Automotive Lighting Technology, Industry, and Market Trends 2018
Biography & contact

**Pars MUKISH**

Pars Mukish holds a master degree in Materials Science & Polymers (ITECH - France) and a master degree in Innovation & Technology Management (EM Lyon - France). Since 2015, Pars has taken on responsibility for developing SSL and Display activities activities as Business Unit Manager at Yole Développement (Yole). Pars is part of the Photonics, Sensing & Display division at Yole. Previously, he has worked as Marketing Analyst and Techno-Economic Analyst for several years at the CEA (French Research Center).

Email: mukish@yole.fr

**Pierrick BOULAY**

As part of the Photonics, Sensing & Display division at Yole Développement (Yole), Pierrick Boulay works as Market and Technology Analyst in the fields of LED, OLED and Lighting Systems to carry out technical, economic and marketing analysis. He has experience in both LED lighting (general lighting, automotive lighting…) and OLED lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO - France).

Email: boulay@yole.fr

**Martin VALLO**

Martin Vallo, PhD is serves as a Technology & Market Analyst specialized in solid-state lighting technologies, within the Photonics, Sensing & Display division at Yole Développement (Yole). With 9 years’ experience within semiconductor technology, Martin is involved today in the development of technology & market reports as well as the production of custom consulting projects at Yole. Prior his mission at Yole, he worked at CEA (Grenoble, France), with a mission focused on the epitaxial growth of InGaN/GaN core-shell nanowire LEDs by MOCVD and their characterization for highly flexible photonic devices. Martin graduated from Academy of Sciences, Institute of Electrical Engineering (Slovakia) with an engineering degree in III-nitride semiconductors.

Email: vallo@yole.fr
# TABLE OF CONTENT (1/3)

- **Automotive Market Trends**
  - Status of the market
  - Macrotrends

- **Light Sources and Associated Functions/Applications**
  - History and overview of light sources
  - Halogen
  - Xenon/HID
  - LED
  - Laser
  - OLED
  - Light source vs. Lighting functions/applications

- **2017 Automotive Lighting Market**
  - 2017 revenue - Breakdown by application
  - 2017 revenue - Breakdown by supplier
  - 2017 revenue - Breakdown by region of sale and headquarter location
  - Drivers

- **2017-2023 Automotive Lighting Market Trends**
  - 2017-2023 automotive lighting market forecast
  - In-depth analysis of the front lighting market

- **Automotive Lighting Industry**
  - Tier-1 competitive landscape
  - Company profiles
  - Analysis of Chinese Automotive Lighting Market and Industry

- **Packaged LED for Automotive Lighting**
  - Packaged LED classification and applications
  - LED device suppliers
  - LED for automotive vs. LEDs for other applications
  - Global trends
  - Highlights on CSP LEDs, high luminescence LEDs, miniLEDs and microLEDs

- **OLED Panel for Automotive Lighting**
  - Drivers and potential applications
  - Challenges for OLED integration
  - Key milestones
  - Automotive application roadmap
  - Recent development & Trends

- **Laser Diode for Automotive Lighting**
  - Technology aspects
  - Laser booster principle
  - Basic full LED headlamp vs. LED headlamp with laser booster
  - Safety aspects
  - Trends - Laser matrix

- **Interior/Ambient Lighting**
  - Benefits of LED
  - Key milestones
  - Functions & Uses
  - Architecture evolution
  - Trends
TABLE OF CONTENT (2/3)

- Exterior Lighting - Rear Combination Lamp (RCL) P160
  - Key milestones
  - Product Evolution
  - Technical Evolution
  - Technologies behind styling
  - Recent trends (excluding OLED)
  - Lighting signature aspects
  - Styling possibilities

- Exterior Lighting - Front Lighting P175
  - Front lighting system typologies
  - Bi-functional headlamp systems
  - Automotive lighting functions
  - History of LED DRL and headlamp adoption
  - Full LED headlamps - Timeline per manufacturer (i.e. Tier-1)
  - Roadmap - Progression of LED, OLED, and laser technologies
  - LED headlamp - From luxury to economy cars

- Automotive Lighting System Development Process P182
  - OEM / Tier-1 supplier development process
  - Request for proposal (RFQ), samples and quality aspects
  - Suppliers management and tier-1s responsibility
  - Development scenarios & Trends

- Automotive Exterior Lighting System Manufacturing Process P199
  - Lighting functions
  - Components and sub-assemblies
  - Lighting component
  - Thermal management
  - Schematic architecture
  - Manufacturing technologies
  - Standard vs. Dedicated components
  - Manufacturing / Assembly synoptic
  - Light management and power supply
  - Assembly / Manufacturing synoptic
  - Assembly / Manufacturing automation
  - Component / Part analysis
  - Architecture and cost analysis
  - Value chain and level of manufacturing

- Key Products and Competencies for Leading Automotive Players P234
  - Key competences
  - Photometric testing competences
  - LED board / module design and manufacturing competences
  - Electronic Control Unit (ECU) competencies - Microcontroller and software

- Automotive Lighting Profitability Analysis P240
  - Architecture of light beam
  - Value analysis
  - System architecture – Electronic vs Mechanic
  - Impact of AFLS technology
  - Risk for Tier-1
TABLE OF CONTENT (3/3)

- Advanced Front Lighting Systems (AFLS)  P251
  - Introduction
  - Applications
  - Lighting technologies overview
  - Lighting technologies roadmap and benchmark
  - Future lighting systems
  - System development trends
  - ADAS and lighting technologies
  - Lighting Software and hardware architectures / content

- Non Visible Lighting for Automotive Applications  P301
  - Introduction
  - IR lighting applications
  - UV lighting applications

- Conclusion  P320
COMPANIES CITED IN THIS REPORT

THIS REPORT’S PRIMARY OBJECTIVE IS TO PROVIDE A COMPREHENSIVE OVERVIEW OF AUTOMOTIVE LIGHTING

This includes deep insight into various automotive lighting technologies and system approaches, including comparisons between LED/OLED/Laser - DRL/Headlamp/Interior Lighting - Advanced Front Lighting Systems (AFLS)

As well as an industry analysis, technology roadmaps, and market metrics.

