

Development of Circular Economy for Precious and Rare Metals in Chinese Taipei



***Economy
Ecology***



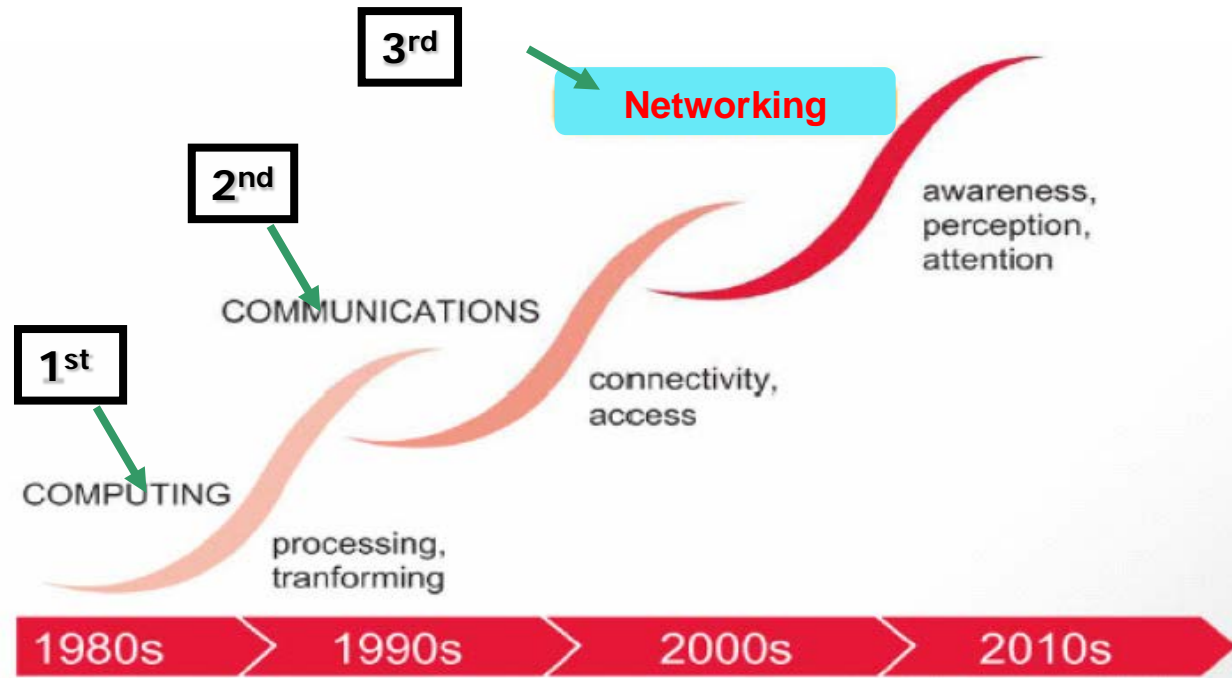
***Material
Applications
Recycling &
Refining***



**Dr. C.Y. Ma
CEO of Solar
2018. 03. 28**



1. Evolution Trends of Industrial Development (1980s~2010s)



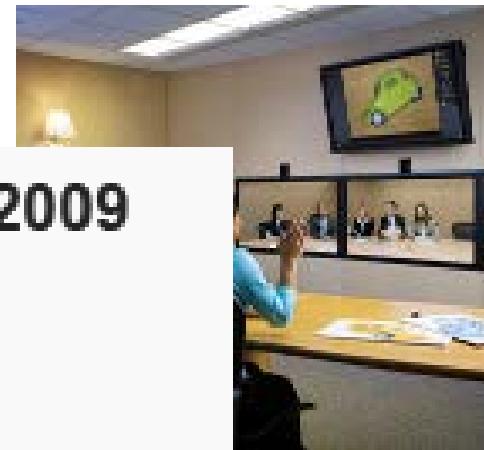
➤ Technical Driving Forces :

- 1st : computer and calculation
- 2nd : communication and video/audio
- 3rd : networking and mobility

