

Sony's Energy Storage System

The Sony Lithium Ion Iron Phosphate (LFP) advantage



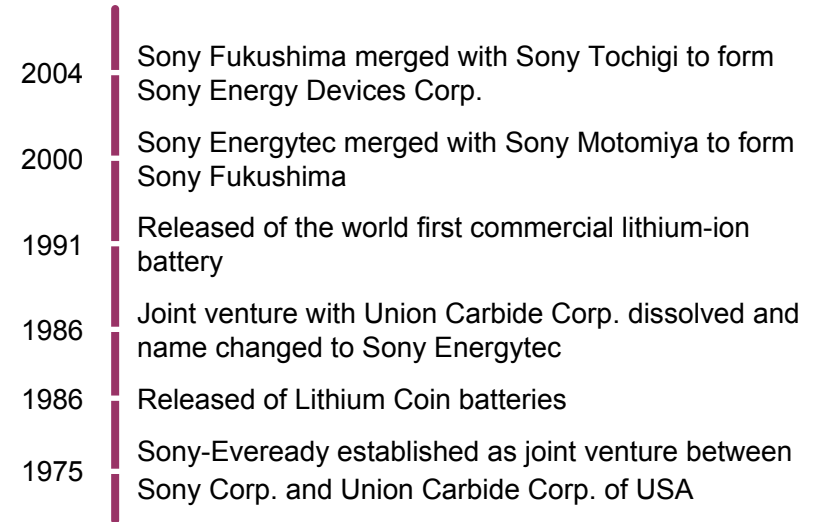
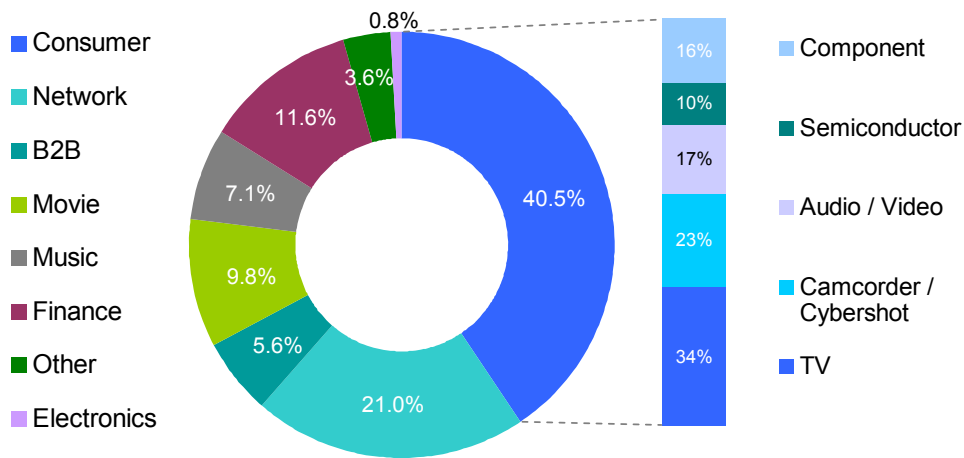
 Sony Overview & highlights

Sony Corporation

Founded	May 7, 1946
Headquarters	Tokyo, Japan
Chairman, CEO and President	Kazuo Hirai
Headcount	167,900 (as of March 31, 2010)
Consolidated Revenue	\7,214 billion (FY ended March 31, 2010)

