



西安交通大学
XI'AN JIAOTONG UNIVERSITY



电力电子与新能源技术研究中心
Power Electronics & Renewable Energy Center

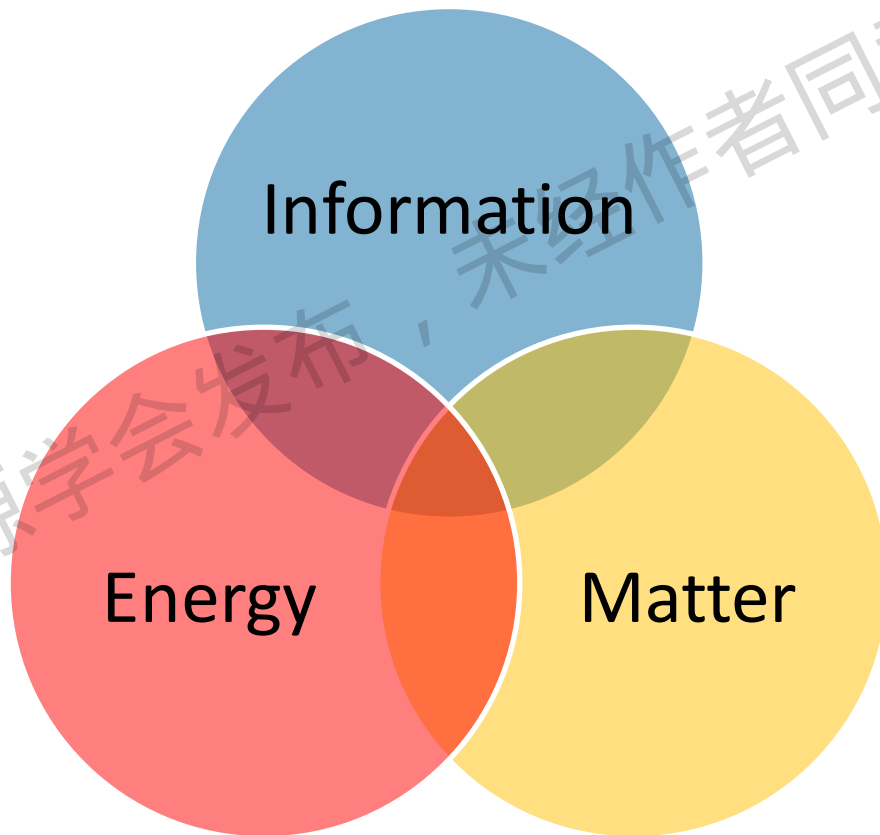
The Role of Power Electronics and that of CPSS

LIU Jinjun

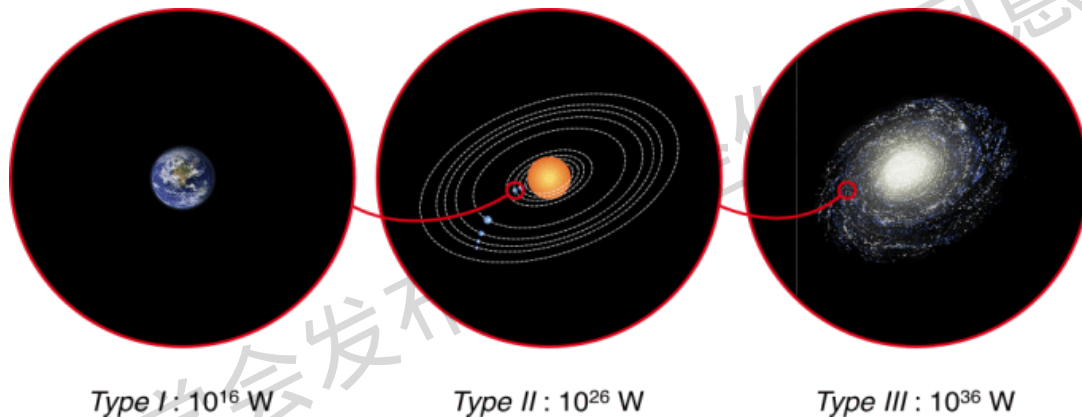
Global Power Electronics Summit
at IEEE PEAC 2022

