MERCK KGAA, DARMSTADT, GERMANY–

BANK OF AMERICA MERRILL LYNCH GLOBAL HEALTHCARE CONFERENCE 2019

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Disclaimer

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Participants in Solicitation
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Agenda

01 BUSINESS OVERVIEW

Group

Three high-tech businesses competing in attractive markets

Leading in specialty pharma markets

- Biologics and small-molecule **prescription medicines** against cancer, multiple sclerosis, infertility
- **Research** focus: Oncology, Immunology & Immuno-Oncology
- **Successful portfolio management:** e.g. divestment of Consumer Health business

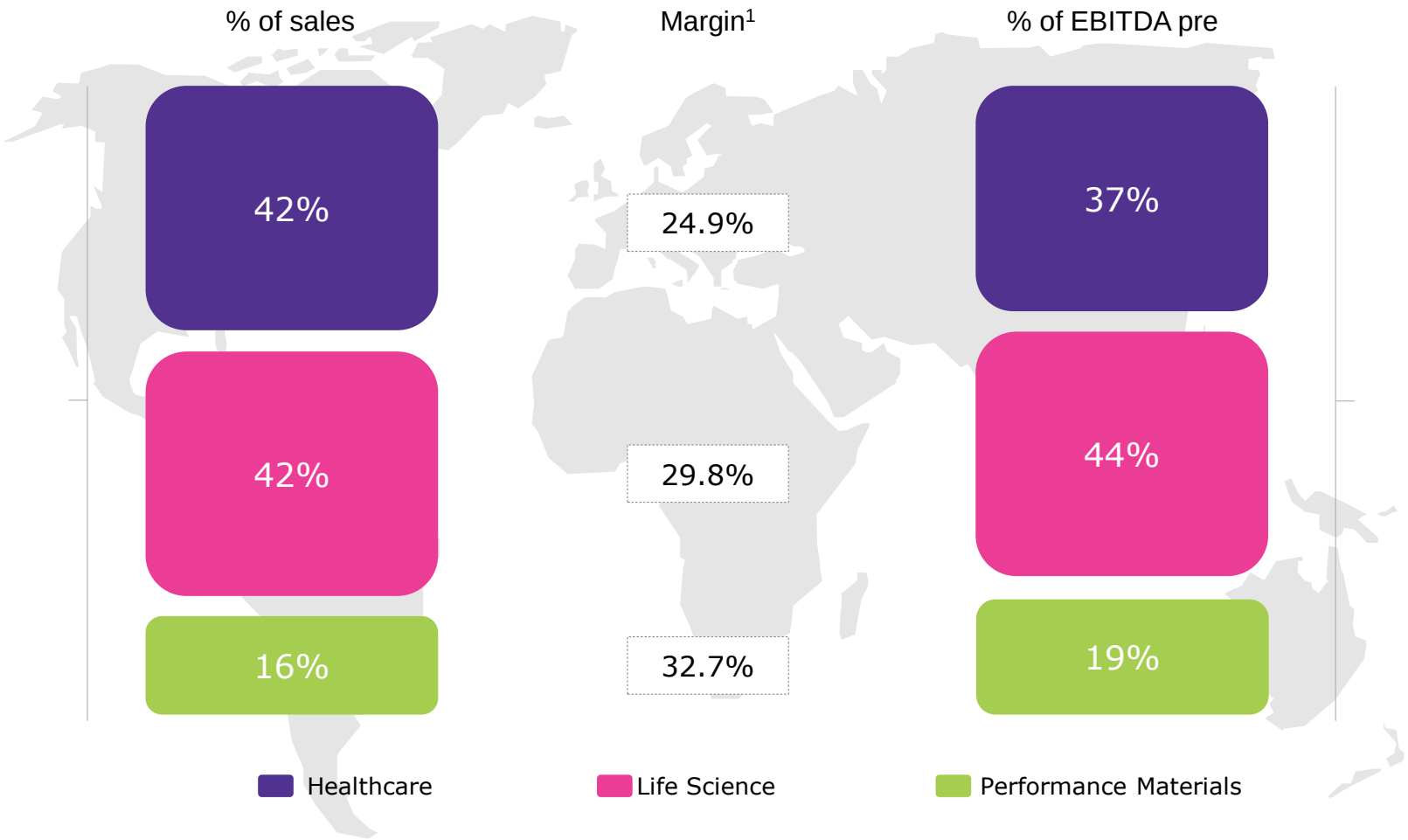
Leading life science company

- Tools and services for **biotech research & production**
- **Tools and laboratory supply** for academic research and industrial testing

Leading company in high-tech solutions

- High-tech solutions and materials for **electronics**
- Broad portfolio of **decorative and functional solutions**

Group
Strong businesses with attractive margins



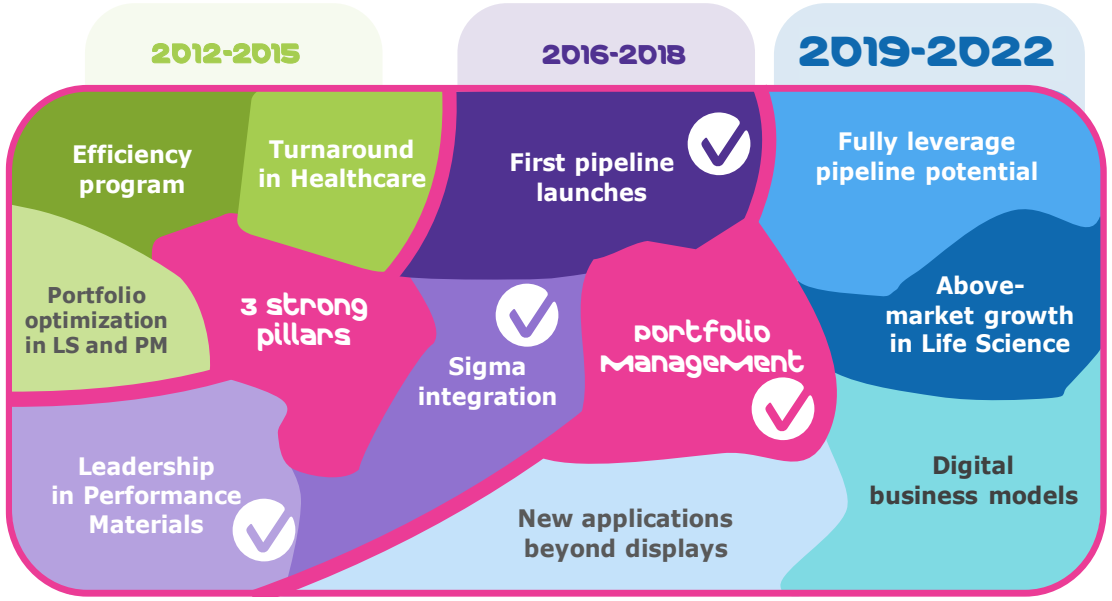
FY 2018
Sales:
€14,836 m

FY 2018
EBITDA pre[2]:
€3,800 m

[1]EBITDA pre margin in % of net sales; [2]Including Corporate/Others (-€382 m)

02 TRANSFORMING THE COMPANY

Group
Strategic roadmap 2016-2022



Group:
Sustainable profitable growth and regular portfolio evaluation

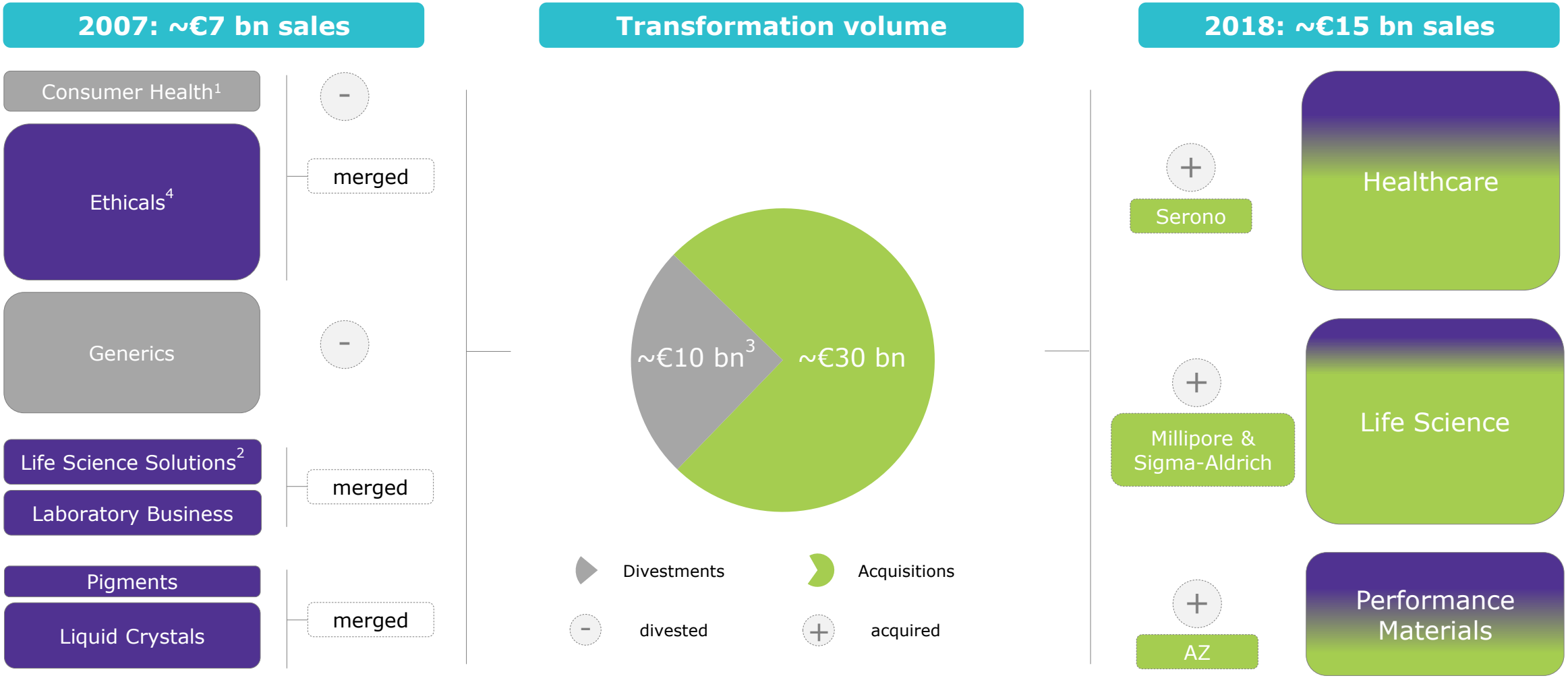
Healthcare:
Fully leveraging pipeline potential

Life Science:
Sustaining above-market growth

Performance Materials:
On track towards a Bright Future

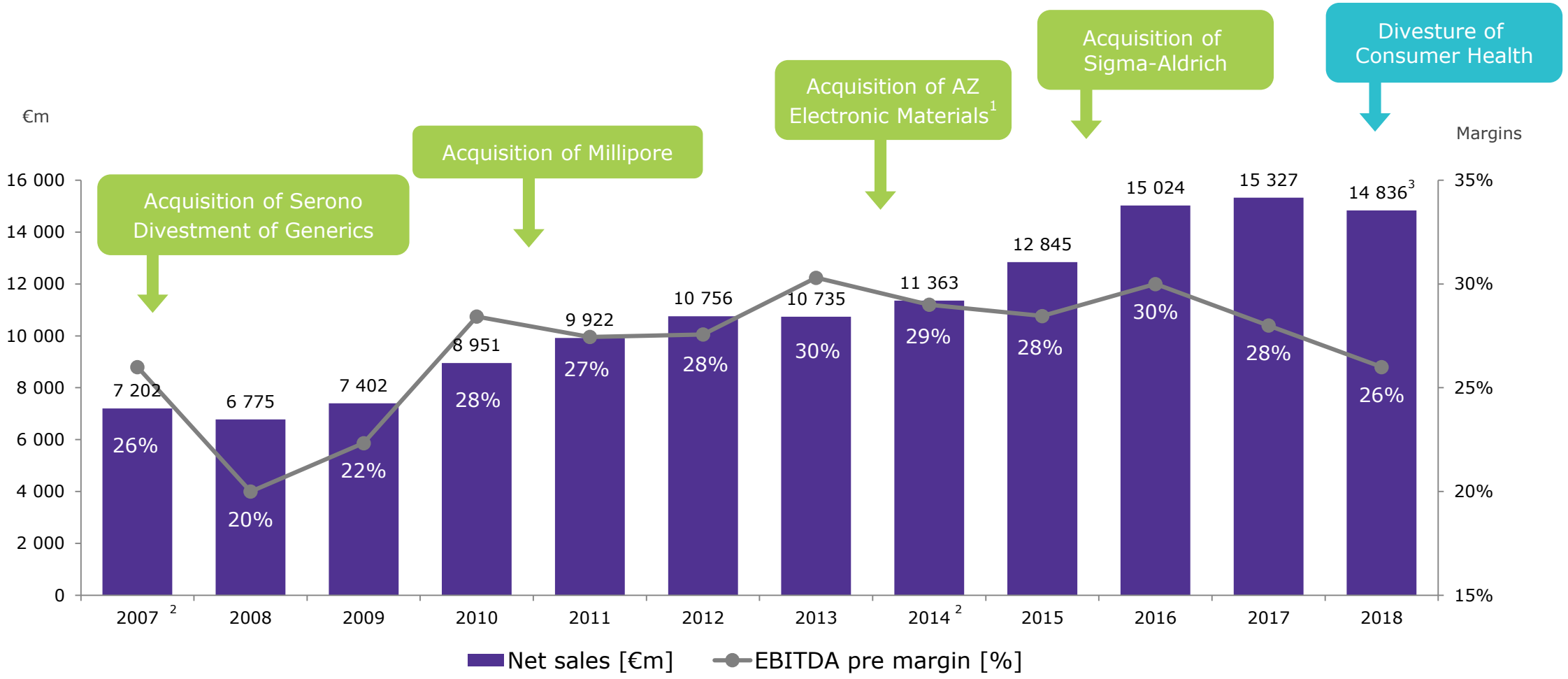
On track to deliver on the growth phase of the 2016-2022 strategic agenda

Group
We have added scale and strengthened the attractiveness of our portfolio



[1]Closing of sale of Consumer Health at a cash purchase price of € 3.4 billion completed as of December 1 2018; [2]Excluding "Crop Bioscience", which was divested;
[3]Profroma divestment volume includes cash proceeds for Consumer Health [4]Excluding "Theramex", which was divested;

Group
Continue to transform to a science and technology focused company

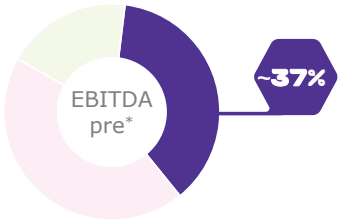


[1]Included since 2 May 2014; [2]2007 and 2014 EBITDA pre margin adjusted for comparability; [3]2018 net sales reflect Consumer Health divesture (reduction of ~ €1 bn net sales p.a.)

