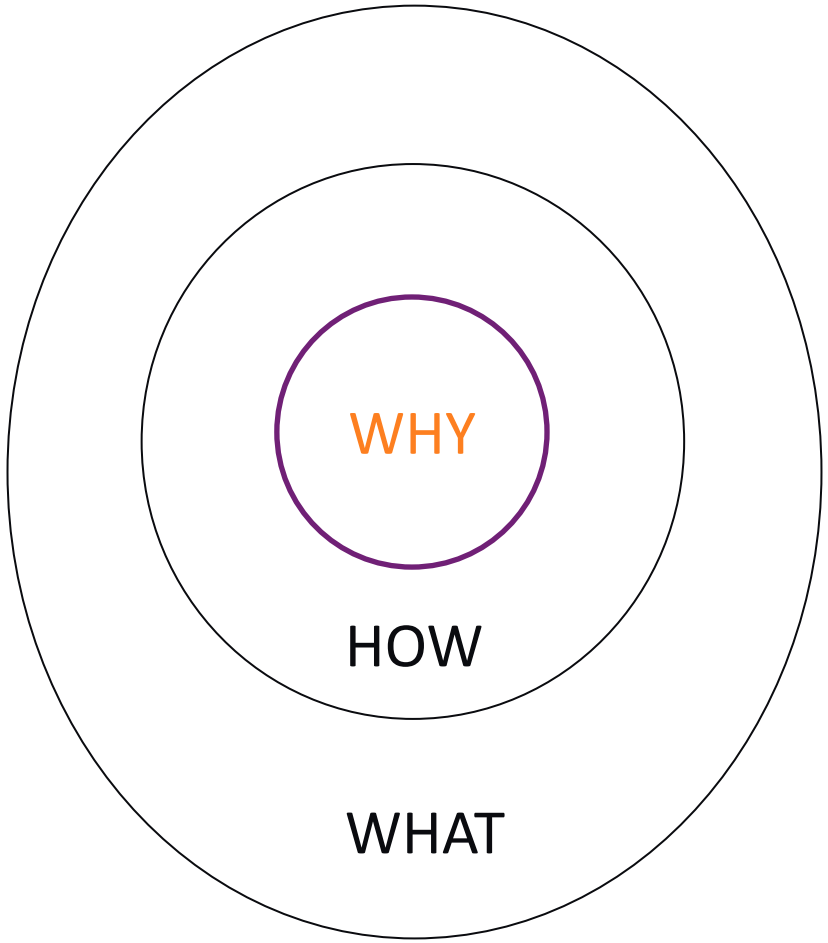
Ethernet in Sustainability

A Leading Provider of Smart, Connected and Secure Embedded Control Solutions

Agenda

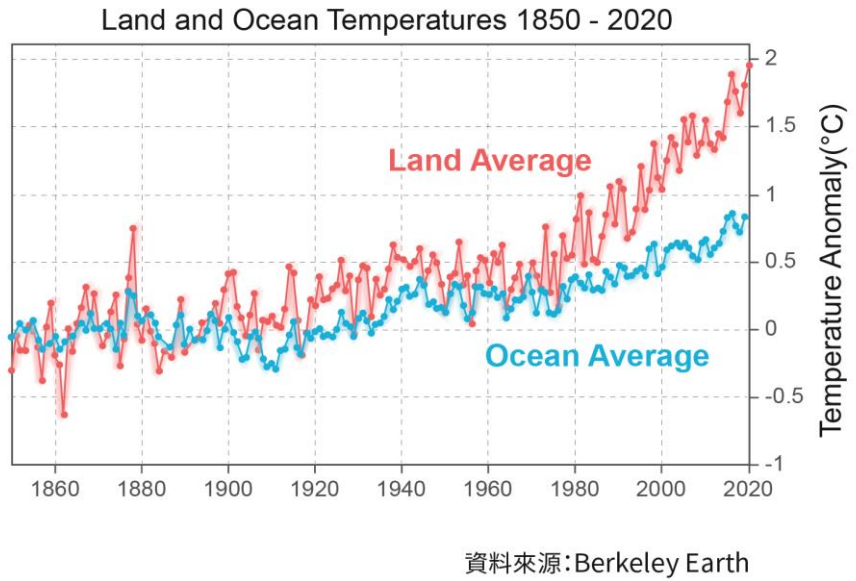
- Update of COP 26 in sustainability
- Green power system
- Power saving & management



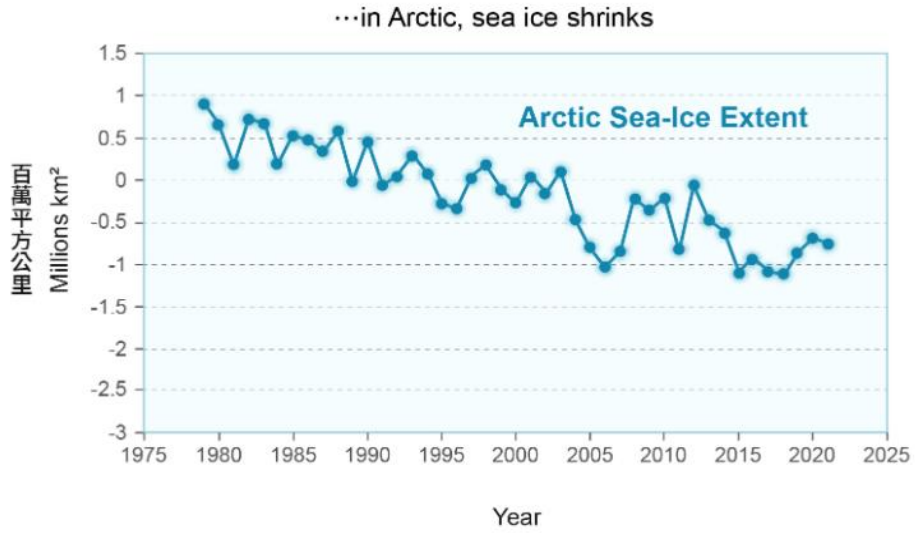
WHY

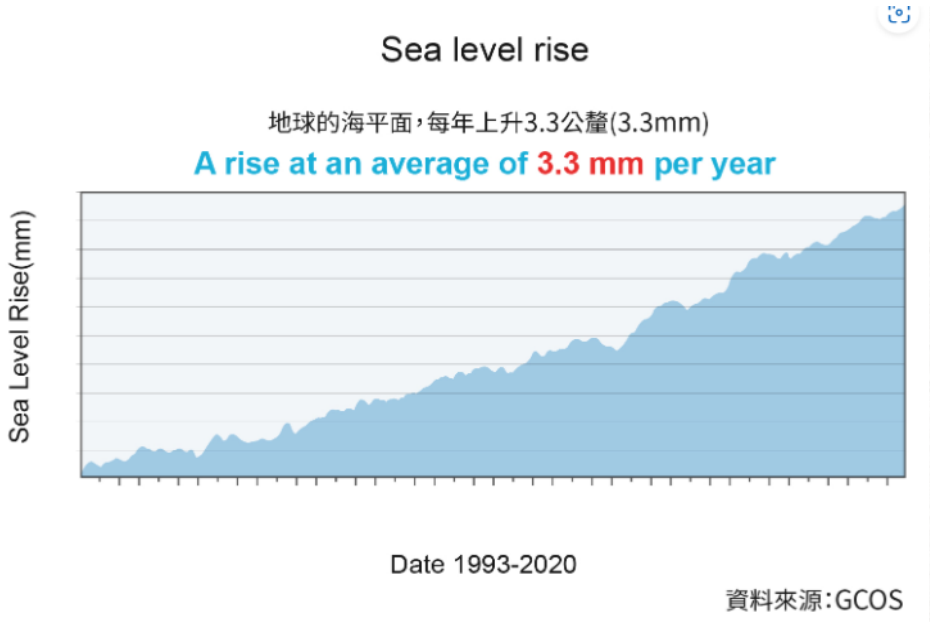
Global Warming Is Driving Polar Bears Toward Extinction, Researchers Say (Published 2020)