➤ Platforms : PC > NB > s-phone > i-Pad > robot

➤ Trends : enhancement of mobility / dynamic

Severe Issues Human Being Facing : *Environmental Pollution / Protection*



E-waste generated worldwide in 2009

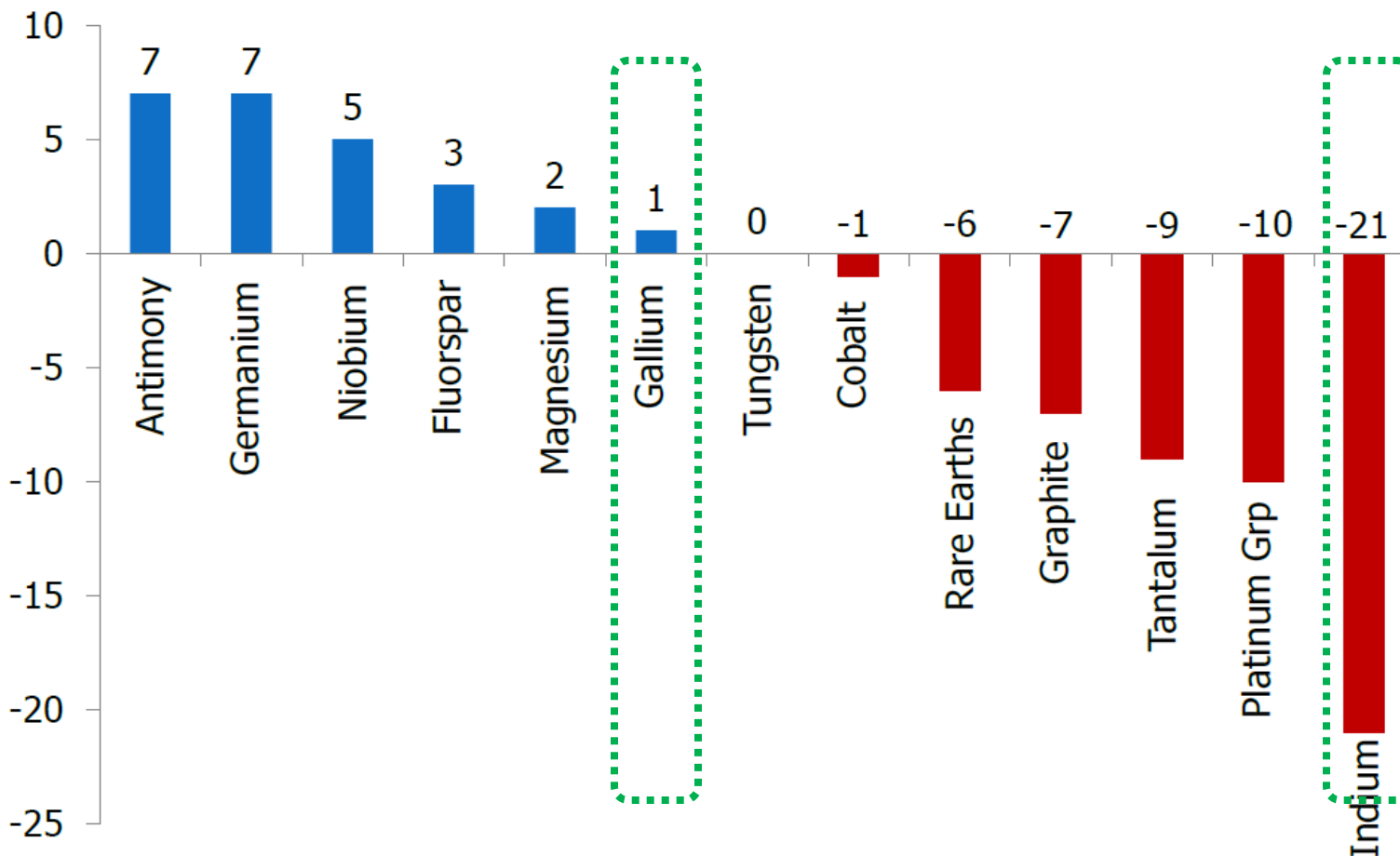
**53 million
tonnes
13% was recycled**

Source: ABI Research



Shortages of “Critical Raw Materials”

Forecast Surplus (Deficit) - 2020 (%)