Group

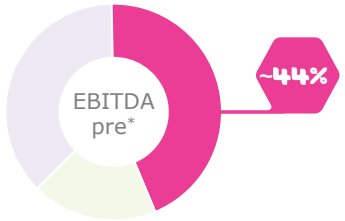
Clear set of priority goals

Healthcare



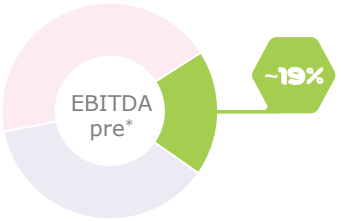
- **Deliver on ambition to keep core business at least stable until 2022**
- **Transition from investment to earnings phase by 2019**
- **Foster successful Bavencio® and Mavenclad® ramp up**
- **Stringent pipeline execution**

Life science



- **Strengthen position as differentiated player in a highly attractive market**
- **Maintain consistent above-market growth trajectory and superior profitability**
- **Implement dynamic strategy for future profitable growth**

Performance Materials



- **Deliver on growth ambition of 2-3% CAGR**
- **Implement 5-year transformation program**
- **Ensure efficient resource allocation to reach financial ambition of 30% margin**
- **Maintain strong cash generation and cash conversion**

*based on FY 2018 reported EBITDA pre, excluding Corporate & Other

Group

Strategic capital allocation until 2022 newly defined

portfolio guardrails

- Three balanced pillars with no business marginalized
- Leading market positions in attractive markets
- Clear portfolio roles assigned

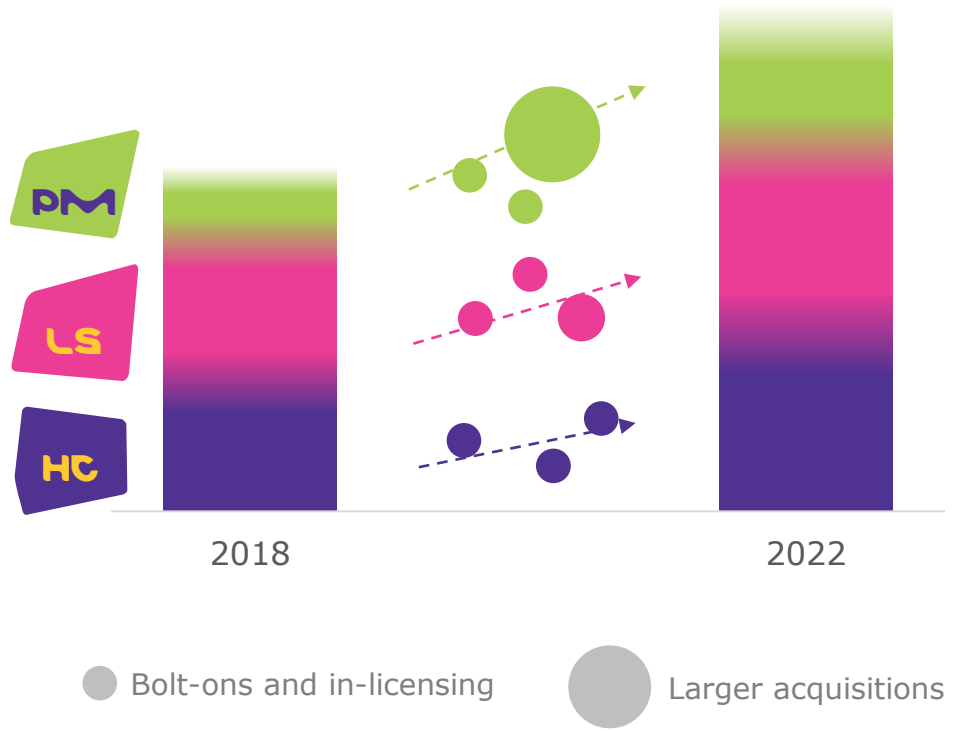
defining portfolio criteria

- Market attractiveness & capabilities
- Best strategic owner
- Risk profile

clear financial M&A criteria

- IRR > WACC
- EPS pre accretive
- Maintain investment-grade credit rating

Illustration Merck's KGaA, Darmstadt, Germany sales and earnings drivers



Regular portfolio review and disciplined capital allocation will continue to ensure sufficiently diversified and value-creating structure of three strong pillars

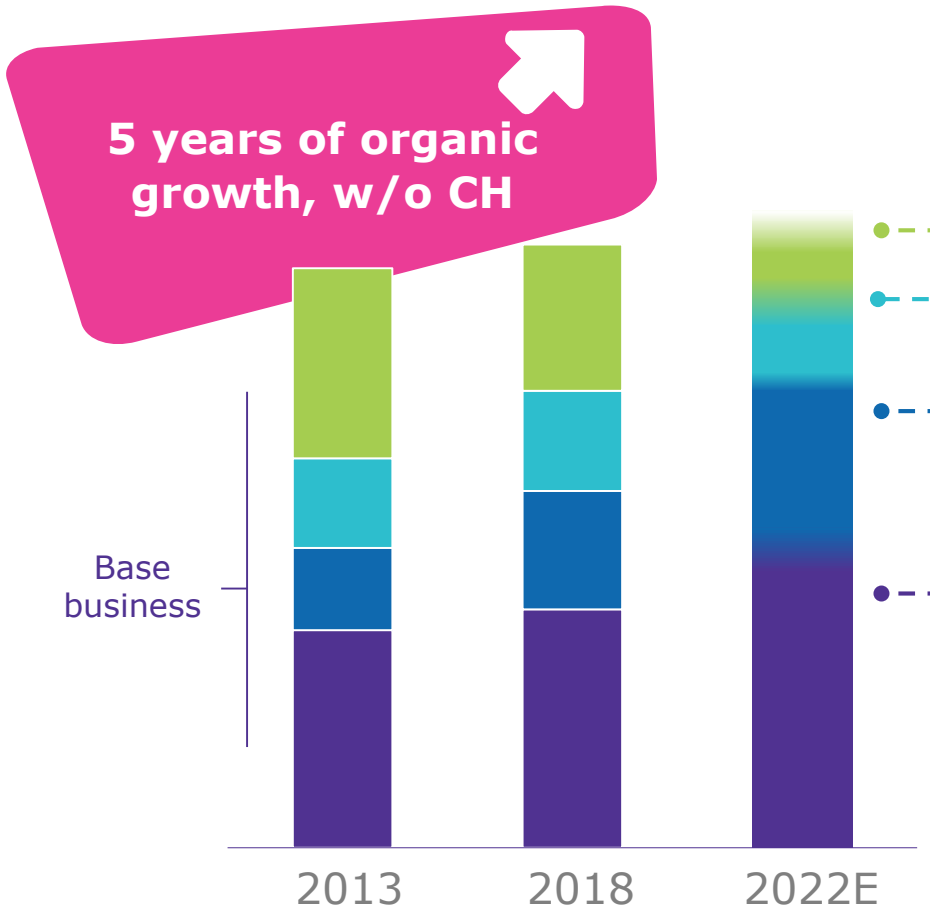
D3 HEALTHCARE

Funding for success

Healthcare

Ambition to keep core business sales organically stable until 2022

Healthcare core business net sales until 2022



Rebif®
Decline in line with interferon market

- Maintaining solid track record of patient retention
- Integration into joint franchise strategy with Mavenclad®

Erbitux®
Stable to slightly growing

- Driving emerging markets growth
- Inclusion in China's NRDL
- Mitigate price and competitive pressure in EU by clear Erbitux® franchise positioning

Fertility
Mid single-digit growth

- Drug demand driven by emerging markets growth and demographics
- Differentiation due to coverage of the entire ART portfolio[1]
- Sustainable growth through innovation (e.g. Pergoveris® pen)

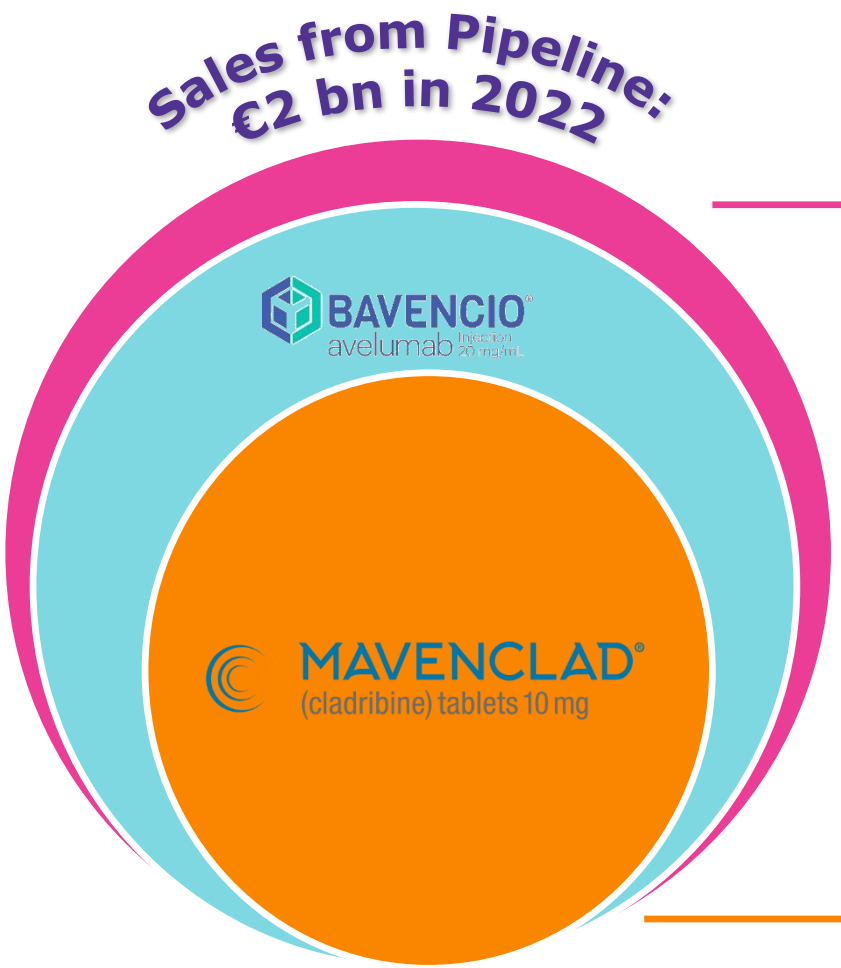
General Medicine[2]
Mid to high single-digit growth

- Increasing prevalence of diabetes and cardiovascular diseases
- Emerging markets growth
- Effective lifecycle management

[1]ART: Assisted Reproductive Technology; [2]includes General Medicine, CardioMetabolic Care (CMC), Endocrinology & Allergopharma

Healthcare

Mavenclad® and Bavencio® launches on track for €2 bn pipeline sales ambition



Tepotinib

- Filing in Japan and USA as of 2020

Bavencio®

- FY2019E: high double digit €m (H1 2019: €45 m)
- Approved for aRCC (USA), mMCC (50 countries incl. USA and EU), and UC 2L (USA, Canada, Israel)
- Several Phase III trial read outs remaining

Mavenclad®

- Approved in 69 countries, including USA, EU, Canada and Australia
- FY2019E: up to mid-triple digit €m (H1 2019: €105 m)
- Global peak sales: €1–1.4 bn

ILLUSTRATIVE - Not to scale

Healthcare

Mavenclad® continuing to make launch progress in 69 countries

MAVENCLAD® (cladribine) tablets 10 mg

Ex-USA

- **Approved in 69 countries** (reimbursed in ~50%)
- **Continuous improvement of clinical perception**[1]
- **Increasing share of high-efficacy dynamic patients (new + switch) in major launch markets vs LY**
  - Germany: from 9% to 14% (Q1/18 vs Q1/19) [2]
  - UK: from 8% to 20% (Q1/18 vs Q1/19) [3]
- **Increasing use in earlier lines of therapy**

USA
Approved on March 29, 2019

- **Positive, early payer acceptance:**

- **Leading share of voice**[4]
- **~ 86% of neurologists willing to prescribe**[5]
- **Broad spectrum of early adopters**[6]
- **Mavenclad® with ~ 7% of high efficacy dynamic share**[7] (new + switch, RRMS and active SPMS, May to July)

On track for up to mid-triple digit €m sales in 2019

1: Global MAVENCLAD ATU; 2: IQVIA LRx data, consolidated retail + hospital data; 3: IQVIA HMSL data; 4: IQVIA/BrandImpactRx Report, rolling 3 months end July 2019; 5: Spherix Global Insights RealTime Dynamix – MS Q2/19; 6: MSLifelines Service Request Forms, IQVIA Claims data, Global ATU Q2, 2019; 7: Source: IQVIA/BrandImpactRx Report, rolling 3 months end July 2019, 17 weeks post approval; Acronyms: HE = High Efficacy, NDC = National Drug Code, RRMS = Relapsing-Remitting Multiple Sclerosis, SPMS = Secondary Progressive MS

Healthcare

Bavencio® recently approved for advanced Renal Cell Carcinoma

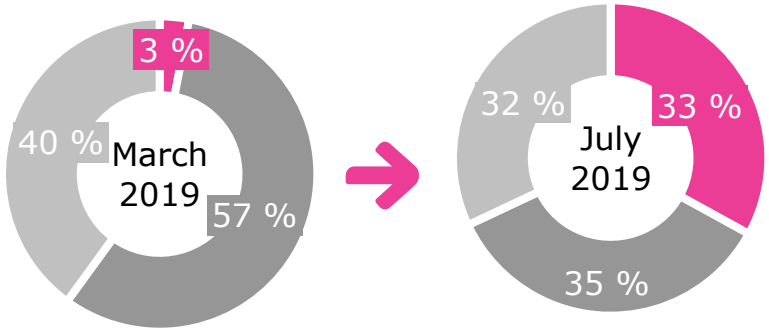
Regulatory Achievements

- Approved by **US FDA** for 1L treatment of advanced Renal Cell Carcinoma (RCC) on May 15, 2019
- Submitted to **Japanese authorities** in January 2019
- Validated by **EMA** in March 2019

BAVENCIO® avelumab Injection 20 mg/mL

USA – Commercial Update[1]

1L New Patient Share[1]:



- **Leveraging Pfizer's heritage and commercial strength** in advanced RCC
- **IO–TKI established as the leading class** in 1L mRCC, with all other classes declining[1]
- **Bavencio®-Inlyta®** establishing itself with **~13% share** of growing IO-TKI class[2]

