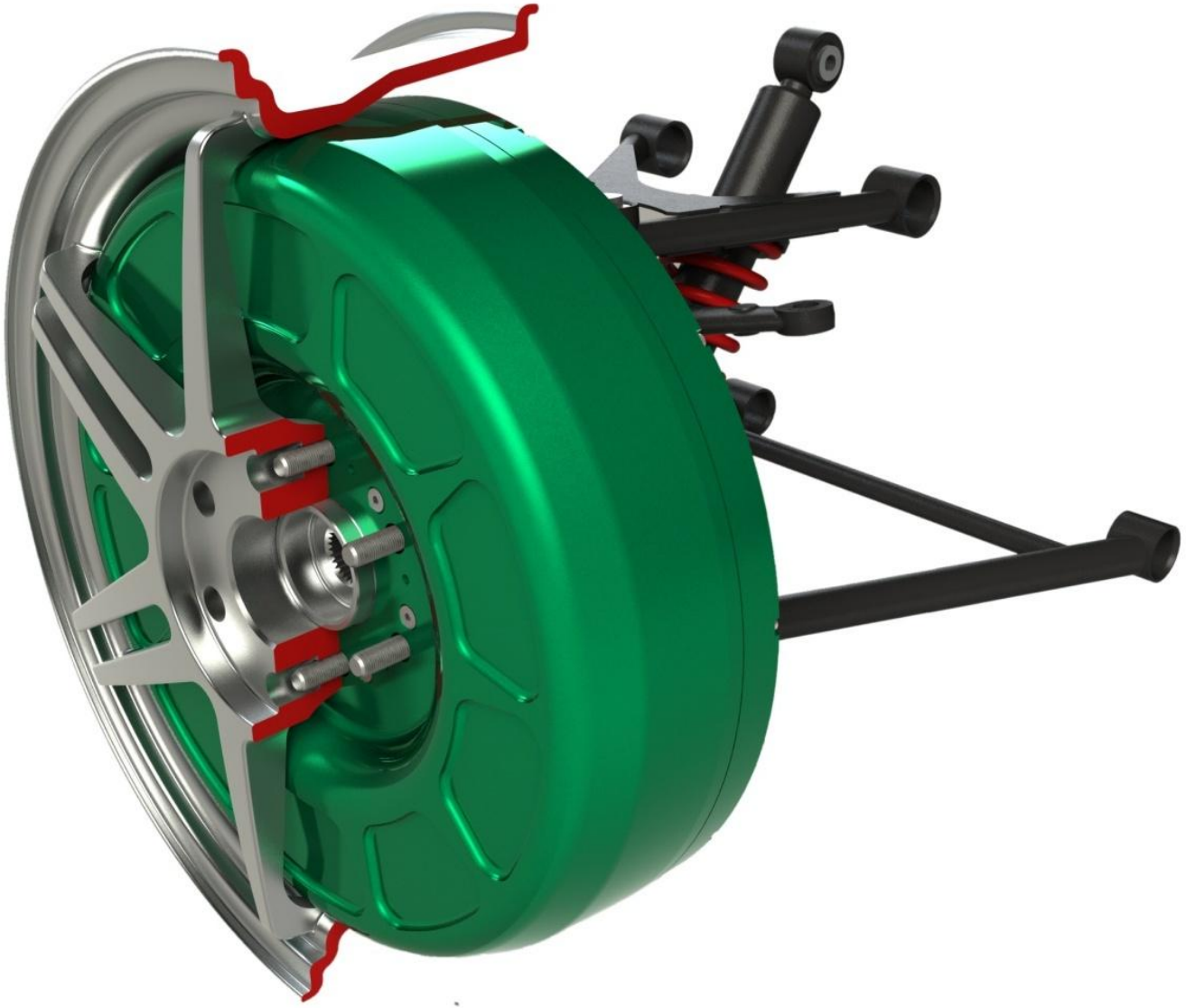
Protean ELECTRIC

Advanced In-Wheel Electric Propulsion Technology

March 2010

The Protean Drive



Big Picture:

Protean Electric is a clean-tech company dedicated to removing oil, carbon and cost from vehicle transportation.