資料來源:
The New York Time July 20,2020

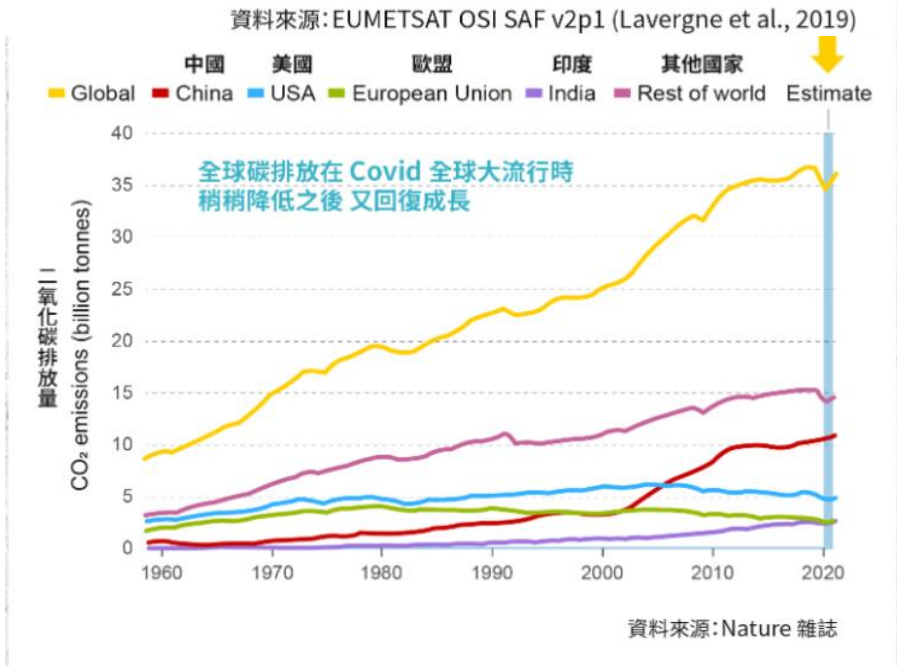


資料來源：Berkeley Earth





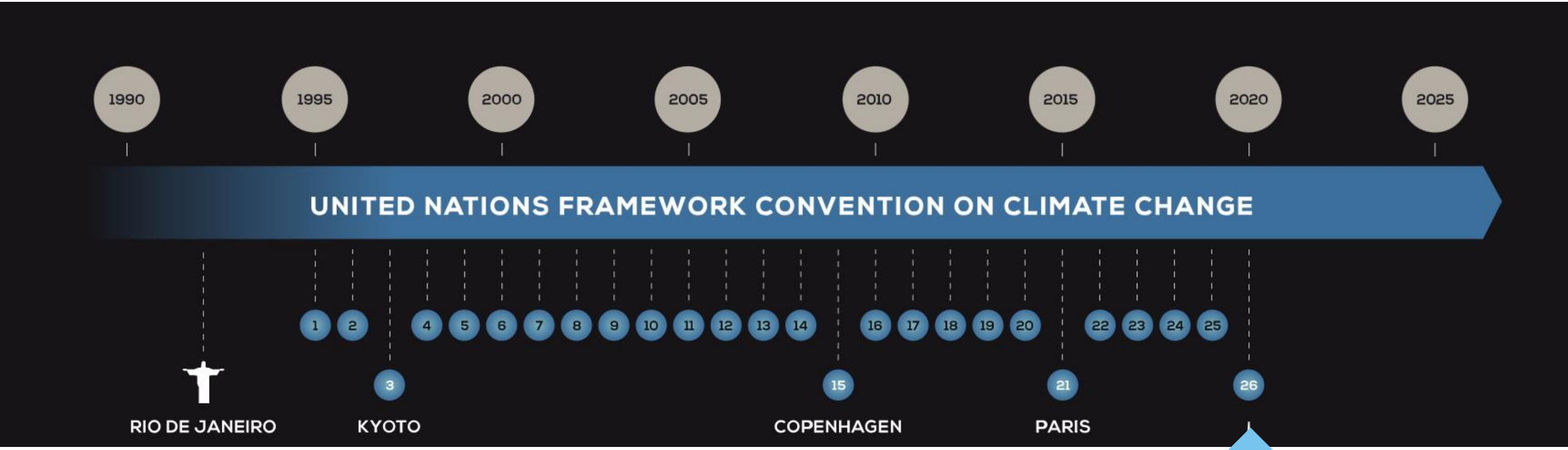
資料來源：GCOS



資料來源：Nature 雜誌

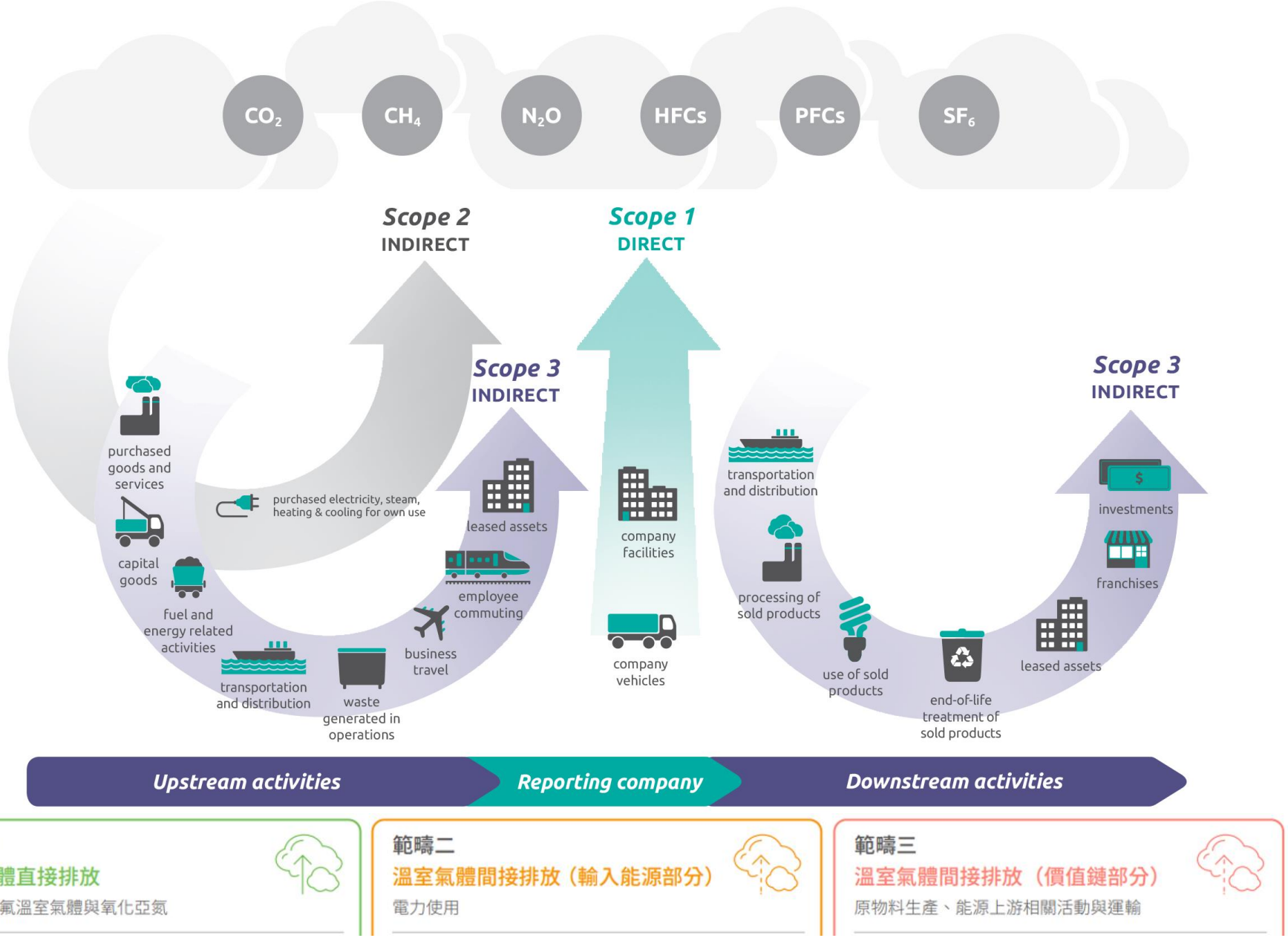
HOW

UN Climate Summits History



資料來源 https://eciu.net/analysis/infographics/un-climate-summits

COP 26 Emission Characteristic