Additional report objectives:

• Analyse the automotive lighting market and applications’ current status and future trends
• Review the automotive lighting industry’s structure and future trends
• Discuss the main technologies used for automotive lighting, and associated roadmaps
• Examine the main lighting systems used for automotive applications, and associated roadmaps
• Analyse emerging lighting technologies including those based on mini-/micro-LEDs, digital light projection (DLP)/digital micromirror devices (DMDs) and lasers
• Review Advanced Front Lighting System (AFLS) architecture, and synergies with Advanced driver assistance systems (ADAS) in sensors and software
• Examine non-visible lighting systems such as infrared and ultraviolet emitters used for automotive applications
• Provide market insights for 2013-2023 for automotive lighting applications
Traditional LEDs vs MiniLEDs vs MicroLEDs

### Traditional LEDs
- Chips: >1 mm
- Packages: SMD, through hole (smallest packages: 0.5 x 0.5 mm²)
- Applications:
  - General and specialty lighting
  - LCD backlight units, LED videowalls

### MiniLEDs
- Chips: 1 mm
- Packages: SMD or Chip on Board Assembly
- Applications:
  - Low pitch LED videowalls, LCD and keyboard backlights
  - Automotive lighting

### MicroLED
- Chips: 100 µm
- Packages: Package-free: “Chip On Board” only
- Applications:
  - Low pitch LED videowalls, MicroLED displays (TV, smartphones...)
  - Automotive lighting

**MicroLED Technologies**
- Lumileds
- Rohinni
- Sony
- X-Celeprint
- Playnitride

**Limitations**
- Traditional LEDs: ~150-200 µm
- MiniLEDs: ~50-100 µm
- MicroLED: ~10-2 µm
High luminance and small spot size are required for well-collimated beams and lighting design with a high degree of freedom.

Laser focused on phosphor

<table>
<thead>
<tr>
<th>Osram Ostar HL Pro (1 die)</th>
<th>3 Laser focused on phosphor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission Area</td>
<td>XX</td>
</tr>
<tr>
<td>Power</td>
<td>XX</td>
</tr>
<tr>
<td>Luminous Flux</td>
<td>XX</td>
</tr>
<tr>
<td>Luminance</td>
<td>XX</td>
</tr>
<tr>
<td>Efficiency</td>
<td>XX</td>
</tr>
<tr>
<td>Op. Temperature</td>
<td>XX</td>
</tr>
<tr>
<td>Risk level</td>
<td>Laser class 4</td>
</tr>
</tbody>
</table>

• Luminance > XX cd/mm² can be achieved with 0.4mm-diameter laser spot size hitting a phosphor converter plate. Up to XXcd/mm² has been demonstrated (source: Schott).

• Laser has several advantages over LEDs:
  • Smaller optical system.
  • XX.
  • Higher luminous intensity.

• But laser has still some challenges to overcome:
  • XX.
  • XX.
  • Eye injury hazard (Avoid direct eye exposure).

Eye injury hazard

Laser eye injury comparison – Source: lasersafetyfacts
• More than $8.5B in automotive lighting (related) deals in 2018!

• With such a booming market, and automotive lighting becoming one potential critical node for autonomous driving because lighting systems could represent a key location for integrating sensors such as local cameras, radio and light detection and ranging (radar and LiDAR), companies are paying ever more attention to this industry.
  • XX
  • XX

• Several new players are likely to enter this market in the future, and some current leading automotive lighting tier-1s are therefore trying to reinforce their position.
  • XX

• But such moves are not restricted only to car maker and Tier-1s. Some Tier-2 and Tier-3 players also want bigger pieces of the pie. In this field.
  • XX

Recent automotive lighting industrial highlights

2017
Valeo takes over Ichikoh

April 2018
Continental and Osram signs JV contract

April 2018
LG Electronic and LG Corp acquire ZKW

June 2018
Varroc IPO kicks off

July 2018
Magna acquires OLSA

October 2018
Fiat agrees to sell Magnetti Marelli to Calsonic Kansei Corp.
Headlamp block results of a complex assembly of individual components or modules. A large amount of technologies is represented:

- Plastic injection for technical parts.
- Plastic injection for optical parts.
- Electronic modules.
- Embedded software.
- Lighting devices.
- Thermal systems.
- Harness and connections.

Full LED headlamp components breakdown
Source: Yole Développement / PISEO
The use of LEDs instead of halogen bulbs allow more design possibilities and functionalities but can be only achieved through a more complex architecture.

**Audi Q3 – Bulb Rearlamp**

**BMW 7 series – Full LED Rearlamp**

Source: Yole Développement / Magneti Marelli
KEY PRODUCTS / COMPETENCIES FOR LEADING AUTOMOTIVE PLAYERS

LED board / module design and manufacturing competencies

- LED boards / modules can be assumed as small power electronics devices with few electronic components.
- LED choice and related performances are theoretically under the responsibility of the XX, but existing relations between XX and XX can lead to force a LED prescription by XX to XX.
- Key competences at the XX level corresponds to the ability to specify XX.
- XX may integrate engineering and manufacturing competences if it wants to integrate more added value in the lighting device.

LED boards / modules are power devices that require a perfect knowledge of the LED behavior.
## Risk for Tier-1s - Summary - Potential market disruption

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>Consequence</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commoditization &amp; Increased Competition</strong></td>
<td>LED standardization is an opportunity for new players to propose cheap LED based products</td>
<td>More competition, low spec products, reduction of market price and margin</td>
<td>WEAK General automotive practice and ecosystem (OEM specifications, methods of work, process, quality requirements) represent strong entry barriers companies not present in automotive market</td>
</tr>
<tr>
<td>XX</td>
<td>XX</td>
<td>XX Large product portfolio is positively perceived by OEM. XX</td>
<td>MEDIUM - XX</td>
</tr>
<tr>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>HIGH - For system suppliers involved in lighting products (VALEO…)</td>
</tr>
<tr>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>WEAK XX OPPORTUNITY : XX</td>
</tr>
</tbody>
</table>
ADVANCED FRONT LIGHTING SYSTEMS (AFLS)

Future lighting systems - μAFS headlamp - Integration aspects

- The headlamp prototype using μAFS pixel LED module is based on series Mercedes-Benz E-Class headlamp housing. The original VarioLED module is replaced by a double μAFS module to enhance the range and the resolution of the headlamp.

