7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

We grow PROUD for ~~you.~~ all of us.

SWISS LAB-GROWN DIAMOND

A DEEPTECH AND PURPOSE-DRIVEN COMPANY

PROUD TECH

PLEASE, DO NOT PRINT ME – SAVE THE PLANET

URE
EAL
UTSTANDING
NIQUE
IAMOND

PROUD

TECHNOLOGY

L.COLINA@PROUD-TECHNOLOGY.CH
JB.DECORZENT@PROUD-TECHNOLOGY.CH

JUNE 2022

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

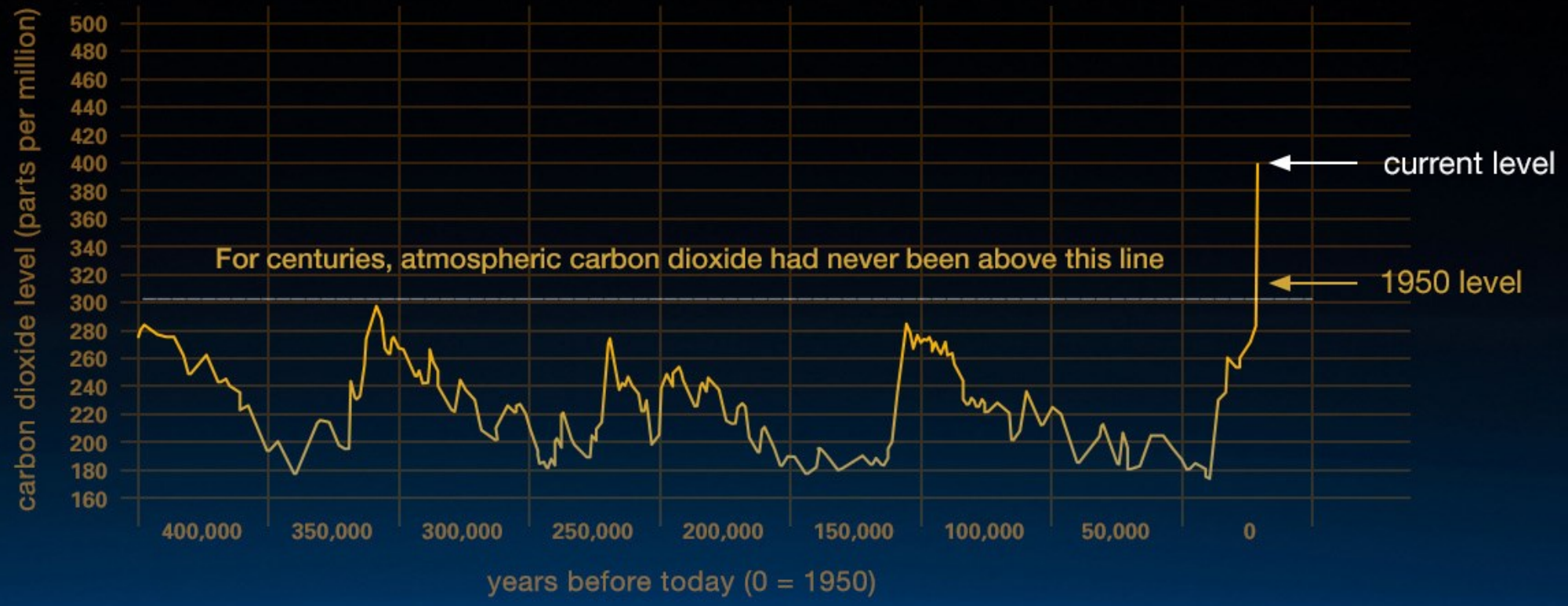
15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

No Comment

GLOBAL CHALLENGE:
Sustainable Development and Climate Change



CLIMATE.NASA.GOV

The Mir mine in Eastern Siberia, Russia. Diamond mining involves the removal of vast amounts of earth and rock creating holes so big they can be seen from space.

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

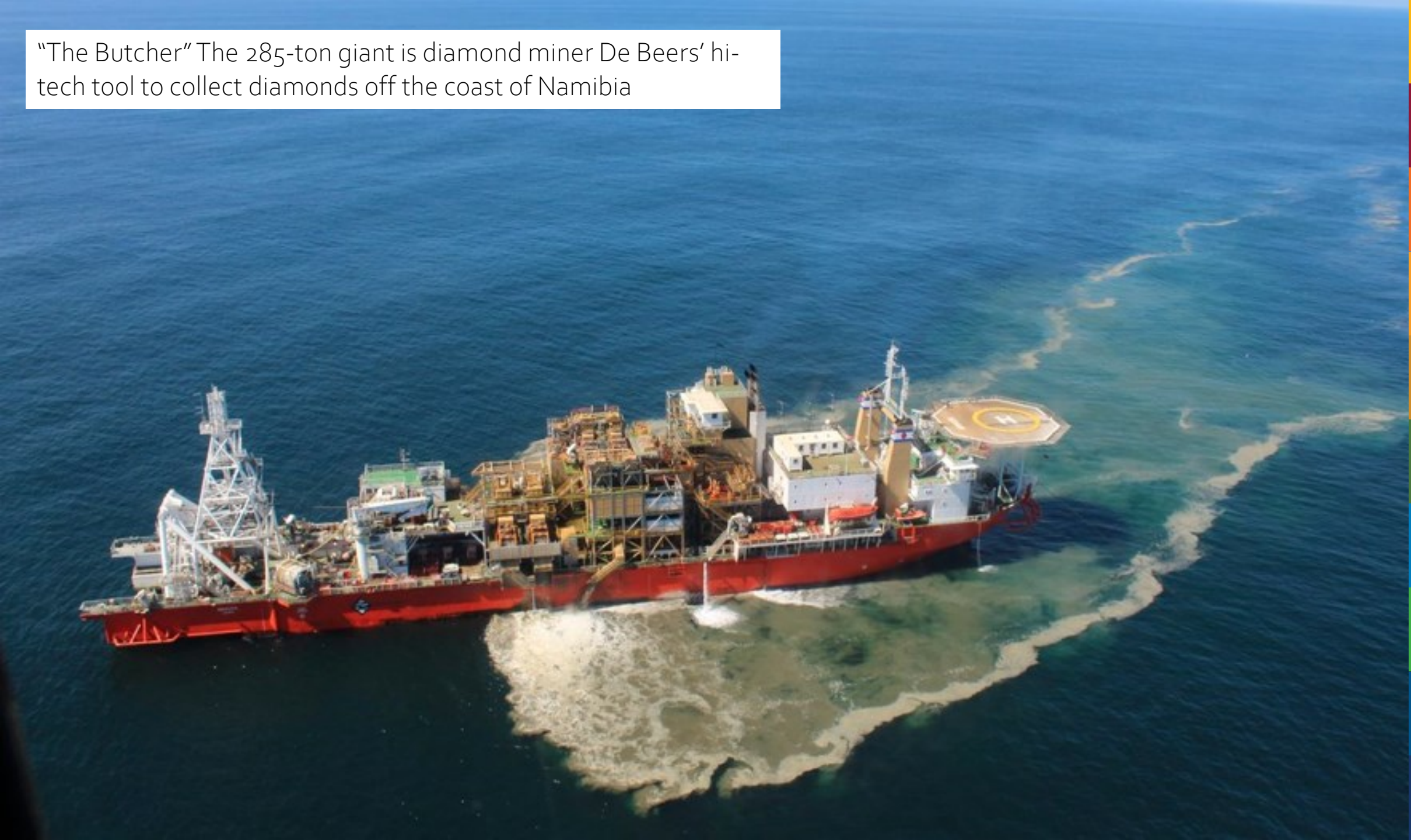
13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS



