From Technologies to Markets

Silicon MOSFET Market and Technology Trends 2021

Market and Technology Report 2021

YOLE Développement

Sample

GLOSSARIES

AC: Alternative Current

ADC: Analog to Digital Converter

ADAS: Advanced Driver Assistance System

ASP: Average Selling Price

BEV: Battery Electric Vehicle

BGA: Ball Grid Array

BJT: Bipolar Junction Transistor

CAGR: Compound Annual Growth Rate

CCFL: Cold Cathode Fluorescent Lamp

CTE: Coefficient of Thermal Expansion

DBC: Direct Bonded Copper (=DCB)

DC: Direct Current

EEFL: External Electrode Fluorescent Lamp

EPS: Electric Power Steering

EV: Electric Vehicle

FOM: Figure of Merit

GaN: Gallium Nitride

HEV: Hybrid Electric Vehicle

IC: Integrated Circuit

IGBT: Insulated Gate Bipolar Transistor

IGCT: Integrated Gate-Commutated Thyristor

LEV: Light Electric Vehicle

LV-HV: Low Voltage – High Voltage

MLF: Micro Lead Frame

MOSFET: Metal Oxide Semiconductor Field Effect Transistor

NPT: Non-Punch-Through

OEM: Original Equipment Manufacturer

PCU: Power Control Unit

PDA: Personal Digital Assistant

PFC: Power Factor Correction

PHEV: Plug-in Hybrid Electric Vehicle

PT: Punch-Through

PWN: Pulse Width Modulation

QFN: Quad Flat No leads

Si: Silicon

SiC: Silicon Carbide

SMD: Surface Mounted Devices

SMPS: Switch Mode Power Supply

TIM: Thermal Interface Material

Tj: Junction Temperature

VRM: Voltage Regulator Module

WBG: Wide Band-Gap materials

WLCSP: Wafer Level Chip Scale Packaging

WLP: Wafer Level Packaging

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SCOPE OF THE REPORT

The main purpose of Yole's MOSFET report is to provide a broad and exhaustive overview of the MOSFET devices, applications and supply chain and associated trends.

This report fulfils the following objectives:

- Assess the market for MOSFET components, discrete and module packaged
- Explain the market dynamics for different MOSFET applications
- Identify the key drivers that will shape the market's future
- Provide an overview of the different MOSFET components used in power electronics
- Deliver a concise overview of the different applications driving the MOSFET business and related system topologies
- Present data rankings for the MOSFET industry leaders, describing supply chain consolidation, the latest M&A activity, and future trends across the player landscape

This report covers all MOSFET types and related markets. This includes:

- MOSFET
  - From -40V up to 4700V (including high voltage niche markets)
- Applications such as:
  - Automotive, including electric and hybrid electric vehicles
  - Consumer applications, including smartphones, audio & image and home appliances
  - Telecom and datacom
  - Industrial (motor drives, UPS…)

This report is both application and technology oriented:

- Each important application is targeted, with specific needs and evolutions analyzed, in order to determine challenges to be faced for MOSFET technologies and their impact on the overall market
- Technology evolution is provided

Special focuses are also included in this report, based on current trends both for technology and supply chain organization:

- Chinese supply chain and market, manufacturers and technology
- Focus on EV/HEV and Telecom
- Packaging trends and challenges to face, especially for power modules
- Competition understanding with WBG and Silicon IGBTs

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OBJECTIVES OF THIS REPORT

- Provide an overview of the entire power MOSFET market.
- Analyze the main drivers for MOSFET device applications.
- Provide market metrics and forecasts for MOSFET discrete devices.
- Analyze the silicon MOSFET competition: SiC MOSFET and GaN HEMT and IGBT.
- Provide the overview of the MOSFET supply chain, with the main players and their market shares as well as their product portfolio, with an additional focus on Chinese market.
- Analyze how business models and supply-chains evolve.
- Present main technological trends and ongoing development of MOSFET devices, dice and package levels.

Main drivers, applications and markets

Value proposition of MOSFET power devices

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Dr. Ana Villamor is a Technology and Market Analyst for power electronics and compound semiconductors within the Power and Wireless division at Yole Développement (Yole). She participates in many custom studies and reports focused on emerging power electronics technologies, including device technology, and reliability analyses on MOSFETs, IGBTs, HEMTs, Power ICs, etc. She is also involved in various aspects of EV/HEV, and she has acquired in-depth knowledge of the power electronics industry. Dr. Villamor previously worked for Onsemi as a Device Development Engineer, where she obtained her Ph.D. in a collaboration with CNM-IMB-CSIC. Moreover, she holds an Electronics Engineering degree and a master's degree in Micro and Nano Electronics from Universitat Autonoma de Barcelona (SP). She has authored and co-authored several papers, as well as a patent.