Nov. 6, 2022

Human's Utilization of Nature



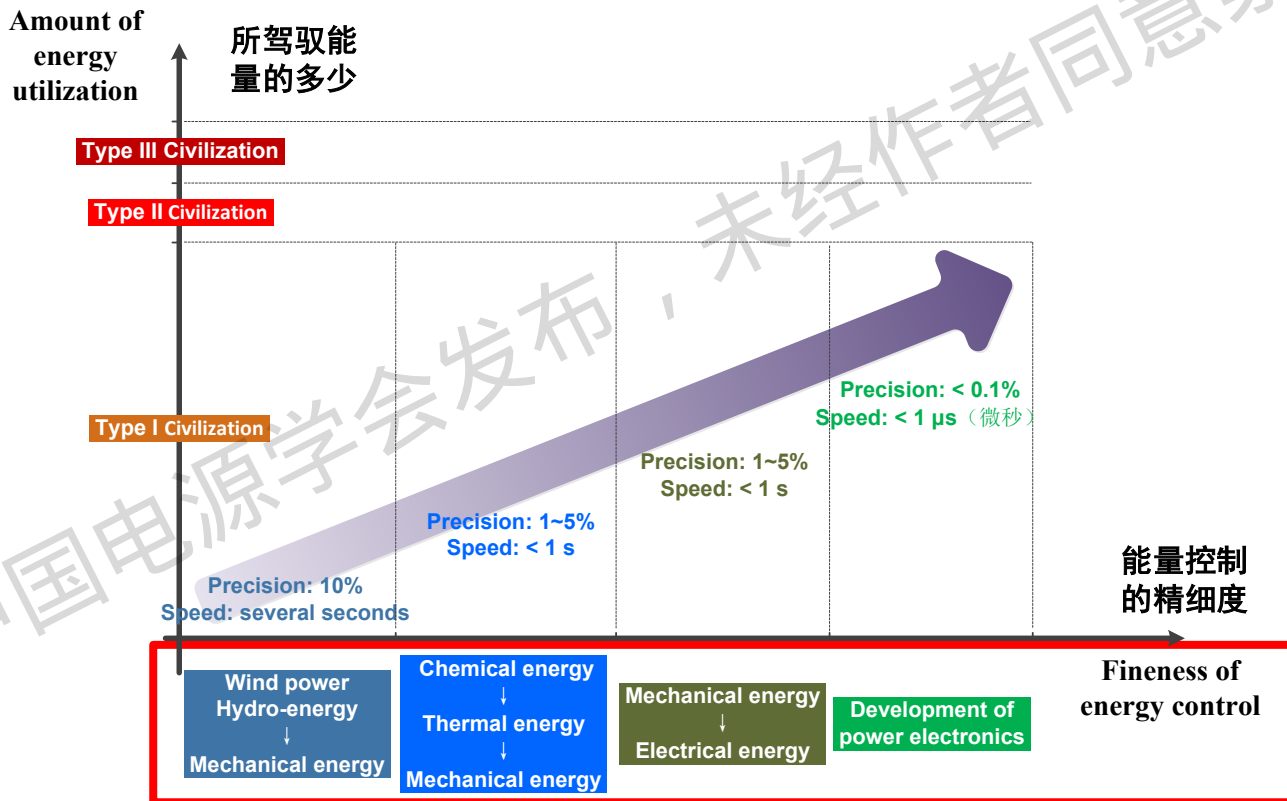
Scaling Civilizations according to Amount of Energy Usage



■ Kardashev Scale (卡尔达舍夫等级)

- ➔ **Type I Civilization:** harness the energy on a single **planet**
- ➔ **Type II Civilization:** harness the energy from a single **star**
- ➔ **Type III Civilization:** harness the energy in a single **galaxy**