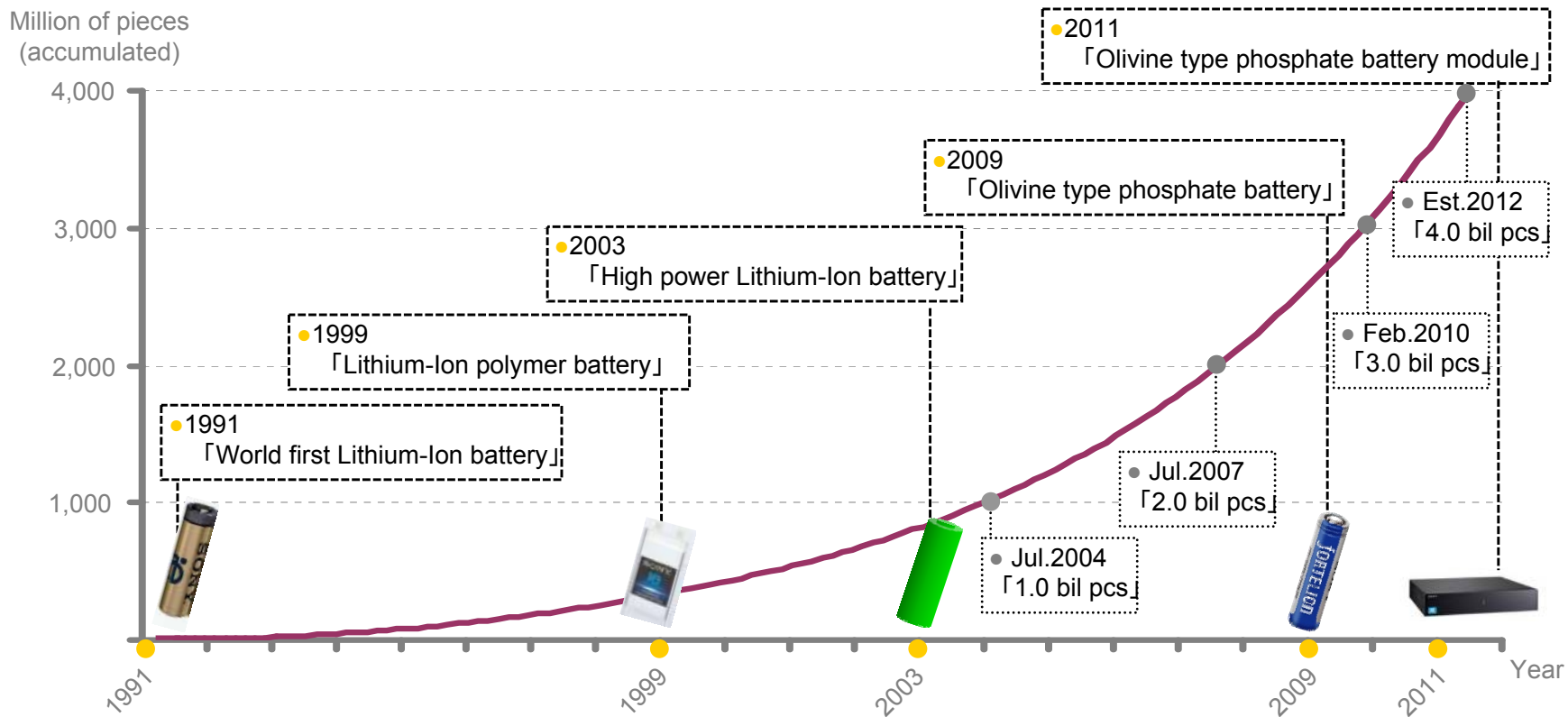
Sony Energy Devices Corporation

Founded	February, 1975
Headquarters	Koriyama, Japan
President	Shinichi Tanemo
Headcount	3,208 (as of July 31, 2011)
Revenue	\182 billion (FY ended March 31, 2010)