IO-TKI Others IO-IO

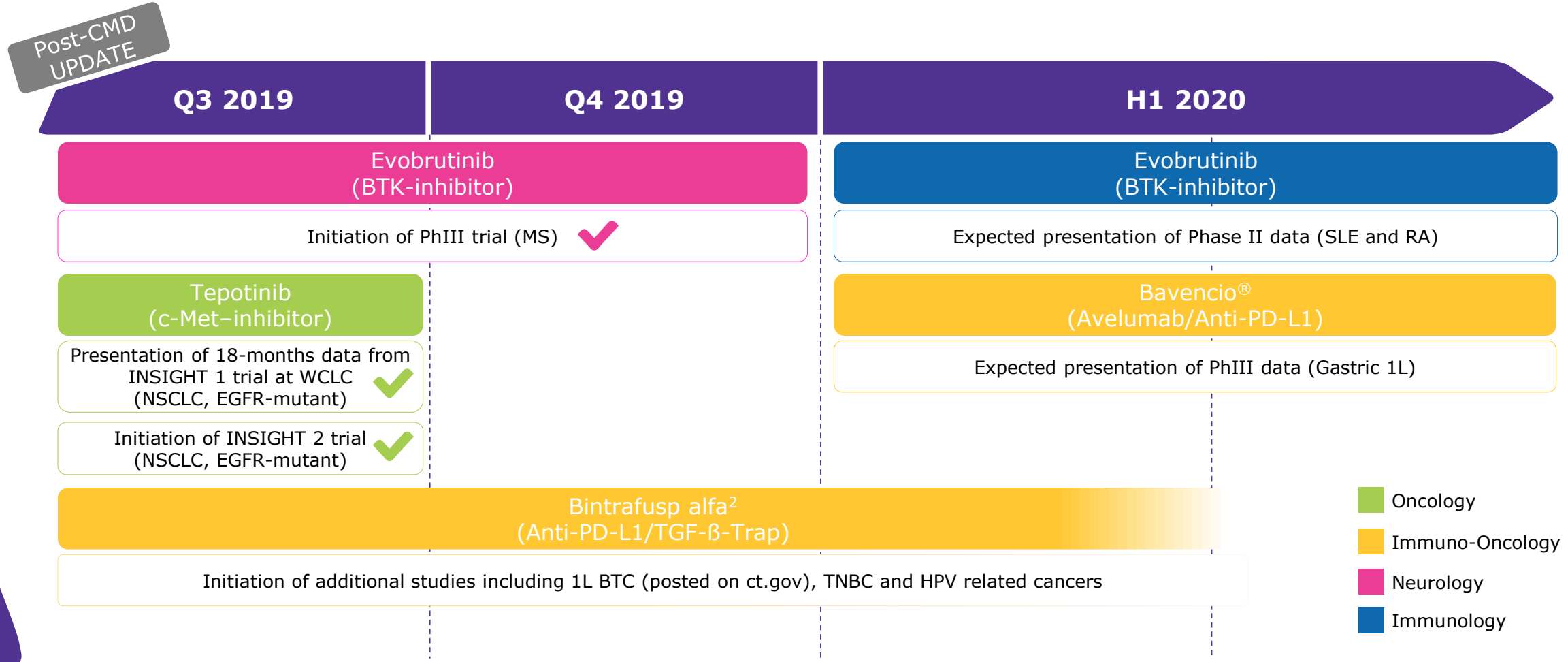
Remaining Phase III Trials[3]

2019	2020	2021
November: **Gastric 1L**	June: **Urothelial 1L** **NSCLC 1L**	**Locally advanced head & neck**

1: BrandImpact Rx - 1L New Patient Start Share, Rolling 3 Months Ending July 2019, decline since Q1 2019 (VEGF mono, IO-IO); 2: BrandImpact Rx – 1L New Patient Share Monthly, Rolling 8 Weeks; 3: Dates shown refer to estimated primary completion date as per www.clinicaltrials.gov; Acronyms: EMA = European Medicines Agency, FDA = Food and Drug Administration; IO = Immuno-Oncology, mRCC = Metastatic Renal Cell Carcinoma, TKI = Tyrosine Kinase Inhibitor, VEGF = Vascular Endothelial Growth Factor

Healthcare

A year of continued pipeline development ahead[1]



[1] Note: All timelines are event-driven and may be subject to change; [2] proposed International Nonproprietary Name (INN); Acronyms: BTC = Biliary Tract Cancer, BTKi = Bruton's Tyrosine Kinase Inhibitor, FDA = US Food & Drug Administration, IA = Interim Analysis, MS = Multiple Sclerosis, NSCLC = Non-small Cell Lung Cancer, RA = Rheumatoid Arthritis, SLE = Systemic Lupus Erythematosus, TNBC = Triple-Negative Breast Cancer

04 LIFE SCIENCE

Focus on profitable growth

Life Science

The Life Science market is driven by distinct sustainable trends

- Increase in **NIH Funding and Pharma R&D**[1,2]
- Increase in **novel technologies**[3]
- Increase in **research outsourcing**[4]

- Increase in **biologics pipeline**[5]
- More **novel modalities** (>30% CAGR)
- Greater **production outsourcing**[6]

- Higher **Drug standards** (e.g. in China)[7]
- Tighter **F&B regulations** (e.g. US FSMA[8])
- More **novel assays/diagnostics**

Research

~€45-50 bn
~2-3% CAGR[9]

Process

~€55-60 bn
~8% CAGR[9]

Applied

~€60-65 bn
~4-5% CAGR[9]

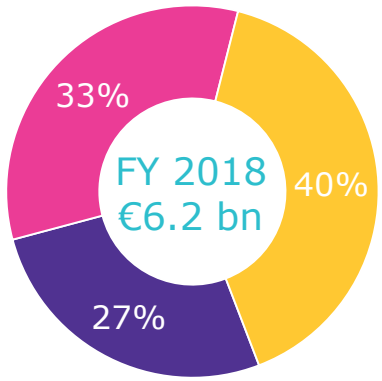
Life Science market

~€170 bn, ~4-6% CAGR[10]

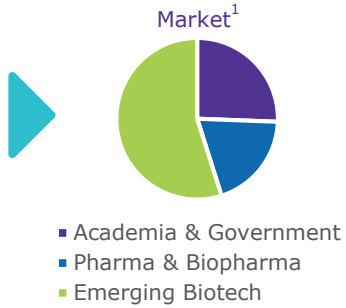
1: CAGR 2015-2019; 2: PhRMA members, CAGR 2013-2017; 3: CAGR 2014-2018 VC investment into platform technologies; 4: CAGR 2015-2022. Discovery outsourcing market; 5: CAGR through 2020, 6. CAGR 2016-2020; 7: International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use, 8: Food Safety Modernization Act implementation through 2024; 9: Total market CAGR; 10: Company estimate based on industry forecast over 5 year horizon; Acronyms: NIH = National Institutes of Health, US FSMA = FDA Food Safety Modernization Act

Life Science
Business is on track to deliver above-market organic growth

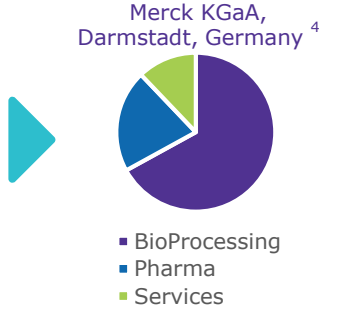
Merck KGaA, Darmstadt, Germany
Life Science



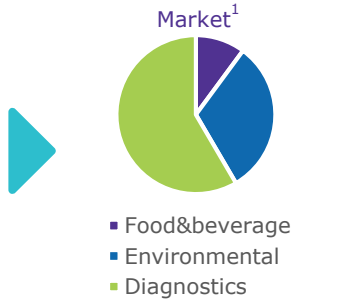
Research Solutions
Low single digit growth



Process Solutions
High single digit growth



Applied Solutions
Mid single digit growth



Long-term growth drivers

- **Research activity**: >3,000 projects in research pipelines[2], rising number of experiments and newly emerging therapies/technologies backs healthy growth in biotech and CROs[3]
- **Public and private funding**: availability, access and predictability drive demand from academia and emerging biotech customers
- **Regulation**: rising requirements foster long-term customer partnerships

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- **Biologics**: mAbs production[5] growing by ~11-15% p.a. for 2018-2024 driven by new molecules and biosimilars
- **Diversification**: contribution by top 10 molecules will decline to ~20% until 2024 from 60% today[6]
- **Noval modalities**: innovation in complex-to-deliver therapies, e.g. gene and cell therapy, will drive demand for single-use, end-to-end and new technology solutions

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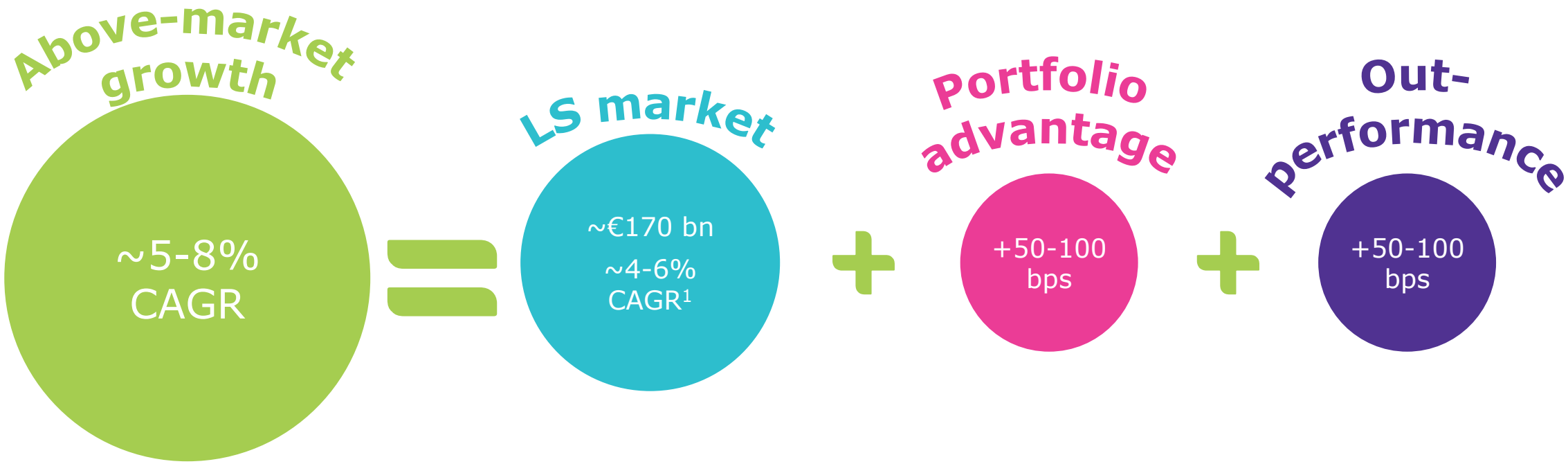
- **Regulation**: testing volumes overall are rising globally rise in quality standards and increased demand for testing across customer segments
- **Population and economic growth**: demand for access to more sophisticated products and services rises, e.g. in emerging markets
- **Speed**: need for fast testing results raises requirements for Applied customers, esp. in clinical testing and food & beverage testing

[1]Source: Merck KGaA, Darmstadt, Germany Factbook; [2]Source: PhRMA; [3]CRO = Contract Research Organization; [4]Indicative only; [5]mAbs = monoclonal antibodies; [6]Source: EvaluatePharma September 2018

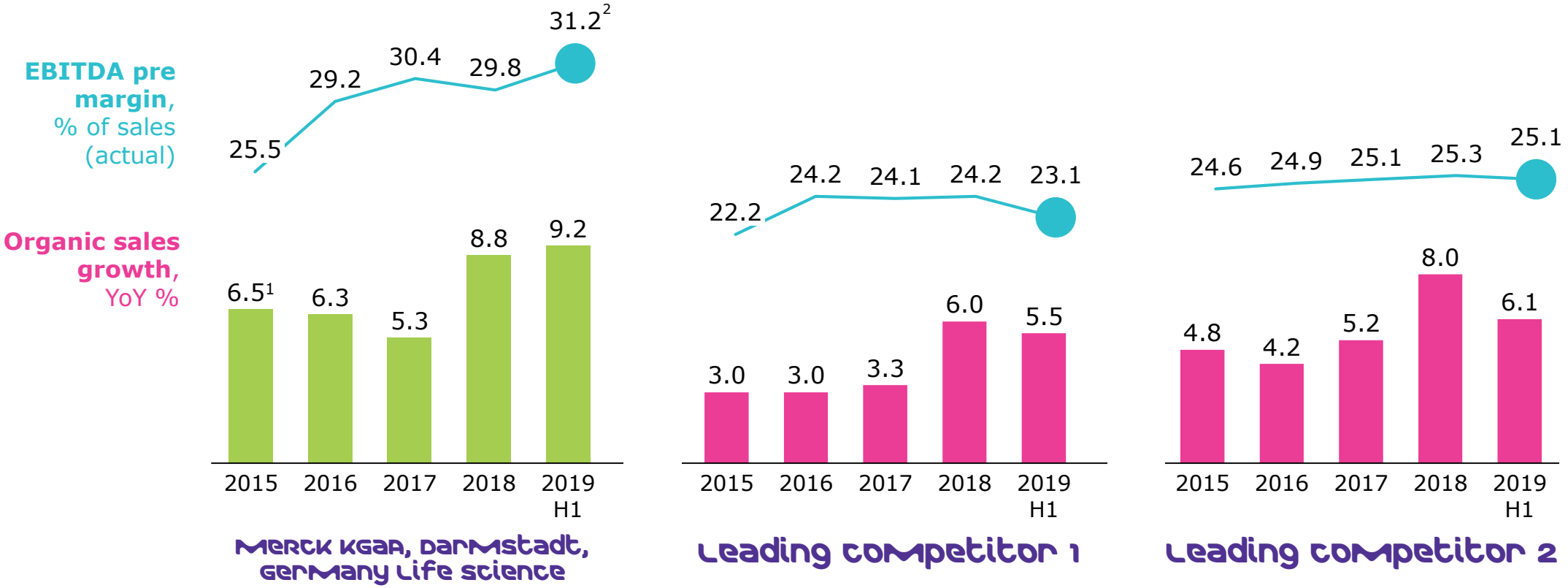
Life Science

Above-market growth continues to be driven by portfolio focus



1: Company estimate based on industry forecast over 5 year horizon

Life Science
We continue to set the benchmark for industry performance



Objective

- Grow **above market**
- Maintain **industry-leading profitability with 20-30 bps underlying margin progression**
- Sustain **leading market position**

1: 6.5% for EMD Millipore; 6.0% for SIAL calculated from first 9 months of 2015; 2: excl. CO

Life Science

Investing into innovation for future profitable growth

New product sales doubled in the past 5 years

Sales from recent launches[1]
% of net sales

External recognition

CPhI worldwide

2018: Excellence in innovation Parteck® MXP Excipient & modified amino acid

INTERPHEX

2019: Exhibitor Award for Best New Product (Pellicon® Capsule with Ultracel® Membrane)

2018: Exhibitor Award for Best Technological Innovation (Millistak+® HC Pro portfolio)

R&D 100

2018: BioReliance® Viral & Gene Therapy Assay Portfolio & Proxy-CRISPR Technology

2018: Corporate Social Responsibility

2017: Sanger Arrayed Lentiviral CRISPR Libraries

1: Launches from last 4+1 years excluding sales of year of launch

Life Science

Leveraging both organic and inorganic levers for growth

Organic –
Global capacity expansion

Asia: e.g. manufacturing and distribution centers in South Korea, China and India (2018)

North America: e.g. BioReliance® End-to-End Biodevelopment Center in Burlington, USA (2018)

Europe: e.g. M Lab™ Collaboration Center in Molsheim, France (2019)

Inorganic – Transformative M&As and bolt-ons for strategic growth

2010: **Millipore** (US$7 bn)

2015: **Sigma-Aldrich** (US$17 bn)

2017: **BioControl** – Food Safety Testing

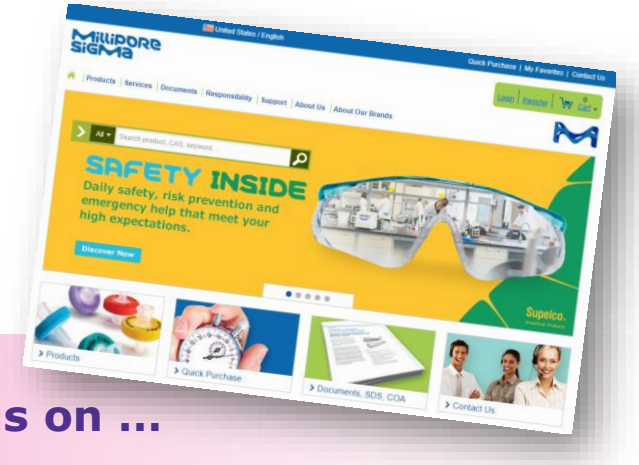
…

Strategic alliances –
Exploring novel growth opportunities

- **Broad Institute (MIT and Harvard)** (2019) – accelerating access to CRISPR intellectual property for research
- **TRANSVAC2 (part of EU's Horizon 2020)** (2019) – advancing vaccine development and manufacturing
- **GenScript** (2019) – accelerating Cell and Gene Therapy industrialization in China

