台灣功率半導體晶圓廠展望

昇陽國際半導體(8028.TT) Aug. 2019

免責聲明

- 本簡報包含對於未來營運的看法。這些對於未來的看法基於許多假設，其中部份假設如大環境變化可能超出本公司的控制範圍，因此這些預測有其風險和不確定性。

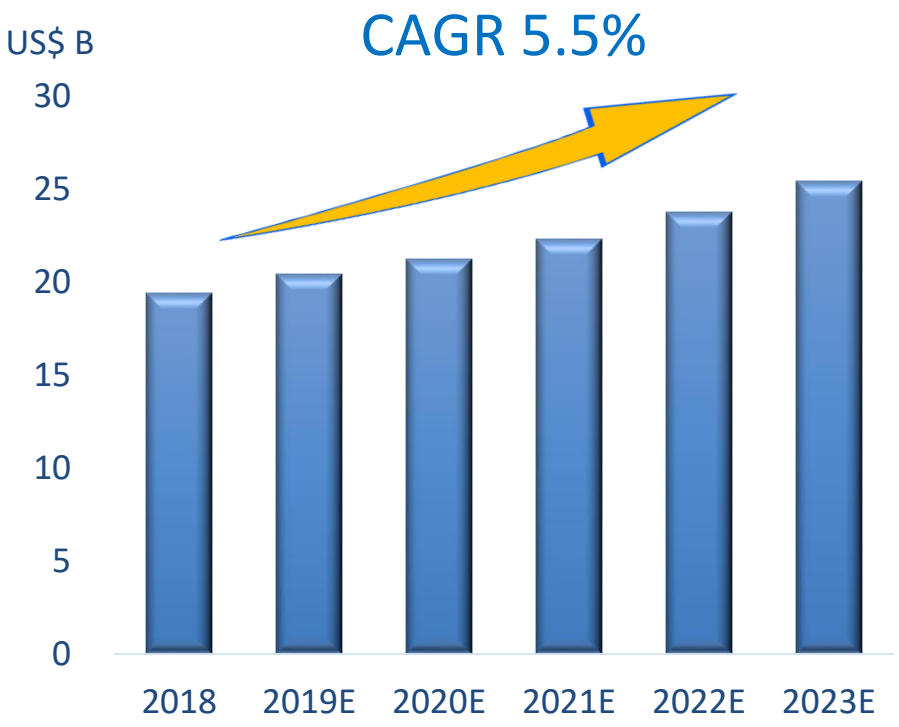
- 本公司未來發展的實際結果會因這些不可控因素的變化，而與現在這個時間點的看法產生差異。