How?

- **No Compromise**
  Direct drive in-wheel electric motor technology that matches ICE performance.

- **You don't have to be small to be green**
  Consumers want to drive and the auto industry wants to build larger vehicles - passenger cars, SUVs, minivans and pick-up trucks, but current electric propulsion technologies cannot deliver the power to match the performance of existing ICE powered vehicles.

- **Commercial applications then consumer market**
  Power assist, plug-in SHEV's and BEVs, powered commercial trailers, medium size truck fleets, new and retrofit solutions.

Company History

1963

Company Established, pioneered printed armature motors

1989

Developed powered wheelchair motors and controllers

2001

Focus on high performance motors and drives

2003

Development focuses on wheelmotor technology

2004

First PML multi-wheel wheelmotor driven vehicle

2006

First public debut of the Hi-Pa Drive™ technology

2007

First Hi-Pa Drive™ equipped OEM vehicle shown to the public

Company History (cont'd)

2008

Wheelmotor development continues

2009

PML Flightlink splits

Protean ELECTRIC

PML

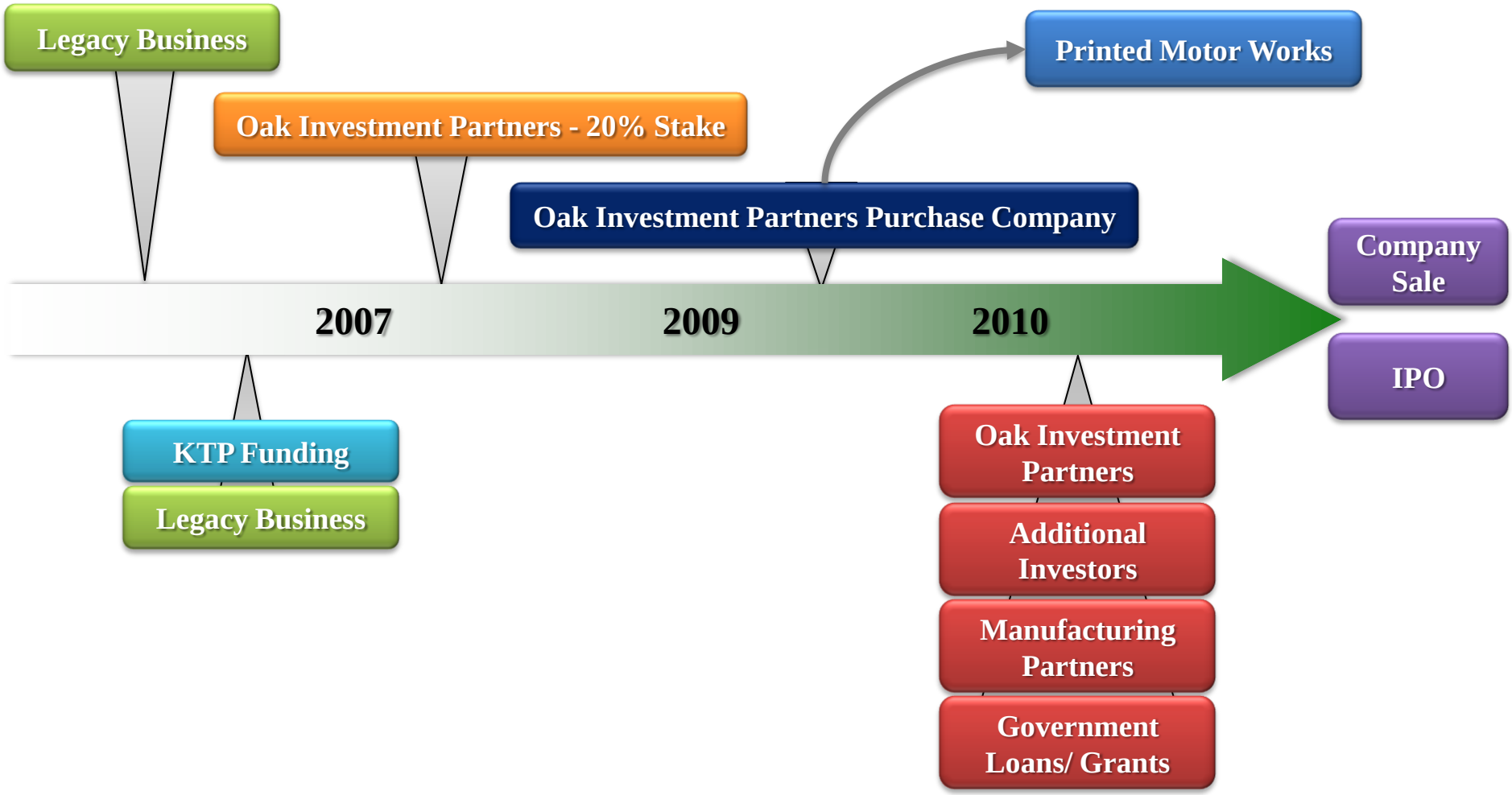
Printed Motor Works

2009

New Protean Electric location

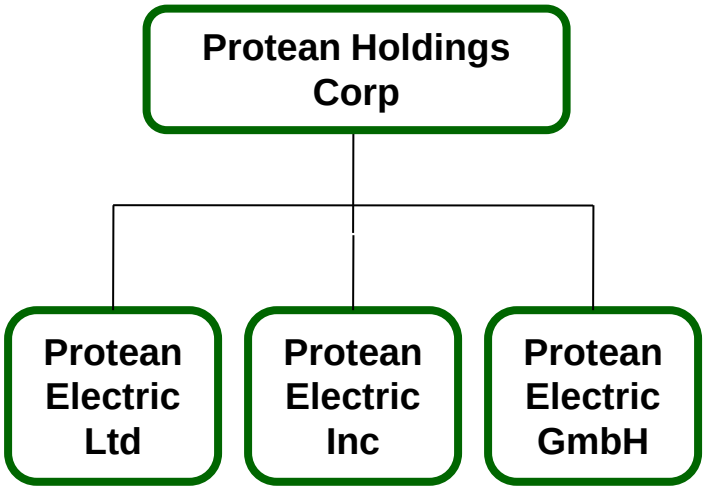
2010.....

Funding


Legacy Business
Oak Investment Partners - 20% Stake
Printed Motor Works
Oak Investment Partners Purchase Company
Company Sale
2007
2009
2010
IPO
KTP Funding
Legacy Business
Oak Investment Partners
Additional Investors
Manufacturing Partners
Government Loans/ Grants