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Abdoulaye LY is a Technology & Market Analyst specializing in Power Electronic Systems at Yole Développement. As part of the Power Electronics & Wireless division at Yole, Abdoulaye's expertise is focused on power electronics system design.
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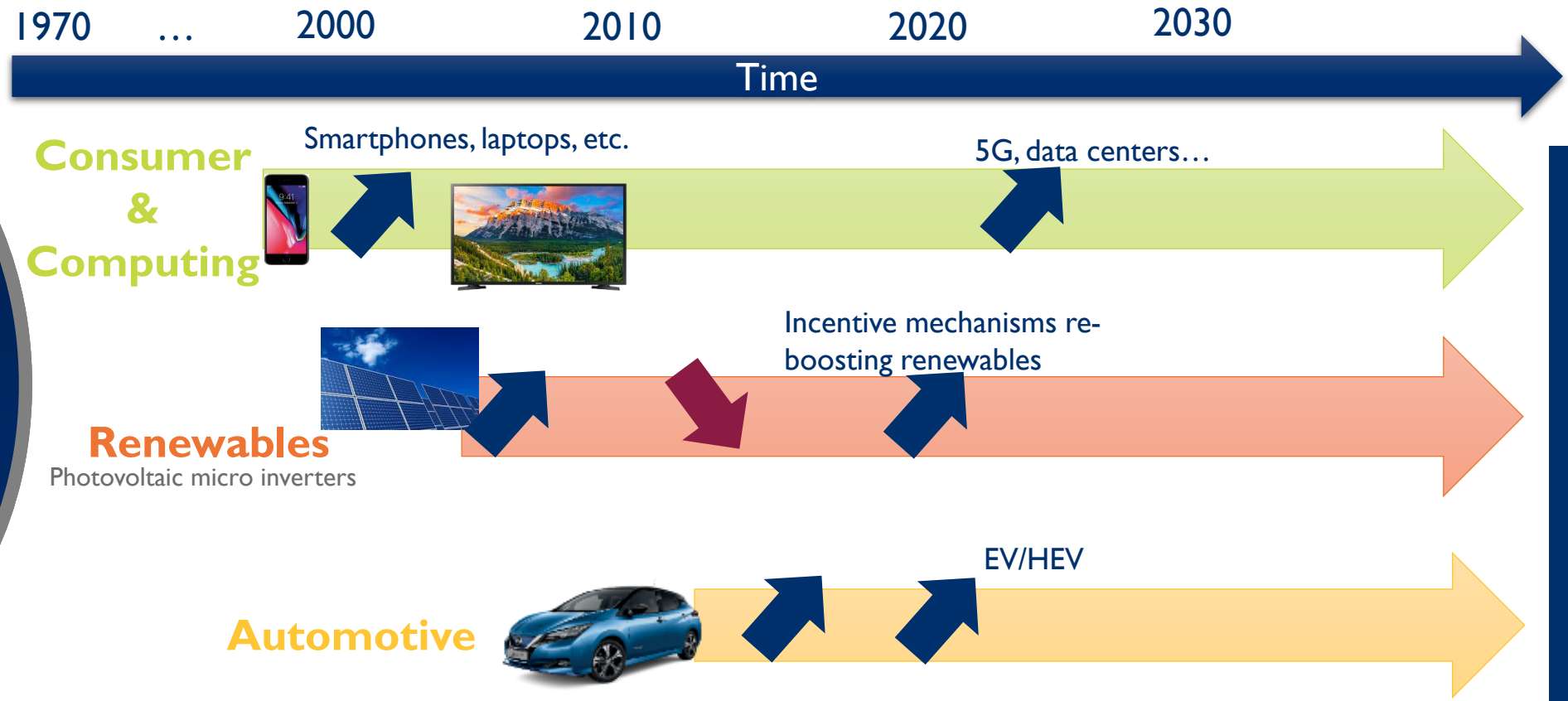
WHO SHOULD BE INTERESTED IN THIS REPORT

- MOSFET device suppliers wishing to identify the most promising markets, new and old growing MOSFET applications and business strategy approaches to adopt in face of growing adoption of SiC-MOSFET and GaN devices.
- Device integrators looking for technology trends and MOSFET suppliers.
- Investors and big companies evaluating investment into increasing MOSFET manufacturing capacities.
- Wafer and equipment manufacturers seeking for understanding the quantitative evolution of the future demand for MOSFET industry.
- R&D teams involved in developing new MOSFET device designs and device packaging solutions.