"The Butcher" The 285-ton giant is diamond miner De Beers' hi-tech tool to collect diamonds off the coast of Namibia

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

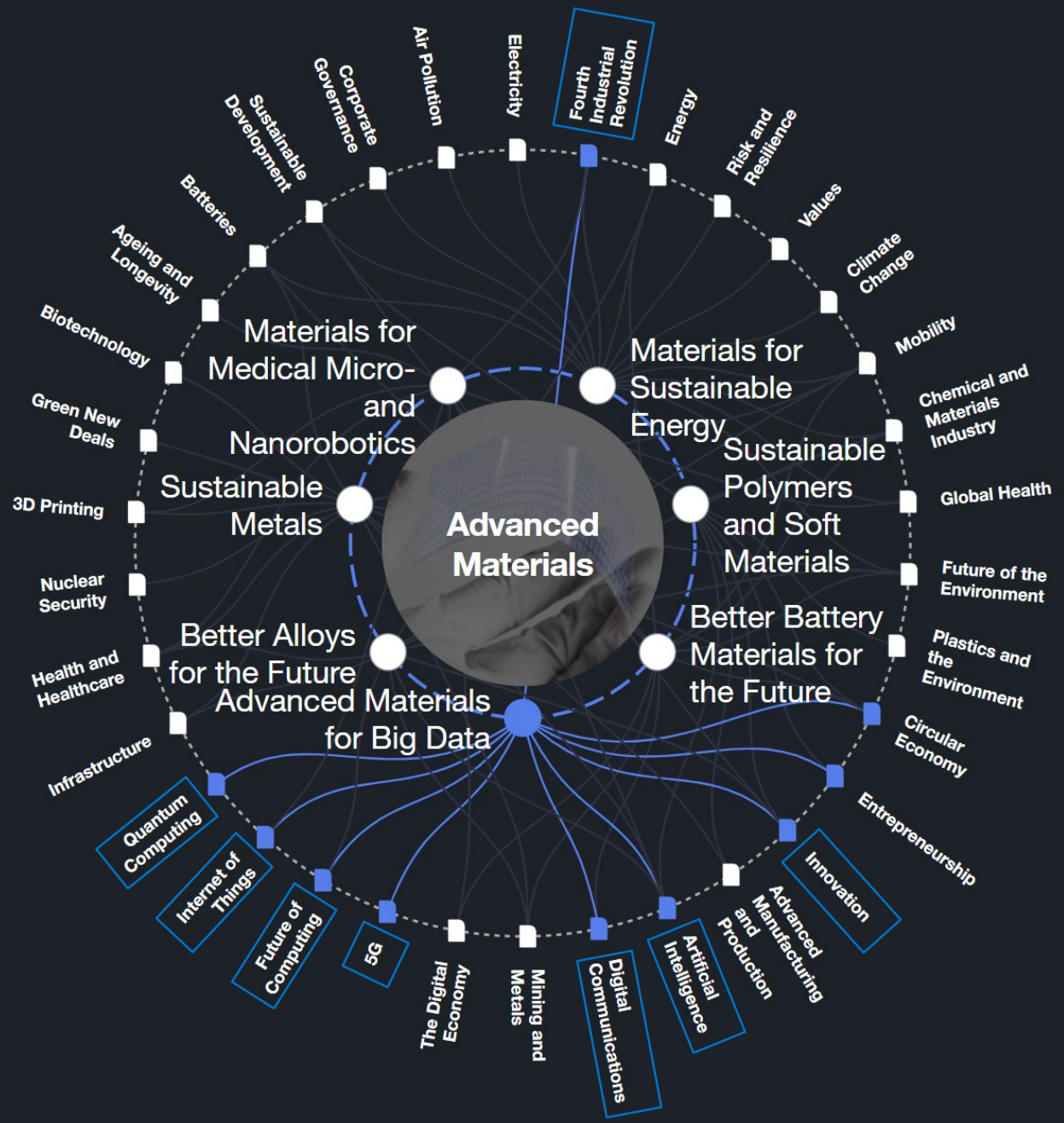
13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS



PROUD TECH

GLOBAL CHALLENGE AND OPPORTUNITY

RAPID INNOVATION AND LOWERING COSTS HAVE **DRAMATICALLY INCREASED** ACCESS TO ELECTRONIC PRODUCTS AND DIGITAL TECHNOLOGY, WITH MANY BENEFITS. THIS HAS LED TO AN INCREASE IN THE USE OF DIGITAL SERVICES, ELECTRONIC DEVICES AND EQUIPMENT. THE **UNINTENDED CONSEQUENCE** OF THIS IS A **BALLOONING** OF ELECTRONIC AND ELECTRICAL E-WASTE, **ENERGY CONSUMPTION**, NATURAL RESOURCES AND **CO_2 EMISSION**.

WORLD ECONOMIC FORUM

INDUSTRY & TECHNOLOGY CHALLENGE – PROBLEM

ADVANCED MATERIALS

LUXURY

FOR 1 CARAT EXTRACTED*

- 1000+ TONS OF EARTH REMOVED
- 3000+ LITERS OF WATER USED
- 500+ KG OF AIR POLLUTION RELEASED
- 100+ KG OF CARBON DIOXIDE EMITTED

SUPPLY OF HIGH-GRADE DIAMOND IS A CHALLENGE.

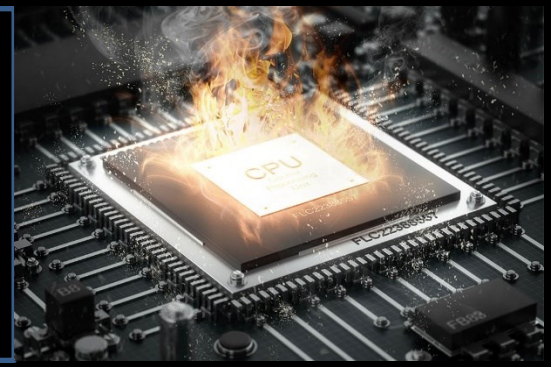
NATURAL DIAMOND EXTRACTION HAS STRONG **NEGATIVE IMPACTS** ON **THE** ENVIRONMENT, HEALTH, WATER USAGE, SOCIAL JUSTICE AND AIR QUALITY.