- 本簡報中對未來的展望，反應本公司截至目前為止對於未來的看法，未來若有任何變更或調整時，本公司不承擔任何義務更新或修改本次報告。

功率半導體成長動能

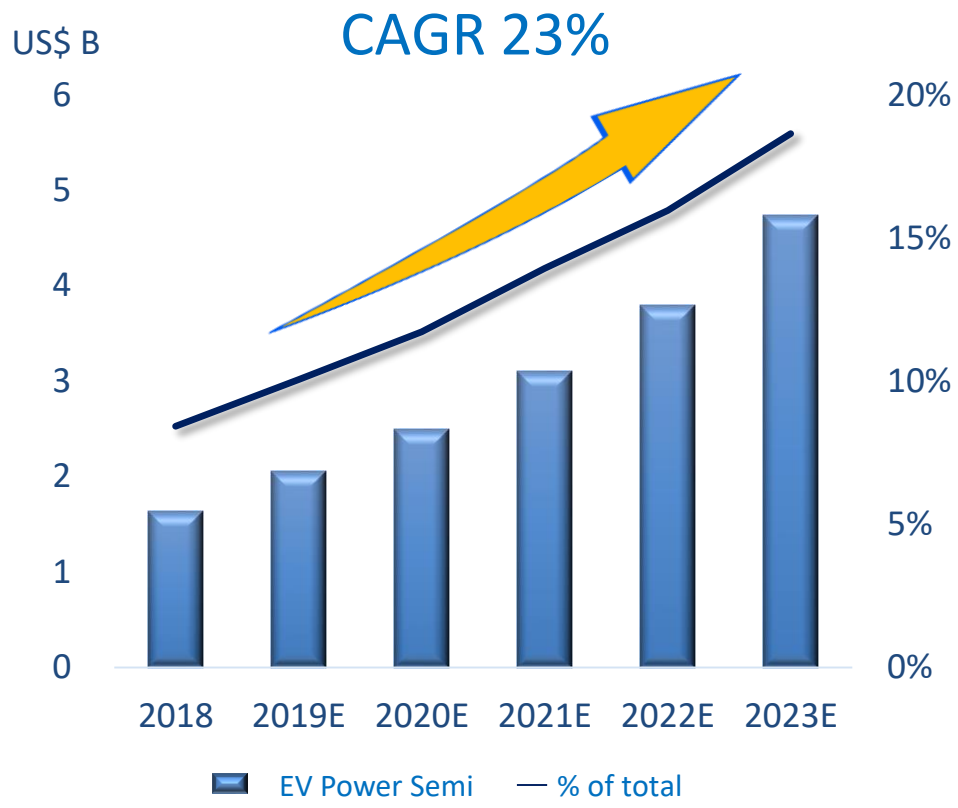
主要成長動能 – 電動車

Power Semi Market Size



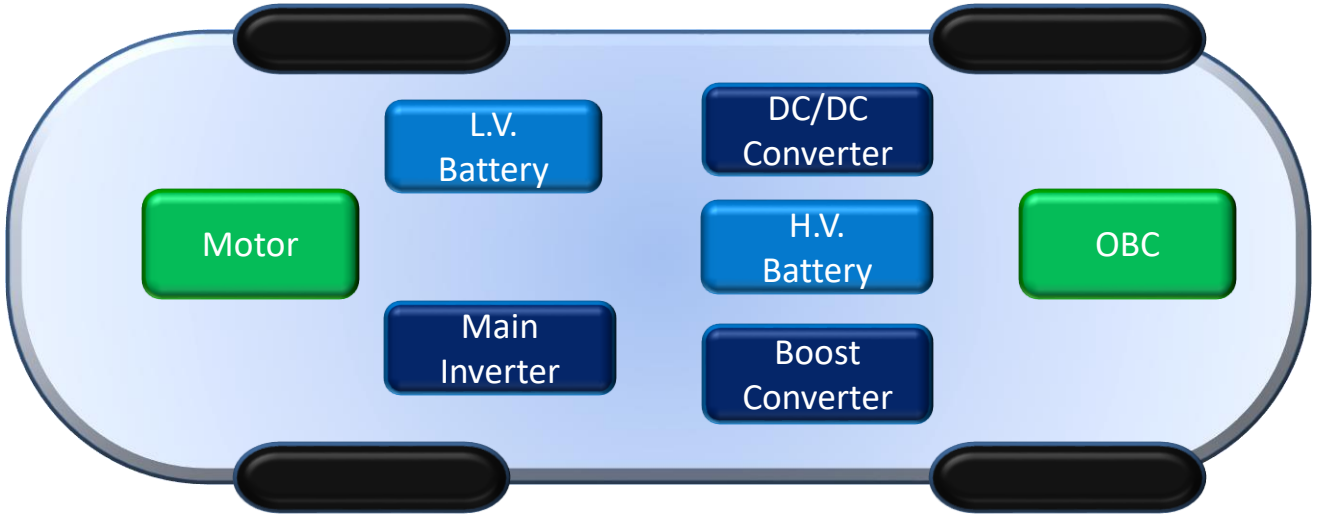
Source: IHS, YOLE and Bernstein

EV Power Semi Market Size



Source: YOLE and Bernstein

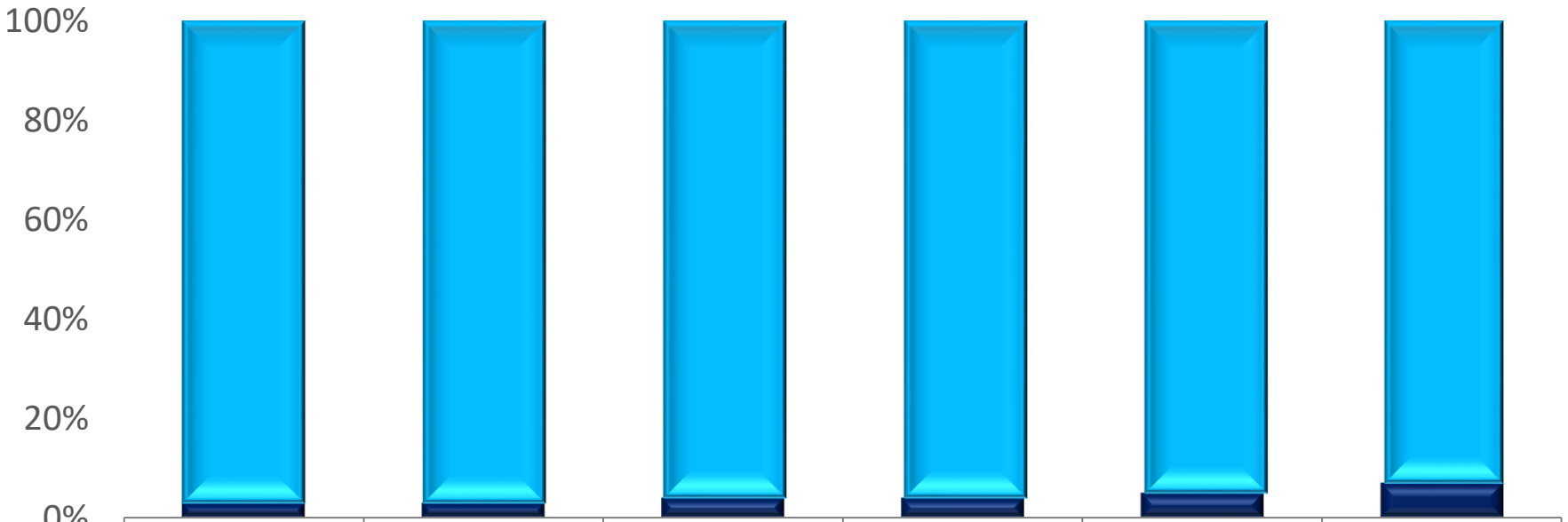
電動車的心臟



Converters	MHEV	FHEV	PHEV	BEV	High-end BEV
DC/DC converter LV-HV	6 MOSFETs: 1.5 – 4 KW				6 MOSFETs: 1.5- 4 KW
Main Inverter (+Boost Converter Option)	6 LV MOSFETs: 5 – 20 KW	6 IGBTs(+2IGBTs): 40 – 120 KW		6 IGBTs: 60 – 150KW	6 or 12 IGBTs: 250 – 600 KW
Generator		6 IGBTs: 20/50 KW			
OBC			6 MOSFETs: 1.8 – 7.2 KW 6 IGBTs: 10 – 20 KW		

