



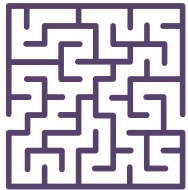
2023 PCIM  
CONFERENCE

POWER REIMAGINED

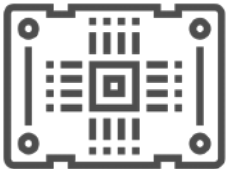
# MAREL'S APPROACH IS SIMPLE, MODULAR, MATERIALS EFFICIENT, & IMMEDIATE



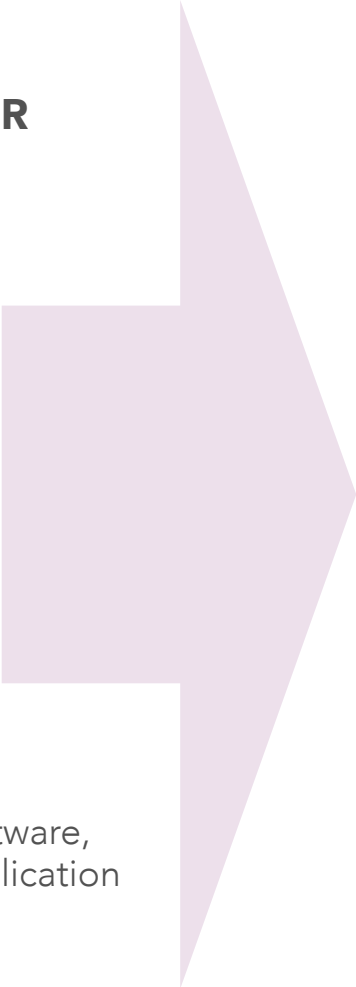
**CONVERTER**



**POWER STACK**



Application Software,  
Housing, & Application  
components.



**Security of Supply**  
Use any die  
Use any technology

**Scalable**  
10kW to 1000kW+  
400V to 800V

**Agnostic to Application**

**Fewer Power Semis**  
25% to 50% fewer

**25% TO 50% REDUCTION IN  
TIME TO MARKET,  
DEVELOPMENT COST, &  
SYSTEM COST**

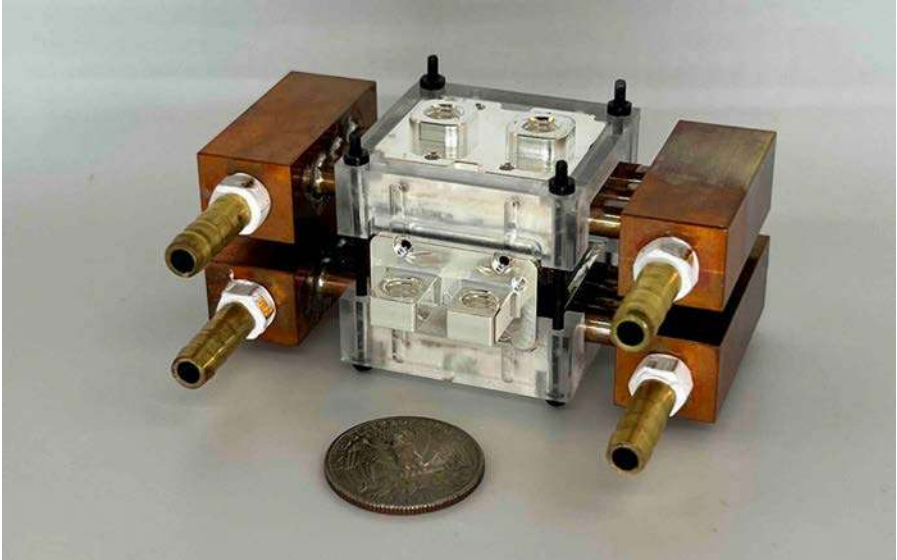
# MAREL builds EXTREMELY POWER-DENSE PACKAGES for POWER-DIE

1200V Silicon Carbide	Standard package	MAREL package
# of Power Semiconductors	1	4
Cooling	single-side	double-side
Thermal Resistance	0.27 C/W	<b>-95%</b> → <0.02 C/W
Power Dissipation @ 175C	208W	<b>5X</b> → 1280W
Continuous Current @ 175C	85A	<b>5X</b> → 420A
Path Inductance	>15nH	<b>-95%</b> → <<1nH



**BUT THIS IS ONLY MEANINGFUL IF THE PACKAGE CAN BE COOLED**

# MAREL extracts HEAT from DIE TO COOLANT in THREE DIMENSIONS



**MAREL POWER STACK UNIT**  
(4 cooled MAREL Packages)

	TODAY'S LEAD TECHNOLOGY		MAREL POWER STACK UNIT
$R_{TH-JC}$ (K/W)	0.1	<b>-50%</b>	0.048
Total Dissipation (W)	2500		5120
Dissipation per Die Area (W/cm <sup>2</sup> )	625	<b>+105%</b>	1280
Amps per Die (A)	70		105
Amps per Switch (A)	550	<b>+50%</b>	850

65C coolant, 175C die temp, 16 die units

**DOUBLE THE HEAT EXTRACTION VS STATE-OF-ART**

**POWER STACK UNITS** can be **COMBINED** into **EXTREMELY DENSE CONVERTERS**



# INTERDISCIPLINARY & EXPERIENCED LEADERSHIP TEAM



**AMRIT VIVEKANAND**  
CEO

General Mgmt. & Broad Automotive  
U of Madras, Duke U & Harvard BS



**MIKE MARCZI**  
PRESIDENT & FOUNDER

Material Science  
Rutgers U



**IAN BYERS**  
CTO

Semiconductor to Systems Design  
Purdue U & Wayne State U



**GARY MILLER**  
COO & PRODUCT DEVELOPMENT

Product Development  
U of Michigan



**ANTONELLA GRIMALDI**  
MANUFACTURING

Process & Quality  
Wayne State U & U of Michigan



**DR STUART WOOTERS**  
PRODUCT ENGG

Semiconductor Design  
Brigham Young U & U of Virginia



**MARTIN BAKER**  
SALES

Product Dev & Biz Dev  
Imperial College & London BS



**MIKE GRIMES**  
BUSINESS STRATEGY & PROD PLANNING

Automotive Systems Development  
GMI/Kettering U & Stanford U



**JEAN PIERRE FOURNIER**  
INDUSTRIAL & RENEWABLES SALES

Startup & Manufacturing  
Université Laval, Quebec



**SRINI MALIPETTI**  
SUPPLY CHAIN

Purchasing & Supply Chain  
U of New Orleans