Another Scale of Civilizations —— Fineness of Energy Control



Finer Energy Control → Higher Accelerating-Speed

■ Sports Cars



Porsche 911 Turbo S **2.98s**



Tesla Model S P100D **3.2s**



Audi R8 **3.41s**



Mercedes Benz AMG E 63S **3.5s**



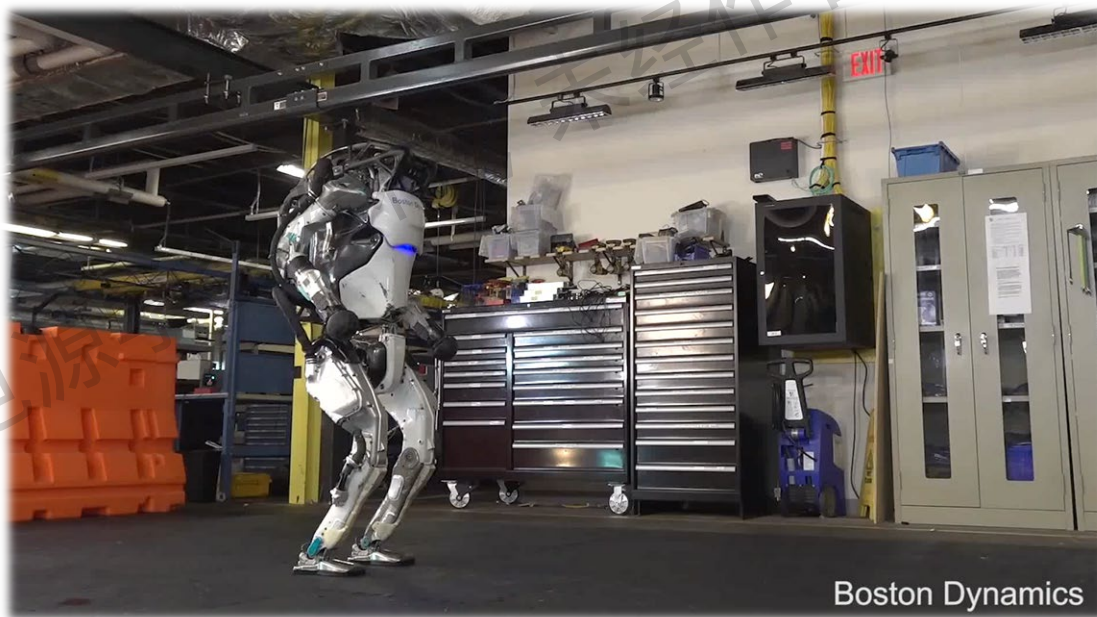
BMW M5 **3.6s**



Jaguar F-TYPE **3.74s**

Finer Energy Control → More Sophisticated and Precise Motions

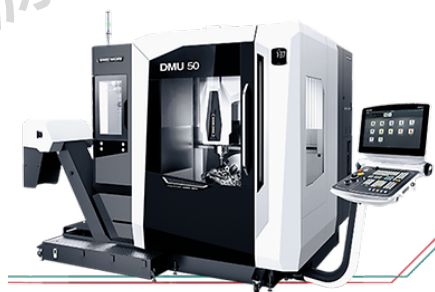
- Robots



Finer Energy Control → Higher Productivity and Better-Quality Products

For motion-based production

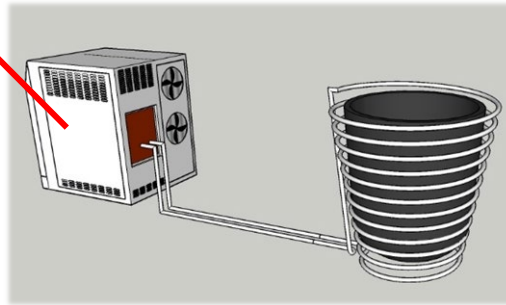
- Machine tools



Finer Energy Control → Higher Productivity and Better-Quality Products

For heating or chemical production

- Melting high-quality alloy with electromagnetic induction heating