- As the system designed by Hella requires sophisticated asymmetrical projection characteristics, an anamorphic lens system had to be implemented.

- Then, the μAFS system is integrated into the car, equipped with the state-of-the-art sensor to detect and monitor traffic conditions and other parameters. A new software taking into account data from the sensors and calculating the best light distribution in real time has been developed by Daimler.

Block diagram of the μAFS system
Future trends / opportunities - Digital lighting - Overview of technologies

- Picture beam technology allows a very high beam resolution that can be between XX and XX pixels depending and the light source/technology.

<table>
<thead>
<tr>
<th></th>
<th>μAFS</th>
<th>Laser scanner</th>
<th>LCD</th>
<th>DMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
<td>XX</td>
</tr>
<tr>
<td>Light source</td>
<td>MicroLED</td>
<td>Laser</td>
<td>LED / LCD</td>
<td>Laser</td>
</tr>
</tbody>
</table>

- All these technologies are in development but will need to overcome technical issues to be used in headlamps:
  - Thermal management
  - XX
  - XX
  - (...)
In this kind of architecture, it is compulsory to have a match between the camera and the image processing software.

Camera is the main sensor use for AFLS.
NON VISIBLE LIGHTING FOR AUTOMOTIVE APPLICATIONS

IR lighting - Interior - Driver monitoring - Usage scenarios

Shared car driver management via face detection and identification.

Transportation/business fleet management: fatigue and attention detection.

Digital cockpit and entertainment interface control enabled by gesture recognition.

Level 3 autonomy: human-machine control transfer enabled by attention detection.

Driver Monitoring System (DMS)
The number of LiDARs increases with the level of ADAS. However, the specifications and technology used for each LiDAR may be different. It will also depend on the quality of the car.
In 2017, 57% of visible automotive lighting value is coming from solid state lighting and we expect it to reach 85% in 2023.
AUTOMOTIVE LIGHTING: TECHNOLOGY, INDUSTRY AND MARKET TRENDS
Market & Technology report - November 2018

Automotive lighting is becoming the new photonic hub.

‘LEDIFICATION’ WILL PROPEL AUTOMOTIVE LIGHTING REVENUES TO $37.3B IN 2023

With the integration of light emitting diode (LED) technology, lighting has evolved from a basic, functional feature to a distinctive feature with high-value potential in automotive. Indeed, LED technology has given manufacturers the opportunity for strong differentiation via lighting design and additional functionalities. This is particularly true for exterior lighting, which profoundly mutating in terms of both technology and supply chain. The integration of new solid state lighting (SSL) technologies is transforming automotive front lighting and rear combination lighting (RCL) systems and their applications, offering more design flexibility, increased efficacy, and intelligent functionalities.

LEDs are rapidly gaining popularity as their cost decreases and efficiency, luminance and package size improves. For example, full LED headlamps that first saw commercialization in 2008 on luxury cars like the V10 Audi R8 have since penetrated the compact, or C-segment, vehicle market in 2012, with the new Seat Leon, and are now being commercialized in emerging markets. Nowadays, nearly all car maker and Tier-1 part suppliers have developed full LED-based headlamp systems and such technology is a must-have in the C and also the D – compact executive car – automotive segments.

Laser and organic LED (OLED) sources are still emerging technologies but could also support the development of new functionalities:

- Laser-based headlamps could enable long-distance night vision, up to 600 meters, or be coupled with digital micromirror devices (DMDs) to provide high resolution lighting systems, up to 1M pixels.
- OLED RCLs could initiate a design shift from 2D to 3D light sources, made possible by the nature of the OLED device itself.

In this context, the automotive lighting market totaled $27.4B in 2017 and is expected to reach $37.3B in 2023 at a compound annual growth rate for 2017-2023 (CAGR2017-2023) of 5.3%. This growth is driven by natural LED cost erosion coupled with standardization and optimization of LED modules, which result in more vehicles equipped with this technology. Indeed, whereas SSL technologies represented 57% of automotive lighting value in 2017, this share is likely to reach 85% by 2023.

This report presents all automotive lighting applications and the associated market revenue for the period 2013-2023, with details concerning integration status of different lighting technologies and systems, recent trends and market size by application.

INTEGRATION OF NEW SEMICONDUCTOR/ELECTRONIC-BASED COMPONENTS IS ALSO ENABLING THE REALIZATION OF FULL ELECTRONIC SYSTEMS, COMBINING SOLID STATE LIGHTING, SENSORS AND SOFTWARE, AND BY EXTENSION THE DEVELOPMENT OF ADVANCED LIGHTING FUNCTIONALITIES. THE MAIN OBJECTIVE OF THESE FUNCTIONALITIES IS TO OFFER BEAM PATTERNS THAT AUTOMATICALLY ADJUST TO THE DRIVING ENVIRONMENT. RECENTLY, THE USE OF MATRIX LED SYSTEMS COMBINED WITH CAMERA AND IMAGE PROCESSING FUNCTIONS HAS ALLOWED FOR CREATION OF NEW...
lighting functions like adaptive front lighting and glare-free lighting. And such evolution toward photonics and full electronic systems is opening a new era/revolution for automotive lighting: the implementation of digital light to further enhance the value of lighting.

Overall, digital lighting enables high resolution front lighting systems, offering new low and high beam functions, to increase road safety and driver comfort, and can make automotive lighting more intelligent. Additionally, this trend of digitalization is supported by the development of advanced driver assistance systems (ADAS), as lighting could serve as a communication tool within the environment of the car, for example for car-to-pedestrian communication.

Today, digital lighting is a key area of investigation for the automotive lighting supply chain as it represents the future of automotive lighting. And several new technologies/systems are being investigated, including DMD/digital light projection (DLP), laser scanners, liquid crystal displays (LCDs), and micro-/mini-LED. An interesting fact is that such lighting systems are providing ever more synergy with projection/display systems as their function is evolving toward communication, like projecting information onto the road. And new parameters now have to be taken into account for related developments, such as resolution, field of view (FOV) and pixel density.

However several barriers have still to be overcome in areas including technology, manufacturing, and regulation. Those challenges will be reinforced as digital light further tightens the relationship between lighting, automotive sensors and data processing.