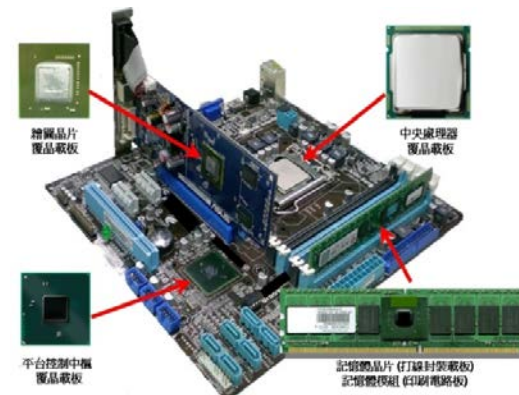
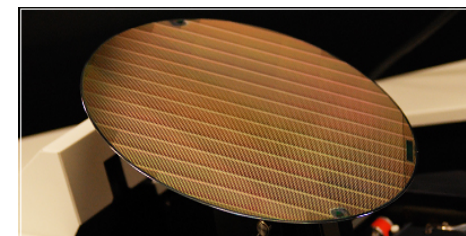
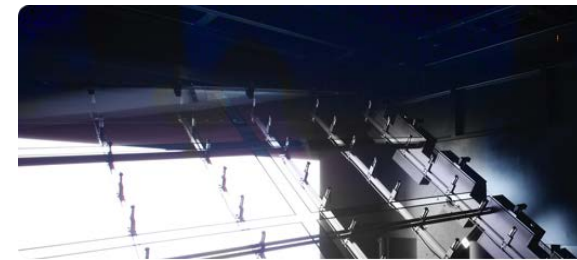
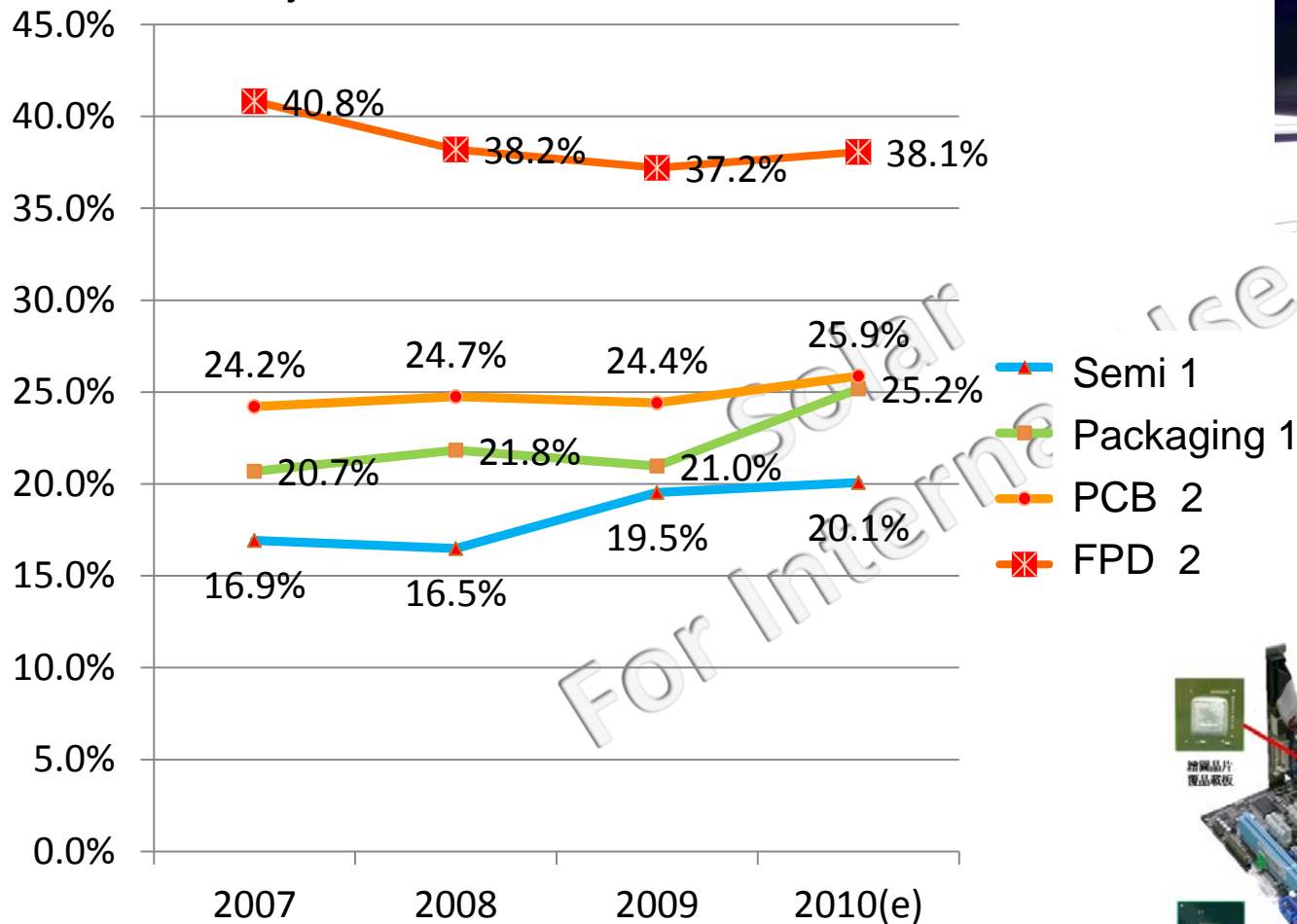