Life Science

Strengthening the #1 eCommerce site in Life Science through increased agility and greater customer-centricity



Best-in-class eCommerce

Continued enhancements driven by focus on …

- **Content** – Informative content with easy access
- **Geographic fit** – Tailored to local preferences
- **Scalability** – Best-in-class site
- **Connectivity** – Enabling dialogue within the scientific community

Leading Life Science website

- **>€1.5 bn sales**
- **>420 million annual page views**
- Rated **#1 website for traffic**[1]

1: Rated by external service SimilarWeb

05 PERFORMANCE MATERIALS

Maintaining leadership and innovation

Performance Materials
A leading player in the electronic materials market

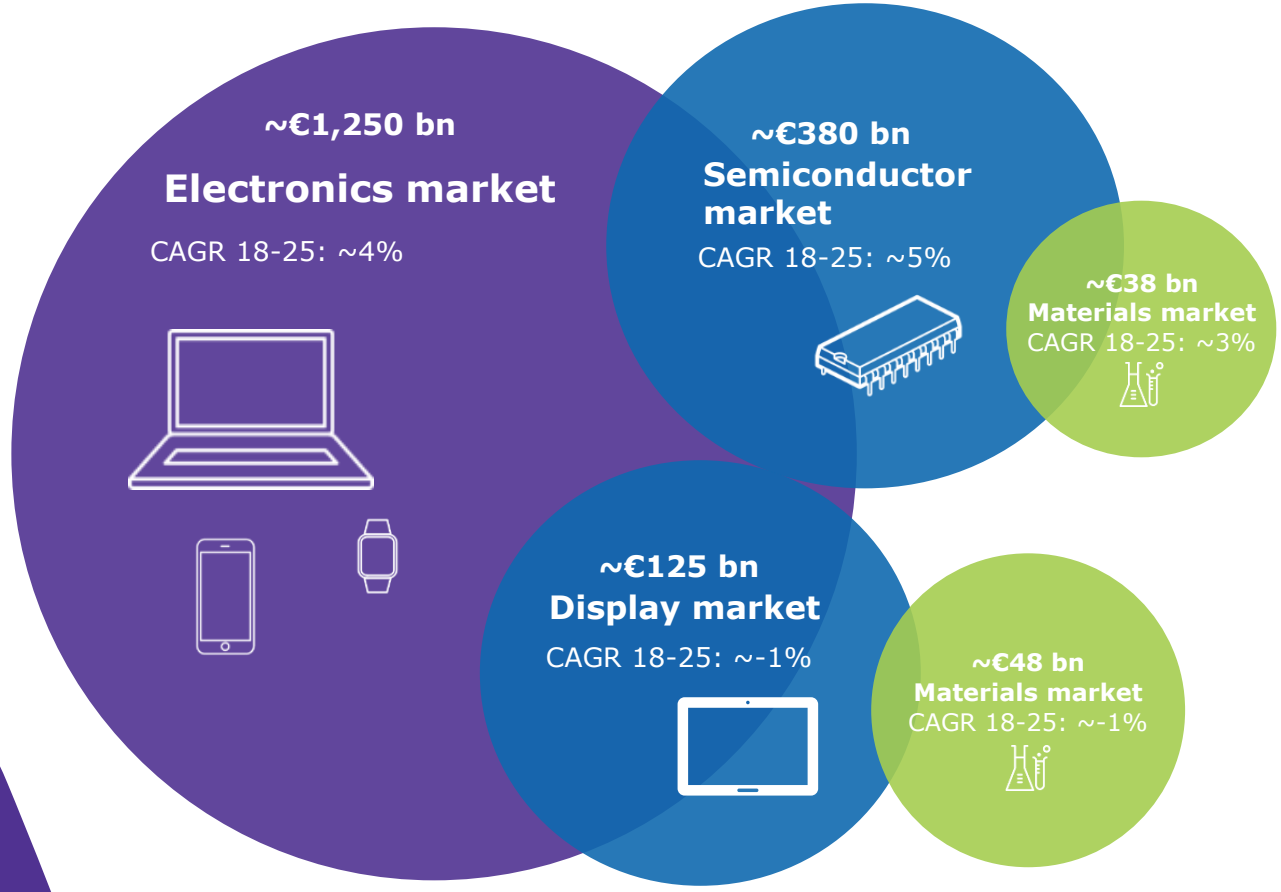
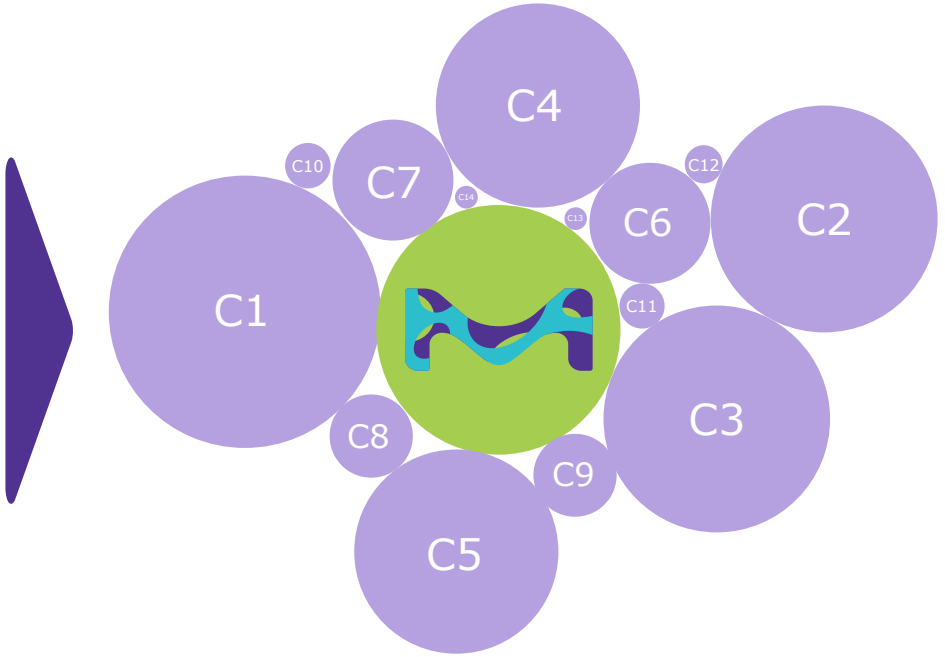


Illustration of the electronics market and thereof its selected sub markets

Electronic materials competitor landscape[1]



[1]Bubble size in competitive landscape illustrates share of semiconductor and display material sales of indicated competitors (C1 – C14)

[1]Source: Linx 2018, Research & Markets 2017, Semi 2015, McClean/IC Insights 2018, IC insights, Gartner 2017, Prismark 2018, FujiChimera, IHS, Market size as of 2017

Performance Materials
Three high-tech pillars serving a diverse customer base

Business allocation within Performance Materials		% sales FY2018	Products
Integrated Circuit Materials	semiconductor solutions	~25%	• Dielectrics, colloidal silica, lithography materials, yield enhancers, edge-bead removers • Polyimide raw materials and printing materials
Display Materials	display solutions	~55%	• Liquid crystals (LC) and photoresists for TVs, smartphones and tablet computers • Other display and non-display applications (e.g. LC Windows) • Organic and inorganic light emitting diodes
Pigments and Functional Materials	surface solutions	~20%	• Effect pigments and functional materials for coatings, plastics, printing and cosmetics • Functional materials for cosmetics & special applications • Functional materials for electronics and energy solutions

Implement 5-year transformation program

Performance Materials
5-year transformation program Bright Future is well on track

Back to organic growth

2-3% CAGR

Resource allocation & process excellence

~30% Margin

- Site closures in Atsugi, Japan (2021) and Chilworth, UK (2019) announced
- Outsourcing progressing; reduction of LC production capacity in Darmstadt until 2022 announced
- Cost saving measures ahead of plan; target of approx. 500 FTE worldwide until 2022

Portfolio Management

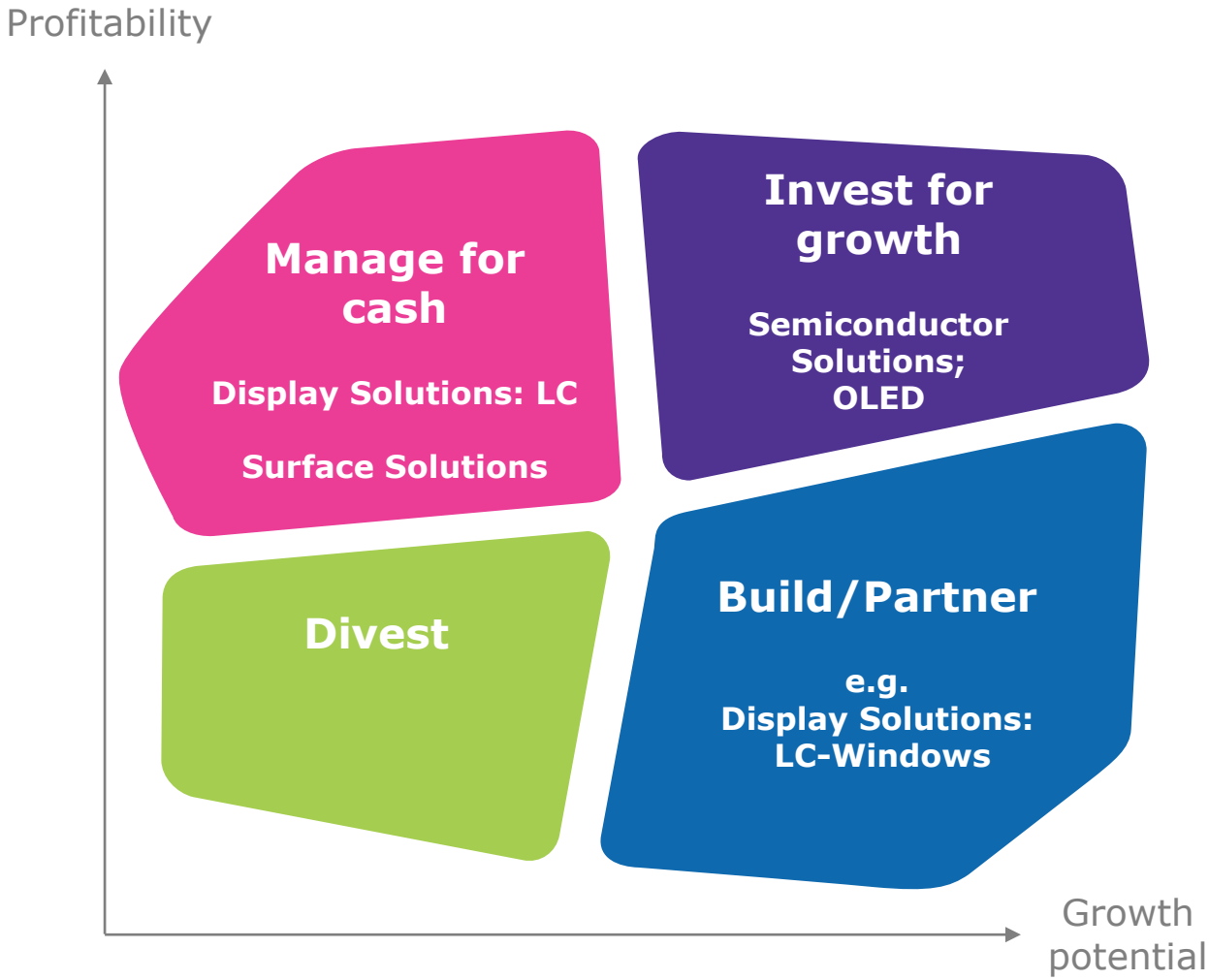
- Acquisition of Versum Materials and Intermolecular expected to close in H2 2019

Cultural change

- Significant changes in composition of leadership team
- Cultural change addressed in three dedicated initiatives focused on customer centricity, market-driven innovation and corporate culture

Performance Materials

Business portfolio management drives capital allocation and enables future value creation



Invest for growth

- Strong and sustainable market growth
- Leading positions and attractive growth opportunities

Manage for cash

- Mature and lucrative market segments
- Invest in extension, while managing for profit

Build or Partner

- Early industry cycles with strong potential
- Strictly prioritize and diversify risk

Divest

- Regular review for better strategic owner

Performance Materials
Strategic roadmap starting to materialize…

Measures for a bright future

Darmstadt

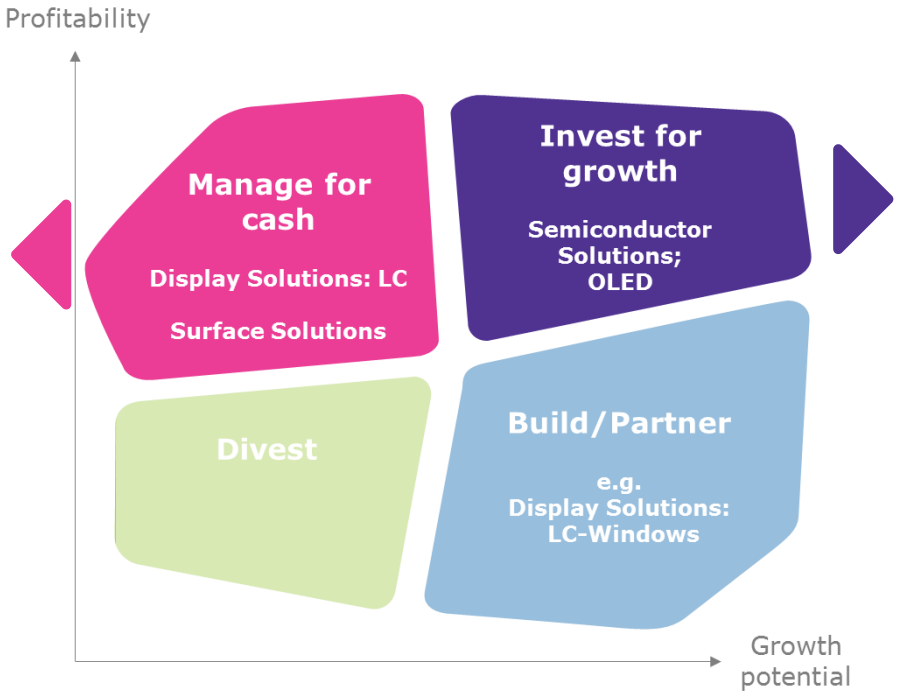
- The focus in Darmstadt will be on R&D and production
- Immediate bottom line contribution from 2019 onwards
- Reduce the number of FTEs by ~15% = ~400 FTEs

Chilworth

- Closing of Chilworth site expected during September 2019

Atsugi

- Shut down of Performance Materials activities at Atsugi site started (to be completed during 2021)
- R&D and production activities in Atsugi transferred and consolidated in other PM locations in Asia
- Consolidation of site structure in Japan