資料來源：https://taise.org.tw/post-view.php?ID=300

Glasgow Climate Pact (COP26)

- 全球甲烷承諾
- 淨零金融聯盟
- 森林與土地利用宣言
- 突破倡議
- 零碳車承諾
- 綠色航運承諾
- 企業領袖提出改造與融資承諾
- 全球著眼 2030 中期減排目標：「2050 淨零碳排」

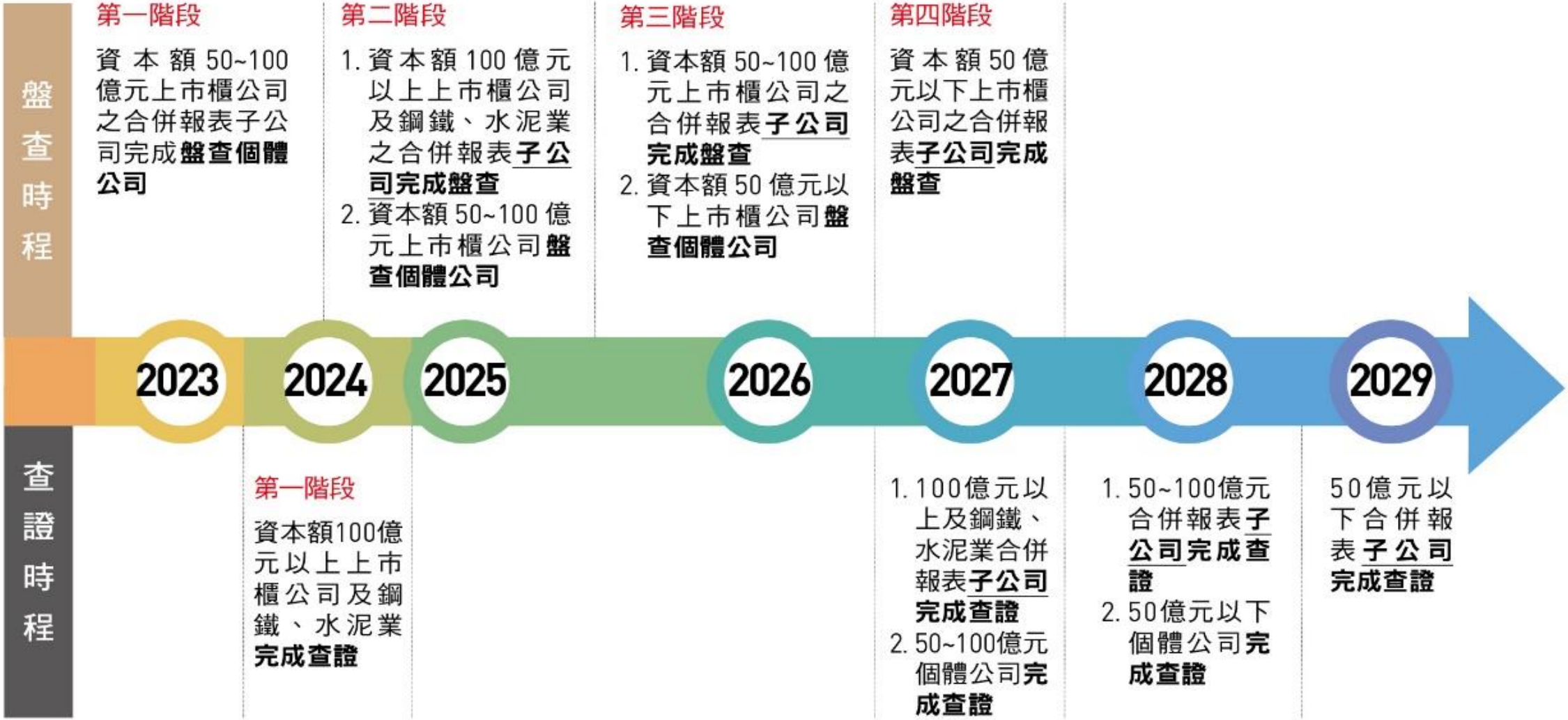
ESG Status Update

- **Europe CBAM milestone , 2023 and 2027**
  - **2023 ~2025 : 試行期間, 不須CBMA憑證， 只交報告(含範疇1/2/3)**
  - **2026 : 正式實施,須CBMA憑證 及申報 (含範疇1/2/3)**