Source: OakdeneHollins, “ Recycling strategic & speciality metals”, 2011



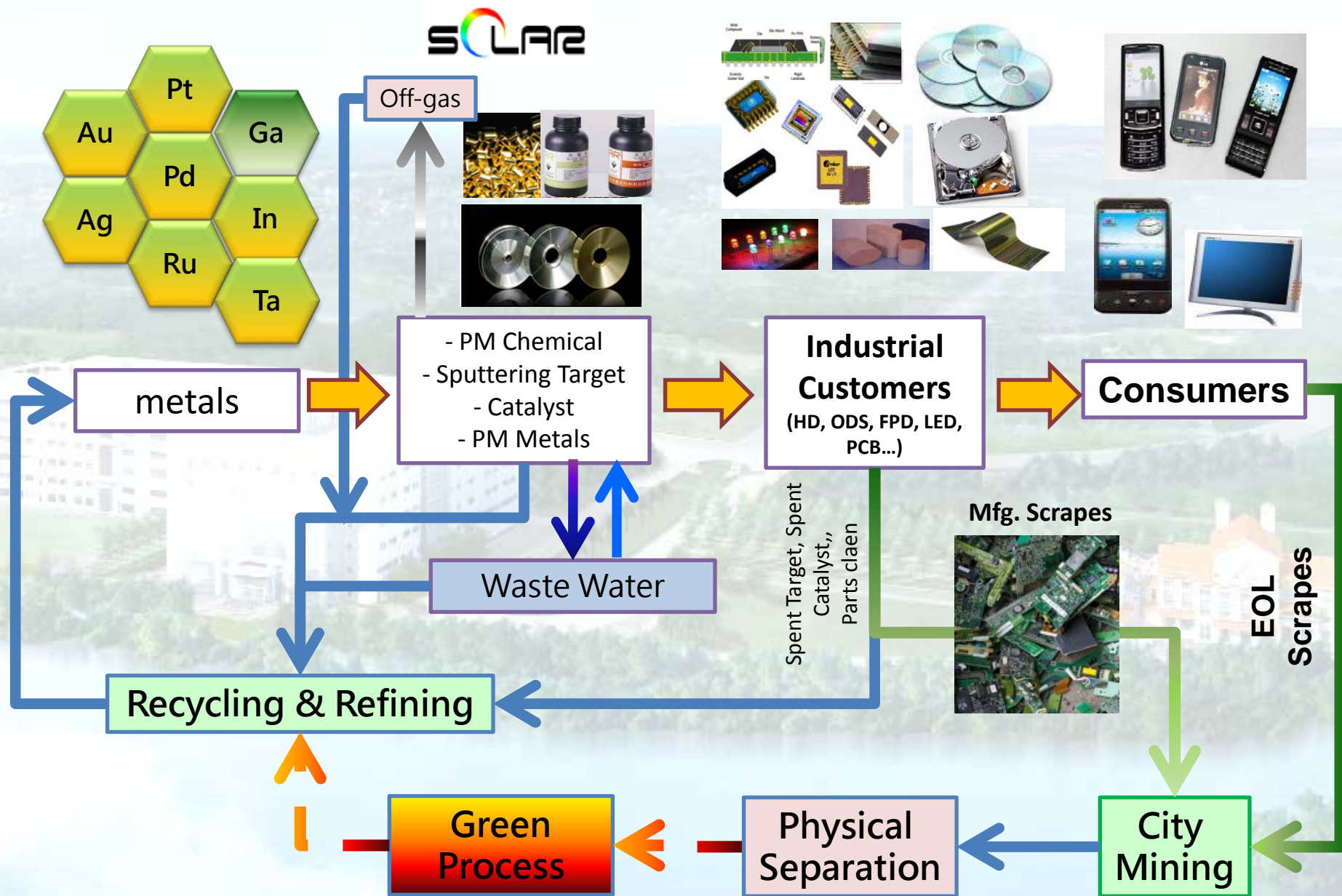
2. Taiwan, a Leading Country of EEE Industry