This report presents a complete overview of new lighting technologies and advanced front lighting systems (AFLS), providing details regarding benefits and drawbacks, integration status, and development roadmaps. The report gives insights into the future of automotive lighting with analysis on synergies with ADAS.

### AUTOMOTIVE LIGHTING: A MUTATING INDUSTRY

With such a booming market, and automotive lighting becoming one potential critical node for autonomous driving because lighting systems could represent a key location for integrating sensors such as local cameras, radio and light detection and ranging (radar and LiDAR), companies are paying ever more attention to this industry.

- Traditional automotive component suppliers are now expanding their business in this field. A good example of this trend is the recent acquisition of Magneti Marelli by CK Holdings, a holding company of Calsonic Kansei Corporation, a leading Japanese automotive component supplier, for 6.2B€.
- Electronic companies seem also to be eyeing automotive lighting. Indeed, with the increased implementation of electronic components in vehicles, automotive electronics should surpass the consumer electronic business in the middle/long term. LG has made the first move in this direction with the acquisition of ZKW for more than 1.1B€. Several new players are likely to enter this market in the future, and some current leading automotive lighting tier-1s are therefore trying to reinforce their position. Valeo has taken over Ichikoh, Varroc has kicked off an Initial Public Offering (IPO) process to raise capital, and Magna has acquired Olsa.

But such moves are not restricted only to car maker and Tier-1s. Some Tier-2 and Tier-3 players also want bigger pieces of the pie. In this field, Osram has recently developed a joint venture with Continental to supply lighting modules and Electronic Control Units (ECUs), which will become the heart of lighting system development in the future.

This industrial evolution is likely to continue as solid state lighting technologies are integrated. The rapid evolution of these technologies coupled with the AFLS trend and increased use of non-visible lighting systems such as LiDAR, autonomous emergency braking (AEB) or driver monitoring systems might reshuffle the cards in an industry that’s mutating.

This report presents an analysis of the automotive lighting industry with details about the top 15 suppliers’ revenue and market share in total and by region. The report also includes a focus on the Chinese automotive lighting market and industry, non-visible lighting applications in automotive, and an in-depth analysis of automotive lighting system development and manufacturing.
COMPANIES CITED IN THE REPORT (non exhaustive list)

TABLE OF CONTENTS (complete content on i-Micronews.com)

| Automobile market trends | 21 |
| Light sources and associated functions/applications | 40 |
| 2017 automotive lighting market | 51 |
| > 2017 revenue - Breakdown by application, supplier and region of sale | |
| > Drivers | |
| 2017-2023 automotive lighting market trends | 59 |
| > 2017-2023 automotive lighting market forecast | |
| Automotive lighting industry | 77 |
| > Tier-1 competitive landscape | |
| > Analysis of chinese automotive lighting market and industry | |
| Packaged LED for automotive lighting | 106 |
| > Packaged LED classification and applications | |
| > LED device suppliers | |
| > LED for automotive vs. LEDs for other applications | |
| > Trends - CSP LEDs, high luminance LEDs, miniLEDs and microLEDs | |
| OLED panel for automotive lighting | 131 |
| > Challenges for OLED integration | |
| > Key milestones & automotive application roadmap | |
| > Recent development & trends | |
| Laser diode for automotive lighting | 140 |
| > Technology aspects & principles | |
| > Basic full LED headlamp vs. LED headlamp with laser booster | |
| > Trends - Laser matrix | |
| > Key milestones, functions and uses | |
| > Architecture evolution & trends | |
| Exterior lighting - Rear Combination Lamp (RCL) | 160 |
| > Key milestones | |
| > Product and technical evolution | |
| > Recent trends (excluding OLED) | |
| Exterior lighting - Front lighting | 175 |
| > Front lighting system typologies | |
| > Automotive lighting functions | |
| > Roadmap - Progression of LED, OLED, and laser technologies | |
| > LED headlamp - From luxury to economy cars | |
| Automotive lighting system development process | 182 |
| > OEM Tier-1 supplier development process | |
| > Request for proposal (RFP), samples and quality aspects | |
| > Suppliers management and tier-1 responsibility | |
| > Development scenarios & trends | |
| Automotive exterior lighting system manufacturing process | 199 |
| > Lighting functions | |
| > Components and sub-assemblies | |
| > Schematic architecture | |
| > Manufacturing technologies | |
| > Manufacturing / assembly synoptic | |
| > Component / part analysis | |
| > Architecture and cost analysis | |
| > Value chain and level of manufacturing | |
| Key products and competencies for leading automotive players | 234 |
| > Key competences | |
| > Photometric testing competences | |
| > LED board / module design and manufacturing competences | |
| > Electronic Control Unit (ECU) competencies - Microcontroller and software | |
| Automotive lighting profitability analysis | 240 |
| > Architecture of light beam | |
| > Value analysis | |
| > Impact of AFLS technology & risk for Tier-1 | |
| Advanced Front Lighting Systems (AFLS) | 251 |
| > Applications | |
| > Lighting technologies roadmap and benchmark | |
| > Future lighting systems | |
| > System development trends | |
| > Lighting software and hardware architectures / content | |
| Non visible lighting for automotive applications | 301 |
| > IR lighting applications | |
| > UV lighting applications | |

AUTHORS

**Pars Mukish** holds a master degree in Materials Science&Polymers (TECH-France) and a master degree in Innovation & Technology Management (EM Lyon - France). Since 2015, Pars has taken on responsibility for developing SSL and Display activities as Business Unit Manager at Yole Développement (Yole). Pars is part of the Photonics, Sensing & Display division at Yole. Previously, he has worked as Marketing Analyst and Techno-Economic Analyst for several years at the CEAA (French Research Center).

**Martin Vallo**, PhD serves as a Technology & Market Analyst specialized in solid-state lighting technologies, within the Photonics, Sensing & Display division at Yole Développement (Yole). With 9 years’ experience within semiconductor technology, Martin is involved today in the development of technology & market reports as well as the production of custom consulting projects at Yole. Prior his mission at Yole, he worked at CEA (Grenoble, France), with a mission focused on the epitaxial growth of InGaN/GaN core-shell nanowire LEDs by MOVCVD and their characterization for highly flexible photonic devices. Martin graduated from Academy of Sciences, Institute of Electrical Engineering (Slovenia) with an engineering degree in III-nitride semiconductors.