* Environmental Impacts of Mined Diamonds, Dr. Gbemi Oluleye, 2021

HIGH-TECH

IMPACT OF TEMPERATURE ON SEMICONDUCTORS

- REDUCE DEVICE LIFETIME
- LIMIT THE DEVICE PERFORMANCE
- INCREASE THE POWER CONSUMPTION



CURRENT METHODS FOR THERMAL MANAGEMENT
NO LONGER EFFECTIVE TO ADDRESS NEW GENERATION OF SEMICONDUCTORS

"ICT'S SHARE OF GLOBAL GREENHOUSE GAS EMISSIONS ACTUALLY LIES BETWEEN 2.1-3.9 %. ICT GHG EMISSIONS COULD BE AS HIGH AS 8 % BY 2025»

MP CVD LAB-GROWN DIAMOND

Microwave Plasma Chemical Vapor Deposition

Advantages of MP CVD diamond

- The highest known thermal conductivity
- The highest known resistance to thermal shock
- The broadest optical transmission spectrum
- A wide electronic band gap
- A very low coefficient of friction
- Excellent electric insulator properties
- Excellent p-type (IIb type) semiconductor properties
- Chemically and biologically inert (resistance to any acid and base)

Parameter	Si	SiC	GaN	 Diamond
Thermal conductivity [W/m.K]	130	460	140	2000
Bandgap [eV]	1.12	3.26	3.45	5.45
Critical electric field (E_C) [MV/cm]	0.3	2.2	3.7	10
Mobility [cm^2/Vs]	1450	700	1200	2000
Baliga figure of merit (relative to Si)	1	500	1300	23000

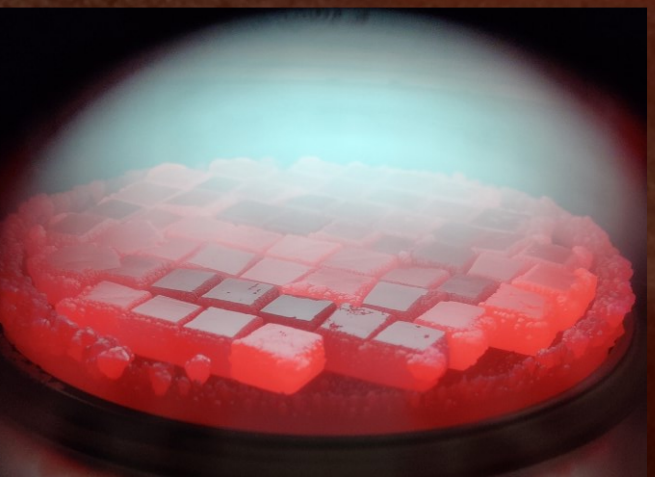
WHY

Diamond is famously a very hard material, but it also has the highest chemical stability, as well as unique conductivity and thermal shock resistance.

CVD diamond offers outstanding physical properties	to a broad range of high-tech applications
Transparency	Optics
Biocompatible	Medical devices
Tailored Atomic Defects	Quantum & Sensors
Hardest Material on Earth	Micromechanics
Best Material to Dissipate Heat	Photonics & Electronics
Best Material to Sustain High Voltage	Power Electronics
Best Material to work in Harsh Environment	Space & detectors

PROUD TECHNOLOGY : CVD LAB-GROWN DIAMOND

SWISS LAB-GROWN DIAMOND



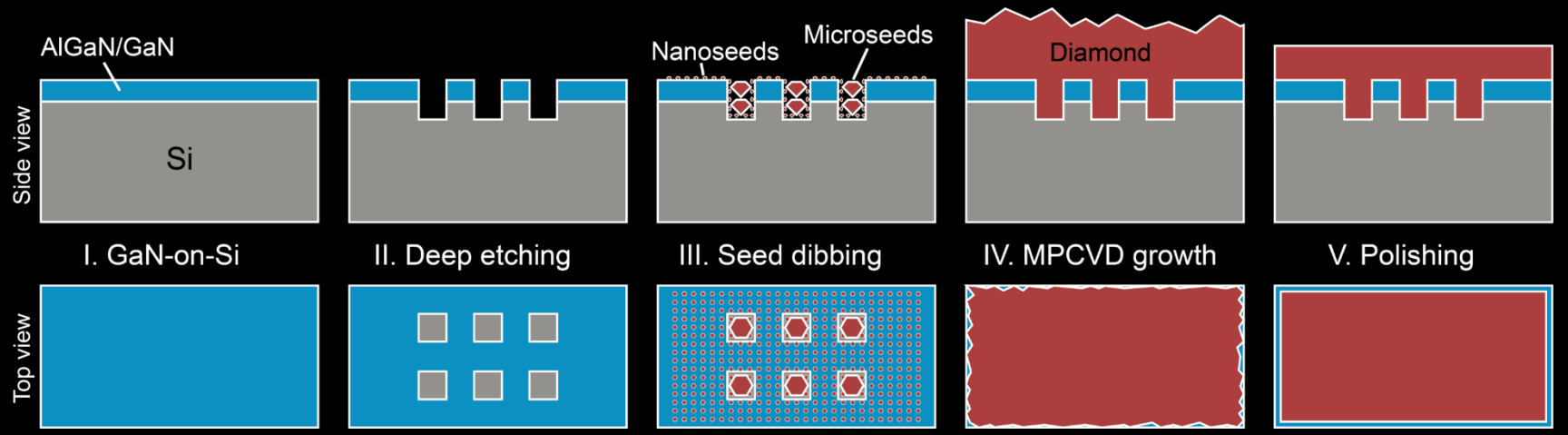
PROUD TECHNOLOGY : DEMONSTRATED TECHNOLOGY

PATENT FILLED WITH TTO

EPFL

OUR STATE-OF-ART FABRICATION METHOD

INSPIRED BY AN AGRICULTURAL METHOD



SEED DIBBLING DIAMOND GROWTH

- RELIABLE METHOD TO GROW HIGH QUALITY DIAMOND ON GAN
- COMPLETELY SOLVED THE ISSUE OF DELAMINATION
- ENABLED THE POLISHING OF DIAMOND
- OPENS PATHS FOR THE DEVELOPMENT OF FUTURE DEVICES

DIAMOND TRANSISTORS ON GAN

- EXCELLENT PERFORMANCES WITH A SIMPLE STRUCTURE AND FABRICATION PROCESS
- HIGH POTENTIALS FOR INTEGRATED CIRCUITS WITH GAN (CMOS, LOGICS, GATE DRIVER, POWER SWITCHES)