Share of output value W.W.
Major EEE Ind. In Taiwan

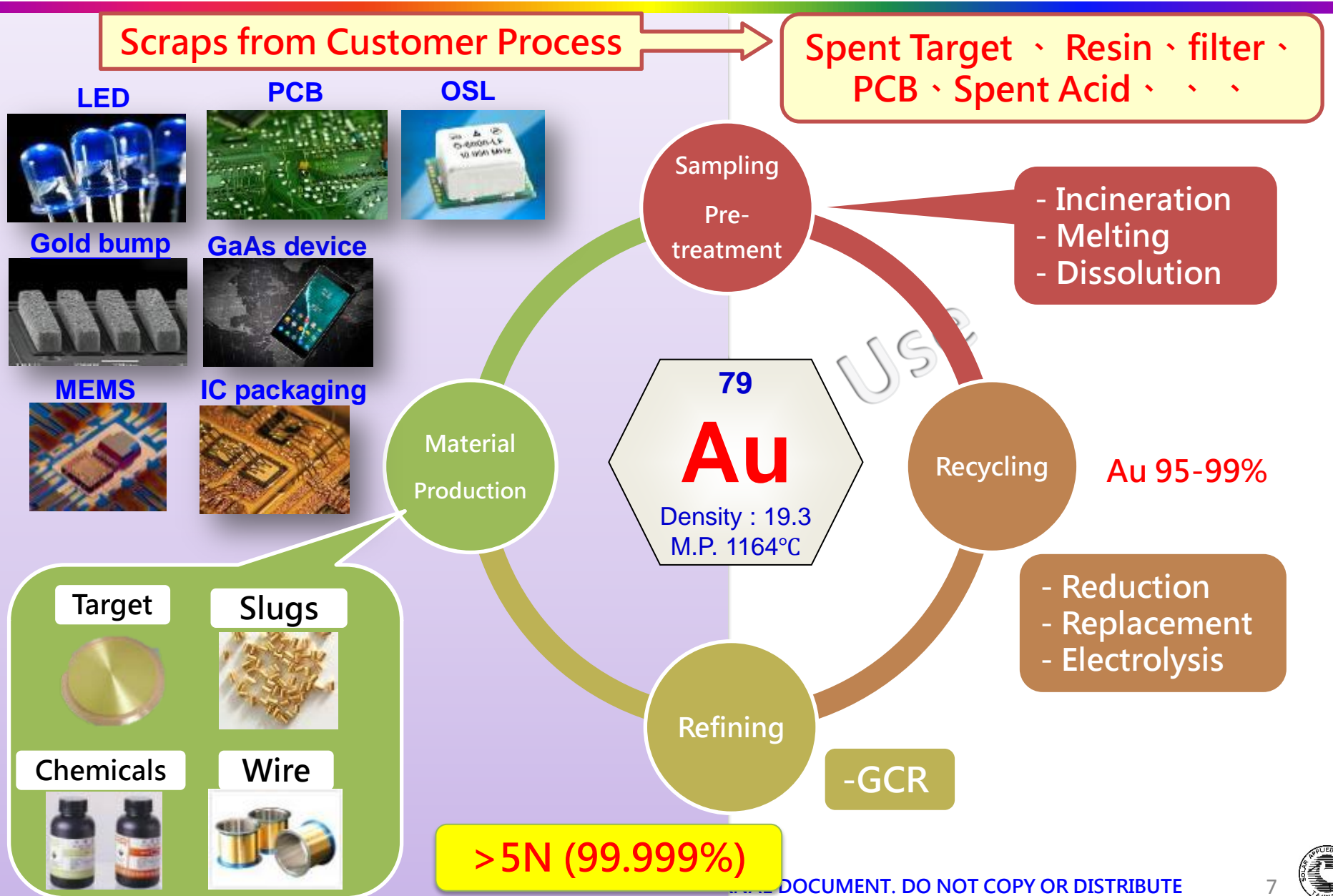


Source: : DOIT, Ministry of Economic Affairs, Taiwan

Circular Economy Developed at Solar in Taiwan



Circular Economy of Gold (Au) at Solar



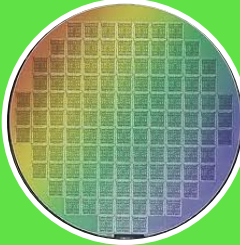
Ten Industrial Applications Developed at Solar for WW Customers