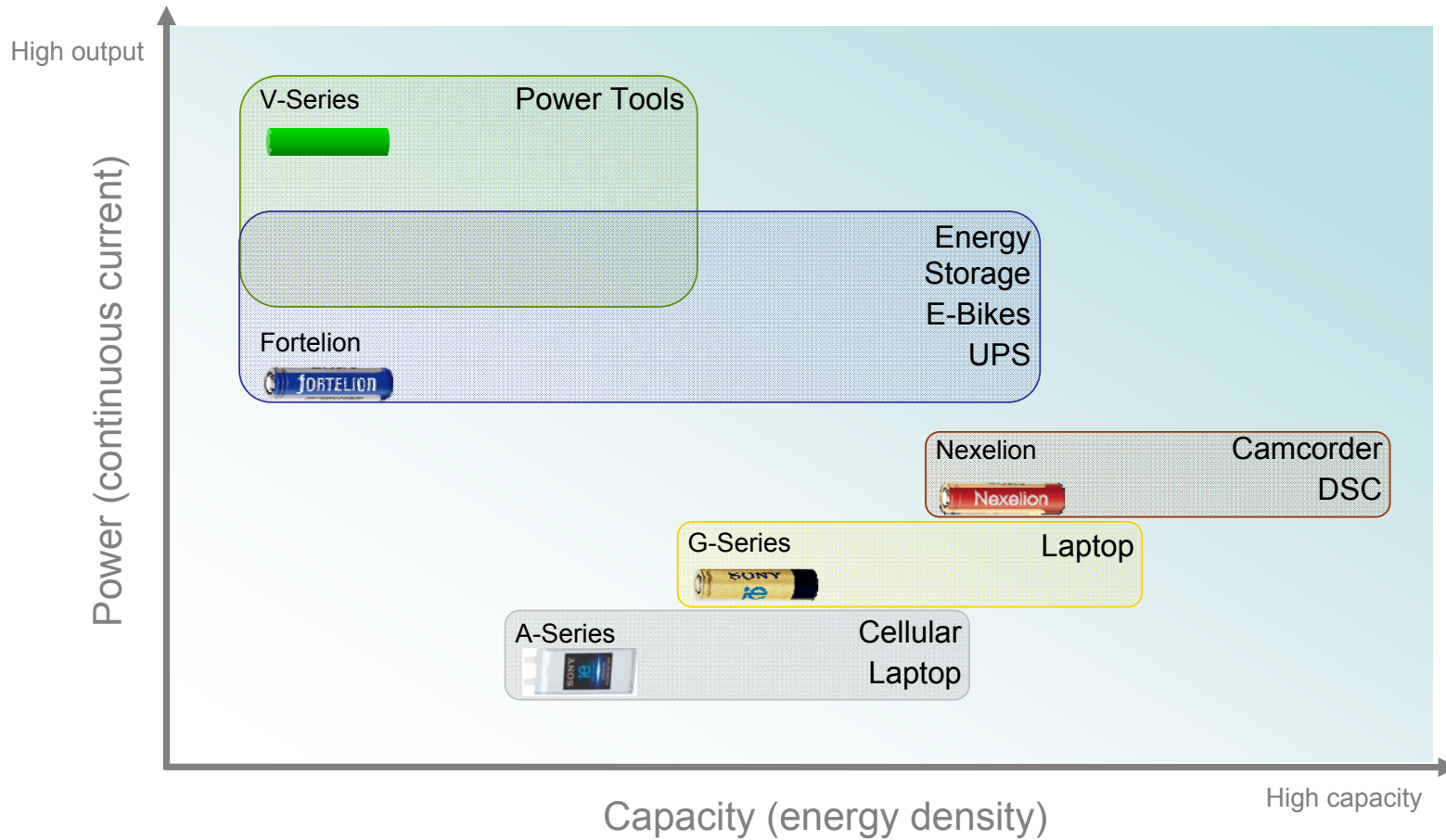




Sony has 21 years experience with Lithium-Ion batteries and has almost 4 billion batteries delivered



