BALLARD®

Putting Fuel Cells to Work for Energy Storage

BALLARD POWER SYSTEMS

SMARTER SOLUTIONS FOR A CLEAN ENERGY FUTURE

WWW.BALLARD.COM

APRIL 2010

About Ballard

Leader in hydrogen fuel cells

Portfolio of proven commercial solutions

- Fuel cell stacks, power modules and systems to meet requirements of a wide range of applications

Strong delivery capabilities

- Access to ~2,000 patents and licenses
- High volume manufacturing facility
- Effective SI/OEM & channel partnerships
- 100MW+ of fuel cell products shipped

Putting fuel cells to work

Meeting demand for clean, reliable energy

- Backup and supplemental power for telecom networks
- Distributed power for renewable energy generation
- Full forklift fleet conversions at US distribution centers
- World's largest fuel cell bus fleet

Commercial Customers Include:

DAIMLER

BCTransit

MOTOROLA

FirstEnergy

acme

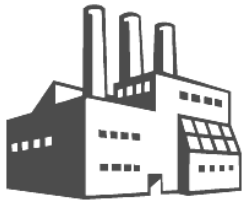
中國移動有限公司 CHINA MOBILE LIMITED

plug power / Walmart

BALLARD®

Distributed Generation: Market Segmentation

Base Load Generation
(by-product hydrogen)

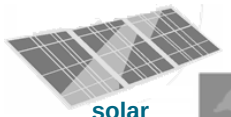


chemical producers

Utility Peak Load Generation

utilities

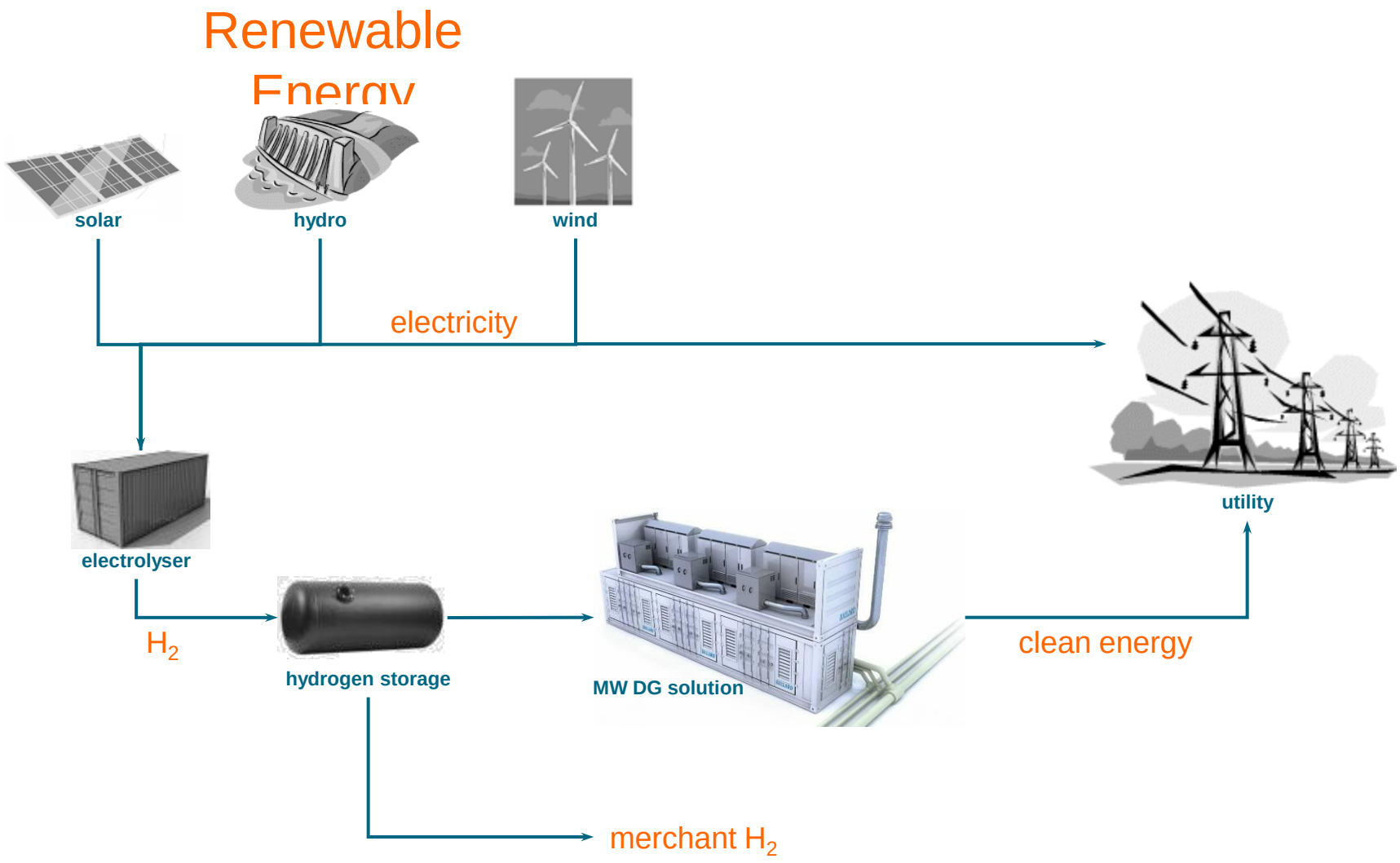
Energy Storage
(independent power producers)