Source: YOLE

矽基材的天下



	2018	2019	2020	2021	2022	2023
Si	97%	97%	96%	96%	95%	93%
SiC	3%	3%	4%	4%	5%	7%

Source: YOLE

*Power IC not included

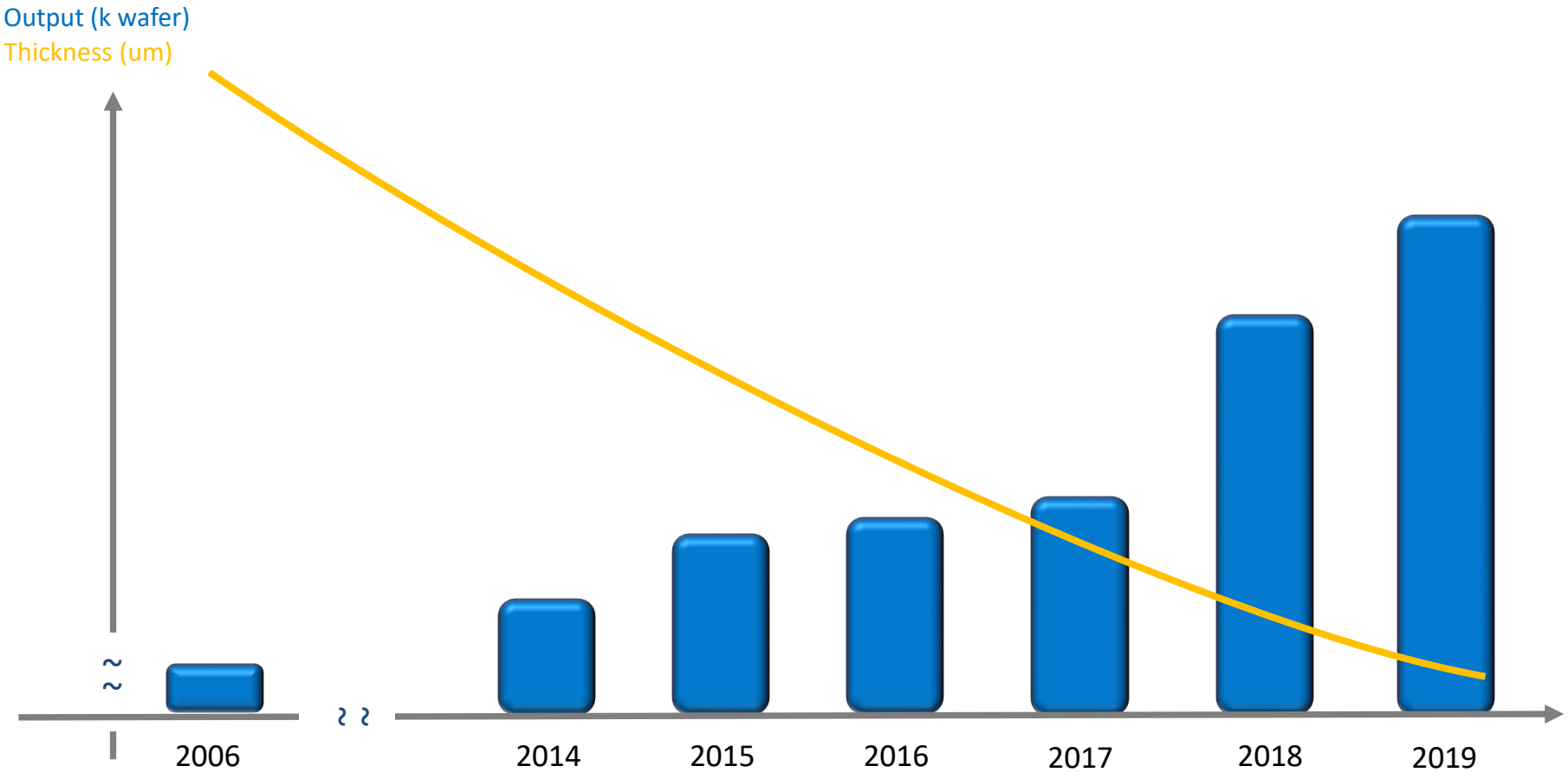
台灣功率半導體供應鏈現況

MOSFET, IGBT, SiC

台灣Power-MOS 供應鏈 – 成熟期

Fabless	SUBSTRATE + EPI	FEOL	MEOL	BEOL
Sinopower	WAFER WORKS	TMSC	PSI	GTBF
APEC	GlobalWafers	UMC	UMC	GEM
Niko-Sem	Episil-Precision	Maxchip	Maxchip	
Inergy Tech.		Episil(6”)	MMEC	
Chip integration		Mosel(6”)	Chipbond	
Excelliance Mos			MSEC	
PFC Device			IST	
Force mos				