DRIVING APPLICATIONS - HISTORICAL PERSPECTIVE

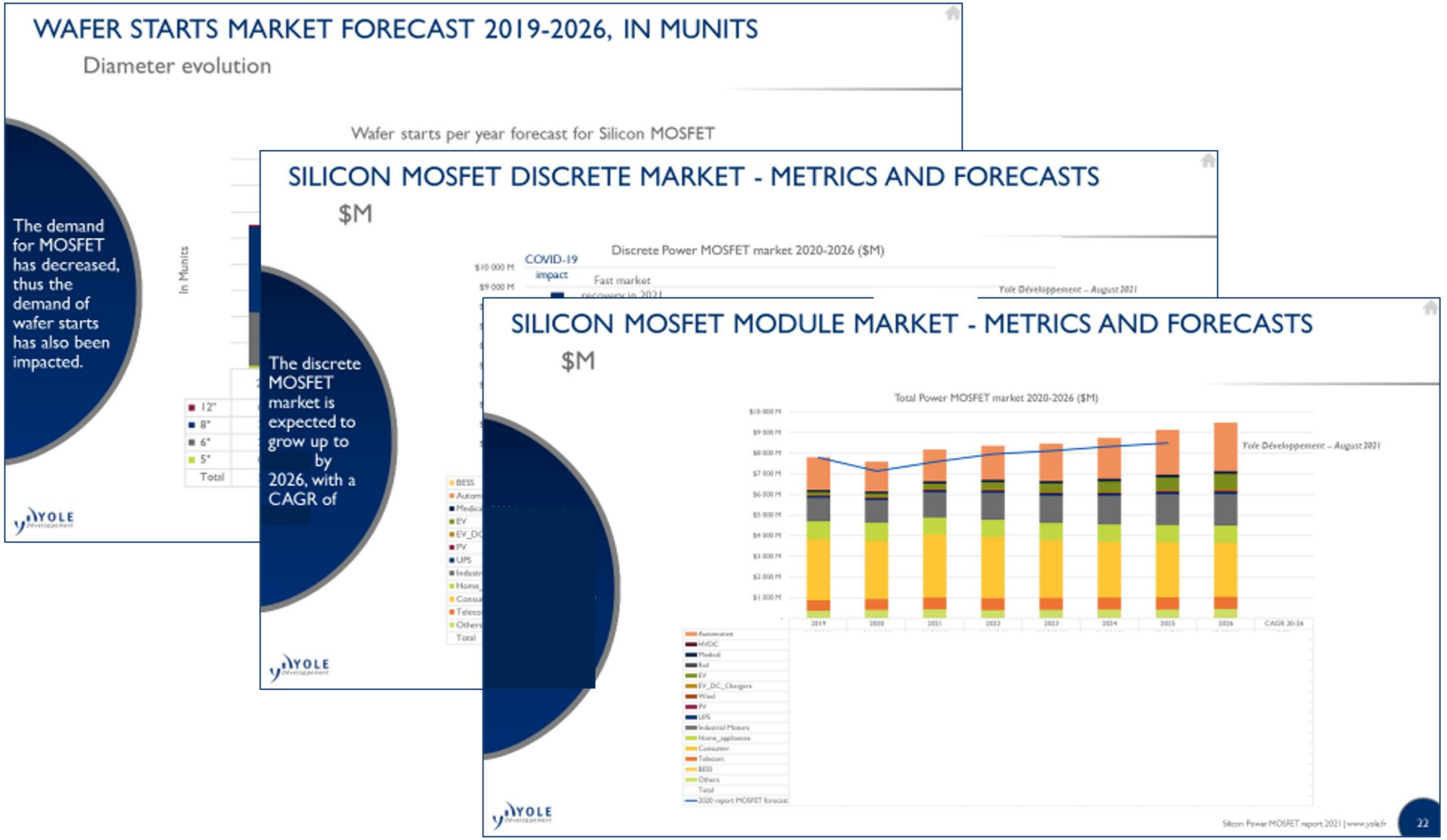
Today, the automotive segment, especially EVs/HEVs, drives both technological development and market demand.