HDD



PV



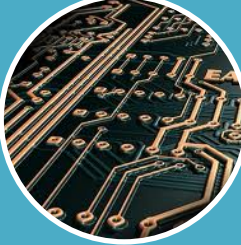
Semi



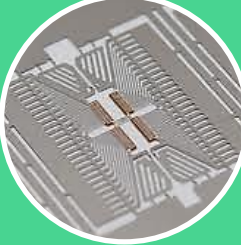
FPD



**CD/DVD
/BD**


PCB



LF



Petro



LED



Auto-Chemicals



3. R&R of Electronic Wastes (e-wastes)



Value Chain of e-Waste Circular Economy



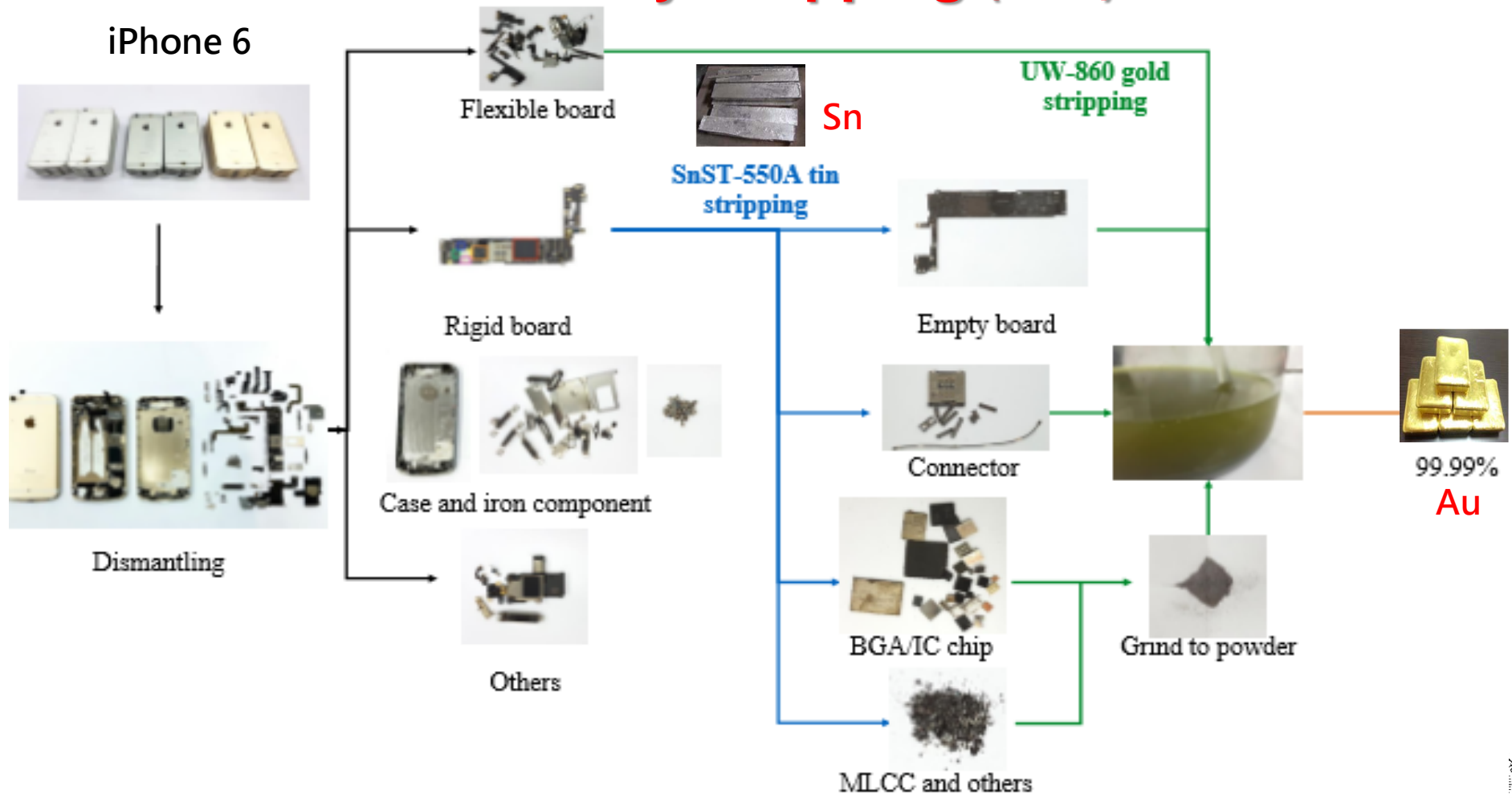
e-Waste R&R via Pyro Process (existing)