昇陽參與MOSFET成長歷程



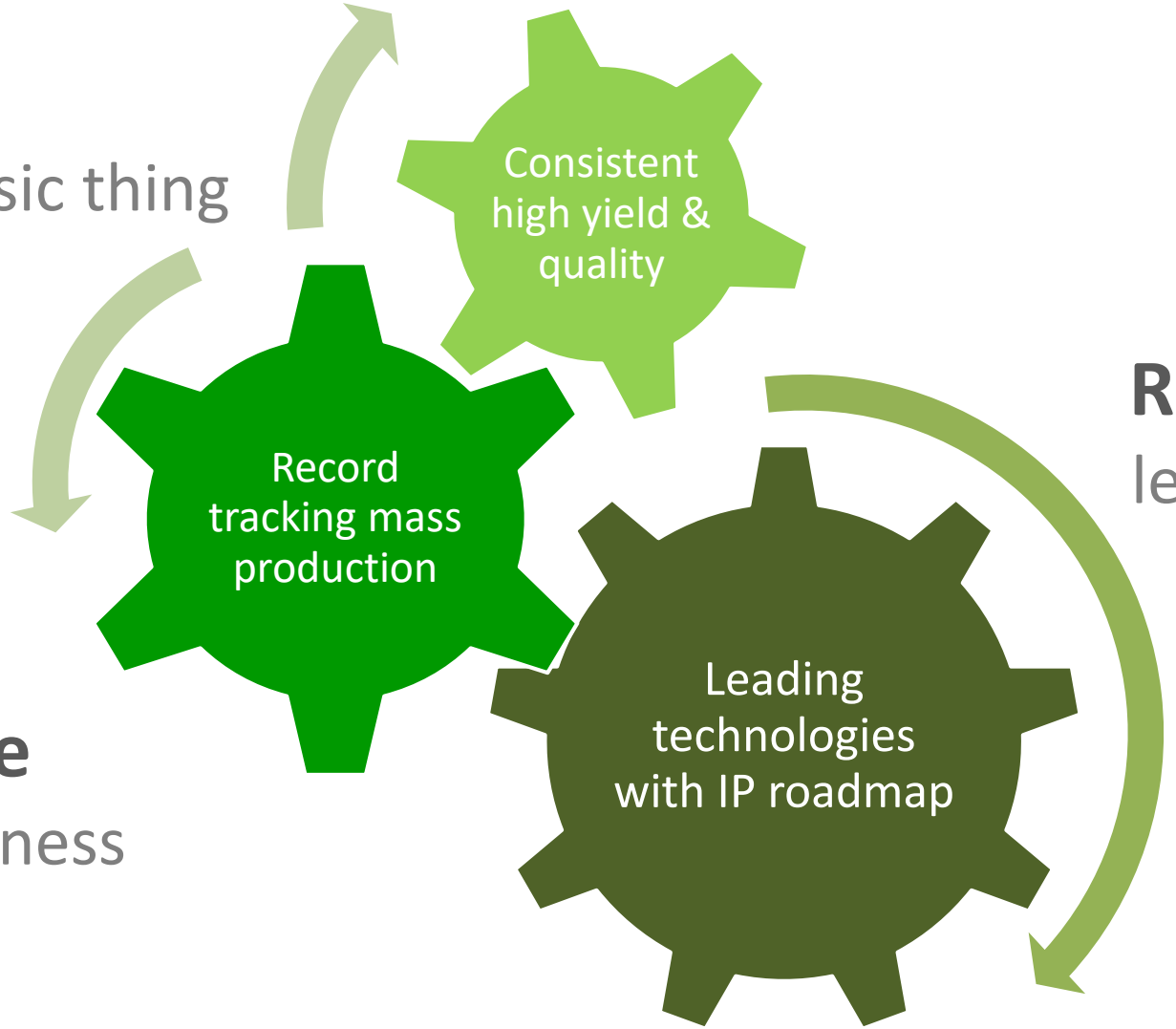
Source: Psi

- Output: increasing 3X, CAGR: 20%
- Expending Thin Wafer Process category: FSM, BGBM, CP
- Wafer Thickness: 250um ➔ 50um Taiko
- Tier 1 customer, Auto graded validated

MOSFET中段服務 成功之必需

Yield

is the most basic thing



Roadmaps & IP

lead to the future

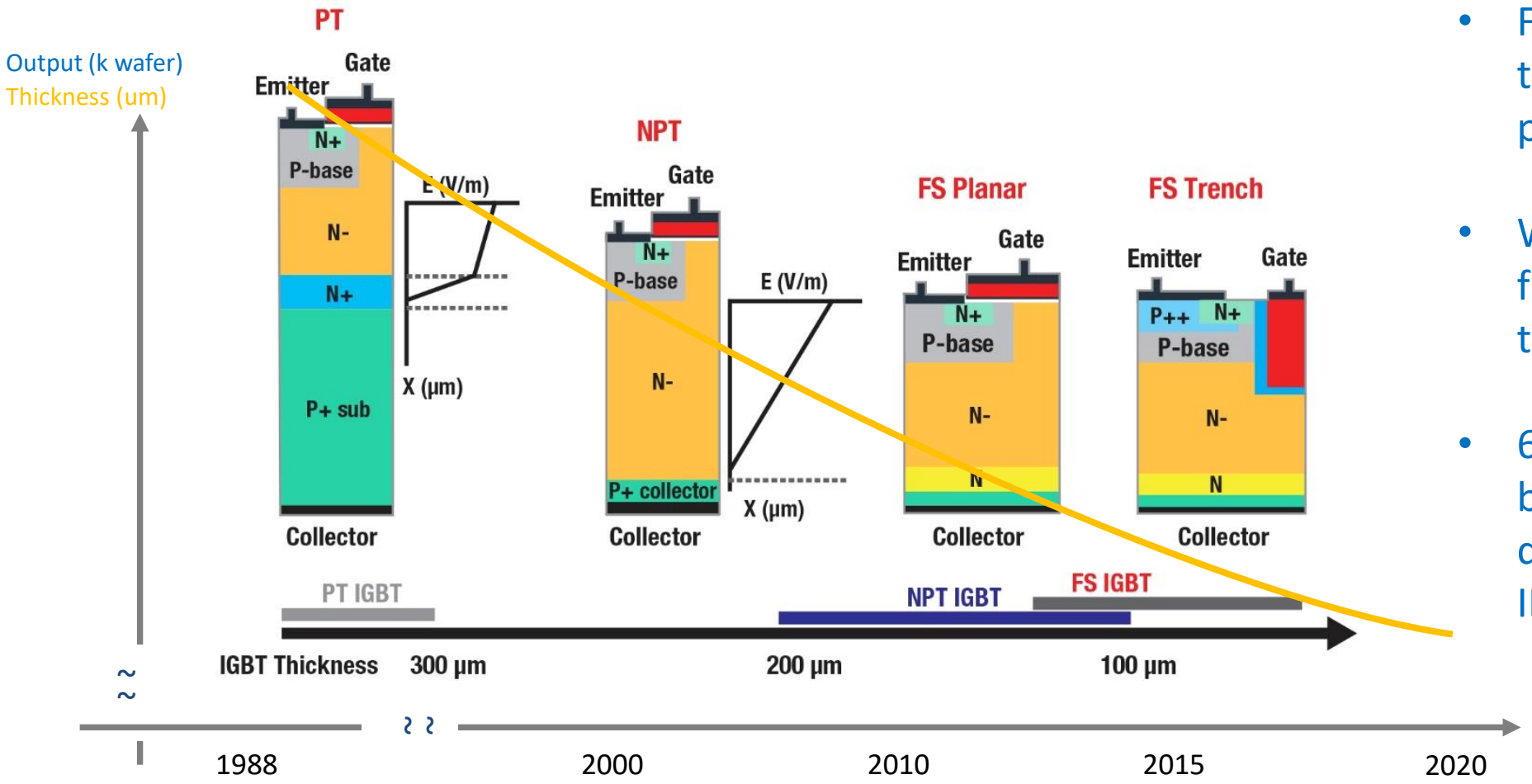
Market share

means competiveness

台灣IGBT供應鏈- 啟蒙時期

Fabless	SUBSTRATE + EPI	FEOL	MEOL	BEOL
A	WAFER WORKS	D	PSI	I
B	GlobalWafers	E	H	
C	Episil-Precision	F		
		G(6”)		