Finer Energy Control → Better-Performance Electricity

■ Electric grid

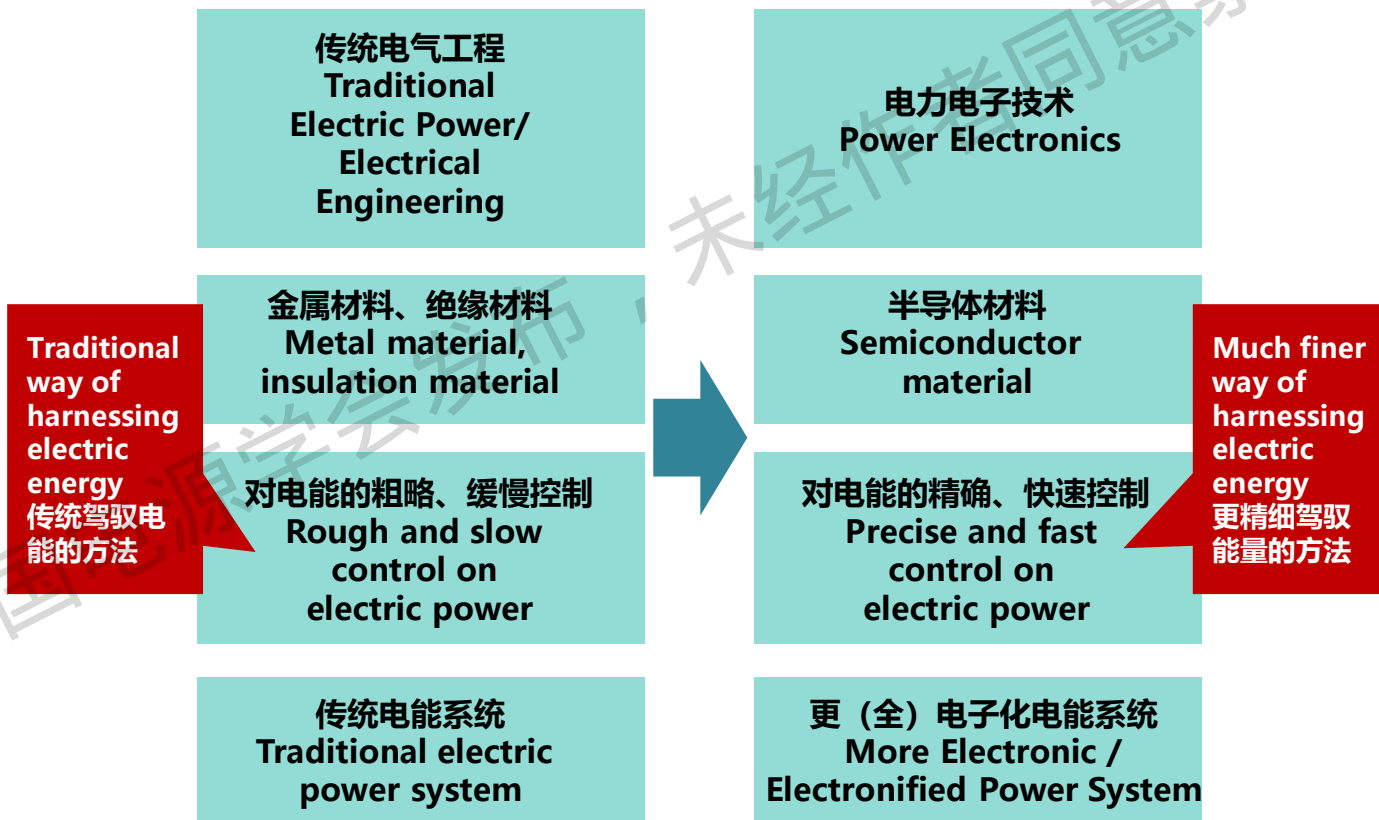
- ➔ Incorporate more renewable energies / Harness more micro-energies
- ➔ Higher quality, more reliable, more efficient, and higher-accessibility energy supply

■ Living

- ➔ Better living environment/households and electronic devices/appliances



Power Electronics Drives Human Society to a New Stage of Civilization



Supplying Better-Performance Electricity Directly Fulfilling Our Daily Needs

Continuous pursuing of better stand-alone power electronics products

- ➔ Higher performance specs
- ➔ Lower power losses
- ➔ Smaller volume and weight
- ➔ Lower cost
- ➔ Higher reliability
- ➔ Better manufacturability
- ➔ Less negative influences
- ➔ Higher accessibility
- ➔ Lower CO₂ emission