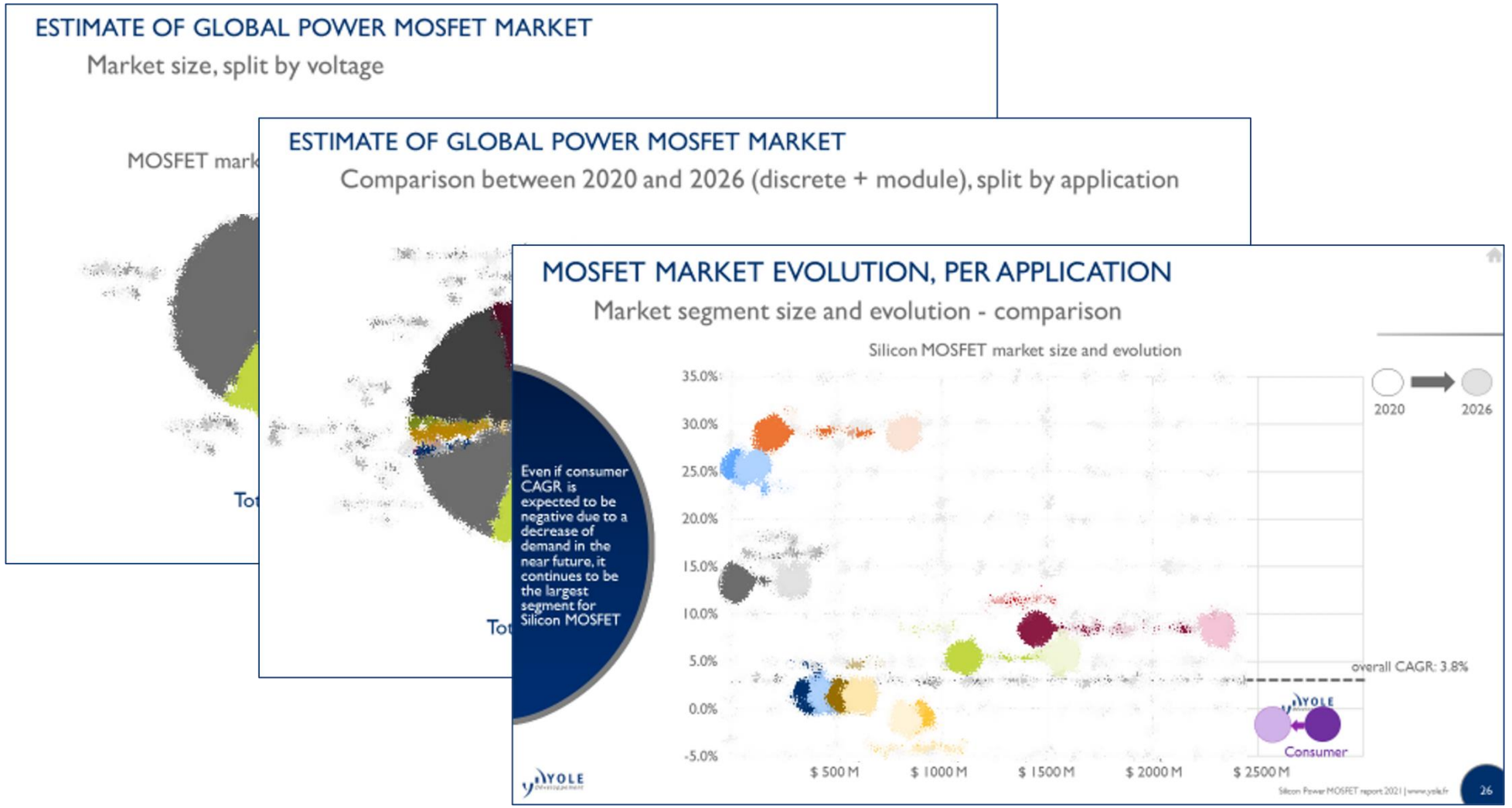
Historical MOSFET applications are still demanding high volumes MOSFETs.

EV/HEV boom and growing number of electrical systems in the vehicles boost even further the need of MOSFETs in automotive.