🔌 Sony offers a wide range of cells developed for specific applications

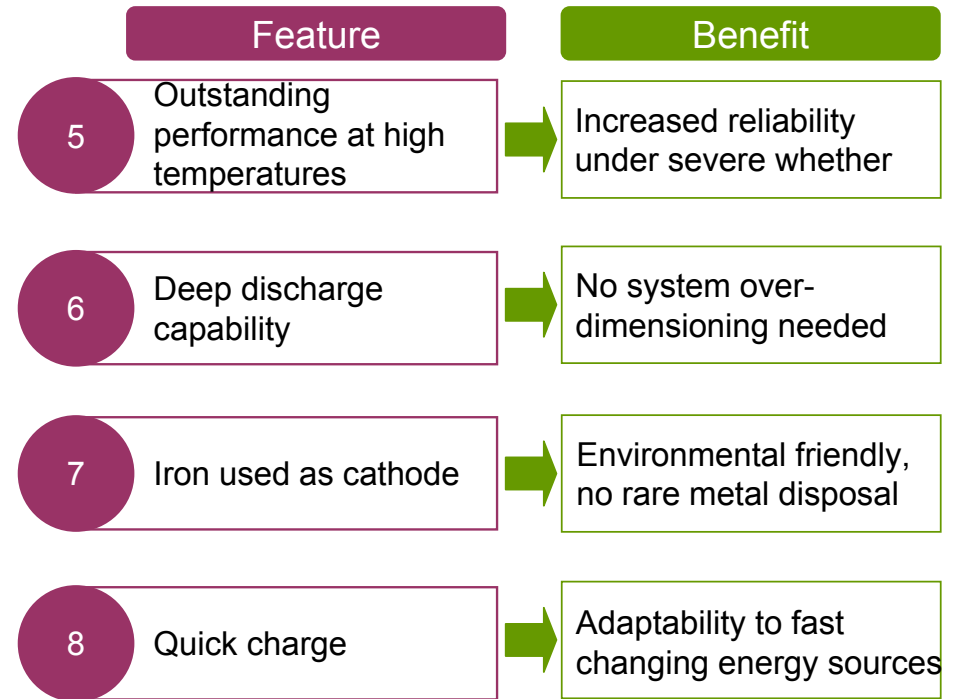
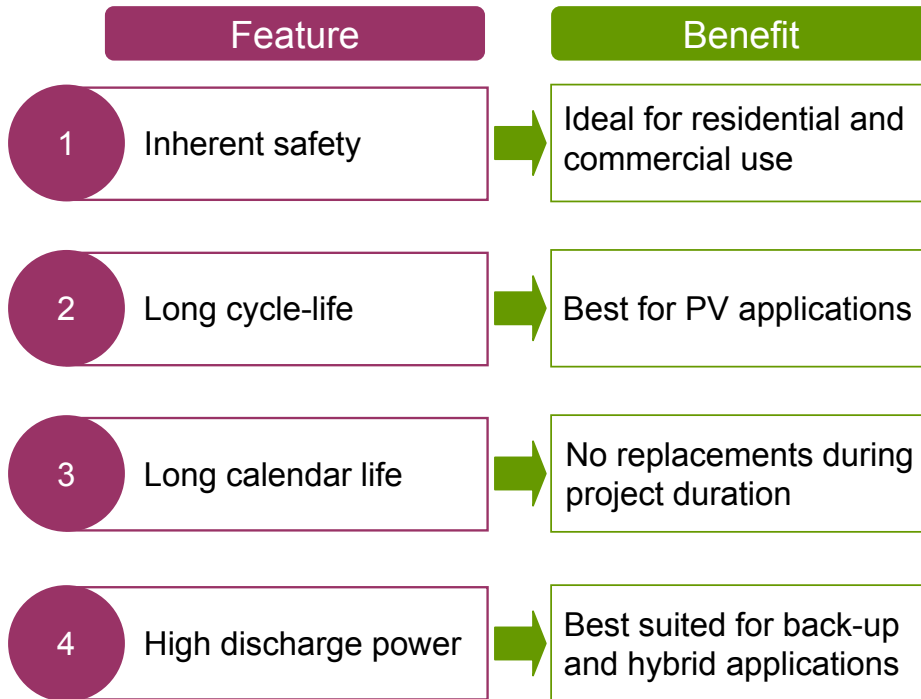




Due to its inherent safety, eco-friendly materials, longer lifespan, and higher discharge power Sony selected Iron Phosphate cell for its Energy Storage System

		Materials				
		Format	Cathode	Anode	Electrolyte	Benefit
G-Series		Cylindrical / Prismatic	Cobalt	Graphite Carbon	Organic Electrolyte	High Capacity
Nexelion		Cylindrical	Cobalt	Tin Based Amorphous	Organic Electrolyte	High Capacity
V-Series		Cylindrical	Nickel Manganese	Graphite Carbon	Organic Electrolyte	High Power
✓ Fortelion		Cylindrical	Iron Phosphate	Graphite Carbon	Organic Electrolyte	High Power, Inherent Safety
A-Series		Laminated	Cobalt	Graphite Carbon	Gel Polymer	Flexible Size, Light and Small