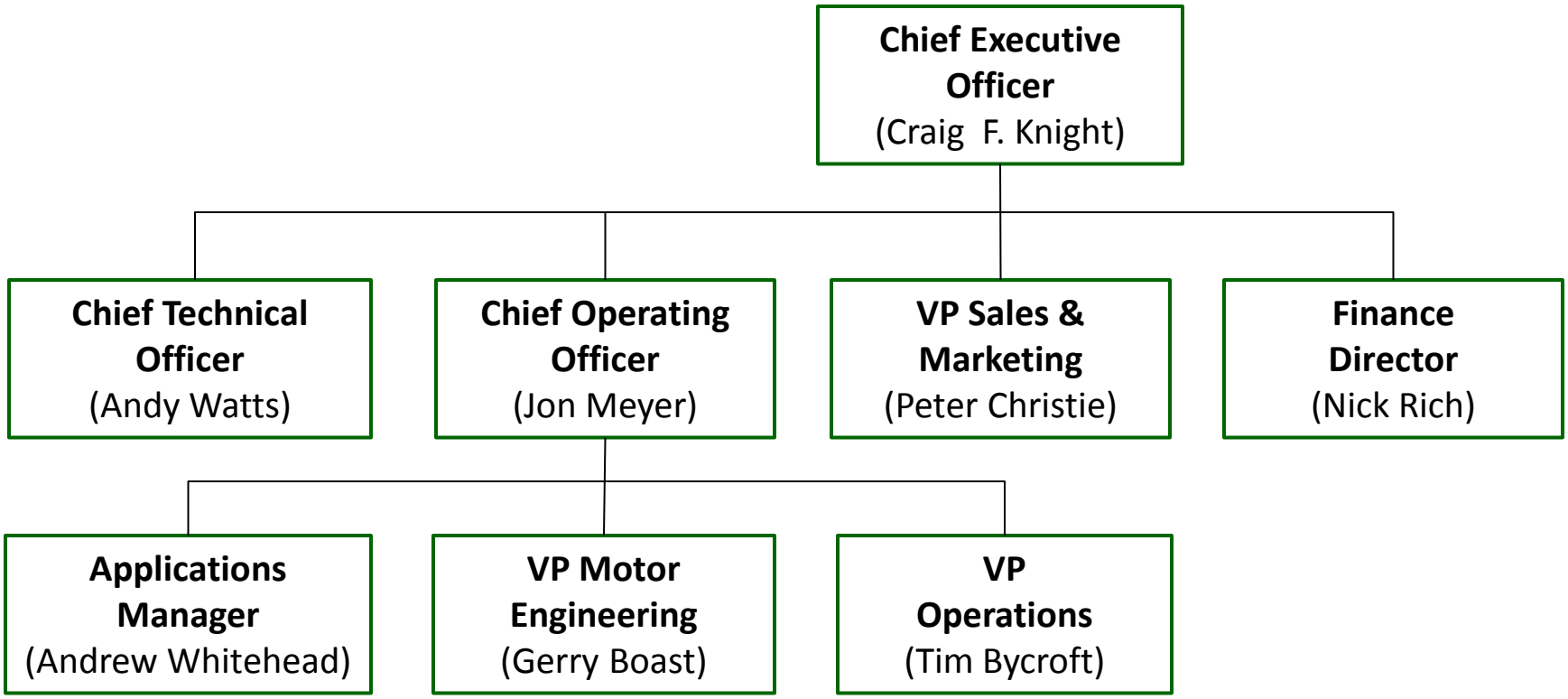
Protean Electric

A spinout from a small established UK company (PML Flightlink), restructured under U.S. holding company (January 2009) with operations in the UK, U.S. and Germany.



Corporate Structure	US holding company, operating subsidiaries in UK, US and Germany
Employees	71 (58 engineers)
Products	Hi-Pa Drive™ 2001-2008 Protean Drive™ 2009-Present
Running Test Vehicles	Volvo ReCharge , Plug-in SHEV Ford F150, BEV
Planned Test Vehicles	Vauxhall Vivaro, Parallel Hybrid Ford Transit Connect, Parallel Hybrid Mercedes E Class BEV
Ownership	Oak Investment Partners

Management Team



Management automotive experience includes: Jaguar, Land Rover, Renault F1, Honda F1, Red Bull F1, McLaren F1, Lotus, Tesla, Mercedes F1, BMW, Delphi, Ford, FEV, Visteon, Omnitech, Lansing Linde, Siemens VDO, TRW, Dana and Ricardo.