VERSUM MATERIALS

- Leading supplier of high-purity process chemicals, gases and equipment serving semiconductor manufacturers
- Track record of accelerated growth and industry leading profitability

➢ Creating a **leading electronic materials player** with **attractive long-term prospect**

INTERMOLECULAR®

- Leading in advanced materials innovation
- Acquisition to strengthen semiconductor technology offering

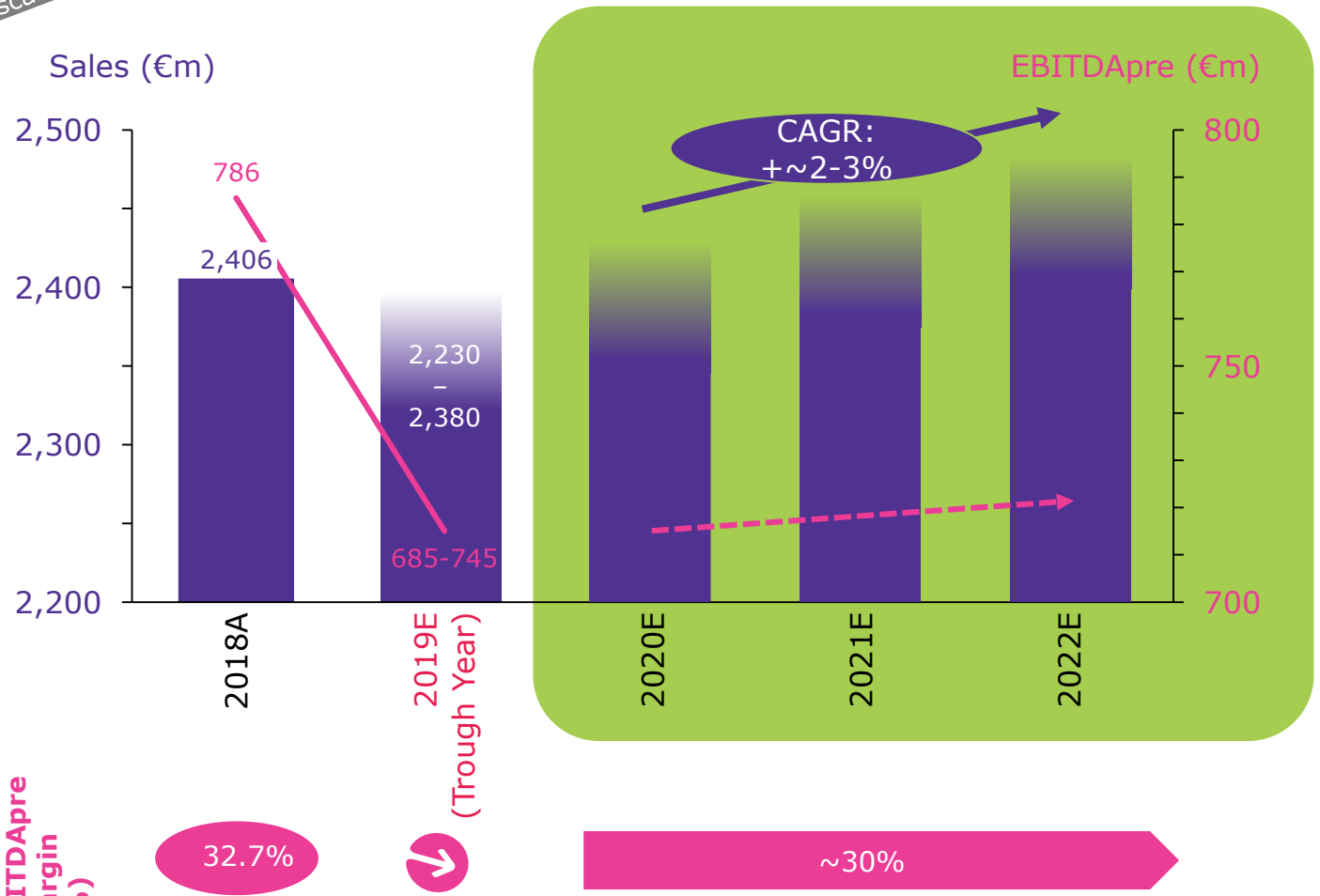
➢ Application specific **materials expertise with** that **perfectly complement** Group's business and technology portfolio

Bottom-line management to support margin ambition of 30% in the long-term

Both transactions are expected to close in H2 2019

Performance Materials
The business is expected to return to organic growth as of 2020

ILLUSTRATIVE
Not to scale



Contribution by business

Semiconductor Solutions
Mid- to high-single digit growth

Surface Solutions
Low single digit growth

Display Solutions
Low single digit decline
- OLED
- LC

06 EXECUTIVE SUMMARY AND GUIDANCE

Group

Key earnings drivers to remember for 2019

EBITDA[1]-supporting factors

- Strong sales contribution from Mavenclad® ramp-up and Bavencio®

NEW

Ongoing strength in Life Science with 7% to 8% organic above-market net sales growth and 20-30 bps underlying margin progression

- Successful partnering of bintrafusp alfa with ~€100 m of deferred income from upfront payment recognized as other operating income in Q2 to Q4 2019
- Income from milestones and management of pipeline (part of operating business in Healthcare) materializing in Q2 and Q4 2019
- Lower expected license payments for Erbitux®
- High level of cost consciousness and prioritization
- Adoption of IFRS 16 contributes ~€130 m[2] to organic growth YoY

NEW

Positive FX impact: Emerging market currencies remain weak but offset by favorable EUR/USD development (range 2019: 1.12-1.16)

EBITDA[1]-reducing factors

NEW

About stable R&D costs budgeted for Healthcare and decrease as % of sales (actual development will be subject to clinical data outcome of priority projects and prioritization decisions)

- Healthcare underlying margins negatively impacted by product mix

NEW

Performance Materials sales and earnings reaching trough due to expected decline in Liquid Crystals in H2; economic environment may lead to moderate decline in Semiconductors, returning to growth in 2020

[1]EBITDA pre; [2]~€130m contribution from IFRS 16 (Healthcare ~40%, Life Science ~40%, PM ~10%, CO ~10%)

Group

Full-year 2019 guidance[1]

Net sales:
Organic +3% to +5% YoY
FX ~ 0% to +2% YoY
~ € 15.3 – 15.9 bn

EBITDA pre:
Organic +10% to +13% YoY[2]
FX 0% to +2% YoY
~ € 4,150 – 4,350 m[3]

EPS pre:
~ € 5.30 – 5.65

[1]Merck KGaA, Darmstadt, Germany stand-alone, i.e. without acquisition of Versum Materials and Intermolecular Inc.; [2]Incl. ~€130 m YoY contribution from adoption of IFRS 16 (Healthcare ~40%, Life Science ~40%, PM ~10%, CO ~10%); [3]CO guidance 2019: -€420 m to -€480 m (assuming FX adjusted CO costs -€390 m to -€400 m)

Group

2019 business sector guidance[1]

Net sales

- Solid organic growth +4% to +6%
- Base business at least stable organically
- Strong contributions from launches including Mavenclad®

EBITDA pre[2]

- Organic +19% to +23% YoY
- FX -1% to +2% YoY
- ~ €1,830 – 1,940 m

Net sales

- Organic growth +7% to +8%, above expected market growth
- Main growth driver Process Solutions but all businesses contributing

EBITDA pre[2]

- Organic +11% to +13% YoY
- FX +0% to +2% YoY
- ~ €2,020 – 2,120 m with 20-30 bps[3] underlying margin progression

Net sales

- Organic decline -4% to -7%
- LC resuming decline, following temporary capacity ramp-up in China
- Economic environment may lead to moderate decline in Semiconductor, return to growth in 2020

EBITDA pre[2, 4]

- Organic -9% to -13% YoY
- FX +1% to +4% YoY
- ~ €685 – 745 m

[1]Divisional guidances are only support to the group guidance and do not have to add up; [2]Incl. ~€130 m YoY contribution from adoption of IFRS 16 (Healthcare ~40%, Life Science ~40%, PM ~10%, CO ~10%); [3]bps = basis points; [4]Merck KGaA, Darmstadt, Germany stand-alone, i.e. without acquisition of Versum Materials and Intermolecular Inc.

Additional financial guidance 2019

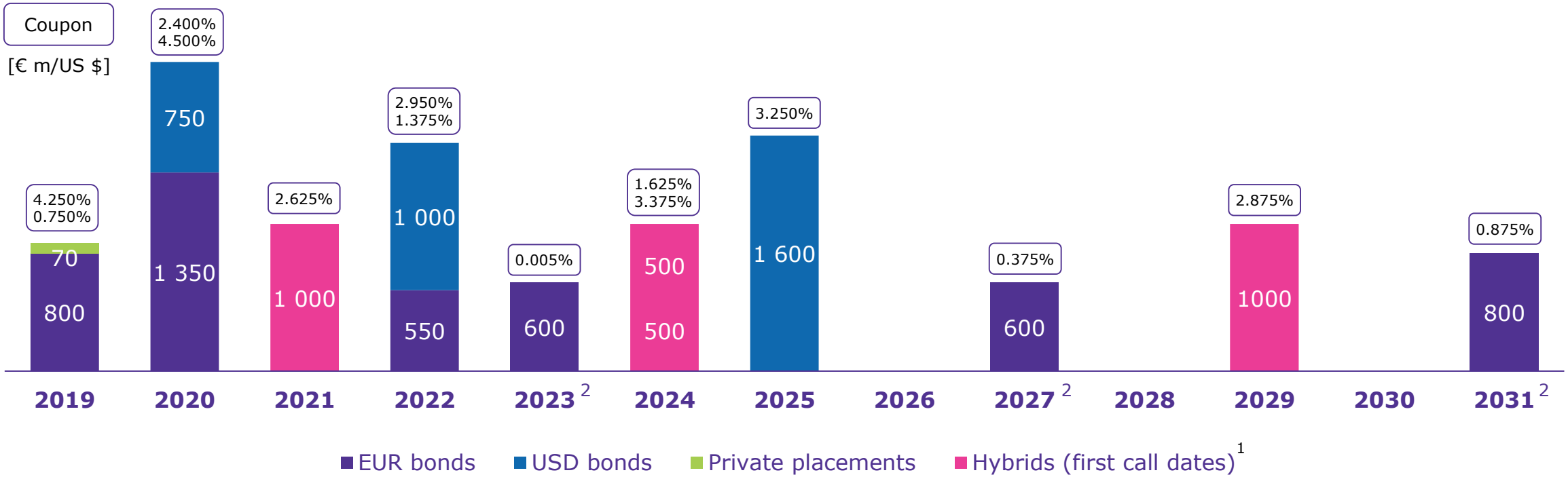
Further financial details

Corporate & Other EBITDA pre[1]	**~ -€420 – -480 m**
Interest result[2]	**~ -€260 – -280 m**
Effective tax rate	**~ 24% to 26%**
Capex on PPE	**~ €1.1 bn – 1.2 bn**
Hedging/USD assumption	**FY 2019 hedge ratio ~60% at EUR/USD ~1.20**
2019 Ø EUR/USD assumption	**~ 1.12 – 1.16**

[1]CO guidance 2019: -€420 m to -€480 m (assuming FX adjusted CO costs -€390 m to -€400 m);
[2]Interest result includes Versum Materials financing expenses

Maturity profile reflects Sigma-Aldrich and Versum financing transactions

Maturity profile as of June 30, 2019

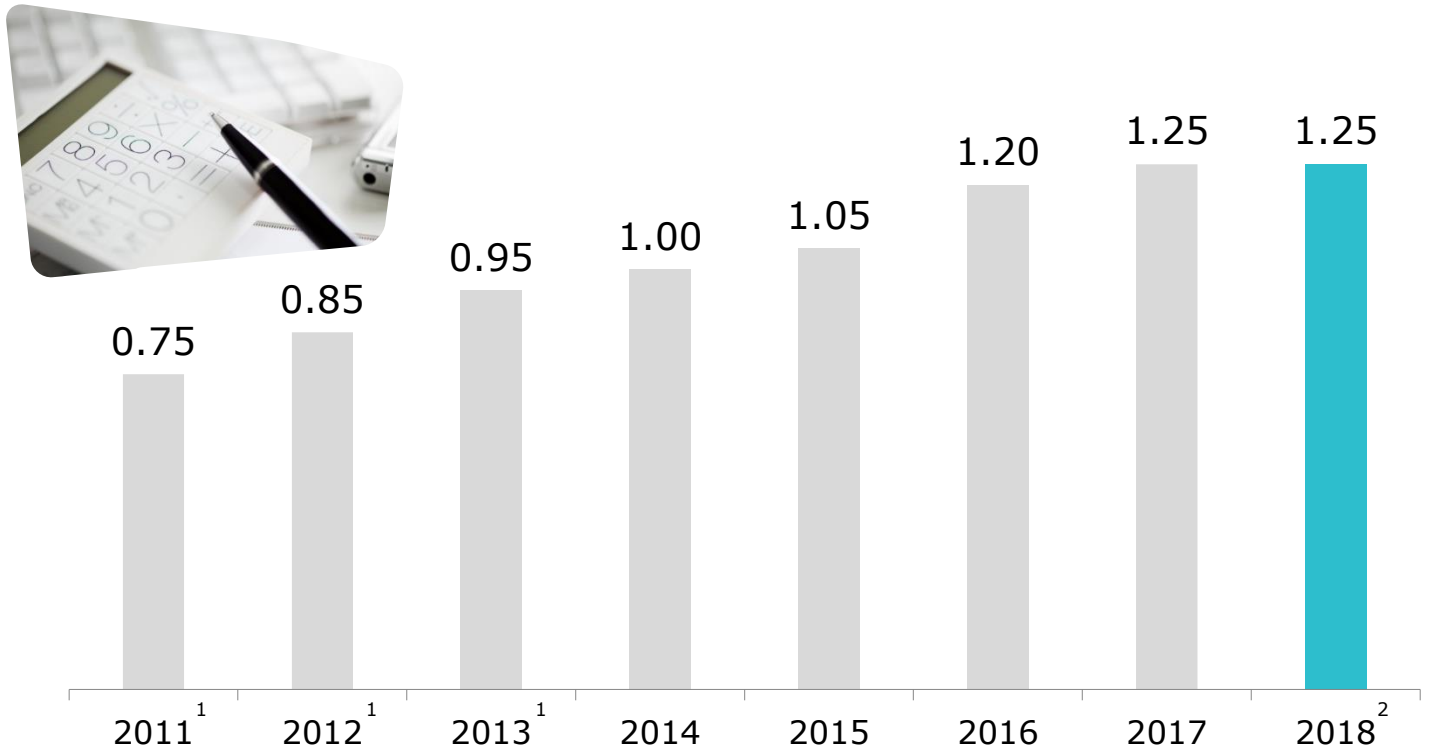


Balanced maturity profile in upcoming years avoids refinancing risks and provides sufficient flexibility for deleveraging

[1]No decision on call rights taken yet;
[2]EUR bonds had been placed at July 1st, 2019

Stable dividend amid lower EPS pre

Dividend[1] development 2011-2018



2018 dividend

- Dividend of €1.25 per share for 2018
- Increase in payout ratio to 24.5% of EPS pre in 2018 vs. 20.3% in 2017[2]
- Dividend yield[3] of 1.4%