昇陽: 將串起台灣FS-IGBT供應鏈

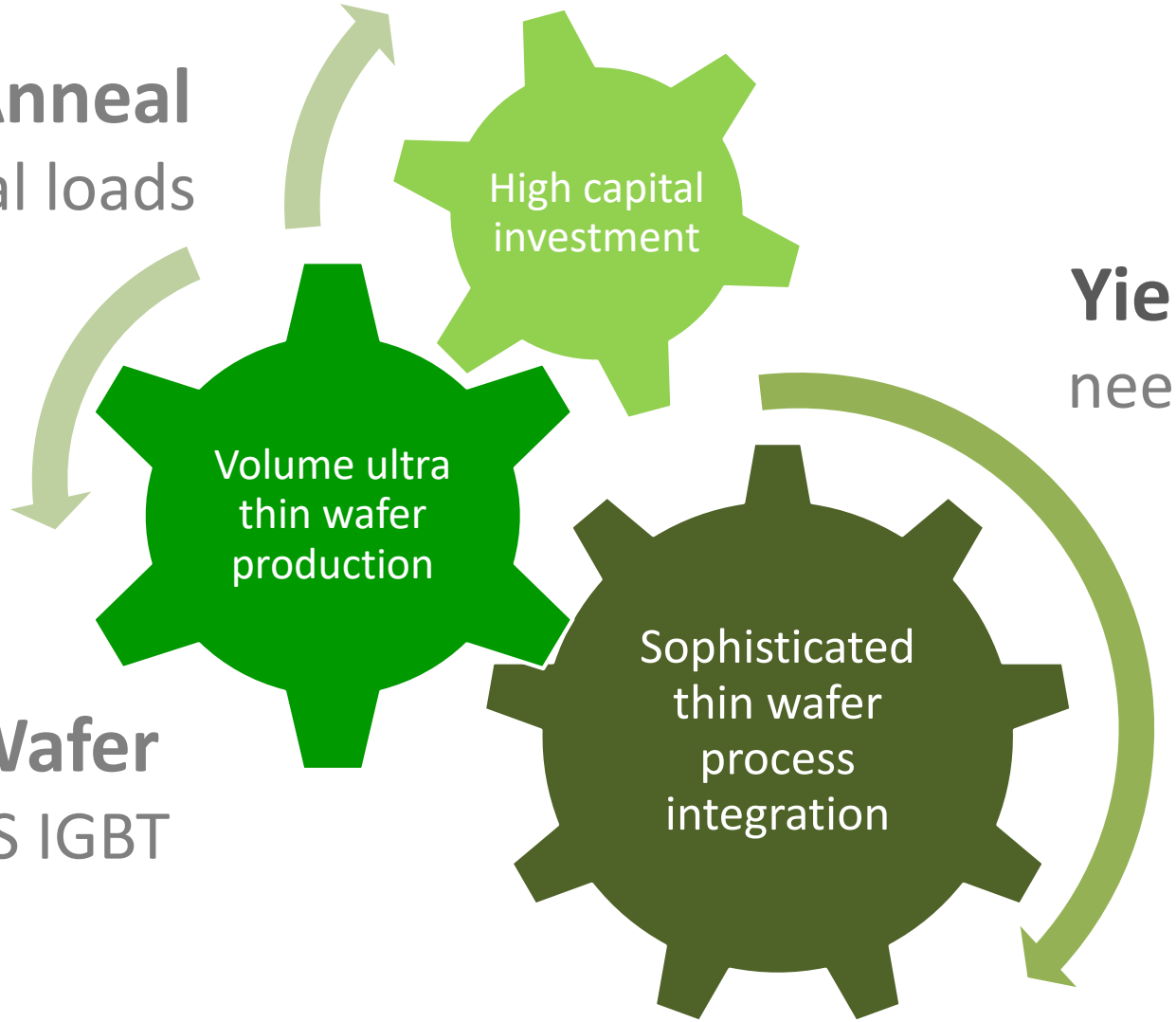


- Field Stop Trench is the main stream IGBT process
- Wafer Thickness down from 250um (PT/NPT) to 50um Taiko (FS)
- 6”/8” wafer stay now but 12” wafer developing by leading IDM