MARKET & TECHNOLOGY REPORT

**RELATED REPORTS**

- Benefit from our Bundle & Annual Subscription offers and access our analyses at the best available price and with great advantages
- IR LEDs and Laser Diodes – Technology, Applications, and Industry Trends
- MiniLED for Display Applications: LCD and Digital Signage
- VCSELs - Technology, Industry and Market Trends
- LiDARs for Automotive and Industrial Applications 2018
Find all our reports on [www.i-micronews.com](http://www.i-micronews.com)

As part of the Photonics, Sensing & Display division at Yole Développement (Yole), **Pierrick Boulay** works as Market and Technology Analyst in the fields of LED, OLED and Lighting Systems to carry out technical, economic and marketing analysis. He has experience in both LED lighting (general lighting, automotive lighting….) and OLED lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO - France).
ORDER FORM

Automotive Lighting: Technology, Industry and Market Trends

BILL TO

Name (Mr/Ms/Dr/Pr):
Job Title:
Company:
Address:
City:
State:
Postcode/Zip:
Country:
*VAT ID Number for EU members:
Tel:
Email:
Date:

PAYMENT

BY CREDIT CARD

☑ Visa ☐ Mastercard ☐ Amex

Name of the Card Holder:
Credit Card Number:
Card Verification Value (3 digits except AMEX: 4 digits):
Expiration date:

BY BANK TRANSFER

BANK INFO: HSBC, 1 place de la Bourse, F-69002 Lyon, France, Bank code: 30056, Branch code: 00170, SWIFT or BIC code: CCFRFRPP, IBAN: FR76 3005 6001 7001 7020 0156 587

RETURN ORDER BY

• MAIL: YOLE DEVELOPPEMENT, Le Quartz, 75 Cours Emile Zola, 69100 Villeurbanne/Lyon - France

SALES CONTACTS

• Western US & Canada - Steve Laferriere:
  +1 310 600-8267 – laferriere@yole.fr
• Eastern US & Canada - Troy Blanchette:
  +1 704 859 0453 – troy.blanchette@yole.fr
• Europe & RoW - Lizzie Levenez:
  +49 15 123 544 182 – levenez@yole.fr
• Japan & Rest of Asia - Takashi Onozawa:
  +81-80-4371-4887 – onozawa@yole.fr
• Greater China - Mavis Wang:
  +886 979 336 809 – wang@yole.fr
• Specific inquiries: +33 472 830 180 – info@yole.fr

PRODUCT ORDER - Ref YD18050

Please enter my order for above named report:
☑ One user license*: Euro 5,990
☐ Multi user license: Euro 6,490
- The report will be ready for delivery from November 30, 2018
- For price in dollars, please use the day’s exchange rate. All reports are delivered electronically at payment reception. For French customers, add 20% for VAT

I hereby accept Yole Développement’s Terms and Conditions of Sale(1)
Signature:

*One user license means only one person at the company can use the report.

SHIPPING CONTACT

First Name: ____________________________________________ Last Name: ____________________________________________
Email: ________________________________________________ Phone: ________________________________________________

ABOUT YOLE DEVELOPPEMENT

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS and Image Sensors, Compound Semiconductors, RF Devices & Technologies, Solid-state Lighting, Displays, Software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

CONSULTING AND ANALYSIS

• Market data & research, marketing analysis
• Technology analysis
• Strategy consulting
• Reverse engineering & costing
• Patent analysis
• Design and characterization of innovative optical systems
• Financial services (due diligence, M&A with our partner)

More information on www.yole.fr

REPORTS

• Market & technology reports
• Patent investigation and patent infringement risk analysis
• Structure, process and cost analysis
• Cost simulation tool

More information on www.i-micronews.com/reports

CONTACTS

For more information about:
• Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
• Reports: David Jourdan (jourdan@yole.fr) Yole Group of Companies
• Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr)

More information on www.i-Micronews.com
Life Sciences & Healthcare
- Microfluidic
- BioMEMS
- Inkjet Printing
- Solid-State Medical Imaging & BioPhotonics
- Bio Technologies

Power & Wireless
- RF Devices & Technology
- Compound Semiconductors & Emerging Materials
- Power Electronics
- Batteries & Energy Management

Semiconductor & Software
- Package & Assembly & Substrates
- Semiconductor Manufacturing
- Memory
- Software & Computing

Photonics, Sensing & Display
- Solid-State Lighting & Display
- MEMS, Sensors & Actuators
- Imaging
- Photonics & Optoelectronics
4 BUSINESS MODELS

Consulting and Analysis
- Market data & research, marketing analysis
- Technology analysis
- Strategy consulting
- Reverse engineering & costing
- Patent analysis
- Design and characterization of innovative optical systems
- Financial services (due diligence, M&A with our partner)

Syndicated reports
- Market & technology reports
- Patent investigation and patent infringement risk analysis
- Teardowns & reverse costing analysis
- Cost simulation tool
  www.i-Micronews.com/reports

Monitors
- Monthly and/or Quarterly update
- Excel database covering supply, demand, and technology
- Price, market, demand and production forecasts
- Supplier market shares
  www.i-Micronews.com/reports

Media
- i-Micronews.com website
- @Micronews e-newsletter
- Communication & webcast services
- Events: TechDays, forums,…
  www.i-Micronews.com
6 COMPANIES TO SERVE YOUR BUSINESS

Yole Group of Companies

1. **Yole Développement**
   - Market, technology and strategy consulting
   - www.yole.fr

2. **SystemPlus Consulting**
   - Manufacturing costs analysis
   - Teardown and reverse engineering
   - Cost simulation tools
   - www.systemplus.fr

3. **KnowMade**
   - IP analysis
   - Patent assessment
   - www.knowmade.fr

4. **Piseo**
   - Design and characterization of innovative optical systems
   - www.piseo.fr

5. **Blumorpho**
   - Innovation and business maker
   - www.bmorpho.com

6. **Yole Finance**
   - Due diligence
   - www.yole.fr
OUR GLOBAL ACTIVITY

40% of our business

30% of our business

30% of our business

Europe office

HQ in Lyon

Greater China office

Yole Inc.