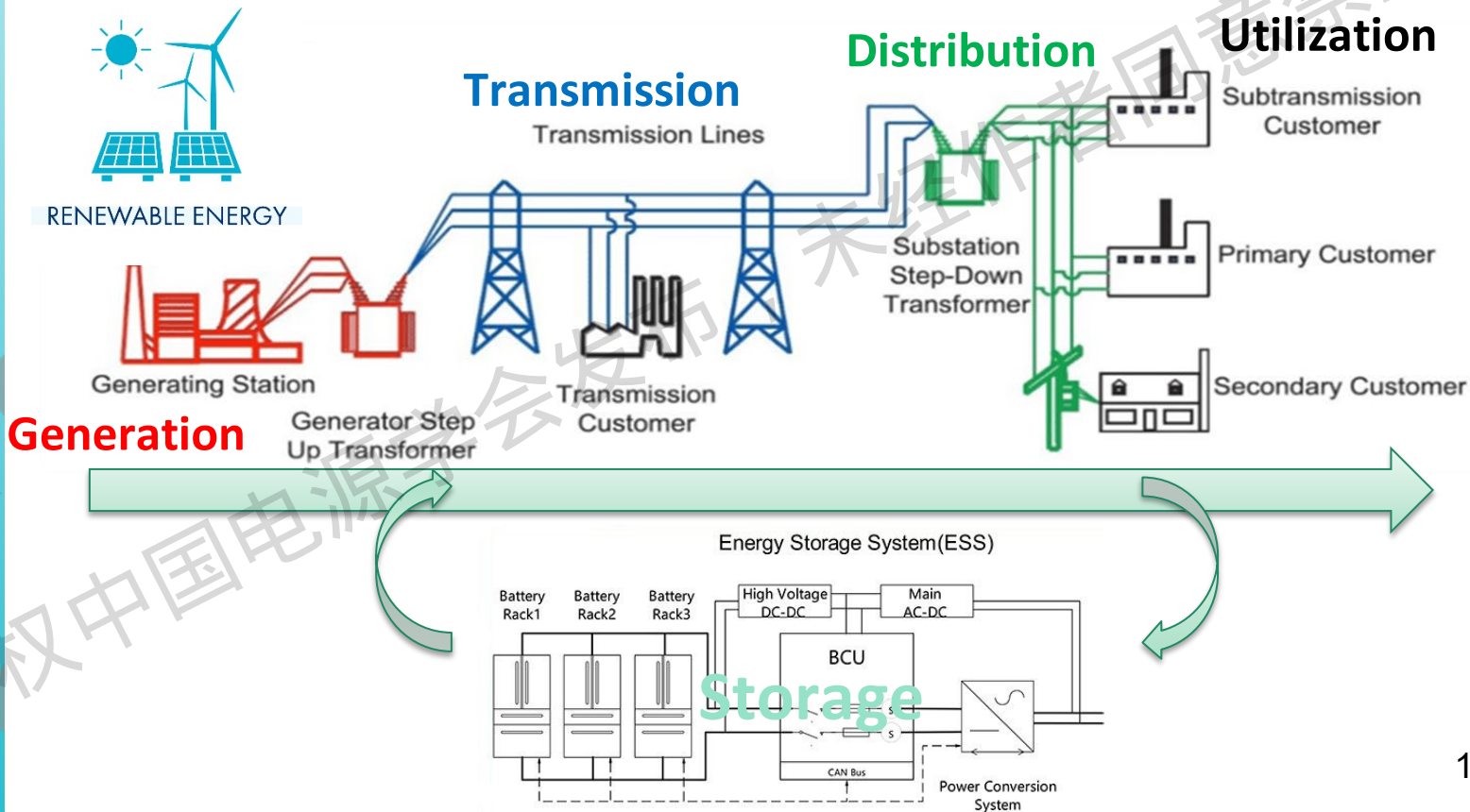
“Lipstick” Power



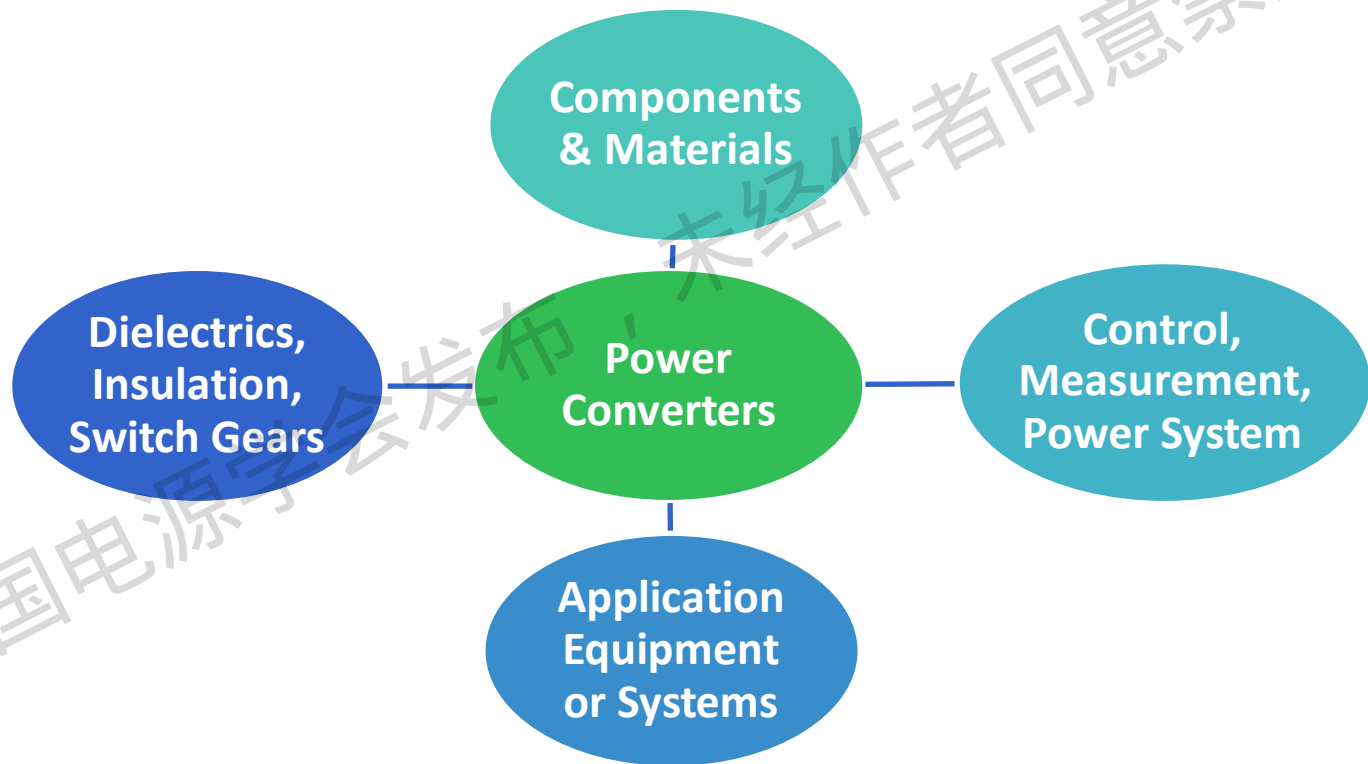
“Cookie” Power



Being Almost Everywhere in the Full Process of Energy Harnessing of Humankind



Playing a Core Role in Electric Energy Control and Conversion with Other Energies



Energy conversion between electric and "X" :
 Electric, Mechanical, chemical, photo, piezo,
 thermal, biological, pulsed power

Vision & Mission of China Power Supply Society (CPSS)



- **Vision**

- Advance electric power supply technology and industry in China, and build a top level society of both academia and industry.

- **Mission**

- Through conferences and exhibitions, publishing and journals, electronic media, technical consulting, education and training program, standards, academic evaluation, international cooperation, we dedicate ourselves to further the exchange and cooperation on the field of Electric Power Supply Technology and Business in China.
- Promote the career development for our individual members, innovation capability and competitiveness of our enterprise members.
- Promote electric power supply technology and industry.

Statistics



- Founded in 1983
- Nonprofit, Non-governmental academic and professional organization
- First tier society under China Association for Science and Technology (CAST)
- 13,000 Individual Members
- 500 Enterprise Members

Field of Interests



- Switching Power Supply for IT, Telcon, automation applications, appliance, transportations
- PV Inverter, Wind Power Inverter
- Electrical Vehicle Charging and Propulsion
- Power Quality and Facts: UPS, APF, SVG, SVC, BESS
- Lighting Power, LED Driver
- AC Stabilized Power Supply
- Inverter for Motor Drives
- Special Power Supply: Inverter for induction heating, High voltage DC power supply, Pulse power
- Components: Semiconductor power device, Capacitors, Inductor and Transformer, Magnetics, EMI filters, Battery, Heatsink, cooling components, and etc.