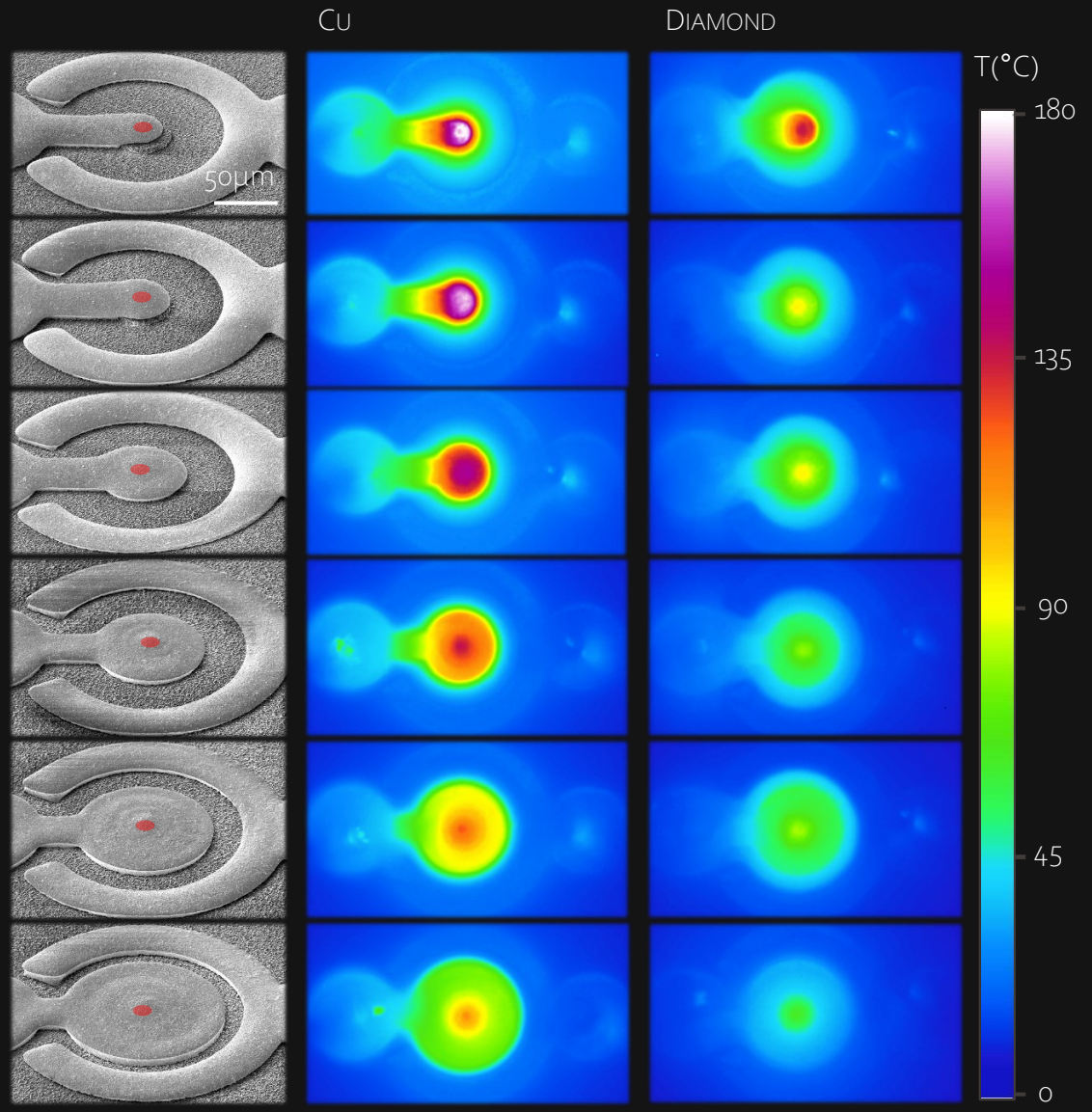
DIAMOND NEAR JUNCTION HEAT SPREADERS

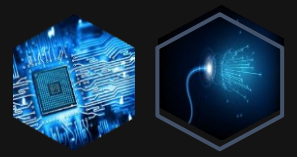
- HIGHLY EFFICIENT IN REDUCING THE THERMAL RESISTANCES (2.5X) AND THERMAL GRADIENTS
- THE THERMAL PERFORMANCE OF GAN-ON-SI WAS UPGRADED TO SIMILAR PERFORMANCES OF GAN-ON-DIAMOND SUBSTRATES

PROUD TECH

PROUD TECHNOLOGY : DEMONSTRATED TECHNOLOGY

STEADY-STATE TEMPERATURE WITH HEAT SPREADERS





OUR STATE-OF-ART FABRICATION METHOD

DIAMOND HEAT SPREADERS ARE VERY EFFICIENT:

- 3 µM DIAMOND ON AFFORDABLE GAN-ON-SI SUBSTRATES
- 50°C OF TEMPERATURE REDUCTION !
- ELECTRONIC LIFETIME MULTIPLY BY 5 !
- THERMAL DISSIPATION CAPACITY MULTIPLY BY 7 (VS SI OR GAN) !

CVD DIAMOND GROWTH ON GAN-ON-SI

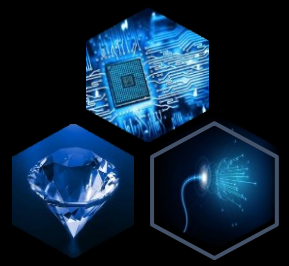
PATENT FILLED WITH TTO

EPFL

Next generation of semi-conductor wafer

Tri wafer Diamond on GaN on Si with enhanced physical properties than traditional electronic wafers at an affordable price

PROUD
TECHNOLOGY



- High Quality Swiss Lab-Grown Diamond
- Cost Effective & Value for Money
- Reliable Supply Chain
- Ethical & Sustainable

PROUD
TECH

PROUD TECHNOLOGY : ADVANCED MATERIALS

PRODUCTS Π SOLUTIONS Π SERVICES

SWISS LAB-GROWN DIAMOND

LUXURY

- AS-GROWN OR PRE-SHAPED
- CUT & POLISHED
- FANCY COLOR
- MICRO-MECHANICS

- CERTIFIED BY GIA, IGI, HRD, GGTL
- 100 % SWISS MADE
- 100 % ETHICAL AND SUSTAINABLE
- 100 % TRACEABLE

HIGH-TECH

SEMICONDUCTOR

- TRI-WAFER Diamond on GaN on Si (EPFL IP)
- BI-WAFER Diamond on GaN (EPFL IP)