Yole Korea

Yole Japan

Palo Alto

Phoenix

Tokyo

Seoul

Hsinchu

Nice

Nantes

Frankfurt

Paris

Nice

Vénissieux

Yole Inc.

Yole Japan

Greater China office

Hsinchu

Yole Korea

Seoul

Tokyo

Palo Alto

Phoenix

©2018 | www.yole.fr | About Yole Développement
ANALYSIS SERVICES - CONTENT COMPARISON

- Technology and Market Report
- Leadership Meeting
- Q&A Service
- Meet the Analyst
- Custom Analysis

Depth of the analysis
Breadth of the analysis

High
Low
SERVING THE ENTIRE SUPPLY CHAIN

Integrators, end-users and software developers

Device manufacturers

Suppliers: material, equipment, OSAT, foundries...

Financial investors, R&D centers

Our analysts provide market analysis, technology evaluation, and business plans along the entire supply chain.
We work across multiple industries to understand the impact of More-than-Moore technologies from device to system.

SERVING MULTIPLE INDUSTRIAL FIELDS

- Industrial and defense
- Medical systems
- Energy management
- Automotive
- Transportation makers
- Mobile phone and consumer electronics

From A to Z…
Yole Développement, System Plus Consulting, KnowMade and PISEO, all part of Yole Group of Companies, keep on increasing their collaboration to offer, in 2018, a collection of 150+ reports. Combining respective expertise and methodologies from the 4 companies, the reports aim to provide market & technology analysis, patent investigation and patent infringement risk analysis, teardowns & reverse costing analysis. They cover:

- MEMS & Sensors
- RF devices & technologies
- Imaging
- Medical technologies (MedTech)
- Photonics
- Advanced packaging
- Manufacturing
- Advanced substrates
- Power electronics
- Batteries and energy management
- Compound semiconductors
- Solid state lighting
- Displays
- Software
- Memory

You are looking for:
- An analysis of your product market
- A review of your competitors evolution
- An understanding of your manufacturing and production costs
- An understanding of your industry technology roadmap and related IPs
- A clear view on the evolution of the supply chain…

Our reports are for you!

The combined team of 60+ experts (PhDs, MBAs, industry veterans…) from Yole Développement, System Plus Consulting, KnowMade and PISEO, collect information, identify the trends, the challenges, the emerging markets, the competitive environments and turn it into results to give you a complete picture of your industry landscape.

In the past 20 years, we worked on more than 1700 projects, interacting with technology professionals and high level opinion makers from the main players of the industry.

In 2018, Yole Group of Companies plan to publish +150 reports. Gain full benefit from our Bundled Offer and receive at least a 36% discount.
OUR 2018 REPORTS COLLECTION (1/4)

MEMS & SENSORS
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Status of the MEMS Industry 2018 – Update
  - Silicon Photonics 2018 – Update
  - Consumer Biometrics: Hardware & Software 2018 – Update
  - Inkjet Functional and Additive Manufacturing for Electronics 2018
  - Fingerprint Sensor Applications and Technologies – Consumer Market Focus 2017
  - Sensors and Sensing Modules for Smart Homes and Buildings 2017
  - Acoustic MEMS and Audio Solutions 2017
  - MEMS & Sensors for Automotive Market & Technology Trends 2017
  - High End Inertial Sensors 2017
  - Magnetic Sensor 2017
- REVERSE COSTING® – STRUCTURE, PROCESS & COST REPORT – by System Plus Consulting
  - Piezo MEMS 2018 *
- PATENT ANALYSES – by KnowMade
  - MEMS Microphone – Patent Landscape Analysis
  - Knowles MEMS Microphones in Apple iPhone 7 Plus – Patent-to-Product Mapping 2017
- LINKED REPORTS – by Yole Développement, System Plus Consulting and KnowMade
  - MEMS Pressure Sensor 2018 – Market & Technology Report
  - Gas & Particles 2018 – Market & Technology Report
  - LiDARs for Automotive and Industrial Applications 2018 – Market & Technology Report
  - LiDAR for Automotive 2018 – Patent Landscape Analysis
  - MEMS Packaging 2017 – Market & Technology Report

RF DEVICES AND TECHNOLOGIES
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Wireless technologies (Radar, V2X) for Automotive 2018
  - RF Standards and Technologies for Connected Objects 2018
  - RF & Photonic Components & Technologies for 5G Infrastructure 2018
- REVERSE COSTING® – STRUCTURE, PROCESS & COST REPORT – by System Plus Consulting
  - Automotive Radar Comparison 2018
- PATENT ANALYSES – by KnowMade
  - RF Acoustic Wave Filters 2017 – Patent Landscape Analysis
- LINKED REPORTS – by Yole Développement, System Plus Consulting and KnowMade
  - 5G impact on RF Front End Modules and Connectivity for Cellphones 2018 – Market & Technology Report – Update
  - RF Front End Modules for Cellphones 2018 – Patent Landscape Analysis
  - Advanced RF System-in-Package for Cellphones 2018 – Market & Technology Report – Update *
  - RF GaN 2018 – Patent Landscape Analysis

SOFTWARE
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Consumer Biometrics: Sensors & Software 2018 – Update
  - Processing Hardware and Software for AI 2018 - Vol. 1 & 2
  - From Image Processing to Deep Learning, Introduction to Hardware and Software Update : 2017 version still available / *To be confirmed
OUR 2018 REPORTS COLLECTION (2/4)

IMAGING & OPTOELECTRONICS

- **MARKET AND TECHNOLOGY REPORT** – by Yole Développement
  - Status of the Compact Camera Module and Wafer Level Optics
  - Industry 2018 – Update
  - 3D Imaging and Sensing 2018 – Update
  - Sensors for Robotic Vehicles 2018
  - Machine Vision for Industry and Automation 2018
  - Imagers and Detectors for Security and Smart Buildings 2018
  - Uncooled Infrared Imagers 2017

- **PATENT ANALYSES** – by KnowMade
  - iPhone X Dot Projector – Patent-to-Product Mapping