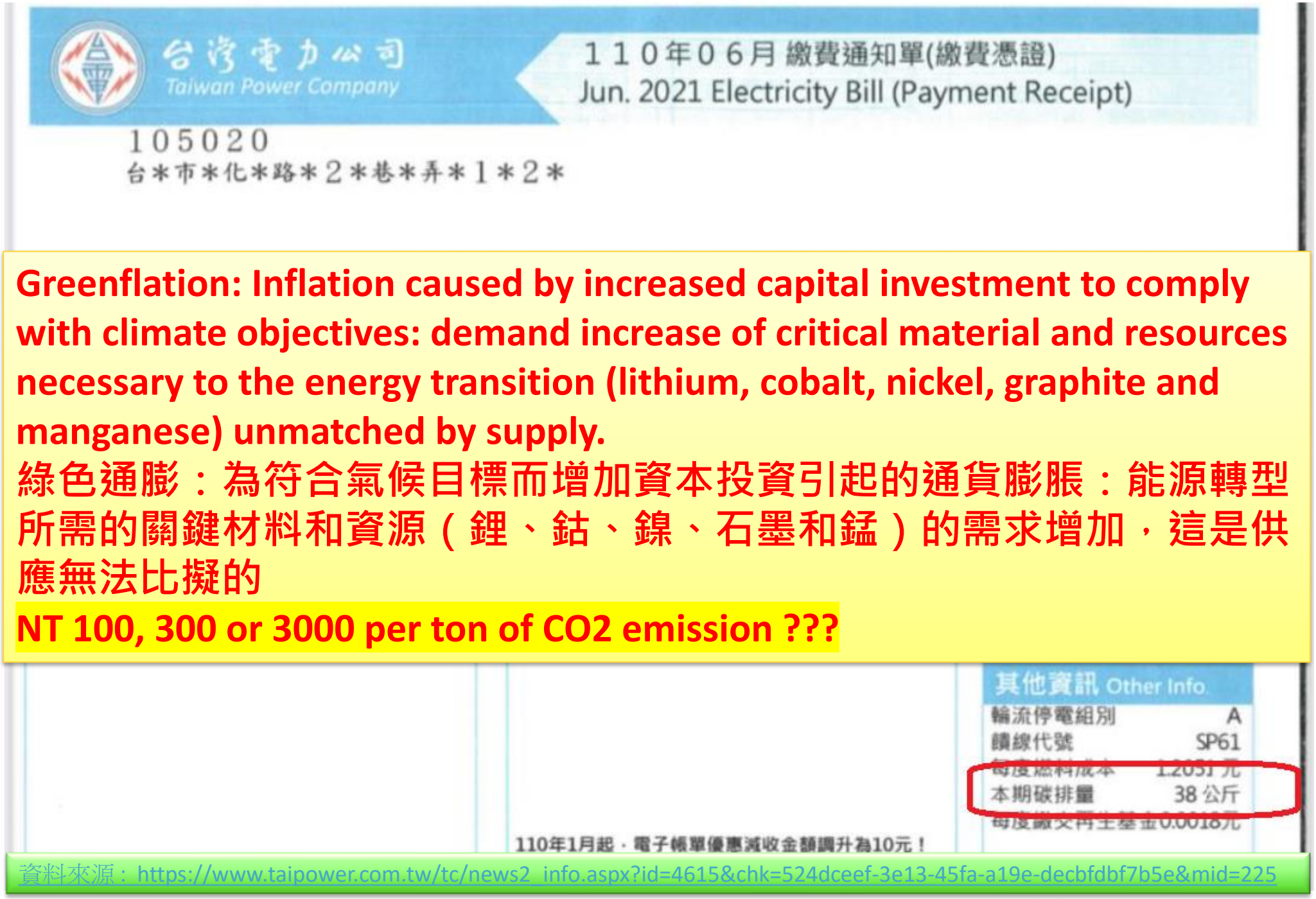
- **Apple calls on global supply chain to decarbonize by 2030**

- **《氣候變遷因應法》三讀通過 @2023**

圖1 **時程規劃**



資料來源：金管會



Greenflation: Inflation caused by increased capital investment to comply with climate objectives: demand increase of critical material and resources necessary to the energy transition (lithium, cobalt, nickel, graphite and manganese) unmatched by supply.

綠色通膨：為符合氣候目標而增加資本投資引起的通貨膨脹：能源轉型所需的關鍵材料和資源（鋰、鈷、鎳、石墨和錳）的需求增加，這是供應無法比擬的

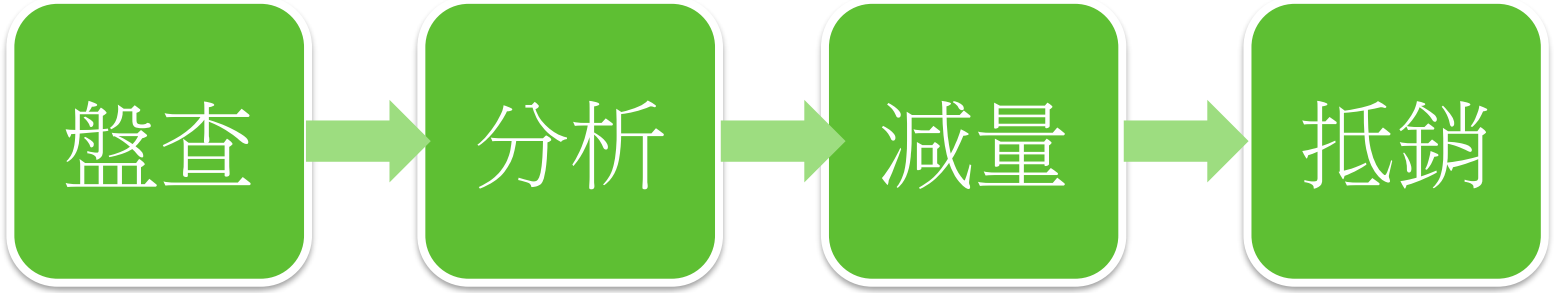
NT 100, 300 or 3000 per ton of CO2 emission ???

資料來源： https://www.taipower.com.tw/tc/news2_info.aspx?id=4615&chk=524dceef-3e13-45fa-a19e-decbfdbf7b5e&mid=225

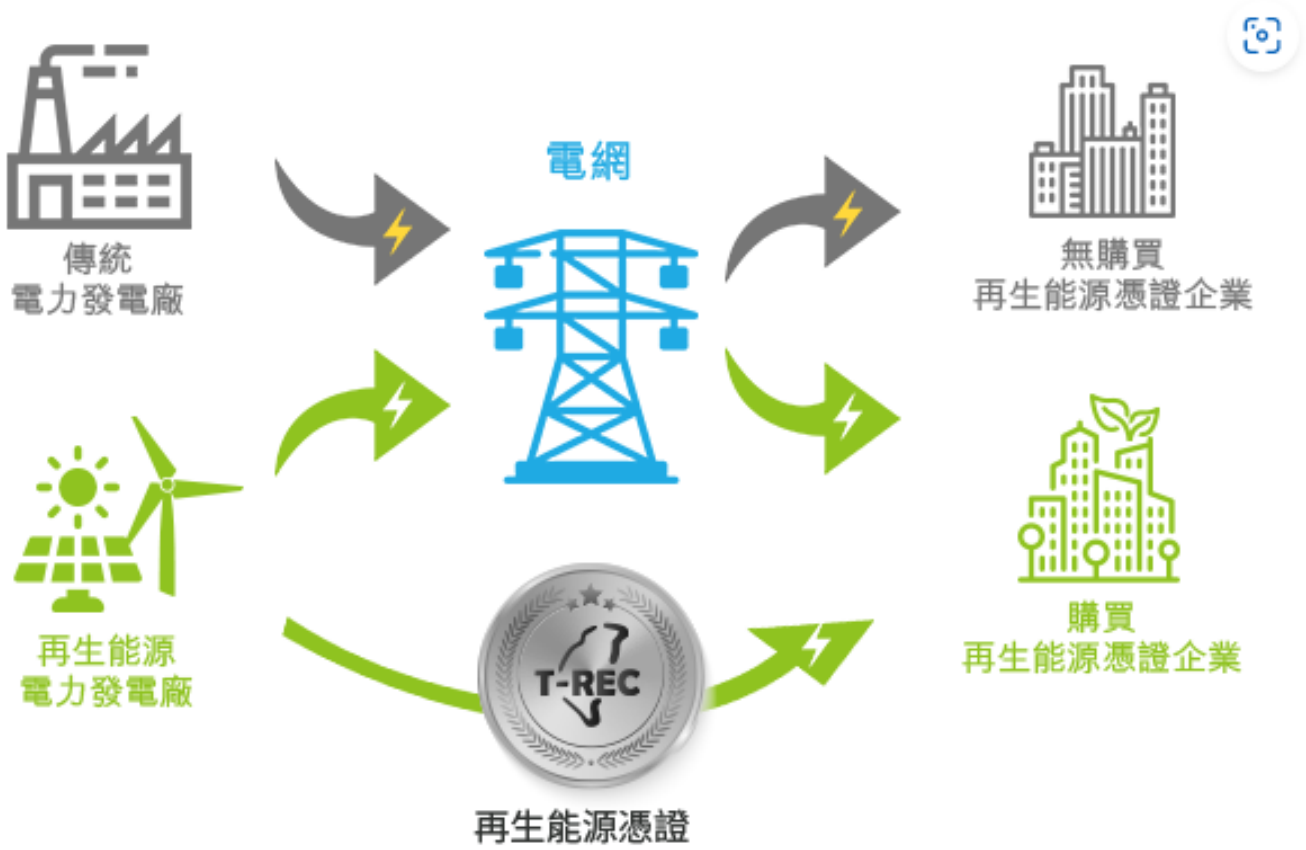
MICROCHIP

碳權 (Carbon Credit)