HIGH VOLTAGE

- DIAMOND-BASED TRANSISTORS

HIGH FREQUENCIES

- DIAMOND-BASED POWER AMPLIFIER

HIGH ENERGY LASER

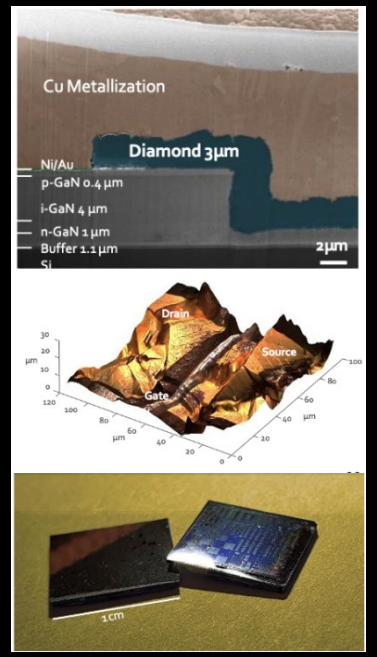
SENSOR

- AGGRESSIVE ENVIRONMENT (SPACE, RADIATION, CHEMICALS)
- VERY LOW MAGNETIC FIELD DETECTION (MEDICAL, MATERIAL CHARACTERIZATION)

LAB ACHIEVEMENTS

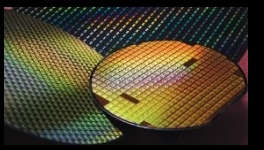
HIGH QUALITY DIAMOND ON SEMICONDUCTOR SUBSTRATE

- HIGH-QUALITY LAB-GROWN DIAMOND ON GAN
- PATENTED TECHNOLOGY

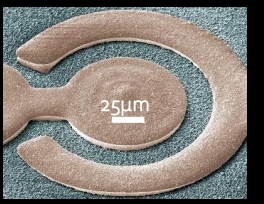


LAB ONGOING PROJECTS

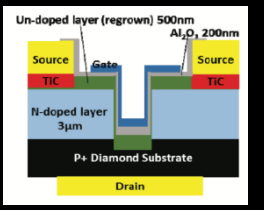
HIGH QUALITY DIAMOND ON ≠ SEMICONDUCTOR SUBSTRATE



DIAMOND-BASED PIN DIODE HETEROSTRUCTURE

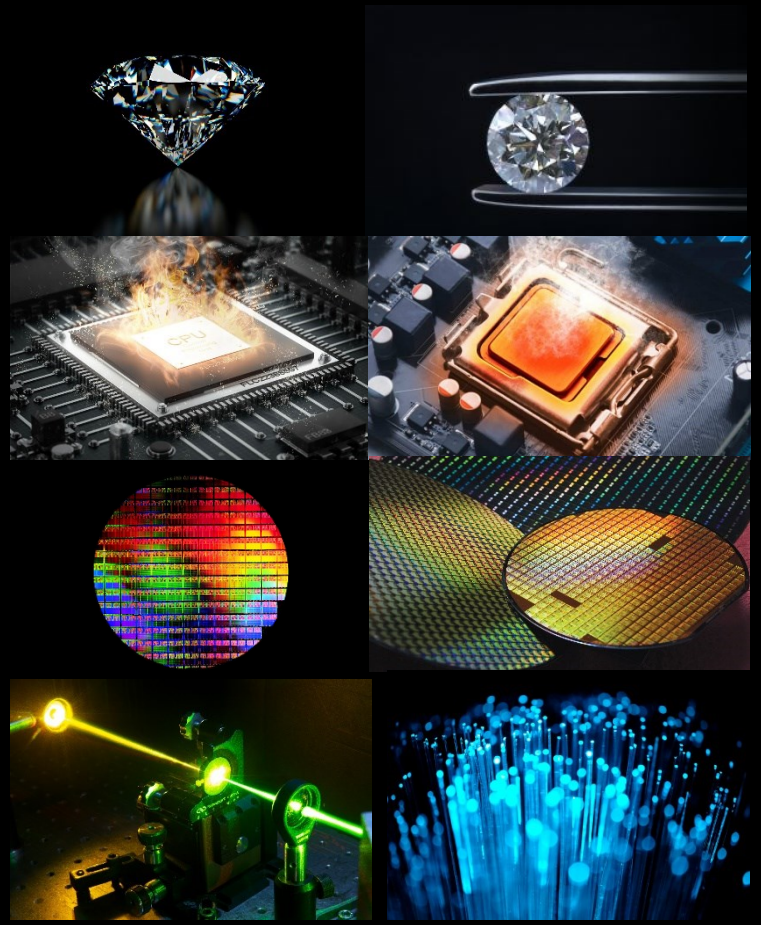


HIGH VOLTAGE P-CHANNEL MOSFET



Novelty + Scalability + Impact

PROUD technology



NOVEL TECHNOLOGY & APPROACH : Ongoing patent filing with the EPFL TTO. No past records of successful direct diamond growth on GaN-on-Si chip. Complete new approach of producing a semiconductors Diamond on GaN BI/TRI-wafers

SCALABLE TECHNICAL SOLUTION : Manufacturing system and process capable to adapt easily to increased workload or market demands. It's able to benefit from economies of scale and quickly ramp up production.

TARGETED IMPACT : Reduce environment impacts. Remove today's heat management limitations to unlock power electronics potential

PROUD TECHNOLOGY : CVD LAB-GROWN DIAMOND

SWISS LAB-GROWN DIAMOND

PROUD TECH

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

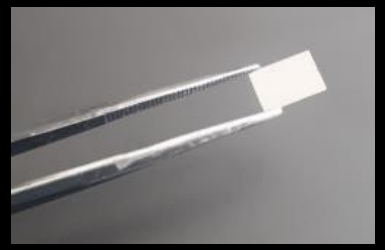
14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