[1]Adjusted for share split, which has been effective since June 30, 2014; [2]Calculated with 2017 EPS pre of € 6.16, while ex CH EPS pre € 5.92 posts 21.1% payout ratio;
[3]Calculated with 2018 year-end share price of € 89.98 per share

Healthcare pipeline

August 5, 2019

Phase I

M2698
p70S6K & Akt inhibitor
Solid tumors

M3541
ATM inhibitor
Solid tumors

M3814
DNA-PK inhibitor
Solid tumors[1]

M4344 (VX-803)
ATR inhibitor
Solid tumors

M6620 (VX-970)
ATR inhibitor
Solid tumors

M7583
BTK inhibitor
Hematological malignancies

M8891
MetAP2 inhibitor
Solid tumors

avelumab
anti-PD-L1 mAb
Solid tumors

bintrafusp alfa
TGFbeta trap/anti-PD-L1
Solid tumors

M9241 (NHS-IL12)
Cancer immunotherapy
Solid tumors[1]

M5049
Immune receptor inhibitor
Immunology

M6495
anti-ADAMTS-5 nanobody
Osteoarthritis

M5717
PeEF2 inhibitor
Malaria

Phase II

tepotinib
MET kinase inhibitor
Non-small cell lung cancer

tepotinib
MET kinase inhibitor
Hepatocellular cancer

M3814
DNA-PK inhibitor
Rectal cancer

M6620 (VX-970)
ATR inhibitor
Ovarian cancer[1]

abituzumab[2]
pan-αv integrin inhibiting mAb
Colorectal cancer 1L

avelumab
anti-PD-L1 mAb
Merkel cell cancer 1L

avelumab
anti-PD-L1 mAb
Solid tumors[3]

avelumab
anti-PD-L1 mAb
Non-small cell lung cancer[3]

avelumab
anti-PD-L1 mAb
Urothelial cancer[3]

bintrafusp alfa
TGFbeta trap/anti-PD-L1
Non-small cell lung cancer 1L

bintrafusp alfa
TGFbeta trap/anti-PD-L1
Non-small cell lung cancer 1L/2L

bintrafusp alfa
TGFbeta trap/anti-PD-L1
Locally advanced non-small cell lung cancer

bintrafusp alfa
TGFbeta trap/anti-PD-L1
Biliary tract cancer 2L

atacicept
anti-BlyS/APRIL fusion protein
Systemic lupus erythematosus

atacicept
anti-BlyS/APRIL fusion protein
IgA nephropathy

evobrutinib
BTK inhibitor
Rheumatoid arthritis

evobrutinib
BTK inhibitor
Systemic lupus erythematosus

sprifermin
fibroblast growth factor 18
Osteoarthritis

M1095 (ALX-0761)[4]
anti-IL-17 A/F nanobody
Psoriasis

Phase III

avelumab - anti-PD-L1 mAb
Non-small cell lung cancer 1L

avelumab - anti-PD-L1 mAb
Gastric cancer 1L-M

avelumab - anti-PD-L1 mAb
Urothelial cancer 1L-M

avelumab - anti-PD-L1 mAb
Locally advanced head and neck cancer

evobrutinib - BTK inhibitor
Multiple sclerosis[5]

Registration

avelumab
anti-PD-L1 mAb
Renal cell cancer 1L[6]

- Oncology
- Immuno-Oncology
- Immunology
- Neurology
- Global Health

1L, first-line treatment; 1L-M, first-line maintenance treatment; 2L, second-line treatment.

[1] Includes studies in combination with avelumab. [2] As announced on May 2 2018, in an agreement with SFJ Pharmaceuticals Group, abituzumab will be developed by SFJ for colorectal cancer through Phase II/III clinical trials. [3] Avelumab combination studies with talazoparib, axitinib, ALK inhibitors, cetuximab, chemotherapy, or novel immunotherapies. [4] As announced on March 30 2017, in an agreement with Avillion, anti-IL-17 A/F nanobody will be developed by Avillion for plaque psoriasis and commercialized by Merck KGaA, Darmstadt, Germany. [5] Enrollment anticipated in Q3 2019. [6] As announced on May 15 2019, the US Food and Drug Administration (FDA) has approved avelumab in combination with axitinib for the first-line treatment of patients with advanced renal cell carcinoma (RCC) and as announced on March 8 2019, the European Medicines Agency (EMA) validated for review the Type II variation application for avelumab in combination with axitinib for patients with advanced RCC.

Tepotinib: Significant unmet need

Tepotinib is a highly selective oral, once daily, MET TKI that blocks MET-mediated signaling pathways

- Preclinical and clinical evidence support MET activation as a **primary oncogenic driver in lung cancer subsets** and as a **secondary driver** of acquired resistance to targeted therapy in other lung cancer subsets[1]
- Higher **prevalence of MET alterations amongst elderly patients in Lung** (median age of patients with METex14: 72.5 years)
- Evidence exists to support the **role of MET in cancers and resistance settings other than lung cancer**

Adressable Patient Population

Total global NSCLC patients
(2 million new cases/year)[2]

- METex14: ~3%
- METamp: ~2%
- EGFRm+: US/EU: ~12% Asia: ~35%
- Other genetic alterations

15 – 20% with METamp

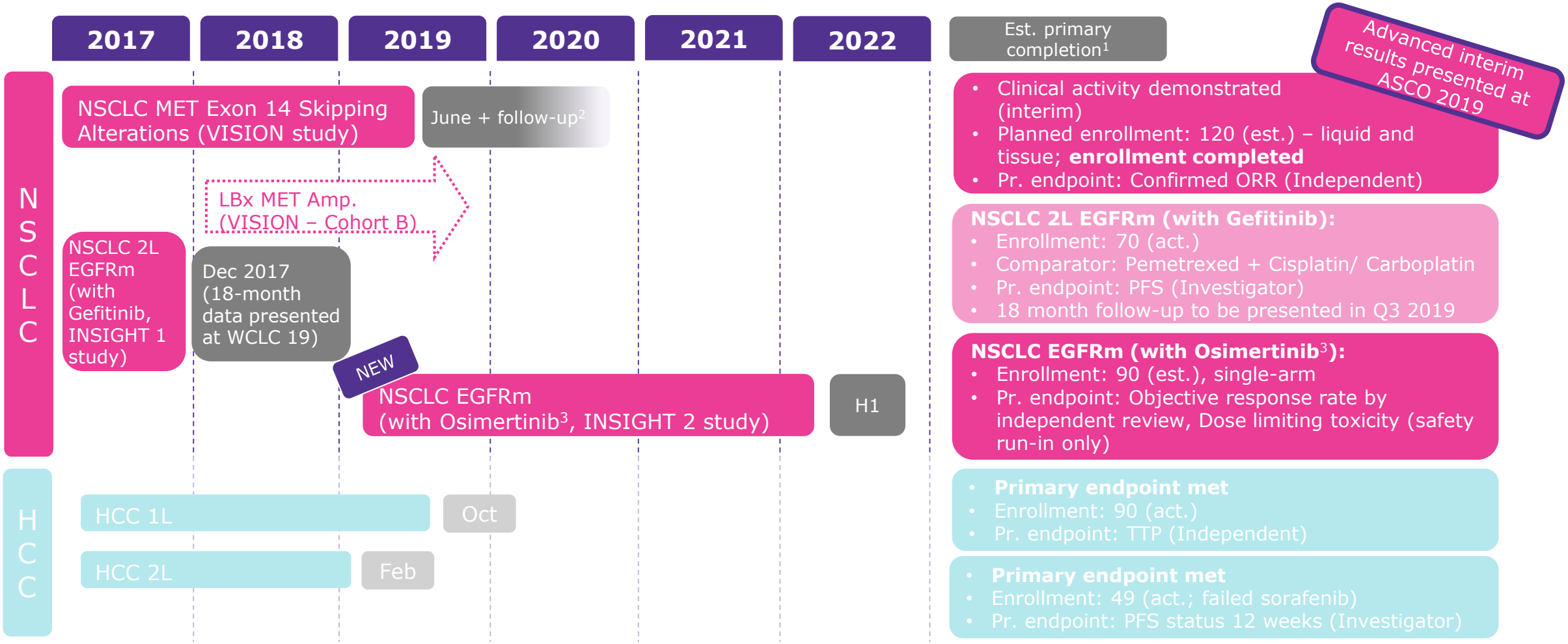
- ~3-5% of total NSCLC population → VISION Trial
- 2-5% of total NSCLC population → INSIGHT 2 Trial

Key Achievements

- **SAKIGAKE designation** awarded in Japan
- **Validated liquid biopsy and/or tissue biopsy test** used to prospectively recruit in both trials
- **METex14:** On track for filing in 2020 in US and Japan
- **EGFRm+/METamp:** INSIGHT 2 program recently started

1: Drilon A et al., J Thoracic Oncol. 2016; 2: Bray F, et al. CA Cancer J Clin. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. 2018;68(6):394–424. https://doi.org/10.3322/caac.21492 PMID:30207593

Tepotinib: Program overview
Development focused on biomarker enriched patient populations



[1] Timelines are event-driven and may be subject to change; [2] Confirmed ORR expected approx. in June 2019, subsequent durability of response/follow-up period pending outcome of discussions with health authorities; [3] brand name: Tagrisso®

Data presented at ASCO 2019
Promising data from VISION (NSCLC, MET Exon 14 cohort) study

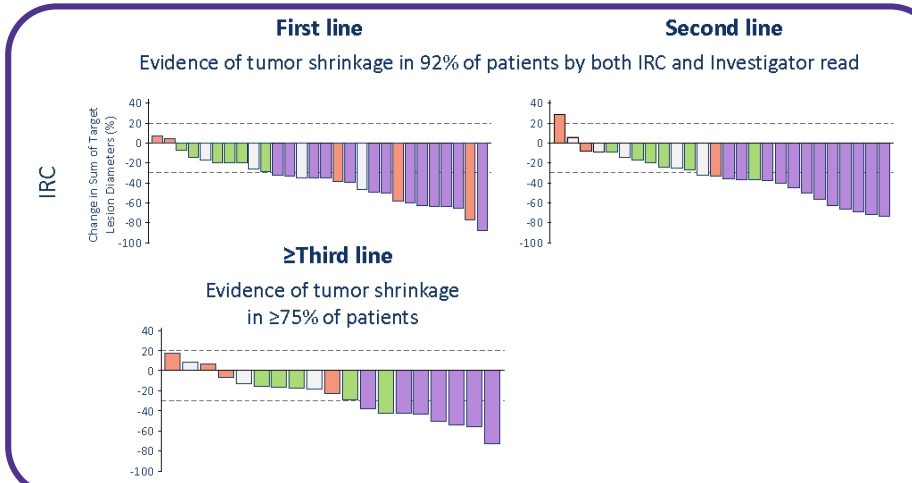
Durable clinical activity across treatment lines[2]

	Other leading MET inhibitor[1]		VISION (tepotinib)[2]	
			Liquid biopsy analysis set (L+)	Tissue biopsy analysis set (T+)
	Oral		Oral	Oral
Cut off date	(15 Apr 2019)		(18 Feb 2019)	(18 Feb 2019)
	IRC		IRC	IRC
Overall	N=97		n=48	n=51
ORR, % [95% CI]	48.5%* Not reported		50.0% [35.2, 64.8]	45.1% [31.1, 59.7]
mDOR, months [95% CI]	Not reported		**12.4** [5.8, ne]	**15.7** [9.0, ne]
1L	N=28		n=17	n=18
ORR, % [95% CI]	67.9% [47.6, 84.1]		58.8% [32.9, 81.6]	44.4% [21.5, 69.2]
≥2L	N=69		n=31	n=33
ORR, % [95% CI]	40.6% [28.9, 53.1]		45.2% [27.3, 64.0]	45.5% [28.1, 63.6]
mDOR, months [95% CI]	9.7 [5.6, 13.0]		**12.4** [5.6, ne]	**12.4** [3.7, ne]
PFS	**1L n=28**	**2L/3L n=69**	n=57	n=58
mPFS, months [95% CI]	9.7 [5.5, 13.9]	5.4 [4.2, 7.0]	**9.5** [6.7, ne]	**10.8** [6.9, ne]

Favorable safety profile[2]

- Grade 3 TRAEs reported in **19% of patients**
- **No grade 4 or grade 5** TRAEs
- **Discontinuations** due to treatment-related adverse events in **only 4.6% of patients**

Consistent tumor shrinkage across lines[2]



[1] J. Wolf et al., Capmatinib (INC280) in METΔex14-mutated advanced non-small cell lung cancer (NSCLC): Efficacy data from the phase II GEOMETRY mono-1 study, presented at ASCO 2019; [2] P. Paik et al., Phase II study of tepotinib in NSCLC patients with METex14 mutations, presented at ASCO 2019; * Data not reported in the oral presentation. Manually calculated from 1 CR, 18 PRs in Cohort 5b (1st line) and 28 PRs in Cohort 4 (+2nd line).

Clinical Efficacy in Met-amp EGFR-mutant Population
INSIGHT 2 study follows from encouraging INSIGHT 1 data

UPDATED

Data from INSIGHT 1 study (18-months follow-up presented at WCLC 2019)[1]

- **MET-amp population:**

Endpoint	Tepotinib + gefitinib	Chemotherapy
Primary - PFS (HR 0.13 [90% CI 0.04, 0.43])	16.6 m	4.2 m
Secondary - ORR (OR 2.67 [90% CI 0.37, 19.56])	66.7%	42.9%
Secondary - OS (HR 0.09 [CI 0.01, 0.54])	37.3 m	13.1 m

- **METamplification** can be considered a **suitable biomarker for treatment with tepotinib**
- **Safety:** generally well-tolerated, most AEs mild to moderate
- Enrollment halted due to low recruitment

Open for enrollment

Recently posted INSIGHT 2 study

Study Design:
- Locally advanced/metastatic EGFR + NSCLC
- MET amplification
- Acquired resistance to prior EGFR TKI therapy
- N = 90

Dose:
- Tepotinib 500mg QD + Osimertinib 80mg QD (21-day cycles until PD)

Primary endpoints:
- Objective response rate by independent review
- Dose limiting toxicity (safety run-in only)

[1] Yi Long Wu et al., Long term outcomes to tepotinib plus gefitinib in patients with EGFR mutant NSCLC and MET dysregulation: 18 month follow up, presented at WCLC 2019

Biomarker focused development program in NSCLC with potential beyond NSCLC **MET exon-14; Met-amp; and EGFR-mutant populations**

NSCLC MET exon-14 alterations (VISION study)

- **SAKIGAKE designation** awarded by Japanese Ministry of Health, Labour and Welfare in March 2018
- **Promising ORR, durable responses and long PFS** reported across treatment lines presented at ASCO 2019
- **Favourable safety profile** with 19% treatment-related grade 3 events, no grade 4 events and **only 4.6% treatment related discontinuations**