Source: Yole

IGBT製程挑戰遠大於MOS

Implanter/Anneal
are high capital loads



Yield & Quality
need one level up

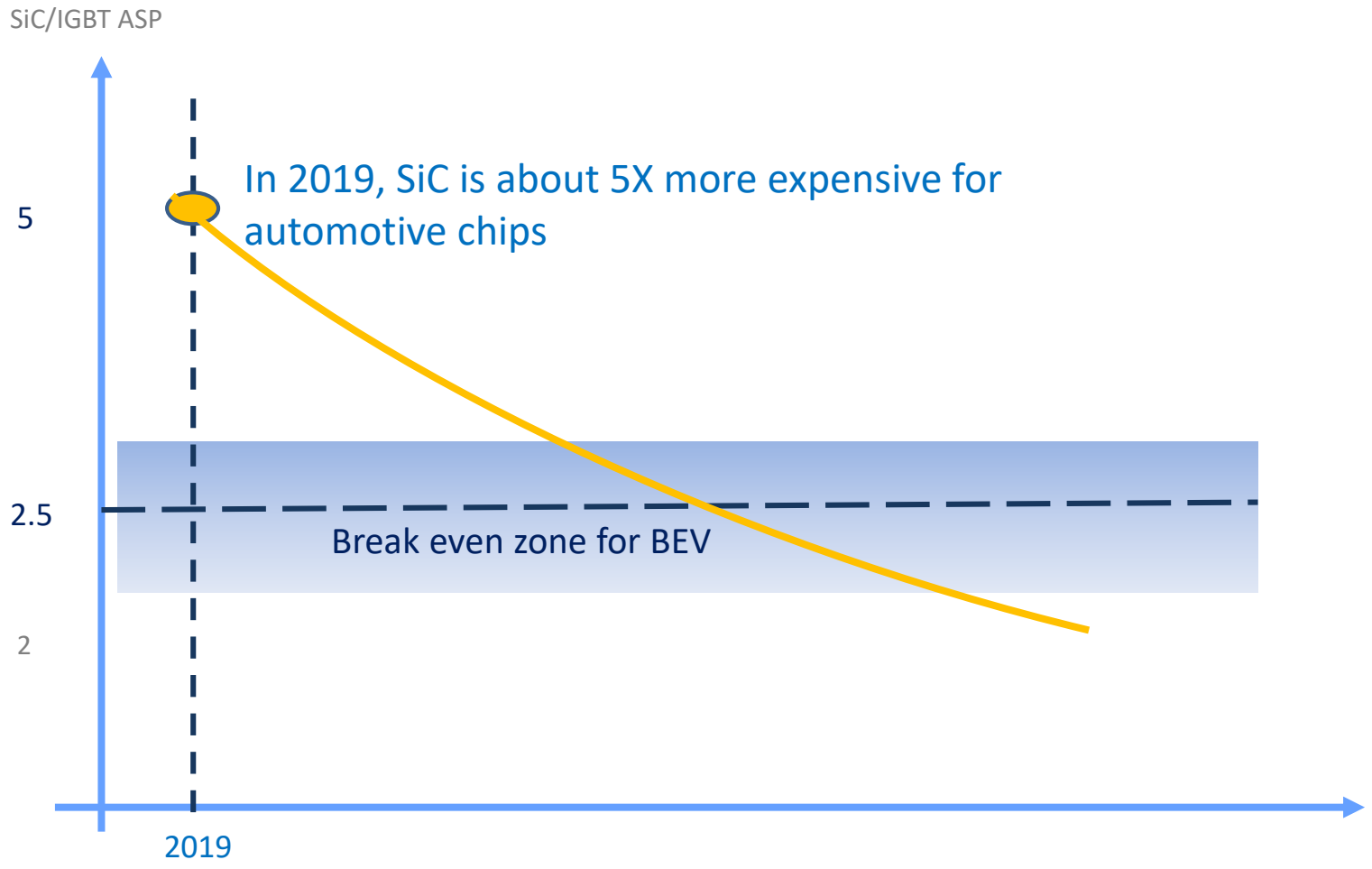
Taiko Thin Wafer
is a must for FS IGBT

台灣SiC供應鏈 – 幼兒期

Fabless	SUBSTRATE + EPI	FEOL	MEOL	BEOL
A	WAFER WORKS	B	PSI	
	GlobalWafers			

?

昇陽研發: 提供降低成本的解決方案



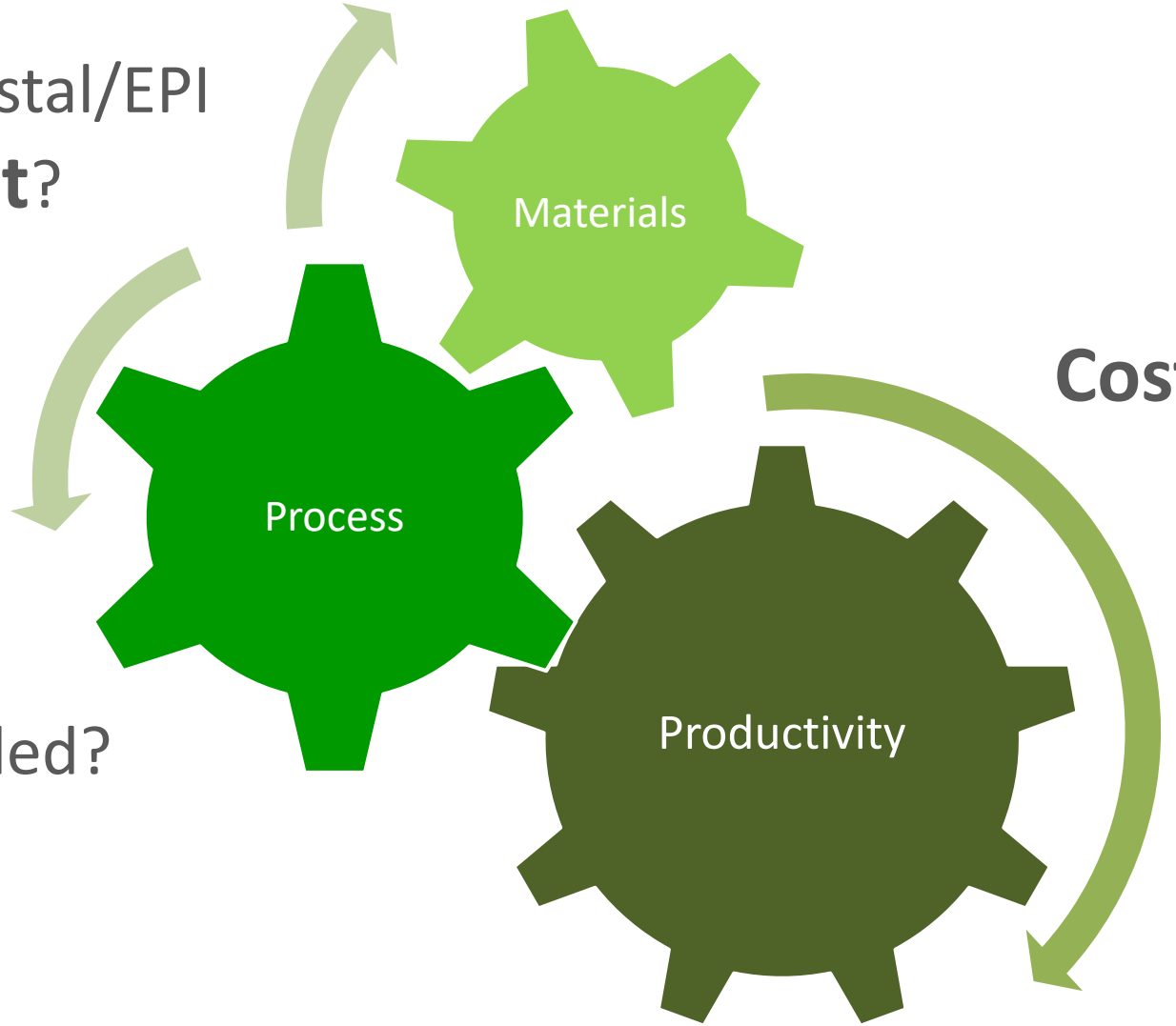
Source: YOLE

- Low SiC EPI yield rate due to SiC crystal wafer
- Major demand comes from EV for lower pack size and high power efficiency
- 4”/6” wafer stay now but 8” wafer developing by leading IDM

SiC 的現在與未來

Low SiC Crystal/EPI

Defect?