- **LINKED REPORTS** – by Yole Développement, System Plus Consulting and KnowMade
  - CMOS Image Sensors Monitor 2018 – Quarterly Update
  - Camera Module 2017 – Market & Technology Report
  - LiDARs for Automotive and Industrial Applications 2018 – Market & Technology Report
  - LiDAR for Automotive 2018 – Patent Landscape Analysis

ADVANCED PACKAGING

- **MARKET AND TECHNOLOGY REPORT** – by Yole Développement
  - Status of Advanced Packaging Industry 2018 – Update
  - Status of Advanced Substrates 2018: Embedded Die and Interconnects, Substrate Like PCB Trends
  - 3D TSV and Monolithic Business Update 2018 – Update
  - Power Modules Packaging 2018 – Update
  - Discrete Power Packaging 2018 – Update

  - Status of Panel Level Packaging 2018
  - Trends in Automotive Packaging 2018
  - Hardware and Software for AI 2018 - Vol. 1 & 2
  - Thin-Film Integrated Passive Devices 2018
  - Memory Packaging Market and Technology Report 2018 – Update*

- **PATENT ANALYSES** – by KnowMade
  - Hybrid Bonding for 3D Stack – Patent Landscape Analysis

- **LINKED REPORTS** – by Yole Développement and System Plus Consulting
  - Advanced RF System-in-Package for Cellphones 2018 – Market & Technology Report - Update*
  - Fan-Out Packaging 2018 – Market & Technology Report – Update*

MANUFACTURING

- **MARKET AND TECHNOLOGY REPORT** – by Yole Développement
  - Wafer Starts for More Than Moore Applications 2018
  - Equipment for More than Moore: Technology & Market Trends for Lithography & Bonding/Debonding 2018
  - Polymeric Materials for wafer-level Advanced Packaging 2018
  - Laser Technologies for Semiconductor Manufacturing 2017
  - Glass Substrate Manufacturing in the Semiconductor Field 2017
  - Equipment and Materials for Fan-Out Packaging 2017
  - Equipment and Materials for 3D TSV Applications 2017

- **LINKED REPORTS** – by Yole Développement and System Plus Consulting

Update : 2017 version still available / *To be confirmed
OUR 2018 REPORTS COLLECTION (3/4)

MEMORY
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Emerging Non Volatile Memory 2018 – Update
  - Memory Packaging Market and Technology Report 2018 – Update*
- QUARTERLY UPDATE – by Yole Développement**
  - Memory Market Monitor 2018 (NAND & DRAM)
- MONTHLY UPDATE – by Yole Développement**
  - Memory Pricing Monitor 2018 (NAND & DRAM)
- REVERSE ENGINEERING & COSTING REVIEW – by System Plus Consulting
  - DRAM Technology & Cost Review 2018
  - NAND Memory Technology & Cost Review 2018
- PATENT ANALYSES – by Knowmade
  - 3D Non-Volatile Memories – Patent Landscape

COMPOUND SEMICONDUCTORS
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Status of Compound Semiconductor Industry 2018*
  - GaAs Materials, Devices and Applications 2018
  - InP Materials, Devices and Applications 2018
  - Bulk GaN Substrate Market 2017
- LINKED REPORTS – by Yole Développement, System Plus Consulting and KnowMade
  - SiC Transistor Comparison 2018 – Structure, Process & Cost Report
  - Power SiC 2018 – Patent Landscape Analysis
  - GaN-on-Silicon Transistor Comparison 2018 – Structure, Process & Cost Report

POWER ELECTRONICS
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Status of Power Electronics Industry 2018 – Update
  - Discrete Power Packaging 2018 – Update*
  - Power Electronics for Electric Vehicles 2018 – Update
  - Integrated Passive Devices (IPD) 2018
  - Wireless Charging Market Expectations and Technology Trends 2018
  - Thermal Management Technology and Market Perspectives in Power
    - Electronics and LEDs 2017
    - Gate Driver 2017
    - Power MOSFET 2017
    - IGBT 2017
  - Market Opportunities for Thermal Management Components in Smartphones 2017
- LINKED REPORTS – by Yole Développement, System Plus Consulting and KnowMade
  - Power Modules Packaging 2018 – Market & Technology Report – Update
  - Power ICS Market Monitor 2018 – Quarterly Update**

BATTERY AND ENERGY MANAGEMENT
- MARKET AND TECHNOLOGY REPORT – by Yole Développement
  - Li-ion Battery Packs for Automotive and Stationary Storage Applications 2018 – Update
- PATENT ANALYSES – by Knowmade
- LINKED REPORTS – by Yole Développement and Knowmade
  - Solid State Electrolyte Battery 2018 – Market & Technology Report
  - Solid-State Batteries 2018 – Patent Landscape Analysis

Update : 2017 version still available / *To be confirmed / ** Can not be selected within an Annual Subscription offer
©2018 | www.yole.fr | About Yole Développement
OUR 2018 REPORTS COLLECTION (4/4)

SOLID STATE LIGHTING

- **MARKET AND TECHNOLOGY REPORT** – by Yole Développement
  - LiFi: Technology, Industry and Market Trends
  - LED Lighting Module Technology, Industry and Market Trends 2017
  - CSP LED Lighting Modules
  - Phosphors & Quantum Dots 2017 - LED Downconverters for Lighting & Displays
  - Horticultural Lighting 2017

- **LINKED REPORTS** – by Yole Développement and System Plus Consulting
  - VCSELs Comparison 2018 – Structure, Process & Cost Report

DISPLAYS

- **MARKET AND TECHNOLOGY REPORT** – by Yole Développement
  - Quantum Dots and Wide Color Gamut Display Technologies 2018 – Update
  - Displays and Optical Vision Systems for VR/AR/MR 2018

- **PATENT ANALYSES** – by KnowMade
  - MicroLED Display – Patent Landscape Analysis

MEDTECH

- **MARKET AND TECHNOLOGY REPORT** – by Yole Développement
  - BioMEMS & Non Invasive Emerging Biosensors: Microsystems for Medical
  - Applications 2018 – Update

