









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

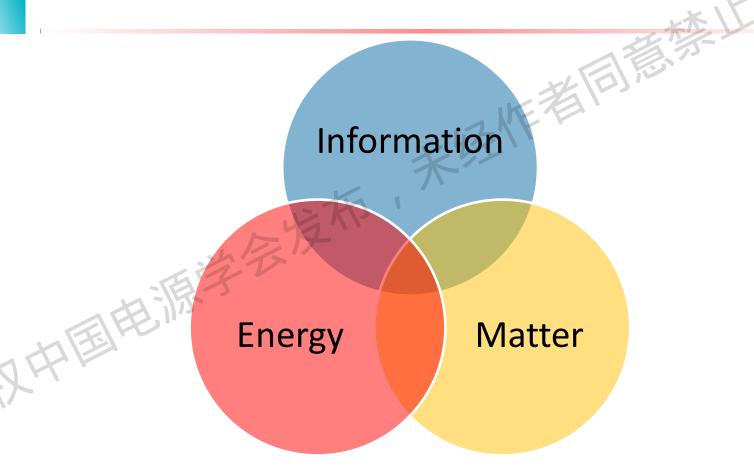
LIU Jinjun

**Global Power Electronics Summit** at IEEE PEAC 2022

Nov. 6, 2022

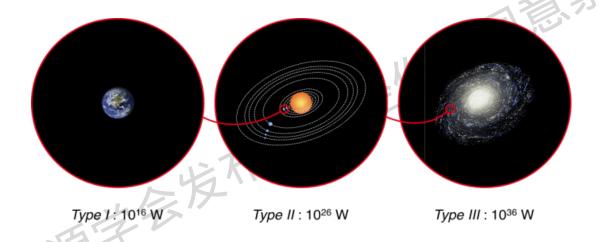


## Human's Utilization of Nature





## Scaling Civilizations according to Amount of Energy Usage

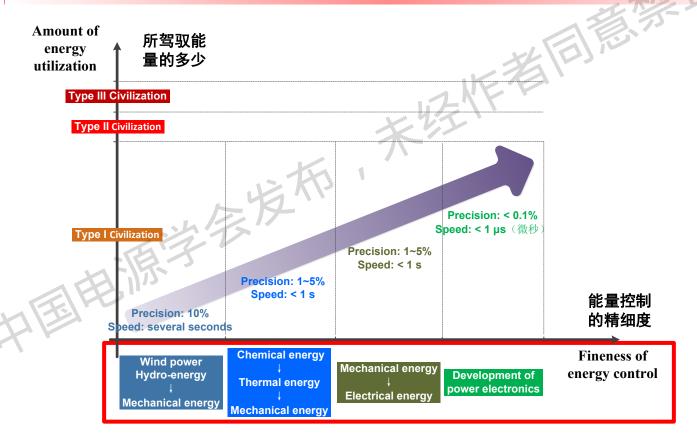


## Kardashev Scale(卡尔达舍夫等级)

- 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



Mercedes Benz AMG E 63S 3.5s



Tesla Model S P100D 3.2s



BMW M5 3.6s



Audi R8 3.41s



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









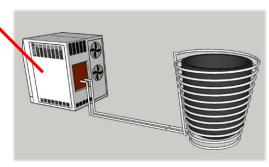


## Finer Energy Control → Higher Productivity and Better-Quality Products

## 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

传统电气工程 Traditional

Electric Power/
Electrical
Engineering

电力电子技术 Power Electronics

Traditional way of harnessing electric energy 传统驾驭电 能的方法 金属材料、绝缘材料 Metal material, insulation material

对电能的粗略、缓慢控制 Rough and slow control on electric power

传统电能系统 Traditional electric power system 半导体材料 Semiconductor material

对电能的精确、快速控制 Precise and fast control on electric power Much finer way of harnessing electric energy 更精细驾驭 能量的方法