- 京都議定書(COP 3) … Now COP 26 (蘇格蘭格拉斯哥)
- 碳權是基於全球淨零排放目標而誕生的機制，對大量排碳的企業設定碳排上限，進行以量制價。
- 企業努力減碳，讓碳排放低於上限，這才有「碳權」額度可以賣給其他人；若企業碳排放超出上限，就需要購買其他人多出來的碳權來達成減碳目標。
- 台灣企業要進行碳權交易，可至行政院環保署的溫室氣體減量與抵換管理機制，提出減碳認證申請，或發布販售碳權的資訊。



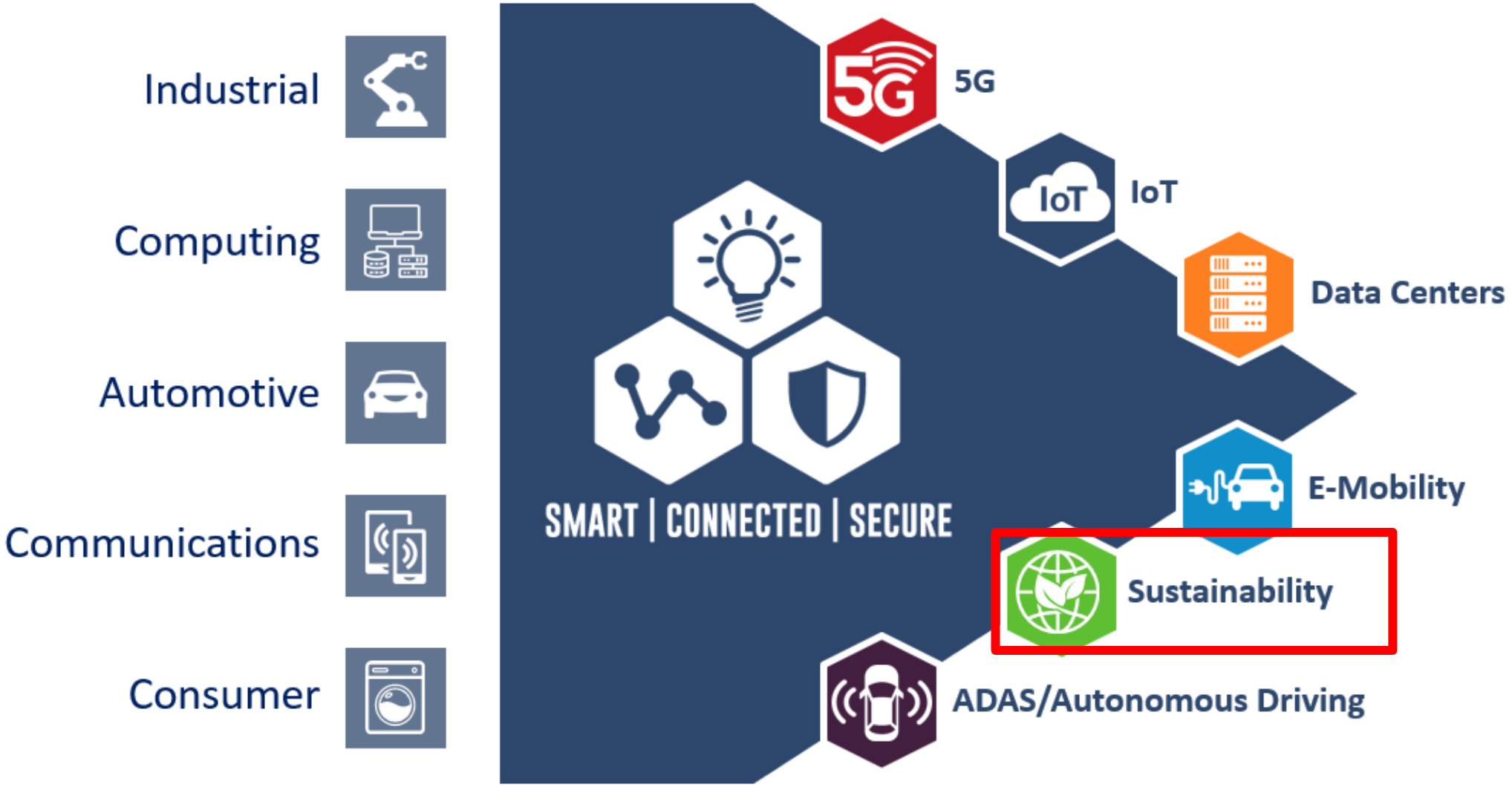
Taiwan , T-REC



*台灣再生能源憑證
資料來源：國家再生能源憑證中心

WHAT

Sustainability solution from Microchip



Sustainability solution from Microchip

TSN Time Sensitive Networking Powered by IEEE 802

MICROCHIP

CoreFFT v8.0

CoreFFT supports the following FPGA families.

- PolarFire®
- PolarFire SoC
- SmartFusion® 2
- IGLOO® 2
- RTG4™

SiC Portfolio: 700V – 3.3 kV

Product Family	Packaging
Die	
Discretes	
Modules	
Gate Drivers	

MICROCHIP

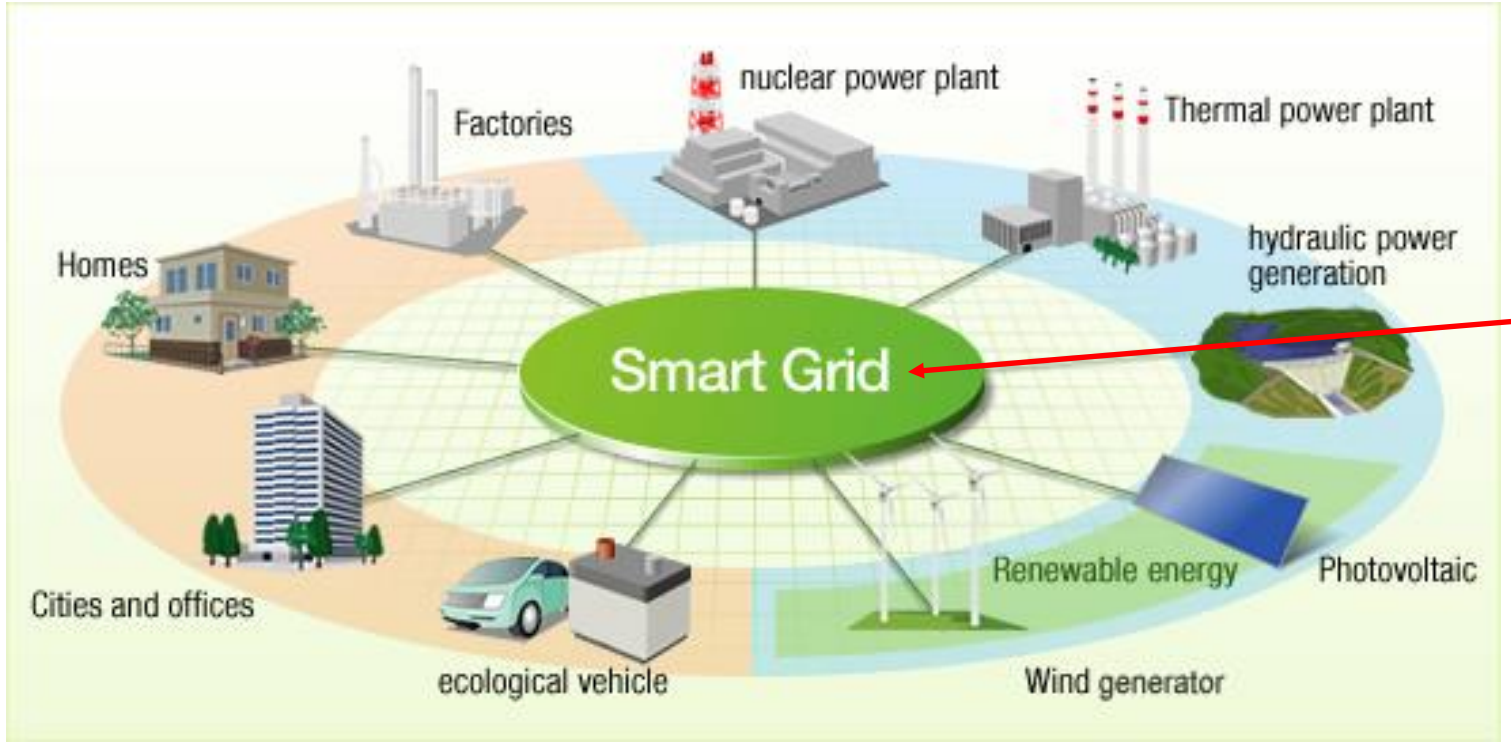
開源 (make more money)