100 % REUSABLE DIAMOND SUBSTRATE



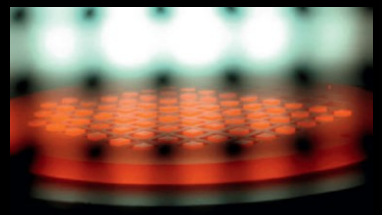
DIAMOND SUBSTRATE AS A SEED MATERIAL

GASES ARE INTRODUCED IN THE DEPOSITION CHAMBER

PLASMA IS FORMED

DIAMOND GROWTH STARTS

MP CVD REACTOR



CUT & POLISH

CARBON DIOXIDE EMITTED COMPENSATED

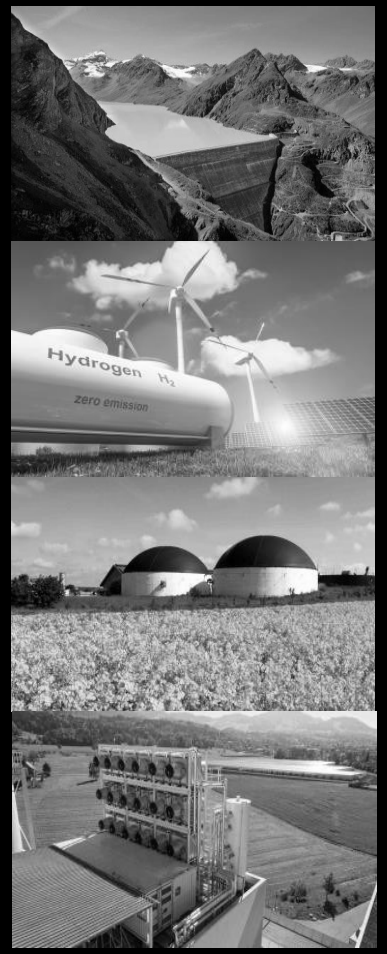
CLOSED LOOP WATER-CIRCUIT

100 % GREEN ENERGY SWISS HYDRAULIC POWER

GREEN HYDROGEN PRODUCTION WITH RENEWABLES ENERGIES

BIO-METHAN FROM ORGANIC MATERIALS

CO_2 FROM THE AIR SWISS-MADE SOLUTION



7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

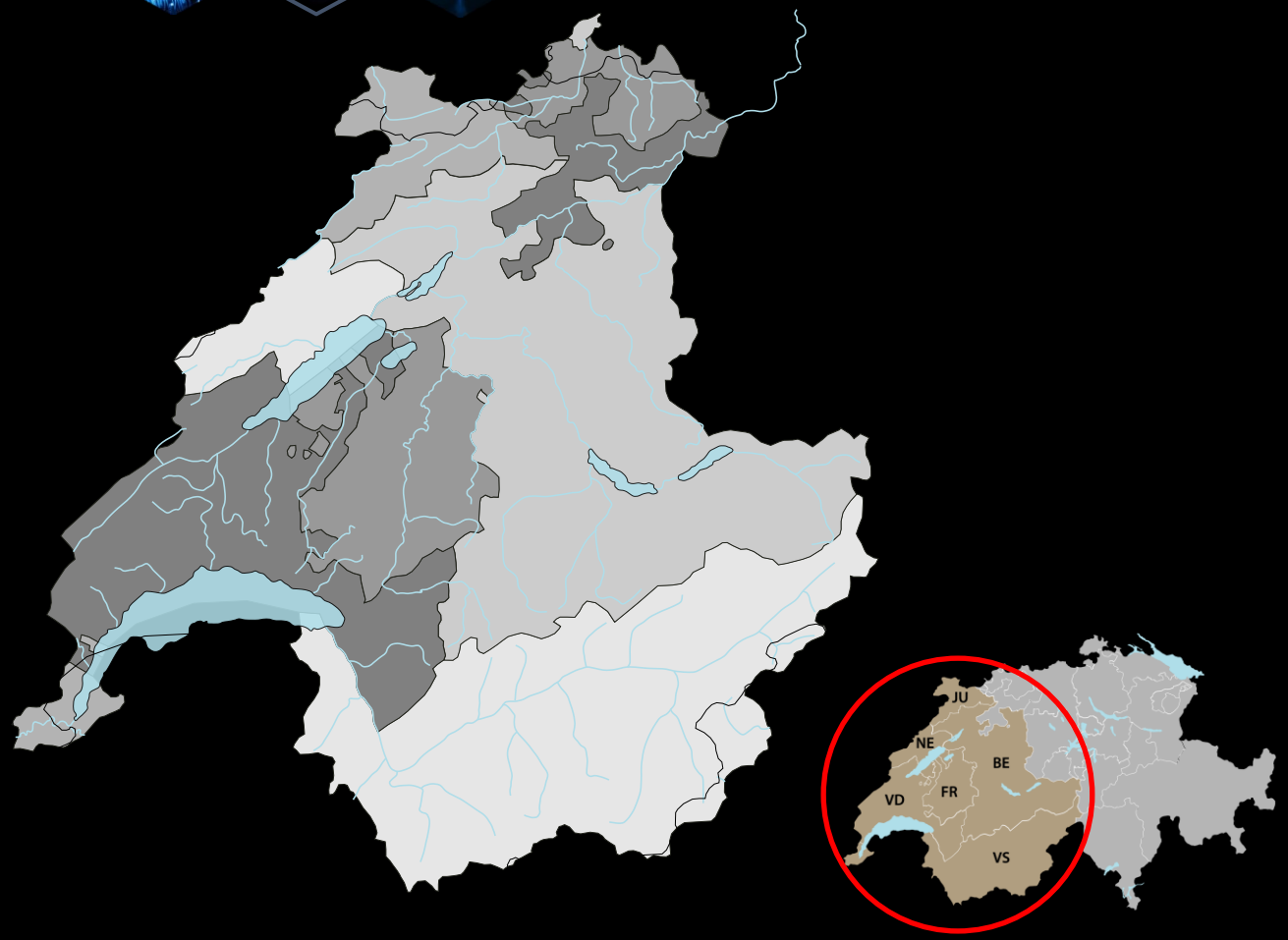
16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

PROUD TECHNOLOGY : CVD LAB-GROWN DIAMOND

SWISS LAB-GROWN DIAMOND

PROUD TECH



PRODUCTION SITE (SUISSE ROMANDE)

- EQUIPMENT (REACTORS FOR GROWTH & POST-TREATMENTS)
- 20 MIN FROM EPFL AND 40 MIN FROM GENEVA
- ACCESS TO SWISS RENEWABLES ENERGIES
- SECURED AREA

TRANSFORMATION SITE (GENEVA, FREE PORTS)

- EQUIPMENT (POLISHING MACHINES, LASER SYSTEMS & CHEMICALS)
- DIRECT ACCESS TO PARTNERS & CUSTOMERS
- EASY ACCESS TO DIAMOND SETTER
- ACCESS TO LAB PARTNERS (GGTL)
- SECURED AREA

STRATEGIC PARTNERS (SWITZERLAND, FRANCE, GERMANY)

OUR ECOSYSTEM

Certified B Corporation

RSE

cnrs

CERN

EPFL

FIT fondation pour l'innovation technologique

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

WE GROW PROUD FOR ~~YOU~~ ALL OF US

SWISS LAB-GROWN DIAMOND

A DEEPTECH AND PURPOSE-DRIVEN COMPANY

PROUD TECH

PLEASE, DO NOT PRINT ME – SAVE THE PLANET

THANK YOU

URE
EAL
UTSTANDING
NIQUE
IAMOND

PROUD

TECHNOLOGY

L.COLINA@PROUD-TECHNOLOGY.CH
JB.DECORZENT@PROUD-TECHNOLOGY.CH

MARKETS & TRENDS : OVERVIEW

LUXURY

GLOBAL JEWELRY MARKET (2020)

$ 330 Bn

GLOBAL DIAMOND JEWELRY MARKET (2020)

$ 80 Bn
CAGR +3.0%

GLOBAL LAB-GROWN DIAMOND MARKET BY 2030

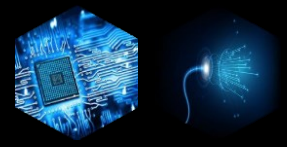
$ 49.9 Bn

GLOBAL LAB-GROWN DIAMOND MARKET (2020)

