

Critical Role of Power Electronics in Short and Long Duration Energy Storage

Himamshu Prasad, VP Energy Storage Center of Excellence, Schneider Electric

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Life Is On



Schneider Electric provides energy and automation digital solutions for efficiency and sustainability

Key figures for 2022

5% of revenues devoted to R&D

€34 billion

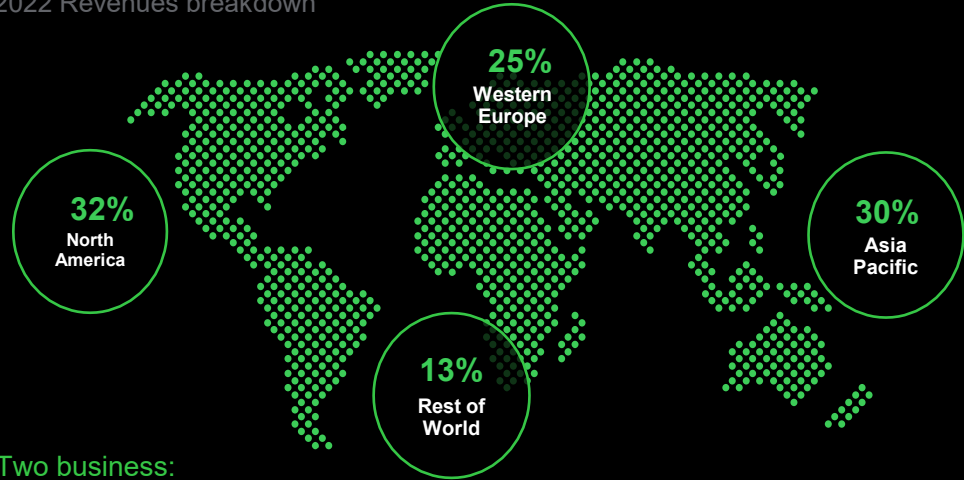
2022 revenues

130,000+

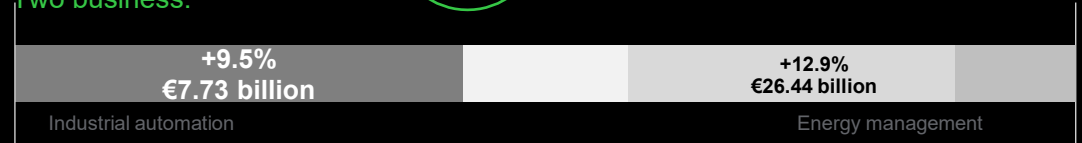
Employees in over 100 countries


A well-balanced global presence

2022 Revenues breakdown



Two business:



An aerial photograph of a dense, vibrant green forest. A river winds through the center of the forest, its water appearing dark brown. The forest extends to the edges of the frame, with rolling hills visible in the distance under a soft, overcast sky.

Our purpose is to **empower all to make the most of our energy and resources** bridging progress and sustainability for all.

At Schneider, we call this **Life Is On**

Electricity 4.0

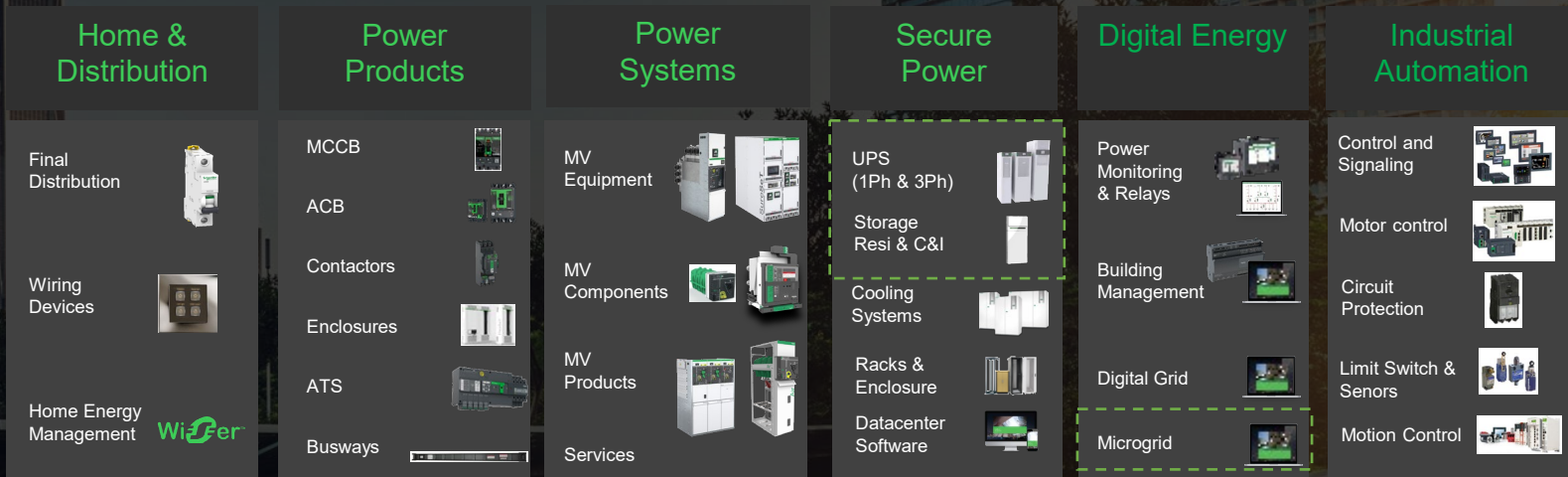
Digital + **Electric** = **Sustainable**