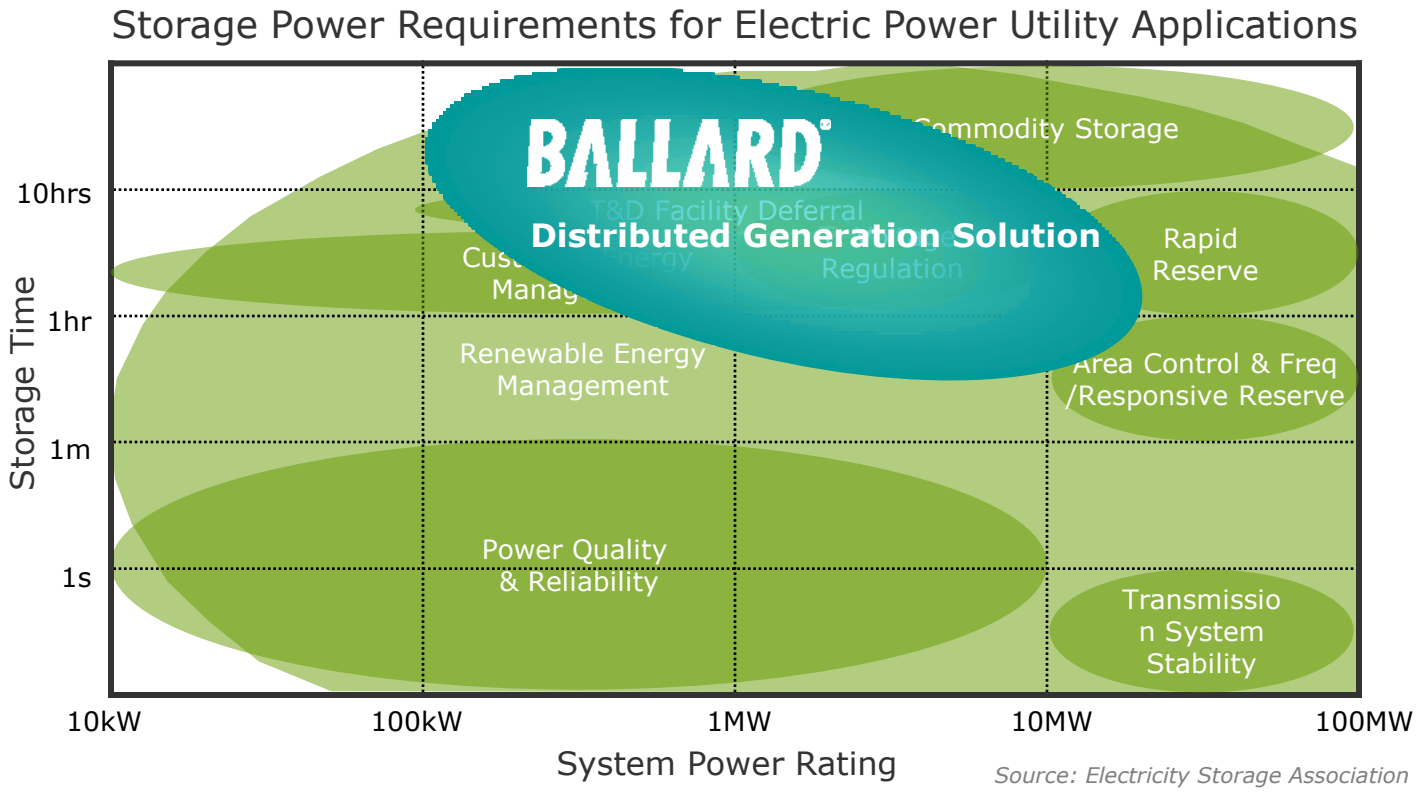
solar

wind

Integrated Fuel Cell Solution for Energy Storage

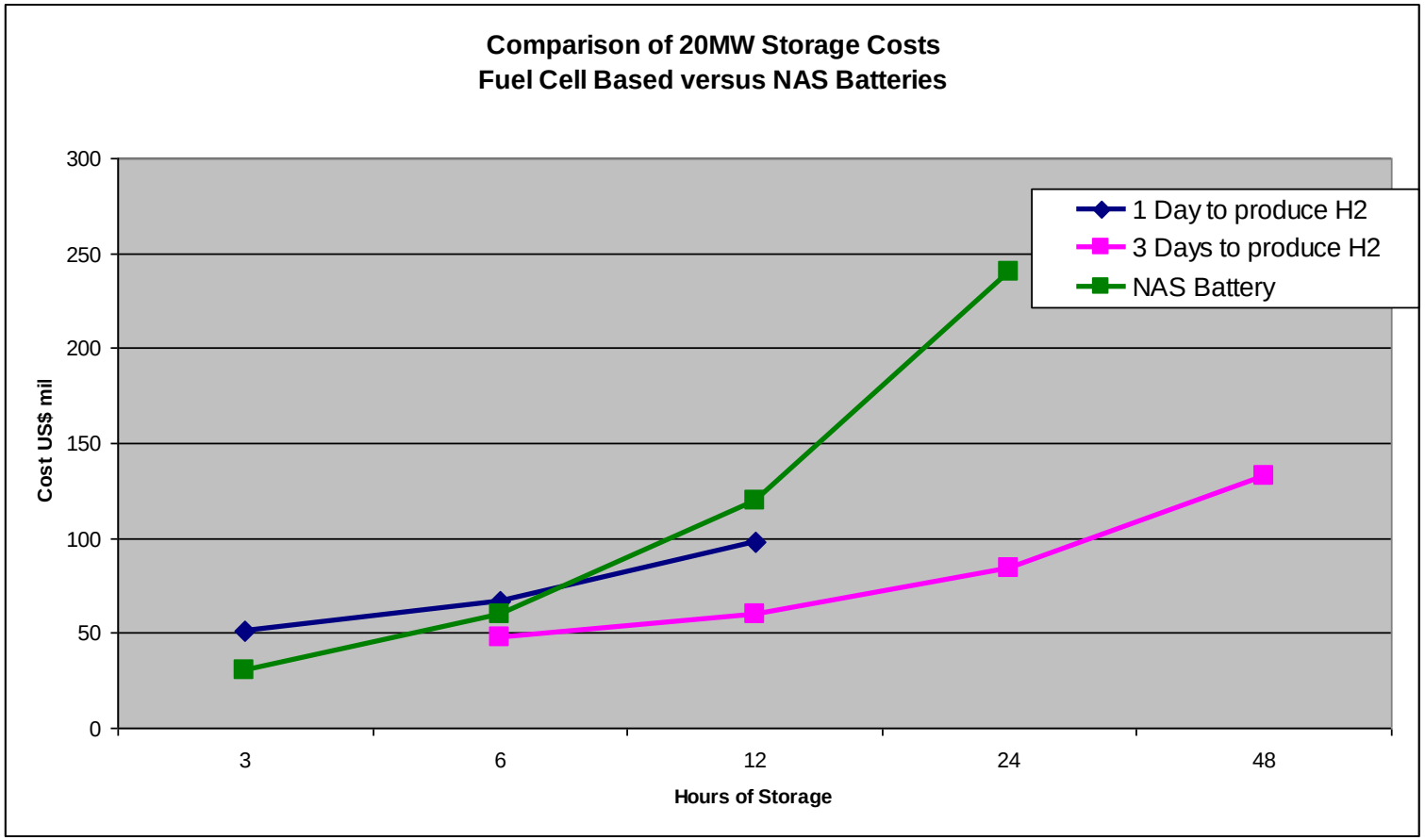


Energy Storage Applications



- **Advantages of PEM fuel cells for energy storage**
  - Fast start-up for excellent load-following capability
  - Highly scalable and configurable, with superior energy density
  - Minimizes wasted electricity via curtailment by storing the energy as hydrogen

Fuel Cell versus NAS Battery



Longer duration run times will favour fuel cell due to cost of storage expansion versus battery addition

Case Study:
Wind Farm Energy Shifting with Fuel Cells

Wind Farm:	With Fuel Cell Solution:
100MW	25MW fuel cell (*4hr operation guarantee*) 460kg/hr electrolyser and H2 storage
PPA peak rate: $60/MWh, 8hrs	PPA peak rate: $125/MWh, 8hrs
PPA off-peak rate: $25/MWh, 16hrs	PPA off-peak rate: $25/MWh, 16hrs
CAPEX: $200 million	CAPEX: $267 million
ANNUAL REVENUE: $9.6 million	Annual revenue: $17 million
RESULTS: 75% increase in revenue, mitigates revenue risk associated with curtailment of off peak wind production	

No merchant hydrogen production assumed

PPA: power purchase agreement