綠電(Green/renewable Energy)

Energy Generation, Storage and Distribution

Smart Grid Applications

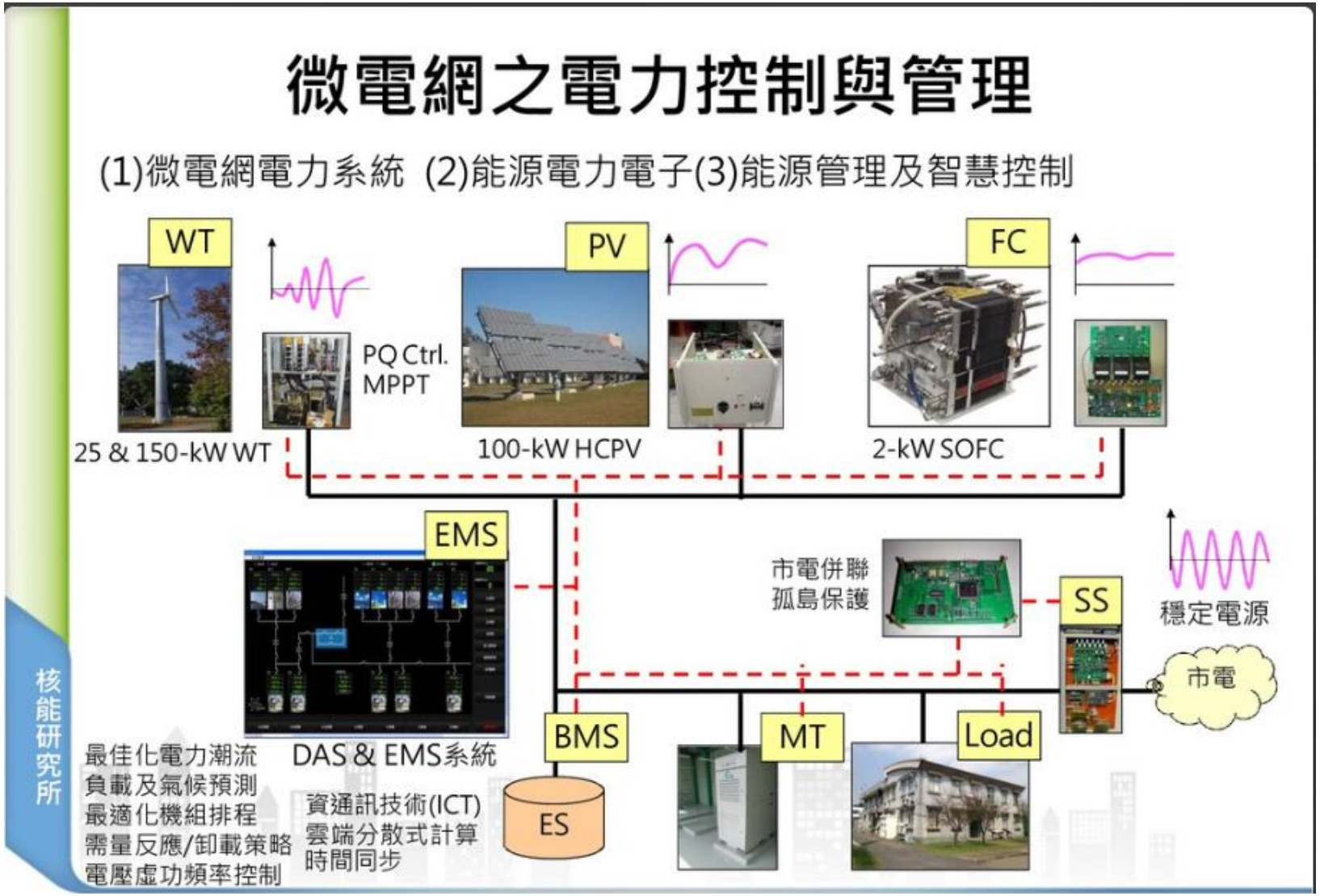
- Smart grid is a power grid that provides high-quality power service and maximizes energy use efficiency by making the power grid intelligent and advanced by utilizing electricity and information and communication technology.
- Technology : Network / Sensor / Metering / Monitoring / HMI/1588/IGBT/SiC/TSN



- Network
- Sensor
- Metering
- Monitoring
- HMI

圖片來源 : http://www.utilisave.com/blog/why-smart-grids-are-the-smart-move/

New Power Distribution Topology (Distributed Generator)