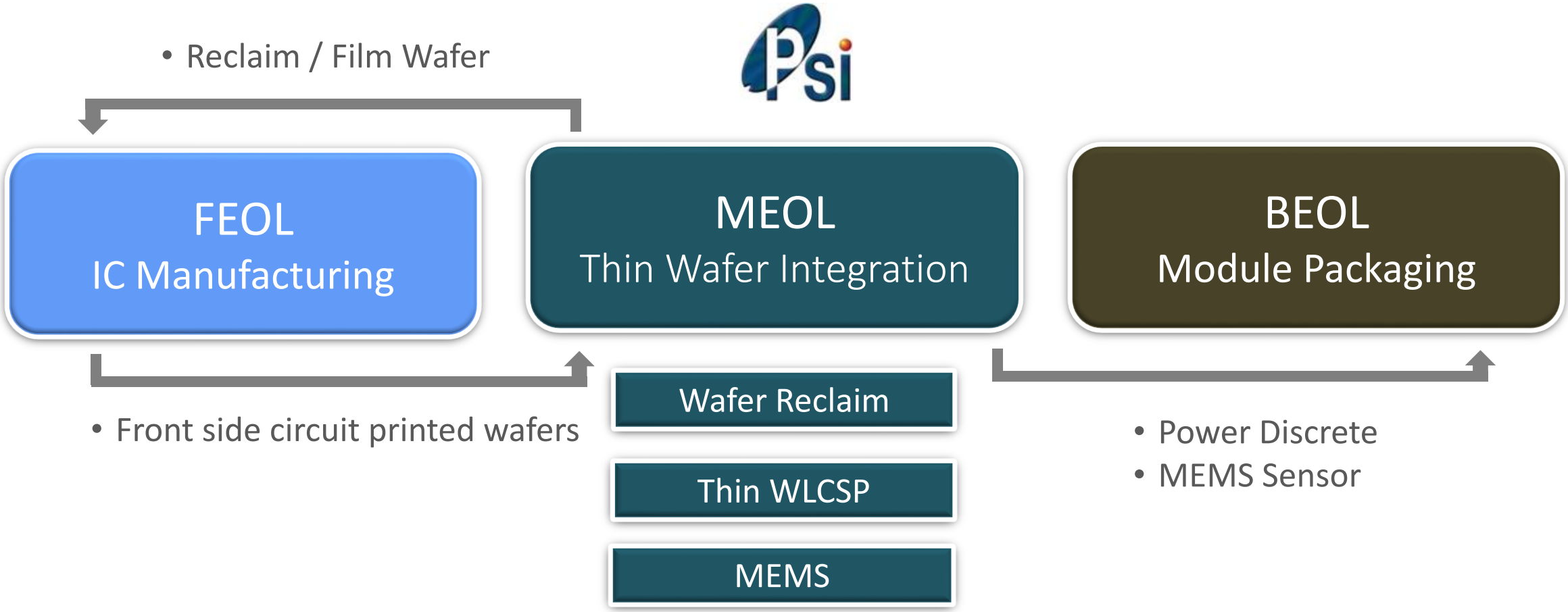


Cost cross over?

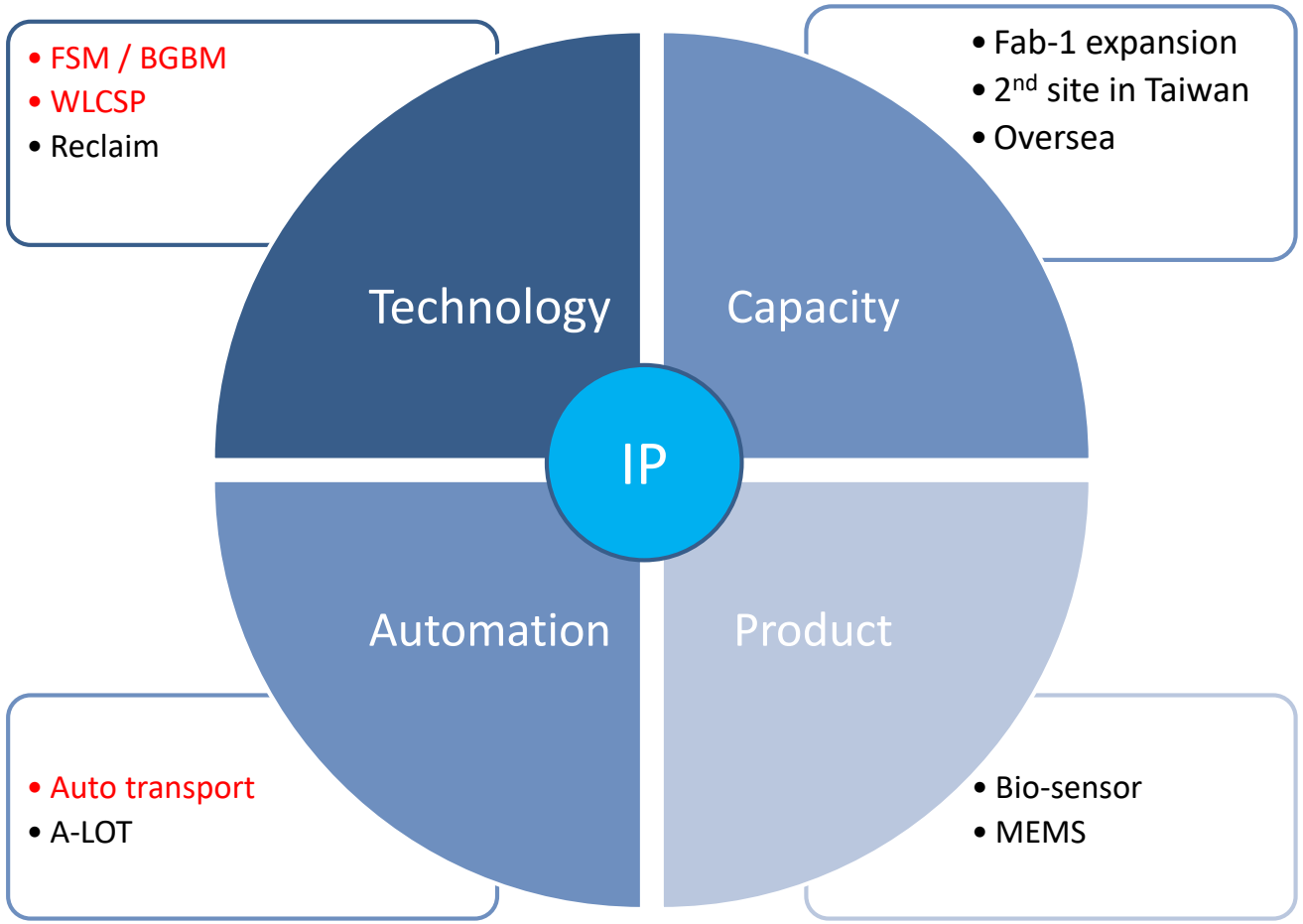
BGBM needed?