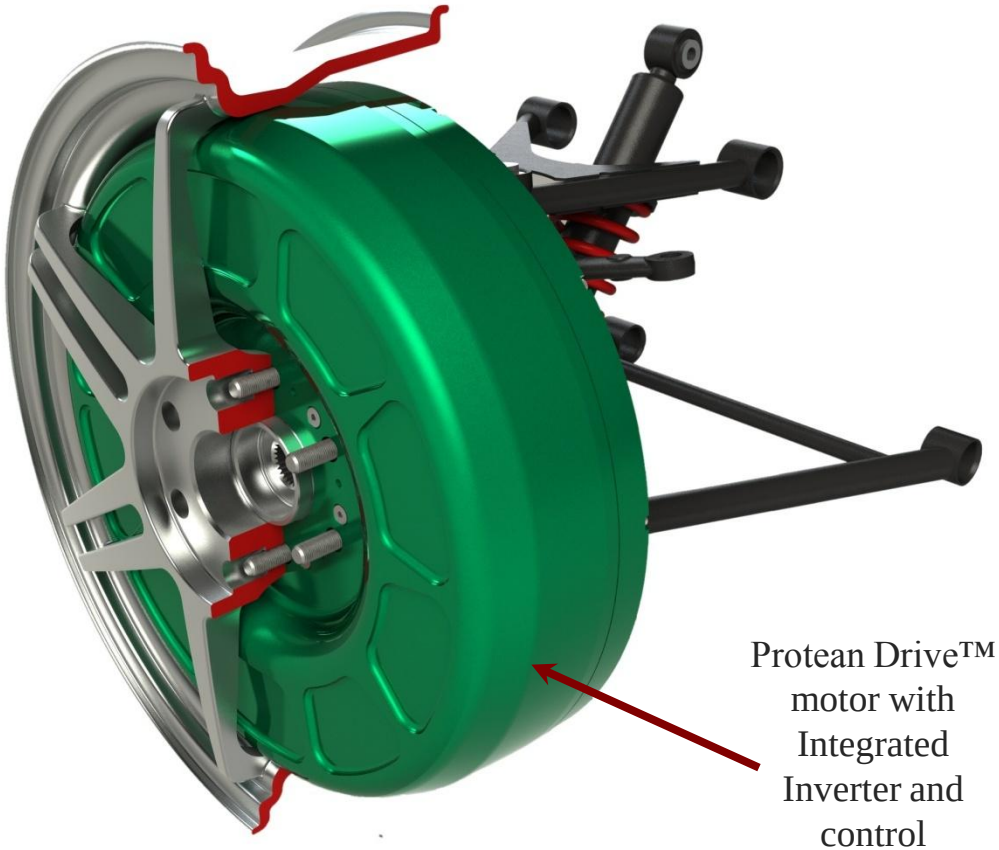
Protean Drive™

Packaging:

- In-wheel
- Fully integrated inverter and control electronics, encased inside each motor

Power Density:

- **Highest power and torque levels**
- **Superior levels of regenerative braking**