High energy consumption / High carbon emission / High investment

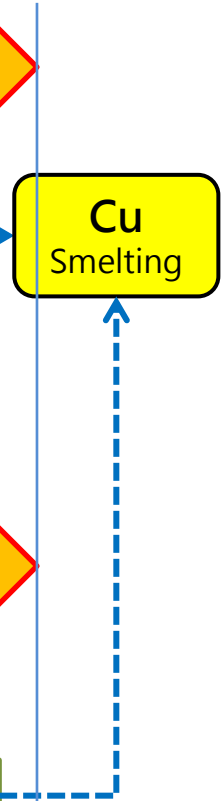
High volume required / Longer treatment time required (8~10 weeks)

Process Eco-friendly Stripping (EFS)





PC



← Cycle Time ~ 2weeks →



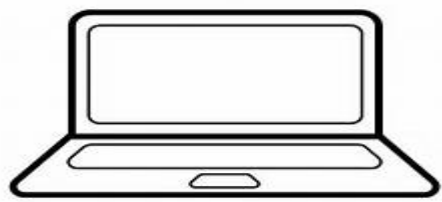
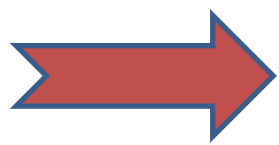
4. e-Waste R&R for Mobile Phone



	空板	BGA/IC	MLCC	SIM卡 連接器	其他 連接器	其他 零件	合計 (每公斤)	合計 (每噸)	合計 (RMB/ 每噸)
金	0.1g	0.19g	0.038g	0.006g	0.001g	0.001g	0.336g	336g	87360
銀	0.62g	0.204g	0.4g	0.001g	0.001g	0.011g	1.237g	1237g	4207
鈹	0.002g	0.003g	0.065g	0	0	0	0.07g	70g	7700
錫	18.4g	0.5g	0.13g	0.001g	0.002g	0.02g	19.05g	19.05kg	1905
銅	310g	3.2g	4.2g	5.2g	4.8g	1.4g	328.8g	328.8kg	9863
								合計	111035

- Based on statistics in scraped mobile phones (1 ton / 50,000 pcs) , there are around **340g Au**, **1.2Kg Ag**, **20Kg Sn** and **300Kg Cu**
- W.W. scraped volume ~ **1.2 bn phones per year**

e-Waste R&R for Notebook



**Circular Economy
Full Close Loop**

Green R&R Process

Target



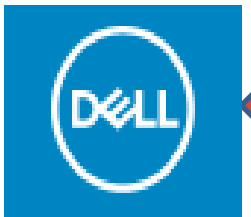
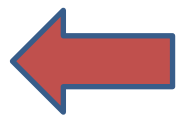
Slugs



Chemicals



Wire



光洋僅供內部

複製

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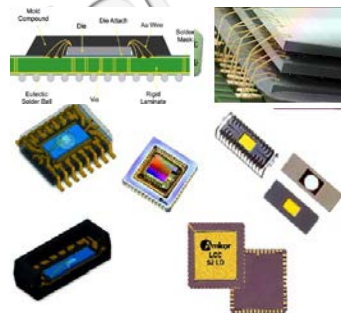
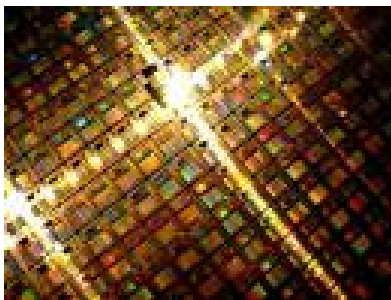


Synergy of Academic & Industry

Making Research Real

Visions : Green / Value / Future

From Inside (TW) to Outside (WW)



6. Strategy in Sustainable Industrial Development (1P / 2I / 3R / 4S)



All Win Policy (AWP)
Industry, User, Society

Thank You for Your Attention !

綠色 價值 未來
Green Value Future



You see waste, we see resource !

Circular Economy for a Better Life !