$ 19,3 Bn
CAGR 9.4%

https://www.alliedmarketresearch.com/lab-grown-diamonds-market-A13694

HIGH-TECH



GLOBAL GaN SEMICONDUCTOR DEVICES MARKET (2030)

$ 72.8 Bn

GLOBAL GaN SEMICONDUCTOR DEVICES MARKET (2021)

$ 12.08 Bn
CAGR +22,1%

GLOBAL GaN ON DIAMOND SEMICONDUCTOR SUBSTRATES MARKET (2028)

$ 179.3 Mn

DIAMOND ON GaN ON Si SEMICONDUCTOR SUBSTRATES MARKET (START 2023)

https://southeast.newschannelnebraska.com/story/46218631/gan-on-diamond-semiconductor-substrates-market-worth-usd-1793-million-globally-by-2028-at-197-cagr-and-classification-application-industry-chain

https://www.psmarketresearch.com/market-analysis/gallium-nitride-gan-semiconductor-devices-market

MARKET LANDSCAPE

TARGETED HIGH-TECH COMPANIES

POWER ELECRTONICS

ABB
SUMITO ELECTRIC
EATON
INFINEON
L3HARRIS
NXO
RENESAS
TOSHIBA
FUJI ELECTRIC
FE
MICROSEMI CORPORATION
STMICROELECTRONICS
ROCKWELL AUTOMATION
TEXAS INSTRUMENTS
PRYSMIAN GROUP
MITSUBISHI ELECTRIC

QUANTUM COMPUTING

QUANTUM BRILLIANCE
PSI QUANTUM
XANADU
Q-CTRL
RIGETTI
DWAVE
SEEQC

SEMICONDUCTOR MANUFACTURER FOUNDRY

WIN SEMICONDUCTORS
TSMC
SAMSUNG
POWERCHIP
HUAHONG GROUP
UMC
GLOBAL FOUNDRIES
SMIC
TOWER SEMICONDUCTOR

HARDWARE

DOVER MICROSYSTEMS
TENSTORRENT
RASPBERRY PI
MSI
CLOUNIX
ASUS
GRAQ

SEMICONDUCTOR MANUFACTURER WAFER

SILTRONIC
TMGCORE
SOITEC
NTT
IQE

FABLESS

AEONSEMI
WILIOT
USOUND
AEPONYX
SCALINX

FABS

KIOXIA
SMIC
SJSEMI
CANSEMI
ZTE
SMART PHOTONICS

SENSORS

SOREXSENSORS
SKYRORA
DISPLAY

LIDAR

LEDDAR TECH
LUNEWAVE
SOSLAB
TRIEYE

AI CHIPS

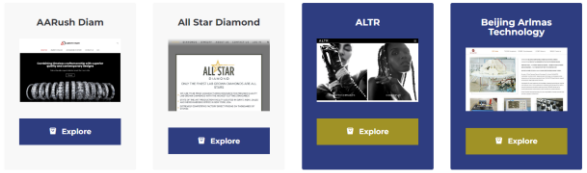
KNERON
ENFLAME
UNTETHER AI
ANOTHER BRAIN
HAILO
CEREBRAS
MYTHIC

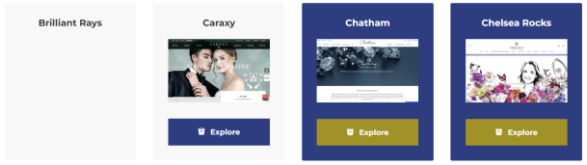
CHIP DESIGNER

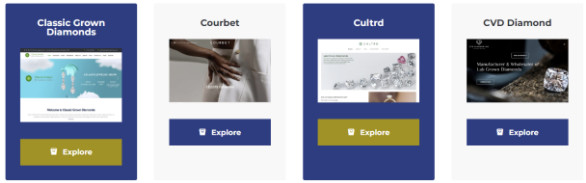
SAMSUNG
INTEL
NVIDIA
HUAWEI
AMD
THALES
IBM

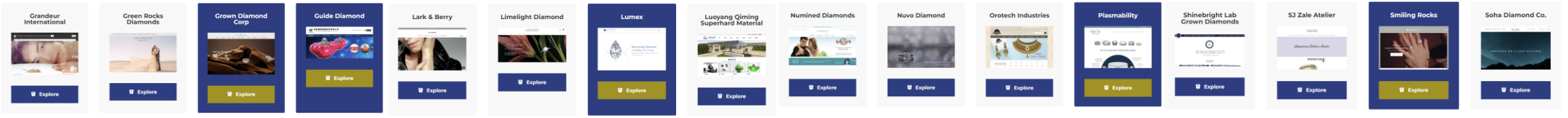
MARKET LANDSCAPE

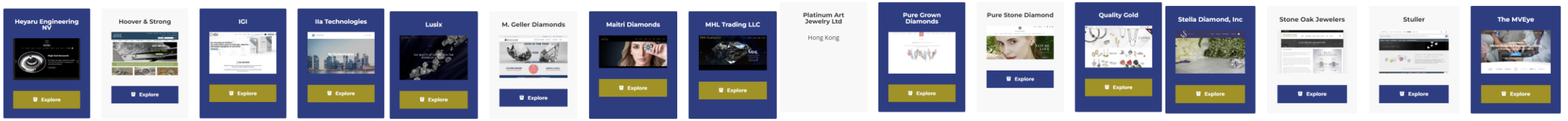
TARGETED PRESTIGIOUS LUXURY BRANDS

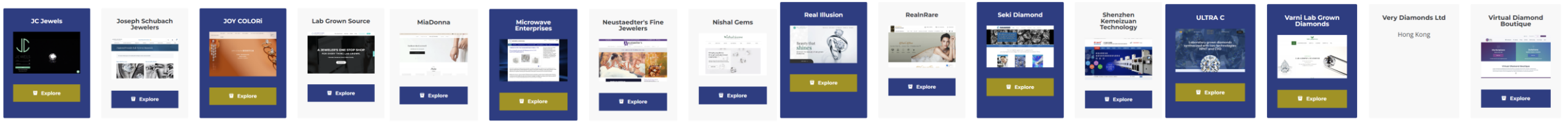












COMPETITIVE ANALYSIS

ADVANCED POWER ELECTRONICS

DIAMOND-ON-GAN

- FUJITSU LABORATORIES: FUJITSU AIMS TO COMMERCIALIZE IMPROVED-HEAT-DISSIPATION GAN HEMT AMPLIFIERS IN YEAR 2022 FOR USE IN WEATHER RADAR SYSTEMS AND NEXT-GENERATION WIRELESS COMMUNICATION SYSTEMS. THEY USE A DIFFERENT APPROACH THAN PROUD TECHNOLOGY. USING A MIX OF DIAMOND AND GRAPHITE.