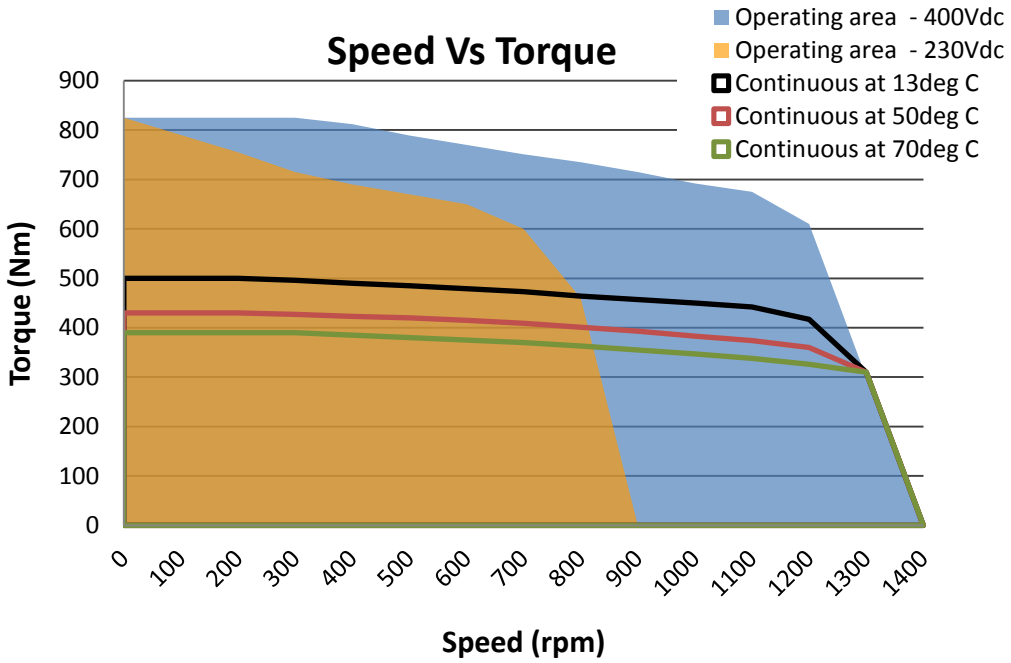


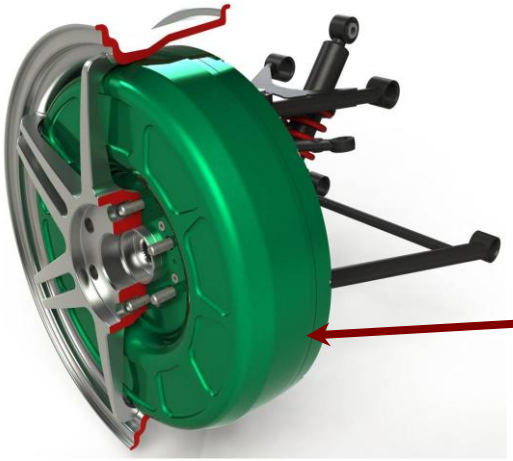
Protean Drive™ motor with Integrated Inverter and control electronics

Protean Drive™ Specification

	Units	PD18
Peak output power @400Vdc	**kW**	83
Continuous output power @ 400Vdc	**kW**	54
Peak output torque	**Nm**	825
Continuous output torque	**Nm**	500
Nominal input voltage range	**Vdc**	200 – 380
Width	**mm**	115
Diameter	**mm**	420
Maximum Speed		
230Vdc Bus	**rpm**	800
400Vdc Bus	**rpm**	1400
Total motor mass	**kg**	31

The above figures are given at 70% maximum motor current, peak motor torque at 100% current is approximately 1100Nm





Protean Drive™ motor with integrated inverter and control electronics

Competitive Advantages

Protean Solution

Inverter weight = within motor

Motor weight = 31kg

Total motor, inverter and gearbox weight = 31kg

Power =83kW Peak
54kW continuous

Competitors' Solution

Inverter weight = 35kg

Motor weight = 65kg

Total motor, inverter and gearbox weight = 145kg

Power = 90kW peak, 30kW continuous

Running Vehicle Case Study: Volvo ReCharge

- Plug-in SHEV, debuted at the 2007 Frankfurt Motor Show.
- Uses 4 x PD18 in-wheel motors, a PD18 motor as an integrated generator and a Volvo-selected lithium polymer battery pack.
- Initial test drive with full regenerative braking.
- 0-60mph in under 5 seconds
  (at 70% torque, battery limited).
- Gross vehicle weight: 1,640kg (3616 lb).
- Video of track testing available at
  www.youtube.com/watch?v=SBT76m-Aoyo
- Additional track testing videos available on request.

Running Vehicle Case Study: Volvo ReCharge

Challenges

Technology Development

- Torque density
- Motor control
- Packaging
- Software integration
- Environmental protection
- Brake integration
- Vibration resistance
- ABS, TC, stability control
- Torque/ speed profile
- Design for manufacture