- Point-of-Need Testing Application of Microfluidic Technologies 2018 – Update
- Neurotechnologies and Brain Computer Interface 2018
- CRISPR-Cas9 Technology: From Lab to Industries 2018
- Ultrasound Technologies for Medical, Industrial and Consumer Applications 2018
- Inkjet Functional and Additive Manufacturing for Electronics 2018
- Liquid Biopsy: from Isolation to Downstream Applications 2018
- Chinese Microfluidics Industry 2018
- Scientific Cameras for the Life Sciences & Analytical Instrumentation Laboratory Markets 2018*
- Artificial Organ Technology and Market 2017
- Connected Medical Devices Market and Business Models 2017
- Status of the Microfluidics Industry 2017
- Organs-On-Chips 2017
- Solid-State Medical Imaging 2017
- Medical Robotics Market & Technology Analysis 2017

- **PATENT ANALYSES** – by KnowMade
  - Microfluidic IC Cooling – Patent Landscape
  - Circulating Tumor Cell Isolation – Patent Landscape
  - OCT Medical Imaging – Patent Landscape
  - Pumps for Microfluidic Devices – Patent Landscape 2017
  - Microfluidic Technologies for Diagnostic Applications – Patent Landscape 2017
  - FLUIDIGM – Patent Portfolio Analysis 2017

- **LINKED REPORTS** – by Yole Développement, System Plus Consulting and KnowMade
  - Organs-On-Chips 2017 – Market & Technology Report
  - Organs-on-a-Chip – Patent Landscape Analysis

Update : 2017 version still available / *To be confirmed
OUR 2017 PUBLISHED REPORTS LIST (3/3)

OUR PARTNERS’ REPORTS

PATENT ANALYSES – by KnowMade
- Wireless Charging Patent Landscape Analysis
- RF Acoustic Wave Filters Patent Landscape Analysis
- NMC Lithium-Ion Batteries Patent Landscape Analysis
- Pumps for Microfluidic Devices Patent Landscape
- III-N Patent Watch
- FLUIDIGM Patent Portfolio Analysis
- Knowles MEMS Microphones in Apple iPhone 7 Plus Patent-to-Product Mapping 2017
- Consumer Physics SCiO Molecular Sensor Patent-to-Product Mapping
- Patent Licensing Companies in the Semiconductor Market - Patent Litigation Risk and Potential Targets
- Microfluidic Technologies for Diagnostic Applications Patent Landscape

TEARDOWN & REVERSE COSTING – by System Plus Consulting
More than 60 teardowns and reverse costing analysis and cost simulation tools published in 2017

MORE INFORMATION
- All the published reports from the Yole Group of Companies are available on our website www.i-Micronews.com.
- Ask for our Bundle Subscription offers: With our bundle offer, you choose the number of reports you are interested in and select the related offer. You then have up to 12 months to select the required reports from the Yole Développement, System Plus Consulting and KnowMade offering. Pay once and receive the reports automatically (multi-user format). Contact your sales team according to your location (see the last slide).
MICRONEWS MEDIA

About Micronews Media

To meet the growing demand for market, technological and business information, Micronews Media integrates several tools able to reach each individual contact within its network. We will ensure you benefit from this.

ONLINE

@Micronews e-newsletter
i-Micronews.com
i-Micronews.jp.com
FreeFullPDF.com

Unique, cost-effective ways to reach global audiences.
Online display advertising campaigns are great strategies for improving your product/brand visibility. They are also an efficient way to adapt with the demands of the times and to evolve an effective marketing plan and strategy.

ONSITE

Events

Brand visibility, networking opportunities
Today’s technology makes it easy for us to communicate regularly, quickly, and inexpensively – but when understanding each other is critical, there is no substitute for meeting in-person. Events are the best way to exchange ideas with your customers, partners, prospects while increasing your brand/product visibility.

IN PERSON

Webcasts

Targeted audience involvement equals clear, concise perception of your company’s message. Webcasts are a smart, innovative way of communicating to a wider targeted audience. Webcasts create very useful, dynamic reference material for attendees and also for absentees, thanks to the recording technology.

Benefit from the i-Micronews.com traffic generated by the 11,200+ monthly unique visitors, the 10,500+ weekly readers of @Micronews e-newsletter

Several key events planned for 2018 on different topics to attract 120 attendees on average

Gain new leads for your business from an average of 340 registrants per webcast

Contact: Camille Veyrier (veyrier@yole.fr), Marketing & Communication Project Manager
CONTACT INFORMATION

- CONSULTING AND SPECIFIC ANALYSIS, REPORT BUSINESS
  
  - North America:
    
    • Steve LaFerriere, Senior Sales Director for Western US & Canada
      Email: laverriere@yole.fr – +1 310 600-8267
    
    • Troy Blanchette, Senior Sales Director for Eastern US & Canada
      Email: troy.blanchette@yole.fr – +1 704 859-0453
  
  - Japan & Rest of Asia:
    
    • Takashi Onozawa, General Manager, Asia Business Development (India & ROA)
      Email: onozawa@yole.fr - +81 34405-9204
    
    • Miho Othake, Account Manager (Japan)
      Email: ohtake@yole.fr - +81 3 4405 9204
    
    • Itsuyo Oshiba, Account Manager (Korea & Singapore)
      Email: oshiba@yole.fr - +81-80-3577-3042
  
  - Greater China: Mavis Wang, Director of Greater China Business Development
    Email: wang@yole.fr - +886 979 336 809
  
  - Europe: Lizzie Levenez, EMEA Business Development Manager
    Email: levenez@yole.fr - +49 15 123 544 182
  
  - RoW: Jean-Christophe Eloy, CEO & President, Yole Développement
    Email elo@yole.fr - +33 4 72 83 01 80

- FINANCIAL SERVICES (in partnership with Woodside Capital Partners)
  
  • Jean-Christophe Eloy, CEO & President
    Email: elo@yole.fr - +33 4 72 83 01 80
  
  • Ivan Donaldson, VP of Financial Market Development
    Email: ivan.donaldson@yole.fr - +1 208 850 3914

- CUSTOM PROJECT SERVICES
  
  • Jérome Azémard, Technical Project Development Director
    Email: azem@yole.fr - +33 6 27 68 69 33

- GENERAL
  
  • Sandrine Leroy, Director, Public Relations
    Email: leroy@yole.fr - +33 4 72 83 01 89 / +33 6 33 11 61 55
  
  • Email: info@yole.fr - +33 4 72 83 01 80

©2018 | www.yole.fr | About Yole Développement

Follow us on