GAN-ON-DIAMOND

- ELEMENT SIX (R&D)
- AKASH SYSTEMS (SPACE APPLICATIONS : POWER AMPLIFIER AND RADIO-TRANSMITTER BASED ON GAN-ON-DIAMOND SUBSTRATE). AKASH SYSTEMS AIMS TO DEVELOP A NEW GENERATION OF SMALLER, LIGHTER, MORE EFFICIENT SATELLITES AND THE COMPONENTS THAT POWER THEM TO PAVE THE WAY FOR LOWER LAUNCH COSTS, LOWER COST PER BIT, MORE LAUNCH CYCLES, IMPROVED ACCESS, AND HIGHER COMMUNICATION SPEEDS.
- QORVO (MILITARY AND TELECOM 5G, 6G 7G APPLICATIONS): QORVO IS AN AMERICAN SEMICONDUCTOR COMPANY THAT DESIGNS, MANUFACTURES, AND SUPPLIES RADIO-FREQUENCY SYSTEMS FOR APPLICATIONS THAT DRIVE WIRELESS AND BROADBAND COMMUNICATIONS, AS WELL AS FOUNDRY SERVICES. THEY WORK WITH GAN-ON-DIAMOND TECHNOLOGY FOR MILITARY APPLICATIONS (WITH LOCKHEED MARTIN, DARPA PROJECT).
- RFHIC CORPORATION : RFHIC IS A COMPANY SPECIALIZED IN GAN TECHNOLOGY FOR THE FABRICATION OF MW GENERATOR SYSTEM. RFHIC CORPORATION PURCHASED GAN ON DIAMOND IP FROM E6 – A PART OF THE DEBEER'S GROUP BACK IN 2017 AND HAS DEVELOPED THE WORLD'S FIRST COMMERCIALIZED GAN ON DIAMOND TRANSISTOR FOR DEFENSE, MILCOM, RF ENERGY, AND COMMUNICATION APPLICATIONS. THEY DO NOT PUBLICLY COMMERCIALIZE ANY GAN ON DIAMOND TRANSISTOR SO FAR. THEY ONLY OFFER GAN-ON-SIC TRANSISTOR.
- MITSUBISHI ELECTRIC CORP
- DIAMOND FOUNDRY

GRAPHENE

CARDEA

PARAGRAF

NANOTECH ENERGY

SKELETON TECHNOLOGIES

GALLIUM NITRIDE GAN

GAN SYSTEMS

VISIC TECHNOLOGIES

EXAGAN

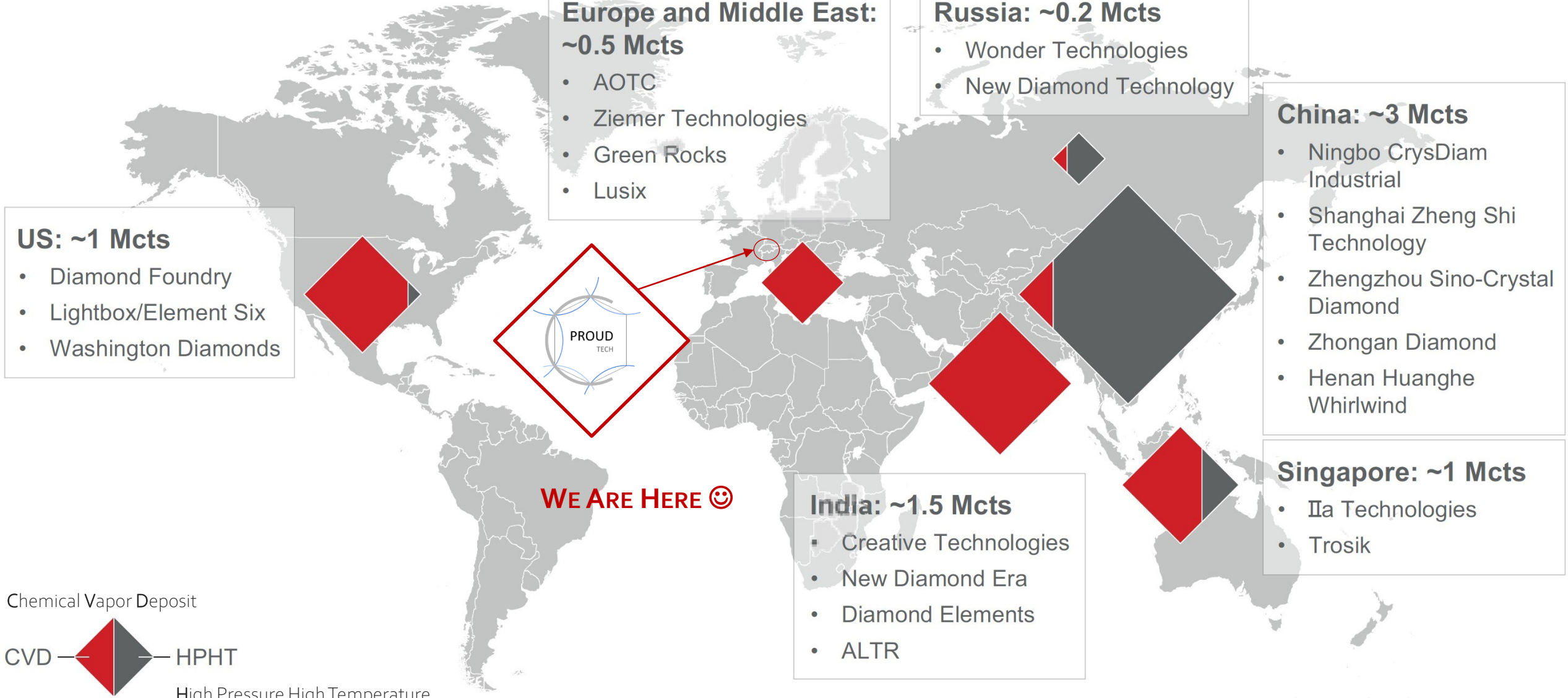
SILICON CARDIDE SIC

SGKS

GENESIC

PALLIDUS

COMPETITIVE ANALYSIS



Europe and Middle East: ~0.5 Mcts
- AOTC
- Ziemer Technologies
- Green Rocks
- Lusix

Russia: ~0.2 Mcts
- Wonder Technologies
- New Diamond Technology

US: ~1 Mcts
- Diamond Foundry
- Lightbox/Element Six
- Washington Diamonds

China: ~3 Mcts
- Ningbo CrysDiam Industrial
- Shanghai Zheng Shi Technology
- Zhengzhou Sino-Crystal Diamond
- Zhongan Diamond
- Henan Huanghe Whirlwind

WE ARE HERE ☺

India: ~1.5 Mcts
- Creative Technologies
- New Diamond Era
- Diamond Elements
- ALTR

Singapore: ~1 Mcts
- IIa Technologies
- Trosik

Chemical Vapor Deposit

CVD — HPHT

High Pressure High Temperature