更 (全) 电子化电能系统 More Electronic / Electronified Power System



## 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 CO<sub>2</sub> emission

"Lipstick" Power





"Cookie" Power

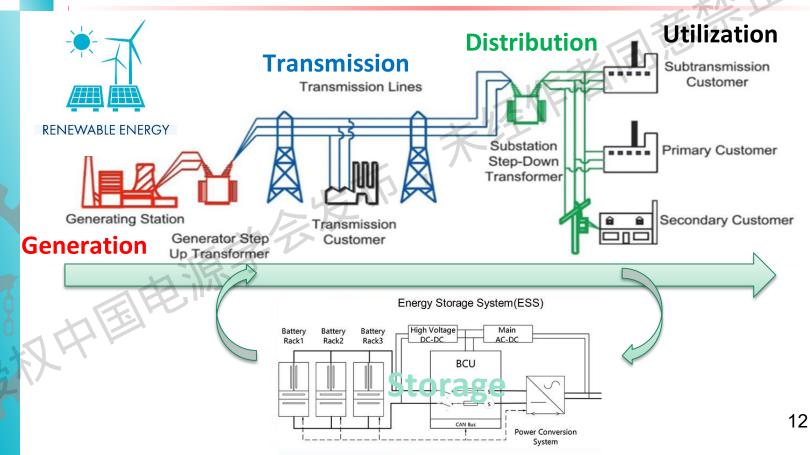


100mm

30W

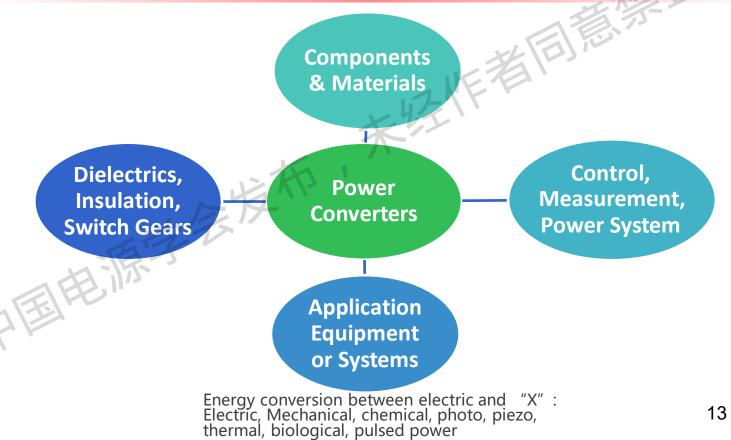


## Being Almost Everywhere in the Full Process of Energy Harnessing of Humankind





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



## 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 Stablized 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**



### National Membership Congress

#### Council

The standing Council

#### Secretariat

#### Secretariat Office

Finance Department

Member Department

Conference & Exhibition Department

Training Department

Journal editorial Department

**Network Department** 

**Award Office** 

#### Working Committee(10)

Organization Committee

Consulting Committee

International exchange Committee

Public Education Committee

**Editorial Committee** 

Standardizing Committee

Young Scholars Committee

Women in Science Committee

Membership Development Committee

#### Technical Committee(14)

AC Power Supply Technical Committee

Lighting Power Supply Technical Committee

Special Power Supply Technical Committee

Inverter and drive technical Committee

Component Technical Committee

Magnetic Component Technical Committee

Power Quality Technical Committee

**EMI Technical Committee** 

Renewable Energy Conversion Technical Committee

Wireless Power Transfer Technical Committee

Information System Power Technical Committee

Electrical Vehicle Charging and Propulsion Technical Committee

The Converter Dominated Flectric Gird Technical Committee

**Transportation Electrification Committee** 

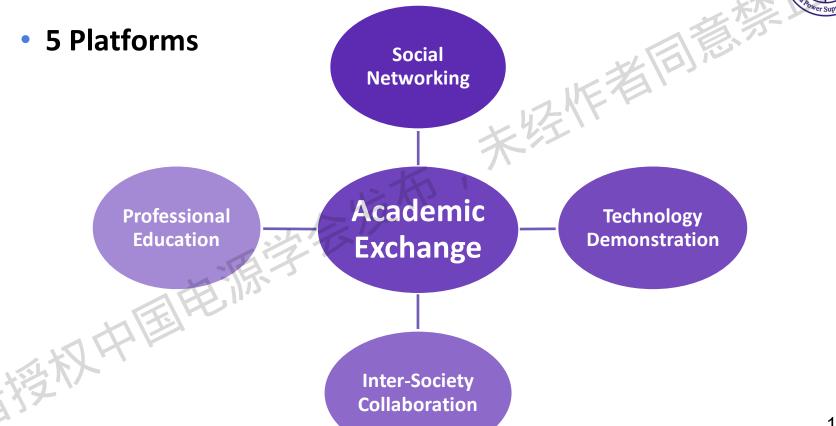
## **Main Services**



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

### The Role of CPSS for Power Electronics















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 jiliu@xjtu.edu.cn