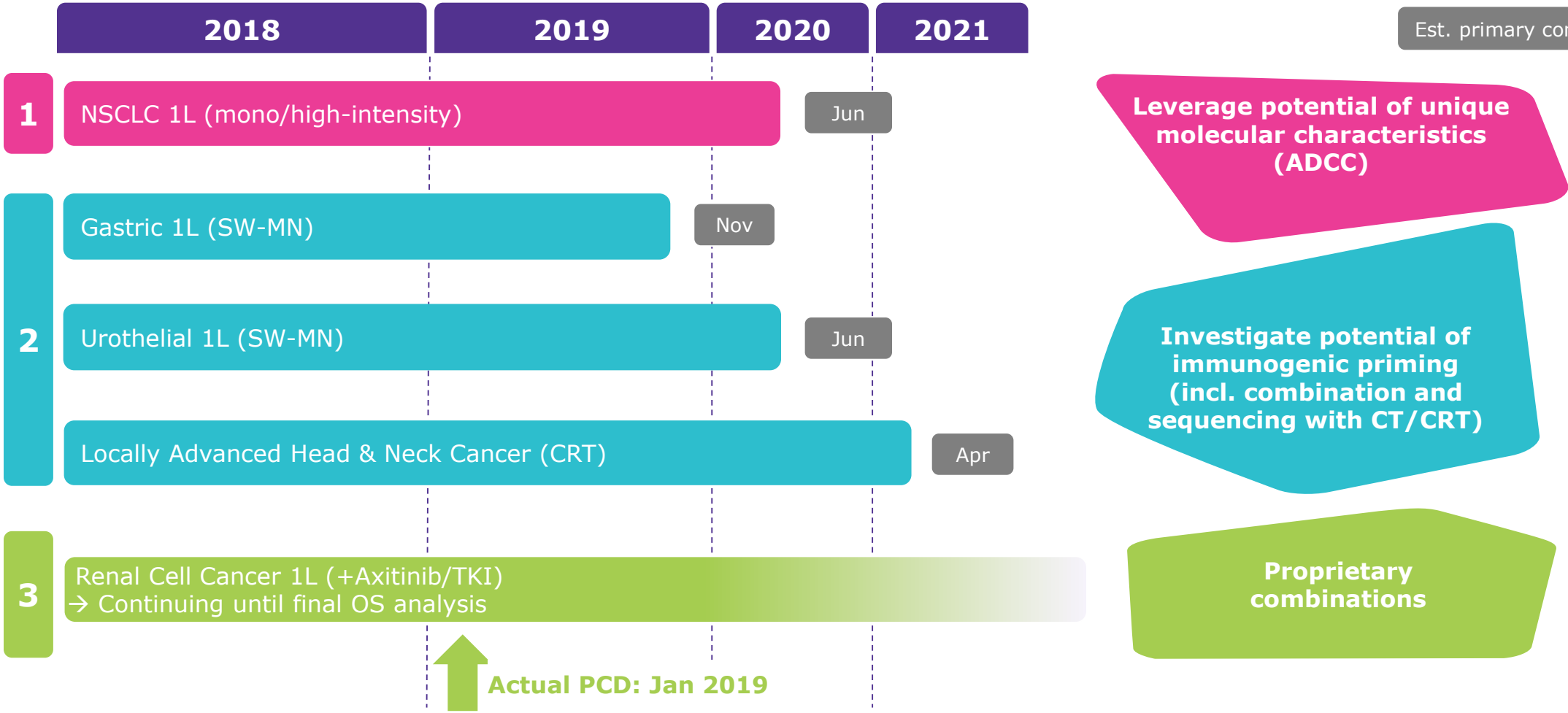
NSCLC harboring EGFR-mutations (INSIGHT study)

- Encouraging data seen in INSIGHT 1 trial, triggering **recent initiation of INSIGHT 2** (Tepotinib + Osimertinib)
- **Liquid biopsy testing (LBx)** integrated into INSIGHT 2 to help mitigate the limited availability of tissue in this tumor indication and treatment setting

Patients prospectively recruited with validated liquid biopsy (LBx) test in VISION

1. **Less invasive** (i.e. than tissue based testing) → appropriate for **elderly patients**, **rapid study recruitment**
2. **Increased selectivity/identification** → improved recruitment numbers/**greater identification**

Avelumab: Program overview
Ongoing studies – Five Phase III trials

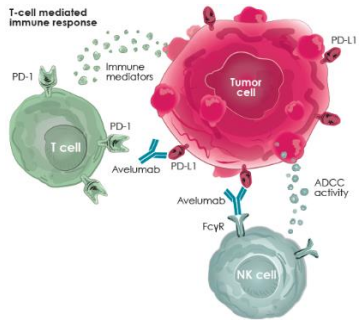


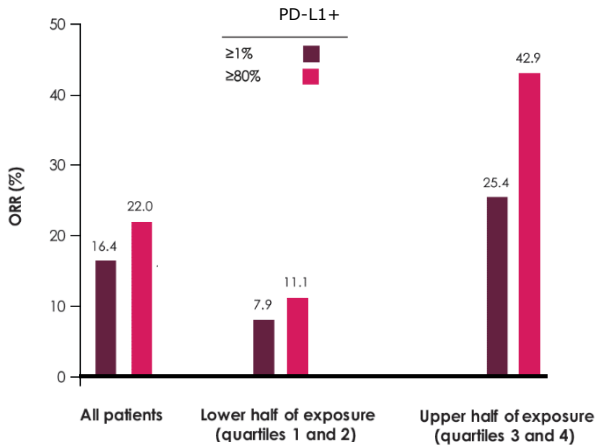
[1] Estimated primary completion date according to clinicaltrials.gov as of July 24, 2019, timelines are event-driven and may be subject to change;
Acronyms: NSCLC = Non-small Cell Lung Cancer, CT = Chemotherapy, CRT = Chemoradiotherapy, MN = Maintenance, SW = Switch, TKi = Tyrosine Kinase inhibitor

Avelumab: NSCLC 1L

Assessing potential efficacy upside in mono-therapy[1]

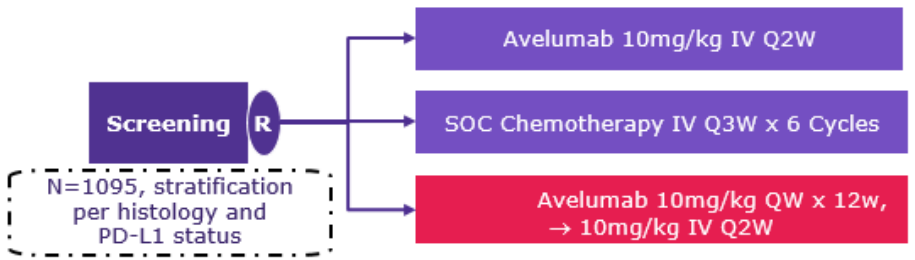
NSCLC 2L+: exposure response





NSCLC 1L: testing hypothesis of higher efficacy/intensity correlation

- **Hypothesis:** higher drug intensity may result in greater efficacy (potentially driven by ADCC)
- Potential association between **higher ORR** and **higher avelumab exposure**
- ORR highest in patients with both higher avelumab **exposure** and tumors with higher levels of **PD-L1 expression**
- **NSCLC 1L phase III trial amended** to leverage high-intensity hypothesis (est. primary completion Jul 2019)



- **Primary endpoints:** PFS & OS @ high PD-L1-expression
- **Secondary endpoints:** PFS & OS @ moderate and low PD-L1-expression (BOR, DOR, Safety, QoL)
- **Hierarchical ordered hypothesis**

[1] Abstract No. 9086. Presented at the 53rd ASCO Annual Meeting; June 2-6, 2017; Chicago, IL, USA: Exposure–response and PD-L1 expression analysis of second-line avelumab in patients with advanced NSCLC: data from the JAVELIN Solid Tumor trial; Acronyms: ORR = Overall Response Rate

Avelumab: Renal Cell Carcinoma (RCC) 1L
Extensive biomarker data set released at ASCO 2019 from Javelin Renal 101

Core data presented at ESMO 2018 and ASCO GU 2019[1]

HR < 1 = favors Avelumab-Axitinib or competitor combo HR > 1 = favours sunitinib	mPFS (Hazard Ratio, Risk groups per IMDC)[2,4]		
	Favorable	**Intermediate**	**Poor**
Competitor A	2.18 (1.29-3.68)	0.82 (0.64-1.05)	
Competitor B	0.81 (0.53-1.24)	0.70 (0.54-0.91)	0.58 (0.35-0.94)
Avelumab – Axitinib (JAVELIN)	**0.54 (0.32-0.91)**	**0.74 (0.57-0.95)**	**0.57 (0.38-0.88)**

Safety (% patients, Gr 3-5 TRAEs)[3,4]
- Avelumab-Axitinib: 57% / 55% (Sunitinib)
- Competitor B: 63% / 58% (Sunitinib)

Discontinuation (% patients)[3,4]:
- Avelumab-Axitinib: 4%
- Competitor B: 8.2%

- **Approved for 1L treatment of advanced RCC by US FDA on May 15, 2019**
- **Filing validated by EMA and submitted to Japanese health authorities**

Significant contribution to understanding of biomarkers presented at ASCO 2019[5]

- **Sunitinib patients with PD-L1+ tumors showed reduced PFS**
- Patients whose tumors contained **greater number of CD8+ cells had extended PFS in the avelumab + axitinib arm** and reduced PFS in the sunitinib arm
- **Novel signature comprised of immune-related genes associated with PFS** in the avelumab + axitinib arm
- Elevated **expression of the published angiogenesis gene signature** and other related genes was **associated with improved PFS in the sunitinib arm**, but did not differentiate PFS in the avelumab + axitinib arm
- Significant **treatment-arm specific differences in PFS were observed relative to wild type when mutations** in genes such as CD163L1, DNTM1 or PTEN were present

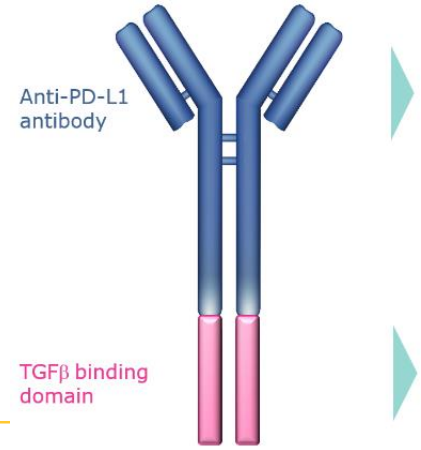
"Findings may inform personalized strategies for patients with advanced RCC"

[1] Choueiri et al., „Subgroup analysis from JAVELIN Renal 101: outcomes for avelumab + axitinib vs sunitinib in advanced renal cell carcinoma", presented at ASCO GU 2019; [2] Table adapted from slides of discussant Dr. Lori Wood, presented at ASCO GU2019; [3] Motzer et al., „Avelumab plus Axitinib versus Sunitinib for Advanced Renal-Cell Carcinoma", New England Journal of Medicine, February 16, 2019; Brian et al., „Pembrolizumab plus Axitinib versus Sunitinib for Advanced Renal-Cell Carcinoma", New England Journal of Medicine, February 16, 2019; [4] Note that this is not a head-to-head trial comparisons; [5] Choueiri et al., „Biomarker analyses from JAVELIN Renal 101: Avelumab + axitinib (A+Ax) versus sunitinib (S) in advanced renal cell carcinoma (aRCC)", presented at ASCO 2019

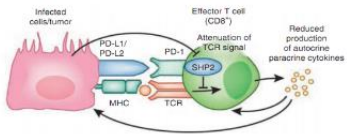
Bintrafusp alfa[1] (M7824)
An innovative first-in-class bifunctional fusion protein leading the TGF-β immuno-oncology field

Mode of action

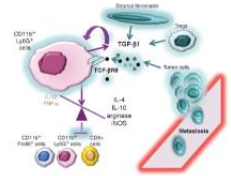
- Innovative **first-in-class bifunctional fusion protein** designed to simultaneously target two immune suppressive pathways (blocking PD-L1 and reducing TGF-β signaling)
- Demonstrated **superior anti-tumor activity in pre-clinical study** compared to anti-PD-L1 alone, and anti-PD-L1 and TGF-β given in combination as separate agents
- **Great excitement in IO community** about M7824 uniquely addressing TGF-ß biology widely accepted as key resistance factor for anti-PDx therapies



PD-1/PD-L1 immune checkpoint[1]



TGFβ immunosuppressive cytokine[2]



clinical development achievements

- Tested in **14 Phase Ib expansion cohorts** across >700 patients in more than 10 tumor types
- Shown clinical anti-tumor activity across multiple hard-to-treat cancers including **advanced NSCLC, biliary tract cancer, HPV-associated cancers, and gastric cancer**
- PhII study **M7824 monotherapy versus pembrolizumab 1L**, advanced NSCLC high PD-L1-tumor expressers started in October 2018
- **Two additional studies started** in April 2019

clinical development plans

- **Eight high priority immuno-oncology clinical development studies** ongoing or expected to commence in 2019, including **studies in non-small cell lung and biliary tract cancers with registrational intent**
- Further plans to be communicated at a later stage

[1] proposed International Nonproprietary Name (INN) | Acronyms: NSCLC = Non-small Cell Lung Cancer, IO = Immuno-Oncology

Strategic Alliance with GlaxoSmithKline (GSK)
Attractive payment terms rewarding developmental success

Effective as of March 27, 2019

upfront & Milestone payment structure

Total deal volume: €3.7 bn

Upfront payment: €300 m

Milestone payments: €3.4 bn

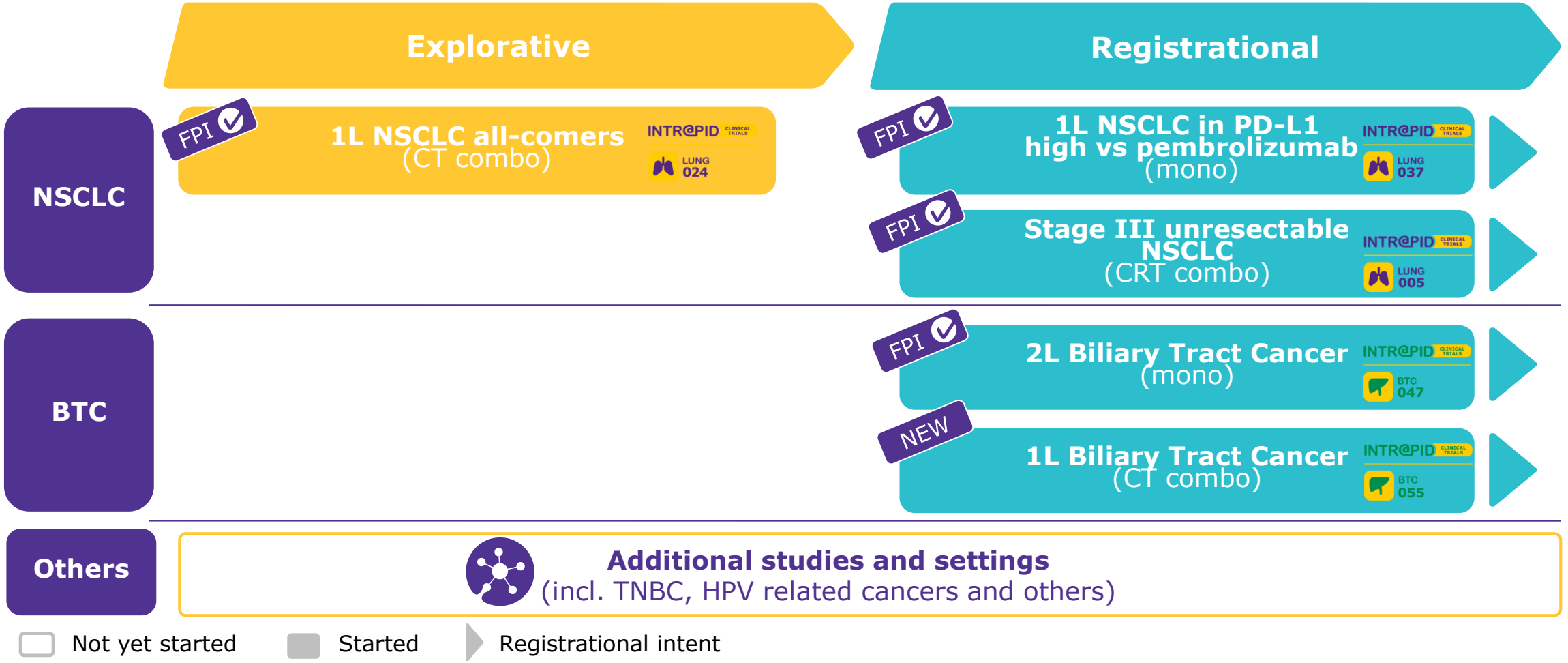
- Development (up to €500 m)
- Approval
- Commercial