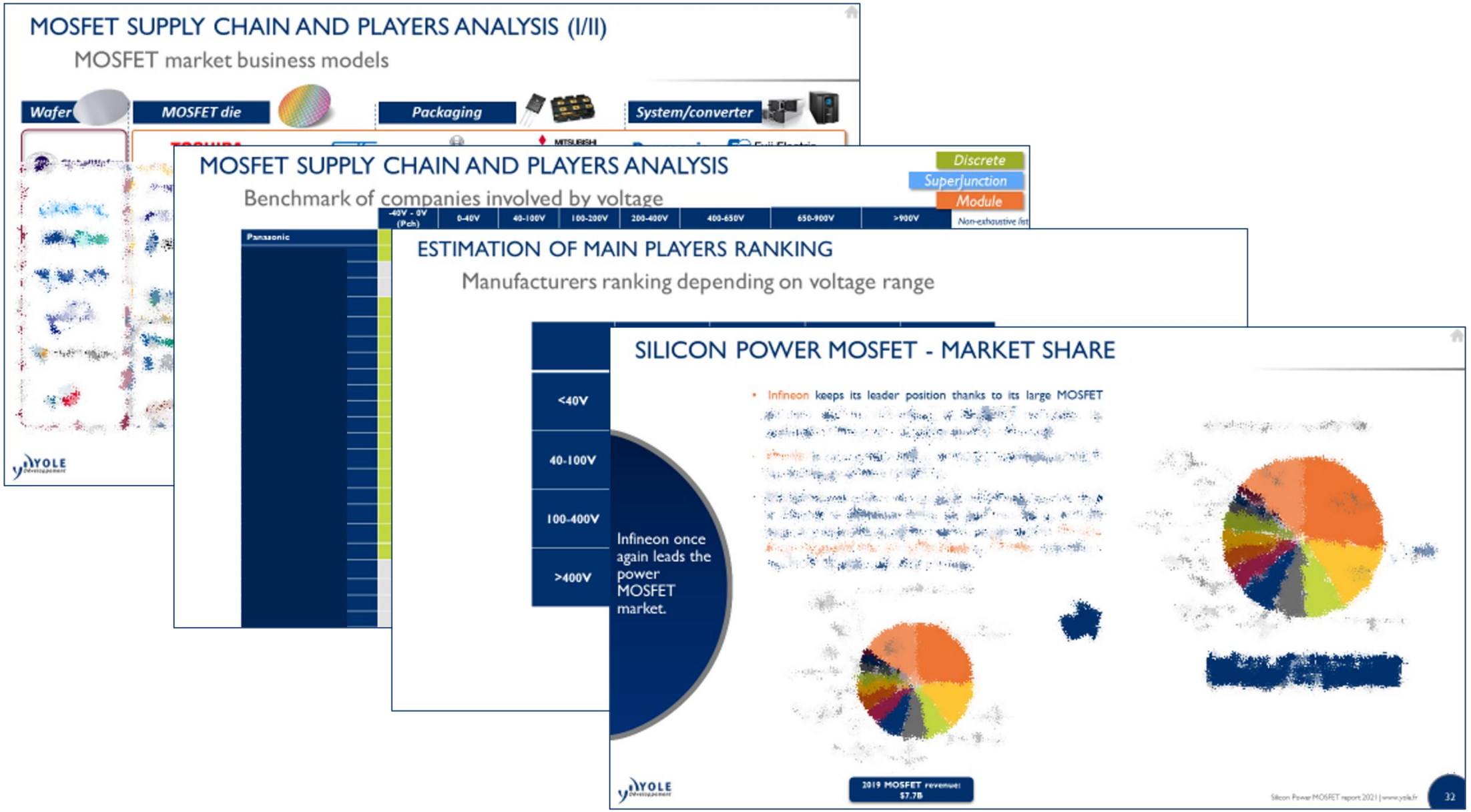
FORECASTS 2020-2026



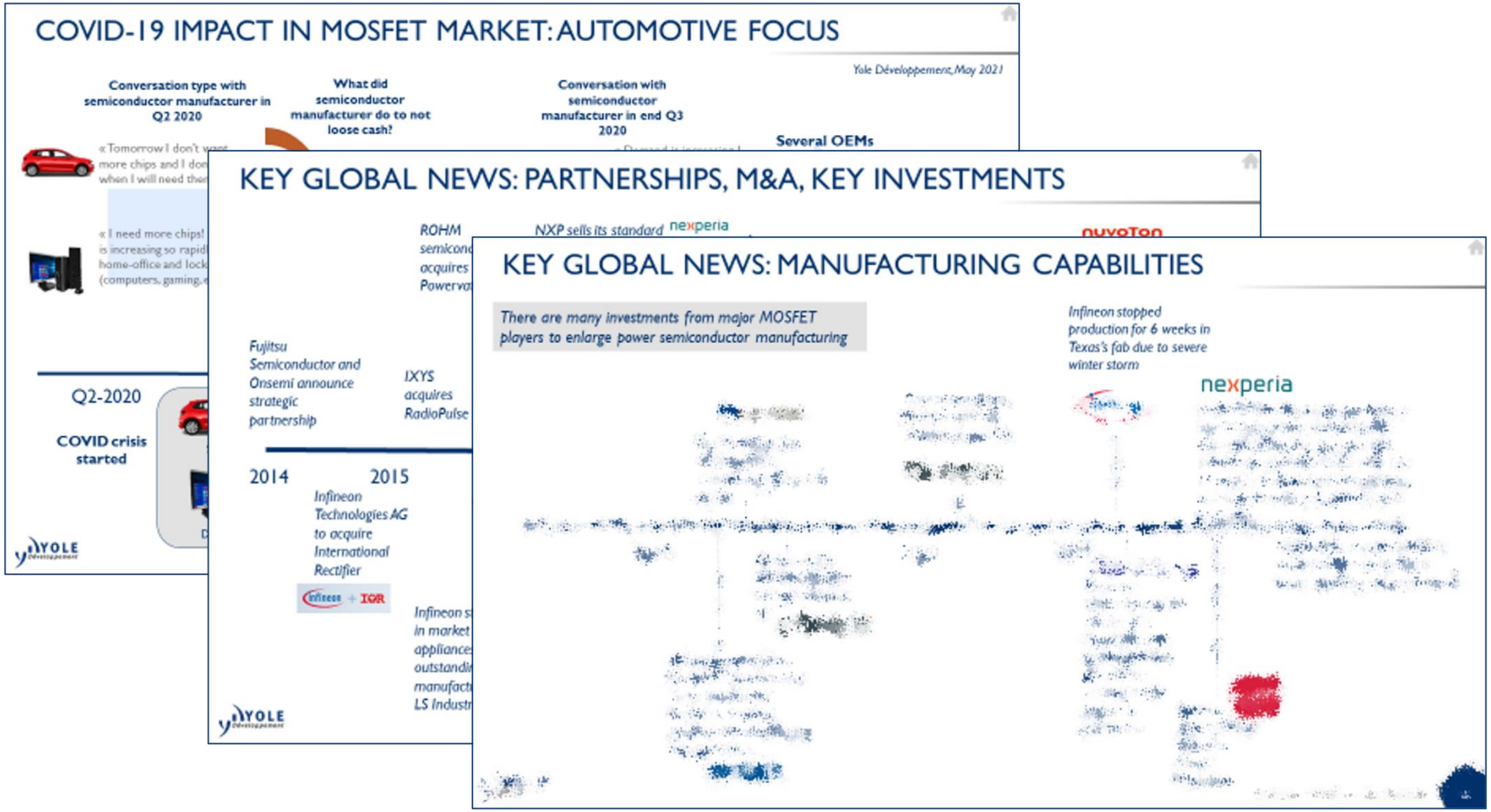
FORECASTS 2020-2026



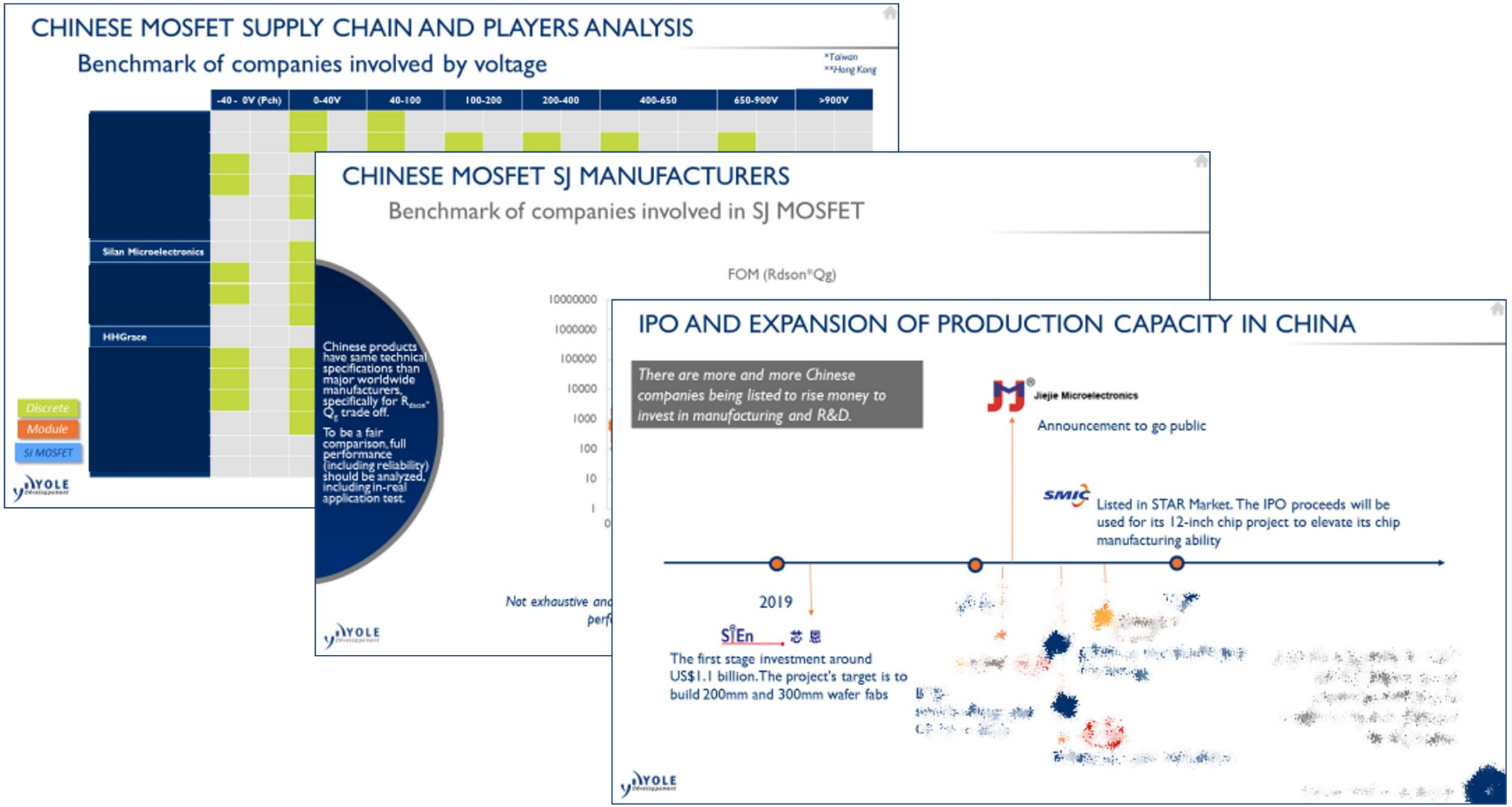
SUPPLY CHAIN ANALYSIS, BENCHMARKING, MARKET SHARES…



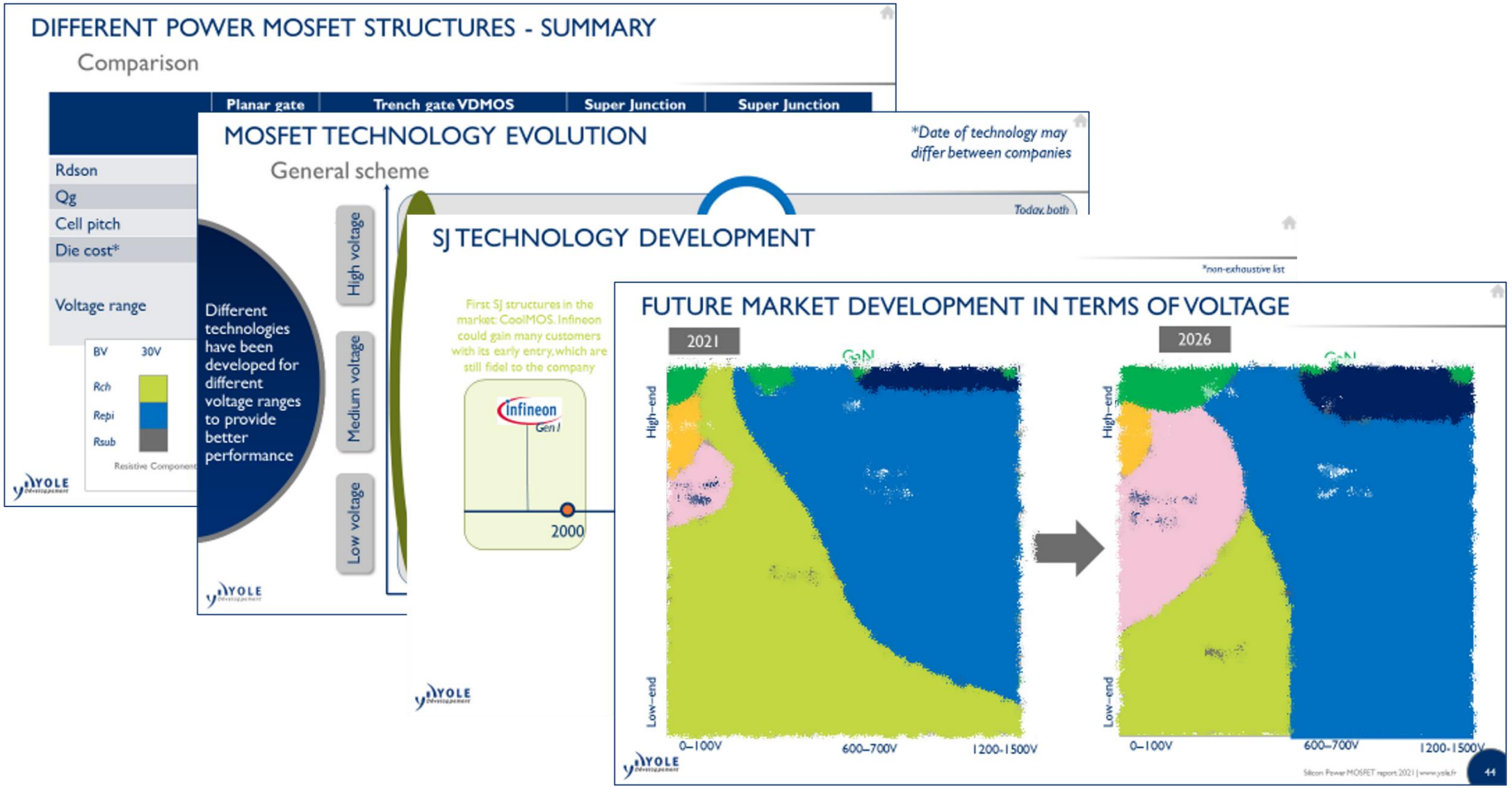
INVESTMENTS, PARTNERSHIPS, COVID-19 SUPPLY CHAIN IMPACT



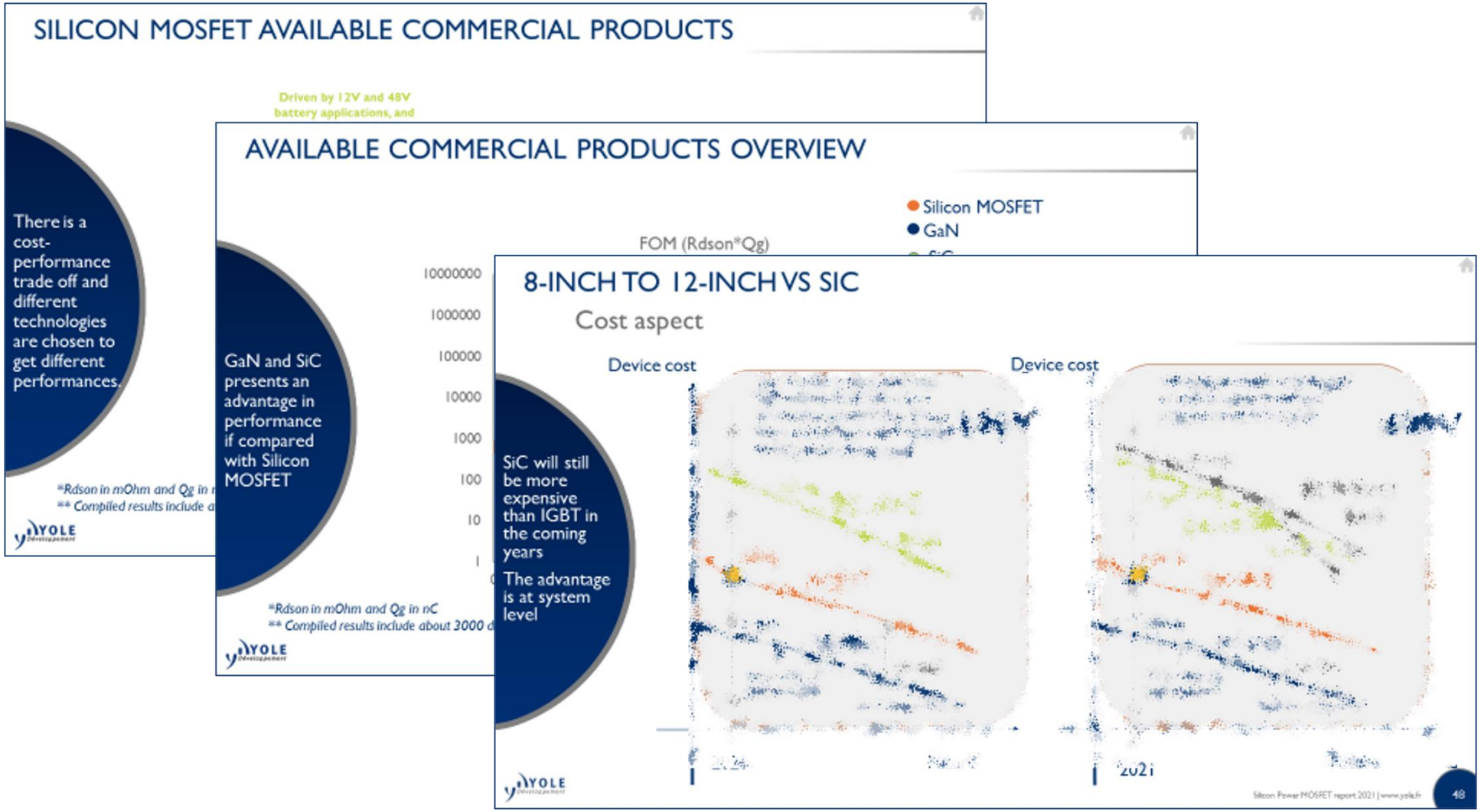