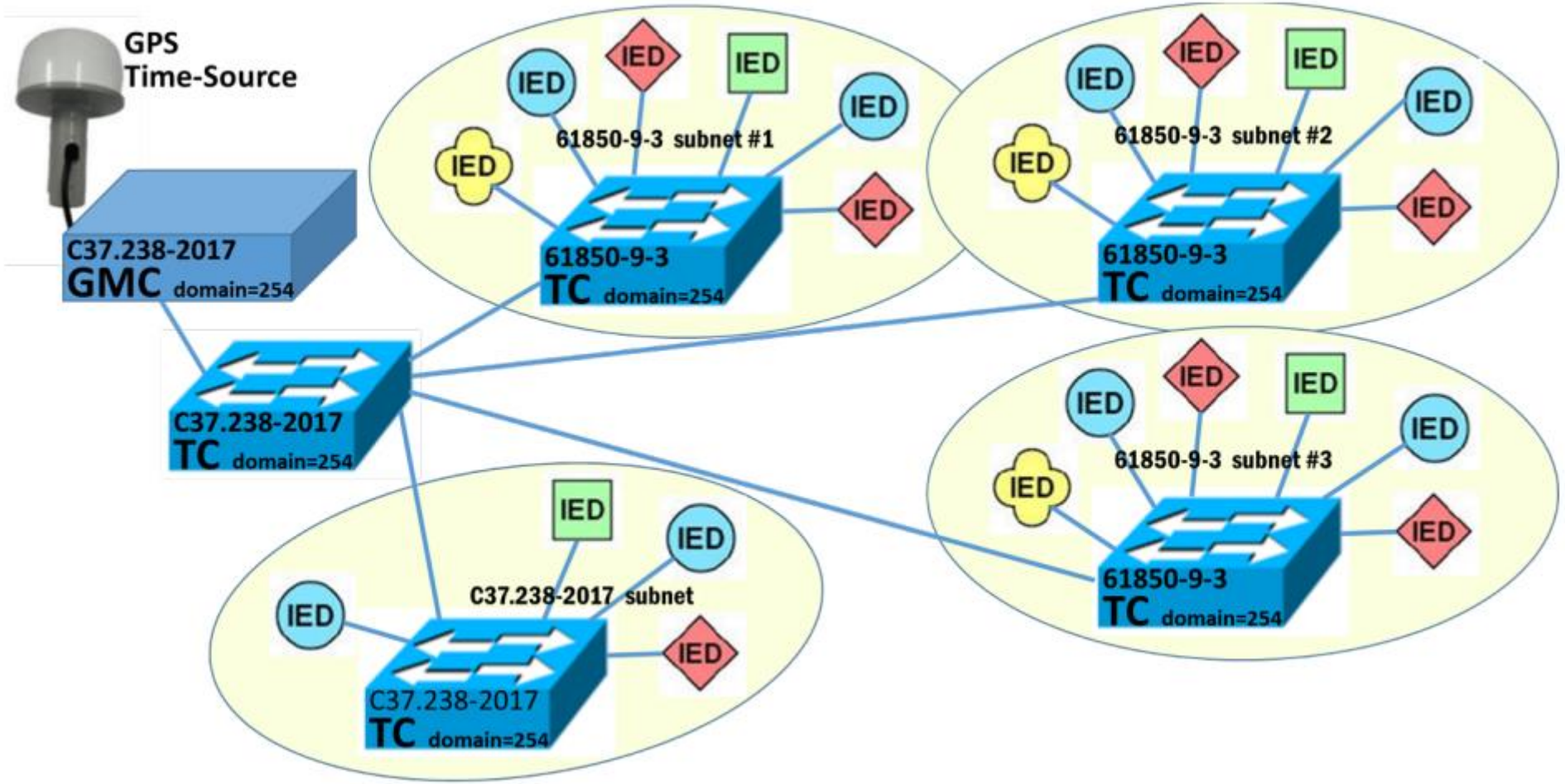


資料來源: https://speakerdeck.com/learnenergy/zhi-hui-wei-dian-wang-ji-shu-yan-fa-xian-kuang-zhang-yong-rui-zu-chang

Issue Need to Take Care in DG

- **LVRT**
  - **L**ow **V**oltage **R**ide **T**hrough
- **Islanding Operation and Anti-Islanding Protection**
- **HVDC Transmission**
  - **H**igh **V**oltage **D**irect **C**urrent

IEEE 1588 Power Profile IEEE Std C37.238



資料來源 https://tsapps.nist.gov/publication/get_pdf.cfm?pub_id=925940

DG (distributed generator)

PV/Wind farm (Zero emission) for operational management

- LVRT (Low voltage ride through) , Reactive power injection when fault (STATCOM)
  - Ethercat or IEEE1588
  - IGBT/SiC
  - FPGA/DSP
- HVDC converter (MMC)
  - IEEE1588
  - IGBT/SiC
  - FPGA/DSP
- Islanding Protection
  - DSP
  - 1588
  - SiC/IGBT

節流(Spent less)

Power management and saving

Power Management

- **Energy-detect power down** → Check PHY Link status
- **Software power down**
- **Chip power down**

  → Suspend/resume via register setting (MDC/MDIO)
- **Energy Efficient Ethernet** → Enabled by Default, partner need support EEE
- **Wake on LAN (idle+ PME)** → **CPU power saving**