昇陽的定位及展望

昇陽定位: 整合薄晶圓工藝

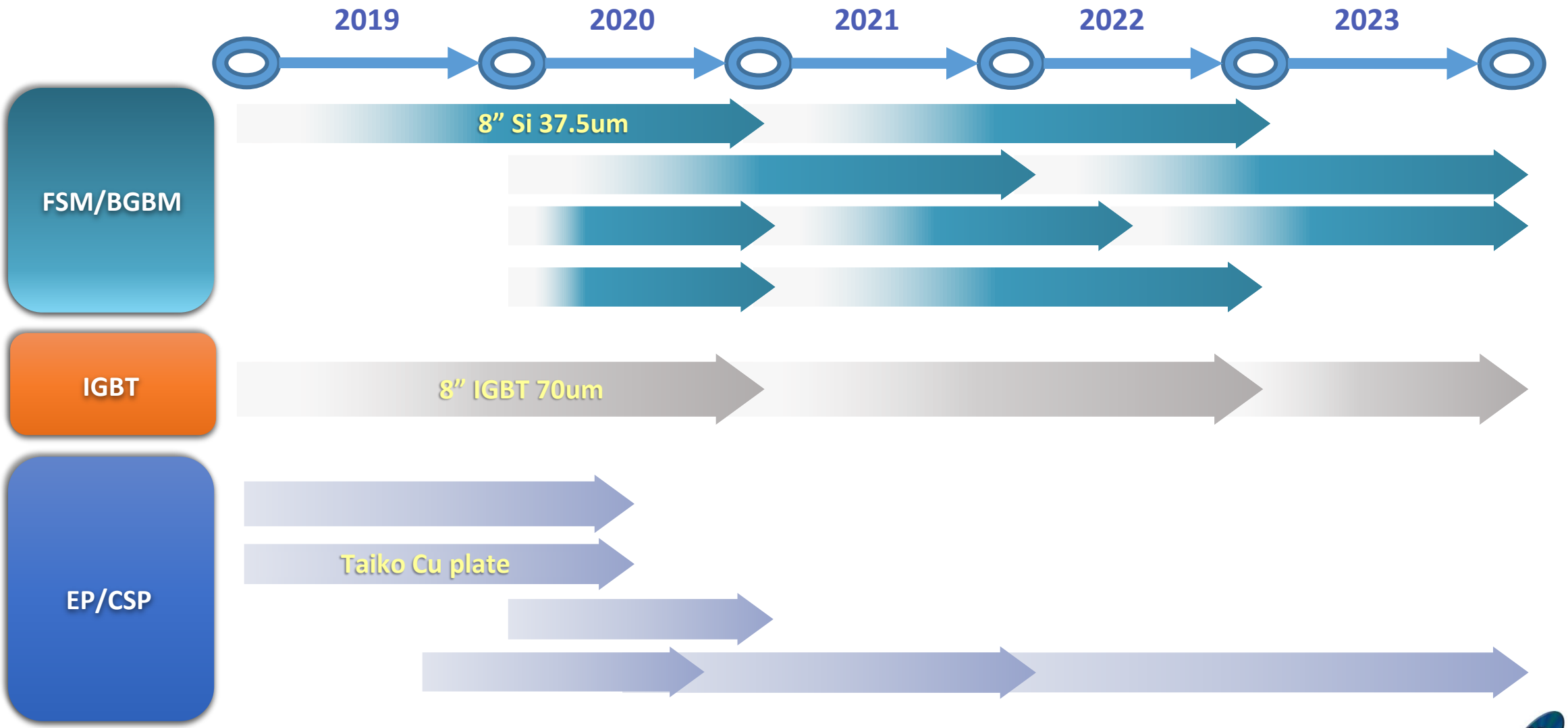


昇陽發展藍圖 – 智財權佈局



"We Design Roadmap to Meet Customer's Need"

技術展望


2019
2020
2021
2022
2023
FSM/BGBM
8” Si 37.5um
IGBT
8” IGBT 70um
EP/CSP
Taiko Cu plate

自動化佈局

Film technology

Etching technology

Metrology technology

Packing technology

2019-1H

2019-2H

2020-2H

2021-2H

重點摘要

- Power semiconductor will keep growing mainly due to coming EV era
- MOSEFT foundry supply chain is getting mature with more IDM outsourcing
- IGBT foundry will follow MOSEFT model once BGBM MEOL is ready
- SiC is a must but complementary technology to silicon, however cost is a barrier
- PSI as the power semi innovator for thin technology will participate with our roadmap

Thinner is Better

Q & A