FOCUS IN CHINA



TECHNOLOGY ANALYSIS AND TRENDS



SILICON MOSFET BENCHMARKING, COMPARISON WITH GAN AND SIC



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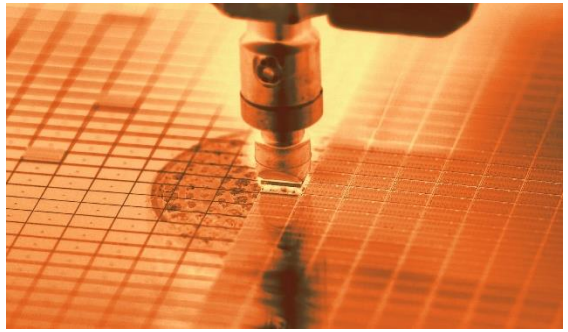
Status of the Power Electronics Industry 2020



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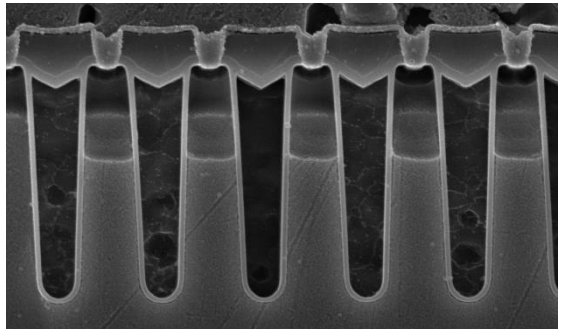

DC Charging for Plug-In Electric Vehicles 2021

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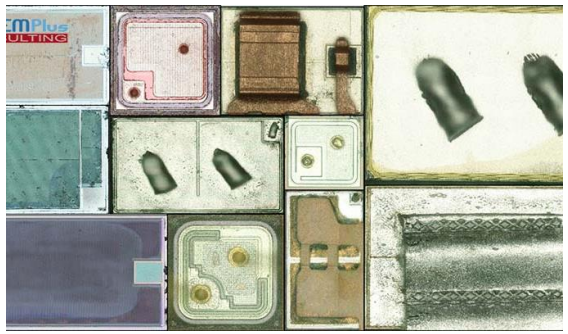
[Automotive Low-Voltage Si MOSFET Comparison 2021]



HOW TO USE OUR DATA?

Yole Group of Companies, including Yole Développement, System Plus Consulting and PISEO, are pleased to provide you a glimpse of our accumulated knowledge.

We invite you to share our data with your own network, within your presentations, press releases, dedicated articles and more, but you first need approval from Yole Public Relations department.

If you are interested, feel free to contact us right now!

We will also be more than happy to give you updated data and appropriate formats.

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