Features of Lithium Ion Iron Phosphate batteries

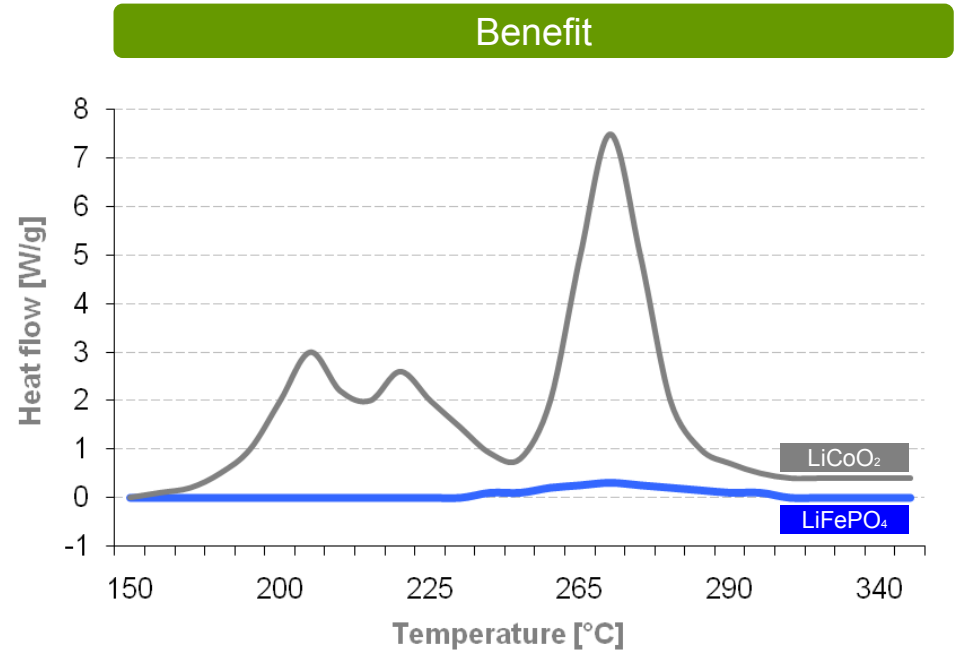
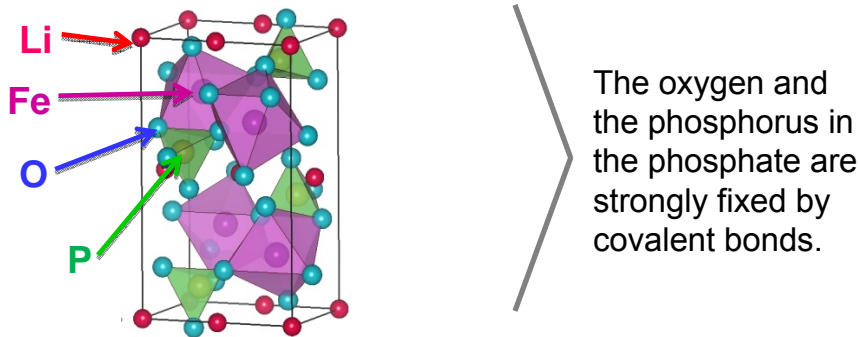


 Inherent safety of Lithium Iron Phosphate comes from its robust chemical structure and high thermal stability

Lithium Iron Phosphate in the nature



Crystal structure of Lithium Iron Phosphate

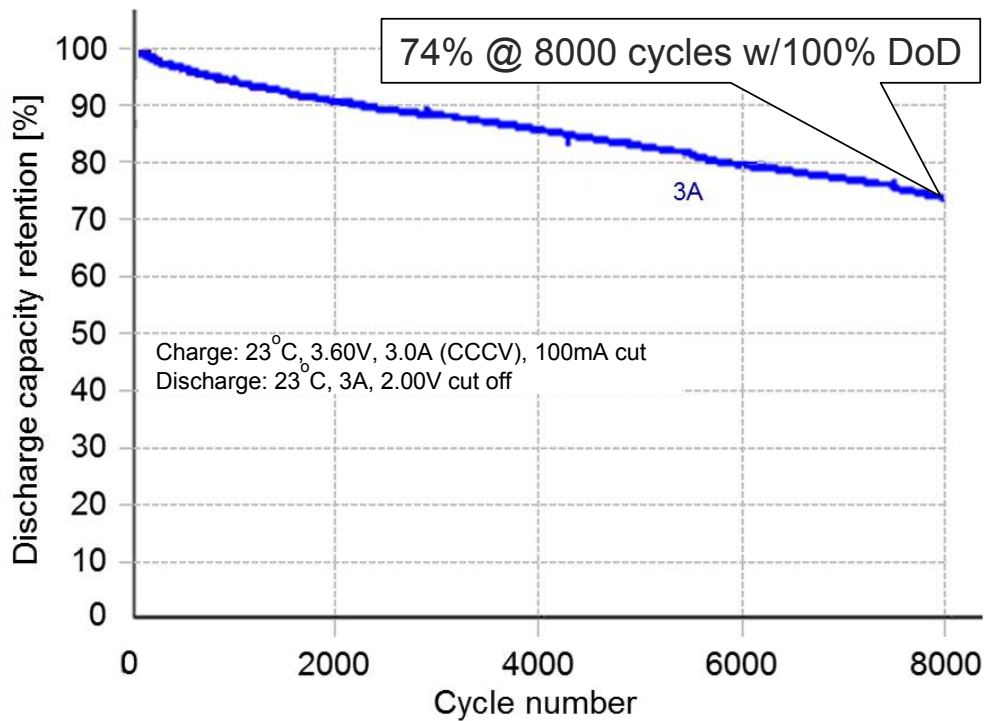


No release of oxygen when heated: temperature run-away reaction is not a concern for batteries based on Lithium Iron Phosphate