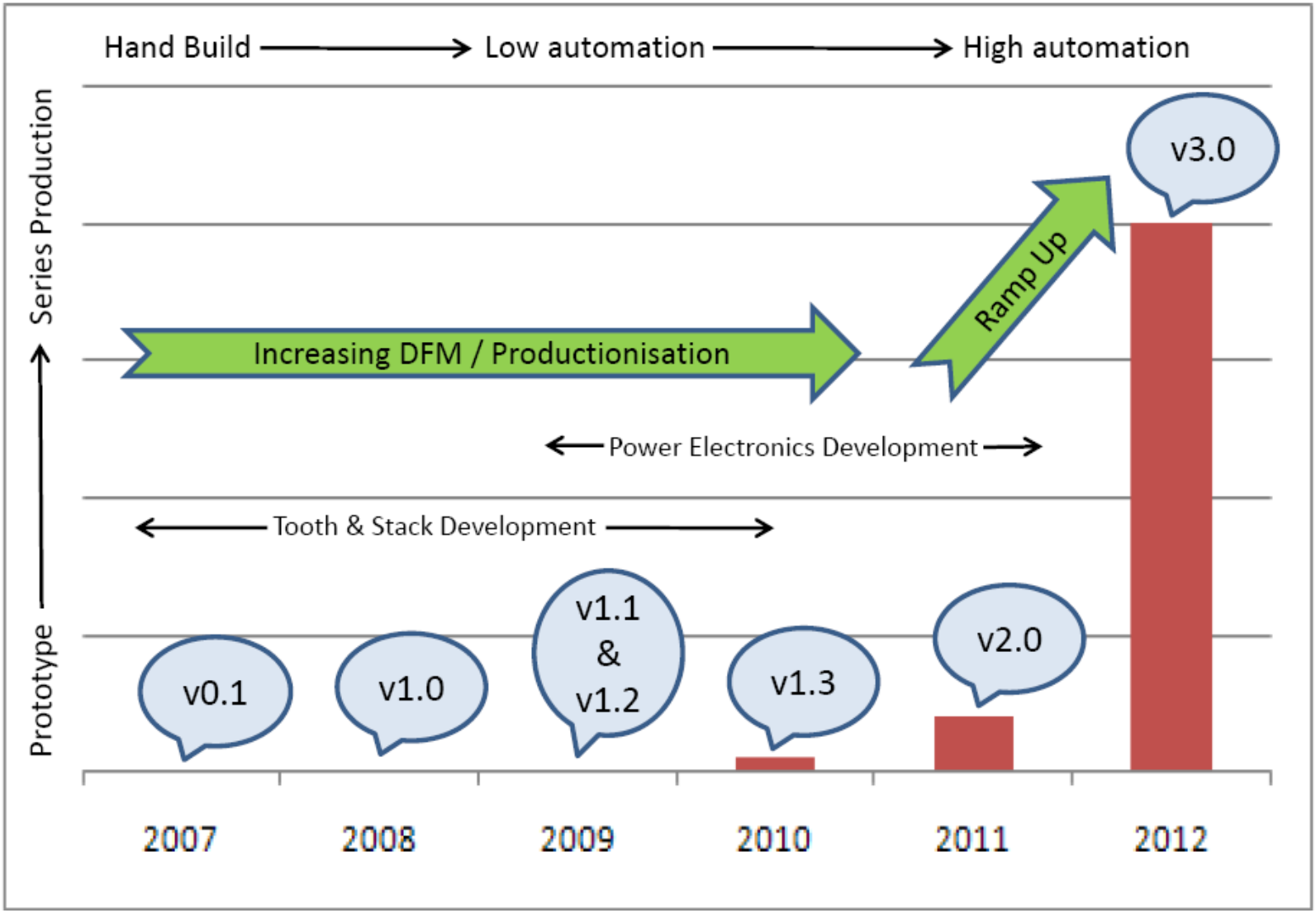
Customer Acceptance

- Unfamiliar technology
- Not invented here
- Ingrained prejudices
- Conservative industry
- Extremely large companies
- Established relationships
- Economic climate
- Time to Market

Business Development

- Funding
- Staff costs
- Time to market
- Rapid growth
- Personality conflicts
- Company culture
- Partner companies
- Economic climate

Timeline To Production



Protean Drive™ Applications

In-wheel motors

In-board motors

Renewable Energy

Power Assist

Thank You

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