For Efficiency

For Decarbonization

Green and Smart Energy

Schneider Electric Businesses



Services

Installation

Commissioning

Maintenance

Sustainability

Consulting

Efficiency Programs 

Software



End Markets

Energy & Infrastructure

Buildings

Data centers

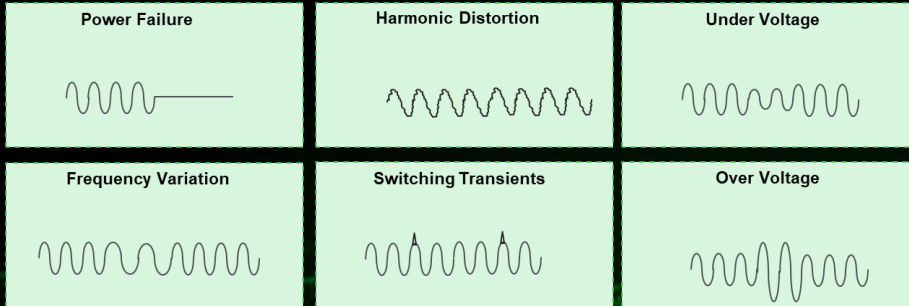
Residential

Industries

Life Is On



*Short Duration Storage - UPS



Network Availability



Hardware Protection



Data Protection

Avoid loss or corruption or damage caused by power issues
Avoid High Cost of Downtime

+\$25,000 on average per hour for small business
+\$540,000 on average per hour for medium & large enterprise

Power Electronics: Voltage & Frequency Dependent/Independent

1 Ph UPS (0.3KVA – 20KVA)



Home

Small & Medium Business

Large Business

Applications



3 Ph UPS 20KVA – 1.5MVA



Applications



*Long Duration Storage - Residential

Rural Home



Apartment



Single Family Home



Inverters (+Storage)



Power Reliability



• No Grid



- >10 Hrs No Power
- 2-10 Hrs Planned Power Cut
- 0-2 Hrs Power Outage



Genset Replacement



Renewable (On Site)
Integration



EV Charging



Time of Use



Power Electronics: Inverters (DC -AC), Converters (DC-DC)

*Long Duration Storage - C&I

Rural Farm



Rural Enterprise (Small)



Urban Enterprise (Large)



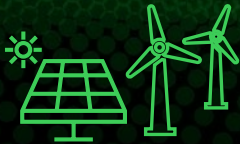
Power Reliability



Frequency & Voltage Regulation



Distribution Upgrade (Deferral)



Renewable (On Site) Integration



EV Charging



Time of Use

Power Electronics: Inverters (DC -AC), Converters (DC-DC)

Inverters (+Storage)



Microgrid

DER (Distributed Energy Resources)



On-site renewables and power generation facilities utilized in parallel with grid



Grid

Utility Meter

Switch





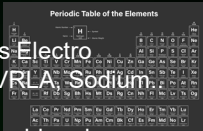







Client Campus

Buildings

Data Centers

May be possible to sell excess power back to the grid through a net metering contract

Key Industry Needs – Power Electronics

| | | | |
|--|--|--|--|
| <h3>High Efficiency</h3> <ul style="list-style-type: none"> Reduce Scope 3 Emissions  Lower Cost (Electricity)  Longer Life (Lower Thermal)  | <h3>Small Size</h3> <ul style="list-style-type: none"> Lower Weight – Easier to Handle (Logistics) Lower Material Usage - Sustainable  | <h3>Battery Agnostic</h3>  <ul style="list-style-type: none"> Chemistry: - Various Electro Chemical – Li-Ion, VRLA, Sodium Age: Mix and match old and new batteries | <h3>Grid Interactive</h3> <ul style="list-style-type: none"> Bi-Directional  Voltage and Frequency Regulation...  VPP |
| <h3>Seamless Integration</h3> <ul style="list-style-type: none"> Clean – EMI/EMC, Harmonics Standards based – Interface. Enable multi-vendor solution Hot Swappable  | <h3>Safe</h3> <ul style="list-style-type: none"> Compliant  Fault Tolerant Intelligent  | <h3>Reliable</h3> <ul style="list-style-type: none"> 15+ year design life Extreme Temperatures  Fault Tolerant | <h3>Sustainable </h3> <ul style="list-style-type: none"> Low Embodied Carbon Reuse/Recycle Low Scope 1/2/3 Emissions |

Innovation Needs

- Devices
- Materials
- Circuit Topologies
- Modelling...Digital Twin

Innovation Example – 1 Ph UPS



Smart-UPS VRLA

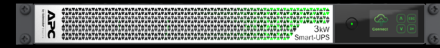


Smart-UPS SRT

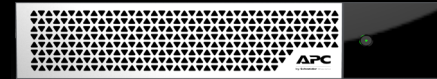


Symmetra

- ✓ ~30-50% Reduced Size
- ✓ ~30-50% Reduced Weight
- ✓ 2-3X Power Density
- ✓ 2X Extended Battery Life



Smart-UPS Ultra 3kVA – 1U



Smart-UPS Ultra 5kVA – 2U



Smart-UPS Ultra Modular 5-20kVA

Innovation in Power Electronics (WBG) and Battery (Li-ion) Technologies enabling Platform Simplification and Breakthrough Leadership Features

Life Is On



Schneider
Electric

Our pledge

✔ **Carbon-neutral**
in our operations by 2025

✔ **Net zero CO₂ emissions**
in our operations by 2030

✔ **Carbon-neutral**
on full end-to-end footprint
(scope 1, 2, 3) by 2040

✔ **Net zero CO₂ emissions**
in our supply chain operations by 2050

✔ **Net zero biodiversity loss**
by 2030