Long cycle life and deep discharge capabilities considerably improve the system's Total Cost of Ownership and greatly reduce the environmental impact

Cell specifications



Benefits

1 Sony LFP battery = 1,2 kWh (100% DoD, >8000 cycles)

is approximately equivalent to

2 kWh any other Li-Ion chemistry (60% DoD, <6000 cycles)

is approximately equivalent to

4 kWh Lead Acid battery (30% DoD, <3000 cycles)

In 20 years you will

- No replacement needed for Sony LFP battery
- Probably 1 replacement needed for other Li-Ion batteries
- At least 2 replacements needed for Lead Acid batteries



Sony is worldwide one of the few experts in LFP material technology as well as a pioneer designing and building advanced Lithium-Ion batteries.

Advantages

World-class own advanced LFP material technology

State of the art Li-Ion battery design

High quality Li-Ion battery mass production

SONY







Energy Storage Module

Customer's benefits

Best in class, environmental friendly battery designed for maximum performance and safety in renewable energy and back-up applications



Sony's Energy Storage System is world's first system to obtain the safety standard accreditation "UL Subject 1973" from the Underwriters Laboratories

Device	Component Recognition Mark	Test passed		
<p>Energy Storage Module</p> 		<p><u>Electrical tests:</u></p> <ul style="list-style-type: none"> • Overcharge • Short Circuit • Forced Discharge • Temperature • Dielectric Withstand • Insulation Resistance • Abnormal Operations • Strain Relief • Push-Back Relief • Electrical Tests on Mains Supplied Controls 	<p><u>Mechanical tests:</u></p> <ul style="list-style-type: none"> • Vibration • Shock • Crush • Impact • Mold Stress • Pressure Release • Start-to-Discharge 	<p><u>Environmental tests:</u></p> <ul style="list-style-type: none"> • Resistance to Moisture • Thermal Cycling • Fire Exposure <p><u>Material tests:</u></p> <ul style="list-style-type: none"> • 20-mm end product flame test • Parts in contact with electrolyte
<p>Energy Storage Controller</p> 				

Benefits

- End customer trust
- Component recognition greatly facilitates to get UL accreditation to system using Sony's Energy Storage components
- Insurance acceptance
- Allow participation in many international RFPs



The Sony's Energy Storage System offers a wide operating temperature range and is modular scalable

Energy Storage Module description



- One 1.2kWh unit contains of 16S8P US26650FTC cells (16 cell clusters are connected in series, 1 cell-cluster contains 8 cells connected in parallel. Each cell in the cluster has a 3Ah capacity)

Controller description



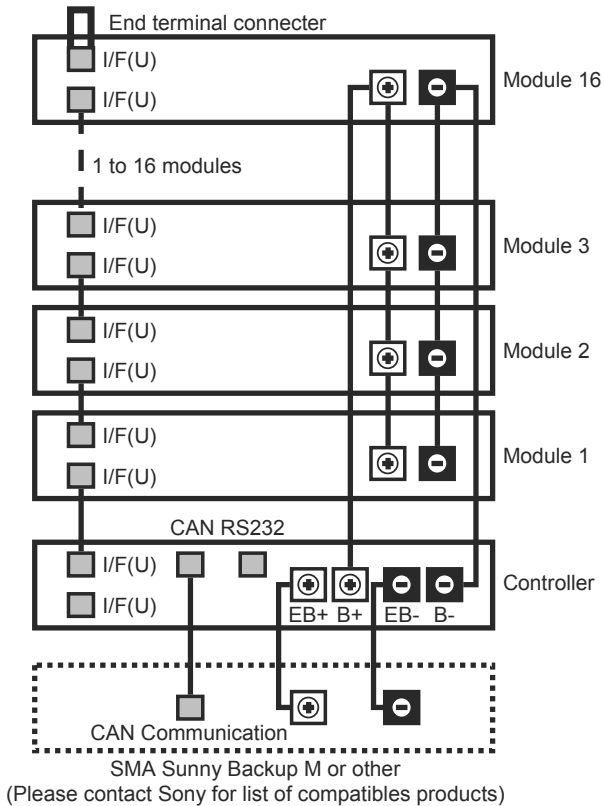
- The controller can monitor the internal cell status (voltage, current, temperature, etc) of up to 16 Energy Storage Modules