Note: Software functions controlled by external SOC

Recommended Single Port Ethernet PHYs

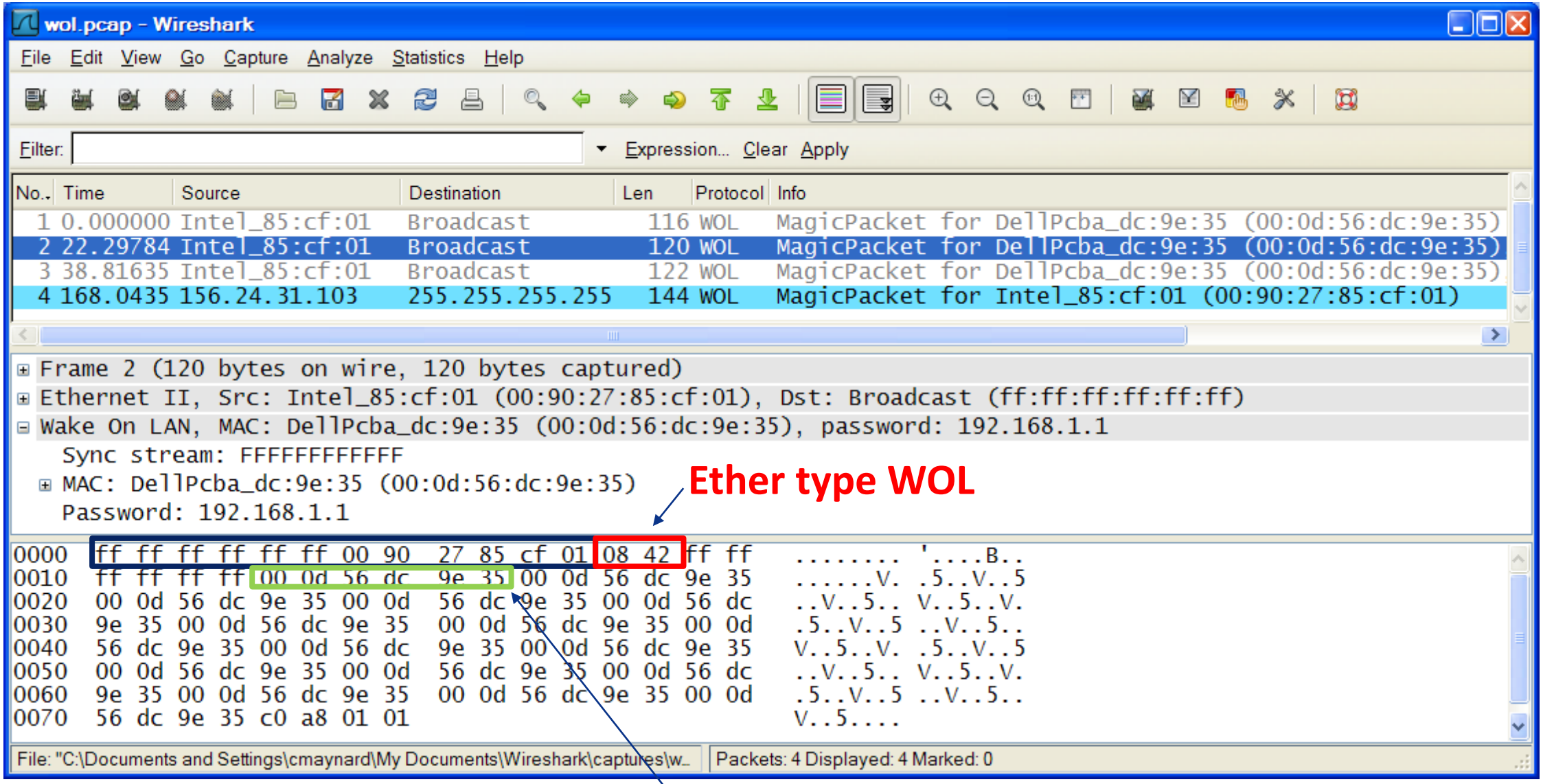
New New

Product	KSZ8081	KSZ8091	LAN8742A	LAN8740A	KSZ8061	KSZ9031	KSZ9131	VSC8541
Bandwidth	10Base-T/100Base-TX					10/100/1000Base-T		
Interface	MII/RMII		RMII	MII/RMII		MII/RGMII/GMII	RGMII/RMII	GMII/MII/RMII/RGMII
Power	155mw (typical)	155mw (typical)	163mW (typical)	180mW (typical)	168mW (typical)	621mW (typical)	410mW (typical)	644mW (typical)
Temp Range	-40 to 85C	-40 to 85C	-40 to 85C	-40 to 85C	-40 to 85C	-40 to 105C	-40 to 105C	-40 to 125C*
Wake-on-LAN	No	Yes	Yes	Yes	No	Yes	Yes	Yes
EEE	No	Yes*See Errata	No	Yes	No	No	Yes	Yes
1588v2	No	No	No	No	No	No	No	Yes
Cable Diags	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Packages	24/32 VQFN 48/LQFP	24/32 VQFN 48/LQFP	24/QFN	32 VQFN 5x5	32 QFN/WQFN 5x5	48 QFN/VQFN 7x7 64 QFN 8x8	48 QFN/VQFN 7x7 64 QFN 8x8	68-QFN 8x8
MAC I/O Voltage	1.8 - 3.3V	1.8 - 3.3V	1.8 - 3.3V	1.8 - 3.3V	1.8 - 3.3V	1.8 - 3.3V	1.8 - 3.3V	1.5-3.3V
Cable Reach	120m	120m	150m	150m	160m	10/100 – 150m	10/100 – 150m	160-200m
						GigE – 120m	GigE – 130m	
10k Pricing	$0.64	$0.75	$0.86	$0.93	$1.16	$1.76	$1.77	$1.91
	KSZ8081RNACA	KSZ8091RNACA	LAN8742A-CZ	LAN8740A-EN	KSZ8061MNXI	KSZ9031RNXCC	KSZ9131RNXCC	LAN8840/Q2A
Voltage Regulator	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Special Features	Back-to-back mode for Copper repeater	Energy Efficient Ethernet (EEE)	AEC-Q100 available	AEC-Q100 available	AEC-Q100 available	AEC-Q100 available	EEE, Lower Power	SyncE, SOF, Alpha Pkg

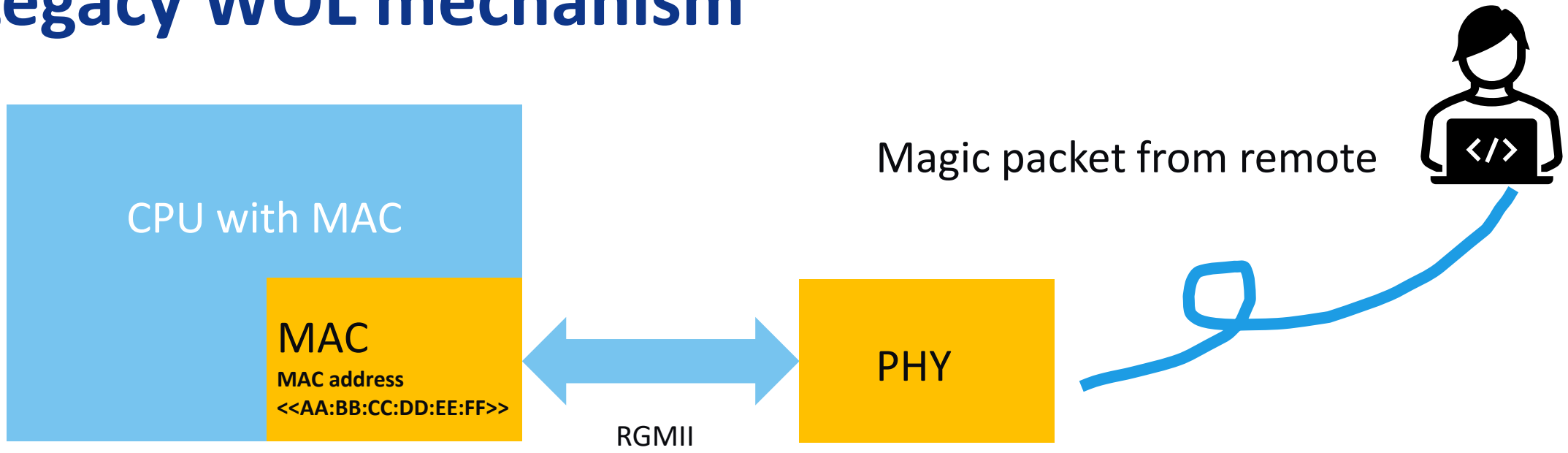
* Junction Temperature

MICROCHIP

Magic Packet

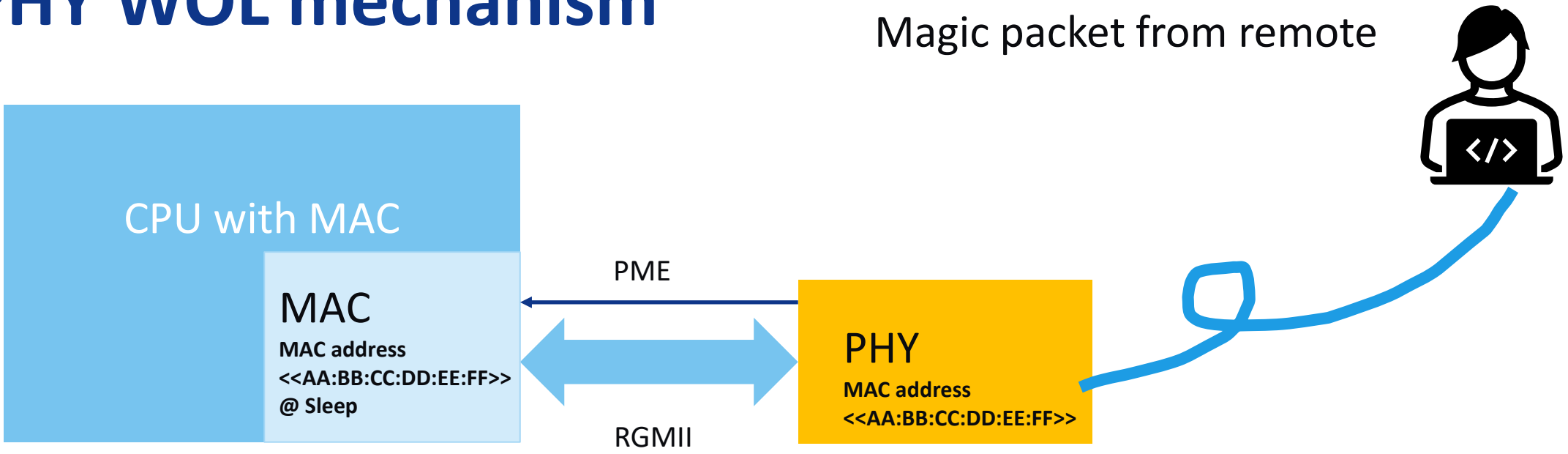


Legacy WOL mechanism



- **Legacy WOL, MAC in CPU need keep awake in order to check if the incoming packet is magic packet or not**
- **CPU need keep awake because MAC need keep awake to recognize magic packet**

PHY WOL mechanism



- **PHY WOL, MAC in CPU will copy the MAC address and set control register into PHY. Then CPU/MAC can enter deep sleep mode**
- **PHY need keep awake (Sentinel) in order to process if the coming packet is a magic packet or not**
- **Once Magic packet recognized, PHY will send an interrupt to wake CPU up, CPU resume to work**

Thanks , Q&A