CPSS Organization Chart



Main Services

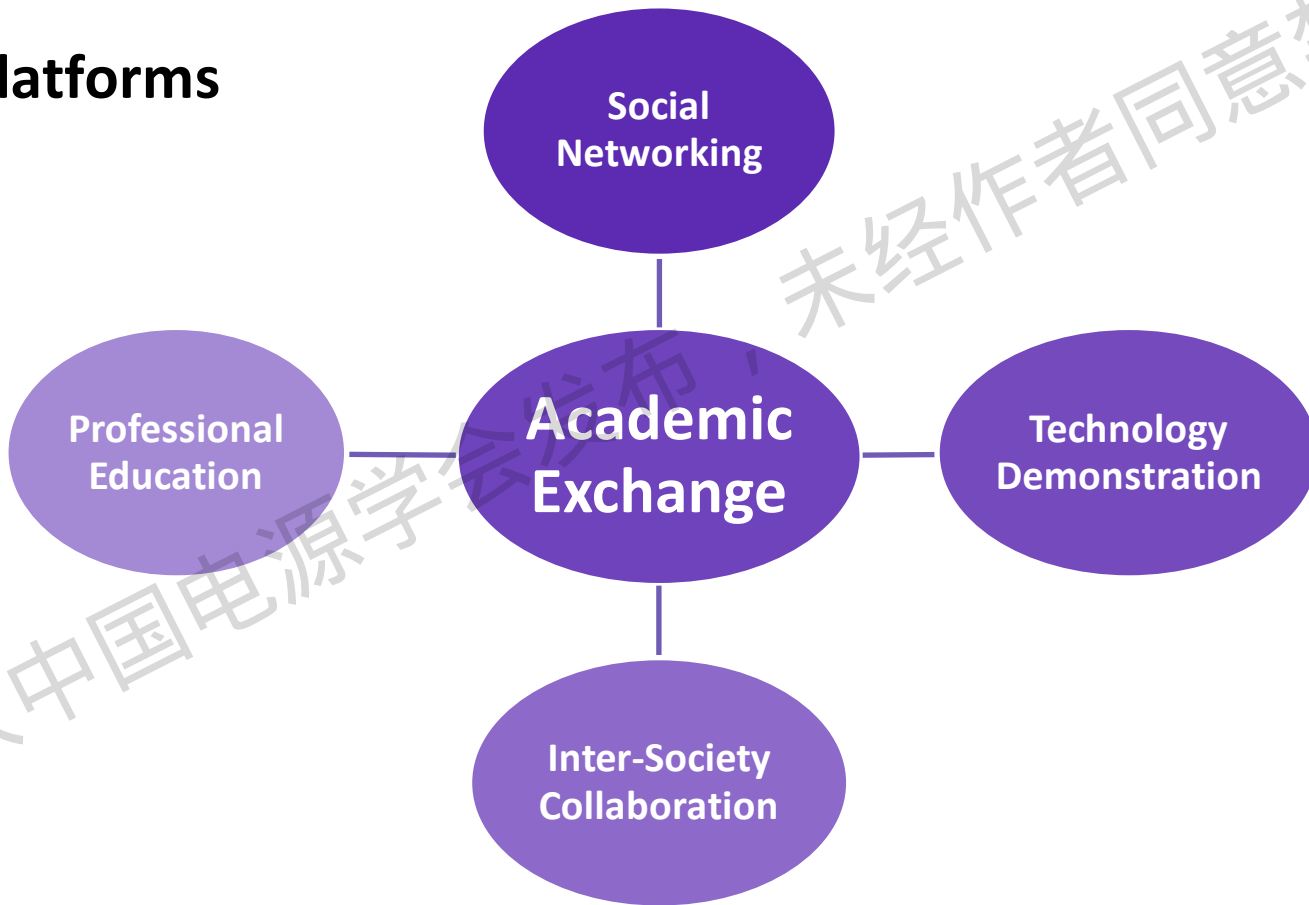


- **Conferences**
- **Publications**
- **Awards**
- **Student Competitions**
- **Professional/Continuing Education**
- **Standards**
- **International Cooperation**

The Role of CPSS for Power Electronics



- **5 Platforms**





西安交通大学
XI'AN JIAOTONG UNIVERSITY



电力电子与新能源技术研究中心
Power Electronics and Renewable Energy Center

Thank you!

For questions, contact me at
jjliu@xjtu.edu.cn