Module/System specifications

	Module	System (module + controller)
Capacity	1.2 kWh (24 Ah)	1.2 to 19.2 kWh (24 to 384 Ah)
Nominal voltage / Maximum output / Maximum discharge current	51.2V / 2.5kW / 50A	51.2V / 5kW / 100A
Charge voltage	57.6 V	
Storage temperature	-40 deg. C to +65 deg. C	
Operating temperature	Discharge: -20 deg. C to +60 deg. C Charge: 0 deg. C to +45 deg. C	
Expected life	Up to 20 years	
Weight	Approx. 17 kg	Approx. 25 kg to 280 kg

Connection diagram for a On-site consumption application in Germany

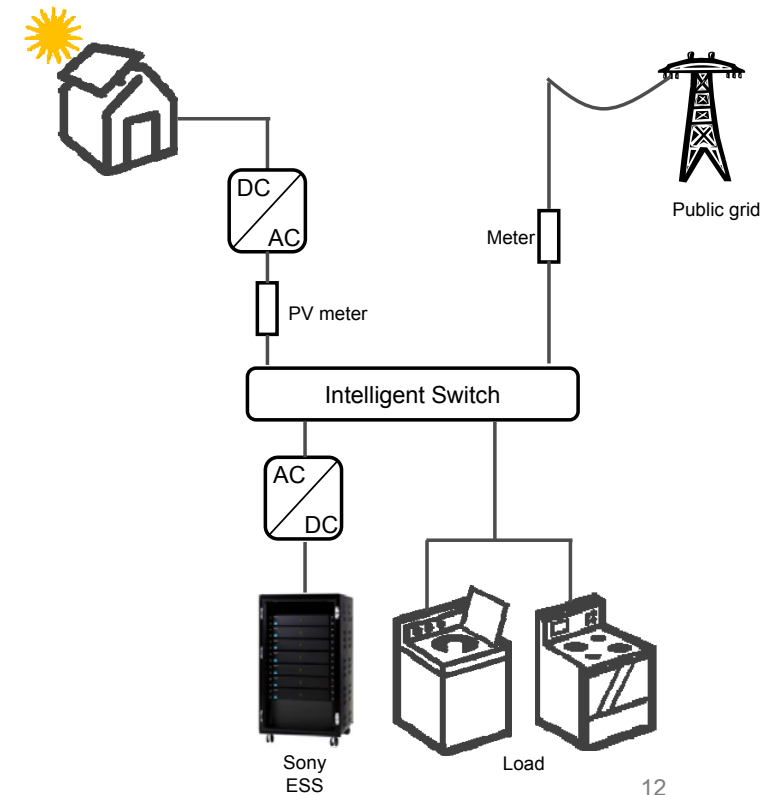
System cabling (example)



System characteristics

- Controller supervision up to 16 Modules
- Energy modules connection Parallel or serial
- Capacity upgrade after commissioning Yes
- Nominal voltage (avg.) 51.2V
- Energy capacity (approx.) 4.8 to 19.2 kWh
- Weight (approx.) 25 to 280 kg
- Max. power output 5 kW
- Room ventilation Not needed

System architecture (example)





Sony's LFP Energy Storage System is the ideal solution for renewable energy applications

The Sony advantage

The Sony'Energy Storage Solutions delivers superior performance for renewable energy applications

With fewer batteries ✓

Without rare metals ✓

With the safest technology in the market ✓

With longer lifespan ✓

Summary of features

1. Safest Li-Ion battery on the market
2. Environmental friendly due to use of iron based compound (no rare metals)
3. Lowest ecological impact due to maximum capacity usage (100%DoD) and long life (up to 20 years)
4. System capacity upgrade after commissioning possible
5. World's first Lithium Ion battery system with "UL subject 1973" accreditation
6. No special room ventilation needed



Thank you for your kind attention!