Development milestones: Up to €500 m triggered by data from the M7824 lung cancer program

profit & cost sharing

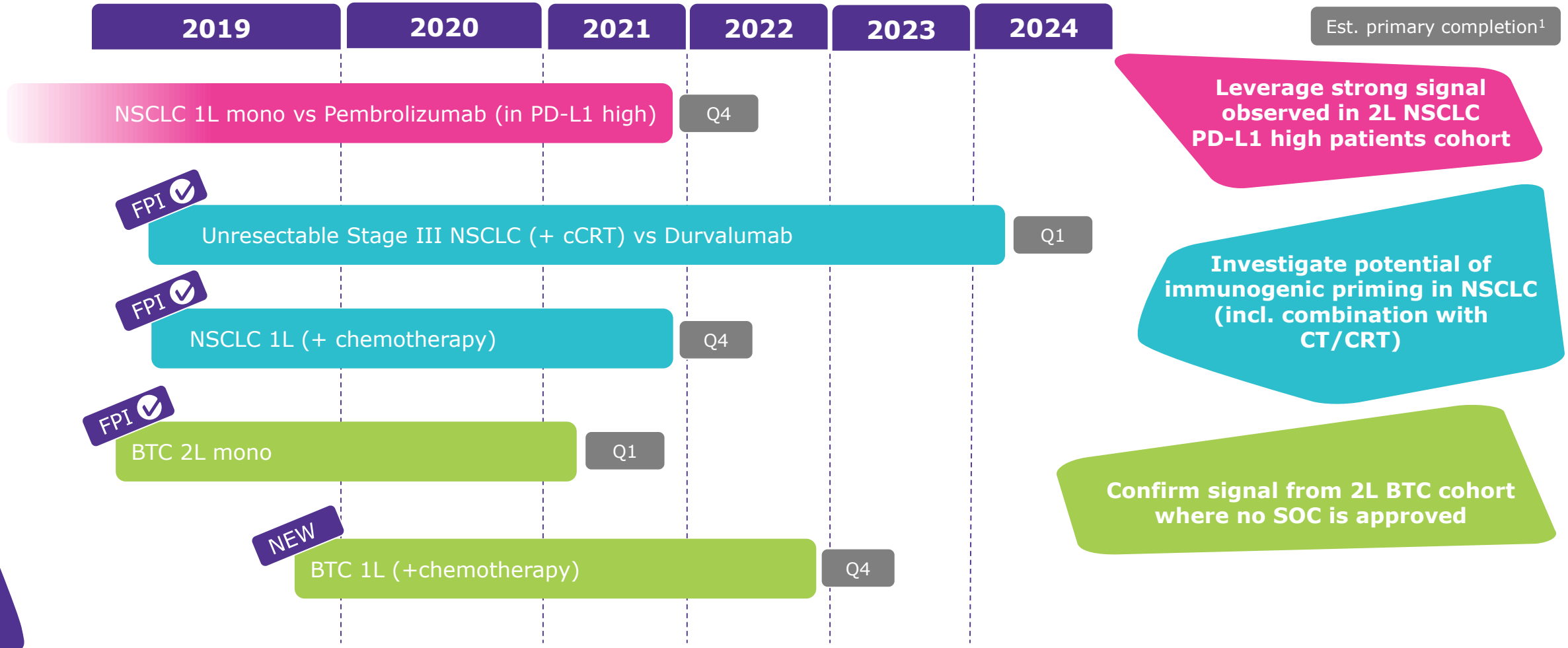
- **Profits & Costs:** Shared equally on a global basis
- **Sales:** Merck KGaA, Darmstadt, Germany to recognize sales in the United States, GSK to recognize sales ex-US

Development Strategy
Several studies ongoing with additional studies expected to commence in the upcoming months



Acronyms: FPI = First Patient In, TNBC = Triple Negative Breast Cancer

Development Strategy
Program overview: Two additional studies recently started



[1] Estimated primary completion date according to clinicaltrials.gov as of July 24, 2019 and internal estimates for upcoming studies; timelines are event-driven and may be subject to change; Acronyms: NSCLC = Non-small Cell Lung Cancer, BTC = Biliary Tract Cancer, CT = Chemotherapy, cCRT = Chemoradiation therapy, FPI = First Patient In

Developmental Progress
2L Biliary Tract Cancer (BTC) monotherapy trial recently initiated

M7824 BTC data presented at ESMO 2018

- **Need:** Few available treatment options (no 2L standard of care)[1]
- **Results: Encouraging activity[2]** in 30 Asian patients with pretreated biliary tract cancer
- **ORR[2]:** 20% (IRC assessment). Median DoR was NR (range, 8.3–13.9 months) with confirmed responses ongoing in all patients
- **Overall Survival by IRC: mOS:** 12.7 months (6.7 – NR), comparing favorably with historical data in pretreated patients receiving second- or later line treatment (<7 months mOS in 2L[1])
- Responses observed **irrespective of PD-L1 expression levels[2]**
- **Orphan Drug Designation** granted by FDA in December 2018

Leading PDx data presented at ASCO 2019[3]

- **ORR:** 5.8% (PhII, 2L); 13.0% (PhI)
- **OS:** 7.4 months (PhII, 2L); 6.2 months (PhI)

INTR@PID BTC 047

INTR@PID CLINICAL TRIALS
BTC 047

Locally advanced or metastatic BTC 2L N = 141 → M7824 1200 mg IV, Q2W, up to 24 months

Endpoints

Primary endpoint: ORR

Secondary endpoints: DOR, DRR ,PFS, OS, Safety

Biomarker endpoints: PDL1 expression MSI status, comprehensive genomic profiles

[1] Lamarca A, et al. Ann Oncol. 2014;25(12):2328–2338; [2] Yoo et al., Poster presented at the 43rd European Society for Medical Oncology Annual Meeting, Munich, October 19–23, 2018; [3] Bang et al., "Pembrolizumab (pembro) for advanced biliary adenocarcinoma: Results from the KEYNOTE-028 (KN028) and KEYNOTE-158 (KN158) basket studies", presented at ASCO 2019; Acronyms: DoR = Duration of Response, NSCLC = Non-small Cell Lung Cancer, NR = Not Relevant, MSI = Microsatellite Instability Status , OS = Overall Survival, PFS = Progression-Free Survival

Developmental Progress
NSCLC Stage III cCRT Combo trial recently initiated

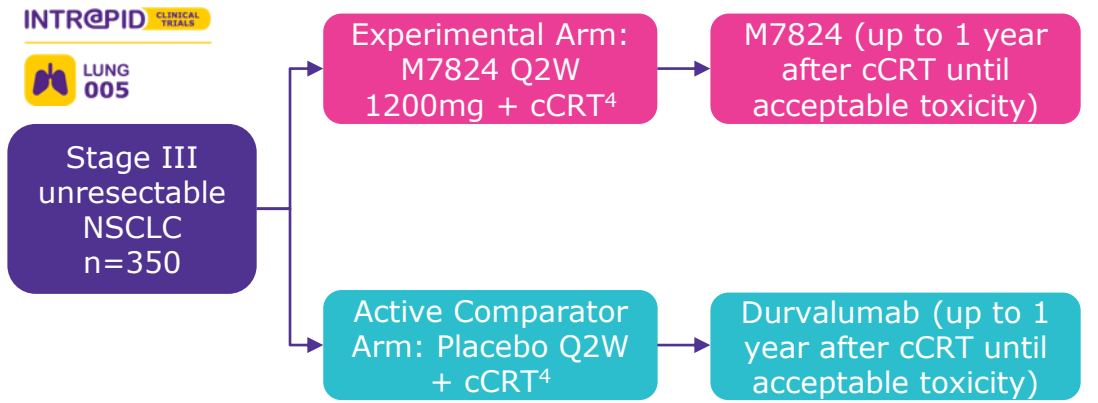
NSCLC 2L data presented at ESMO 2018

- **Need:** NSCLC accounts for 80-85% of all cases of lung cancer[1]
- **Results: Encouraging efficacy comparing favorably** to established PDx-inhibitor monotherapy (IRC)[2,3]:
  - **ORR (all-comers):** 25.0%
  - **ORR (PD-L1-positive):** 37.0%
  - **ORR (PD-L1-high):** 85.7%
- **Progression free survival by IRC** (PD-L1 ≥ 1%):
  - M7824: **mPFS = 9.5 months**, competitor: 4.0 months[2,3]
- **Overall Survival by IRC** (PD-L1 ≥ 1%):
  - M7824: **mOS not reached**, competitor: 12.7 months[2,3]

Pre-clinical data on M7824 + RT combo[5]

- M7824 and RT combination therapy **enhances antitumor activity relative to mono-therapies** in mouse models
- EMT, VEGF, and RT-induced fibrosis gene signatures are decreased with M7824 and combination therapy, and **M7824 reduces RT-induced fibrosis**
- Results **support evaluation of M7824 + RT in the clinic**

INTR@PID LUNG 005



Endpoints

Primary endpoint: PFS

Main secondary endpoints: OS, Safety, Pulmonary function, Association of PD-L1 expression at base line and efficacy

[1] Jemal A et al., Cancer statistics, 2007, CA Cancer J Clin 2007;57:43-66; [2] Paz-Ares et al., Poster presented at the 43rd European Society for Medical Oncology Annual Meeting, Munich, October 19–23, 2018, data shown for 1200mg Q2W dose; [3] Herbst et al.; Pembrolizumab versus docetaxel for previously treated, PD-L1-positive, advanced non-small-cell lung cancer (KEYNOTE-010): a randomised controlled trial (www.thelancet.com Published online December 19, 2015 http://dx.doi.org/10.1016/S0140-6736(15)01281-7); [4] Cisplatin/Etoposide or Carboplatin/Paclitaxel or Cisplatin/Pemetrexed concomitant with Intensity Modulated Radiation Therapy (IMRT); [5] Lan et al., Combination of M7824 and radiation therapy enhances antitumor activity, increases immune response, and modulates radiation-induced fibrosis in cancer models, 2018

Developmental Progress
Data shown at AACR 2019 highlights opportunity in HPV-related cancers

Efficacy variable	HPV-associated cancer (n=43)	HPV+* (n=36)
Confirmed BOR, n (%)		
CR	2 (4.7%)	2 (5.6%)
PR	10 (23.3%)	9 (25%)
SD	6 (14.0%)	5 (13.9%)
PD	20 (46.5%)	17 (47.2%)
Not evaluable	5 (11.6%)	3 (8.3%)
Delayed PR†	3 (7.0%)	3 (8.3%)
ORR per RECIST v1.1, n (%) [95% CI]	12 **(27.9%)** [15.3–43.7]	11 **(30.6%)** [16.3–48.1]
Total clinical response rate†, n (%)	15 **(34.9%)**	14 **(38.9%)**
DCR, n (%)	18 (41.9%)	44.4%

Prevalence: >630,000 new cases of HPV-related cancer are reported worldwide annually[1]

Response Rates:

- Bintrasfusp alfa response rates **compared favorably to those with anti–PD-1 inhibitors** (ORRs of 13%–24%)[1-7]
- **ORR was 27.9% and 30.6% in HPV-associated and HPV+ cancers, respectively**
- Including three additional patients with delayed PRs after initial PD: **Total response rate was 34.9% and 38.9% in HPV-associated and HPV+ cancers, respectively**

Long-term Benefit:

- **Most responses durable** with 4 responses having DoR >18 months and 11/15 responses ongoing at the data cutoff
- Responses to bintrafusp alfa occurred **irrespective of tumor type** or PD-L1 expression
- **Safety profile was similar to anti–PD-(L)1 therapy[1,5]** except for SCC/KAs and low grade mucosal bleeding which are anticipated AEs with TGF-β inhibition[8,9]

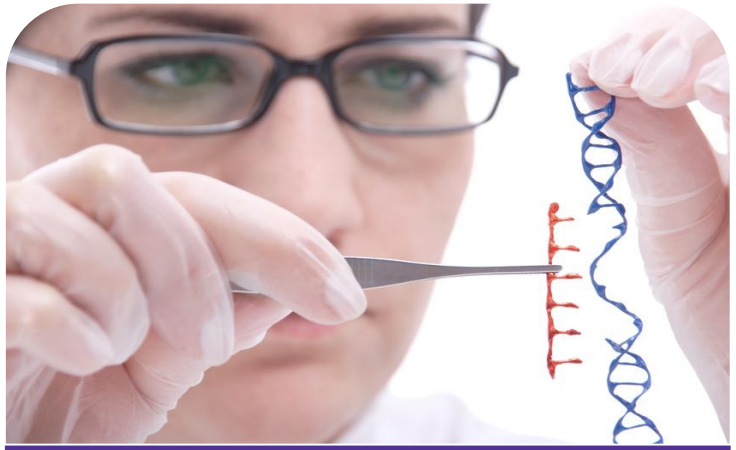
Additional study in HPV-related cancers to commence shortly

† Due to confirmed PD before onset of response, these patients did not meet response criteria by RECIST v1.1; * HPV status was determined from prior documentation, or by using cobas® 4800 HPV Test (Roche) in the dose escalation phase or RNA sequencing (RNASeq) in the expansion phase.

[1] Bauml J, et al. J Clin Oncol. 2017;35:1542–49; [2] Ott PA, et al. Ann Oncol. 2017;28:1036–41; [3] Hollebecque A, et al. J Clin Oncol. 2017;35(Suppl):Abstract 5504; [4] Chung HC, et al. J Clin Oncol. 2018;36(Suppl):Abstract 5522; [5] Ferris RL, et al. N Engl J Med. 2016;375:1856–67; [6] Mehra R, et al. Br J Cancer. 2018;119:153–59; [7] Morris VK, et al. Lancet Oncol. 2017;18:446–53; [8] Lacouture ME, et al. Cancer Immunol Immunother. 2015;64:437–46; [9] Trachtman H, et al. Kidney Int. 2011;79:1236–43

Merck KGaA
Darmstadt, Germany

DNA Damage Response (DDR)
Leadership in next generation assets beyond PARP



DNA Damage Response

A Core Research Innovation Cluster

- DDR defects are an **"achilles heel" of cancer cells**
- **ATR, ATM and DNA-PK are the trinity of targets** that orchestrate cellular response DNA damage and replication stress
- **Leading clinical portfolio** with 6 assets (in Phases 1 and 2) targeting ATR, ATM and DNA-PK
- Rich pre-clinical and translational science driving **biological innovation and patient selection**
- Ideally placed to drive **novel combinations within DDR portfolio and broader immuno-oncology portfolio**
- Multiple **early signal finding studies** allow for **evidence-based decision making** & **focus** in future development

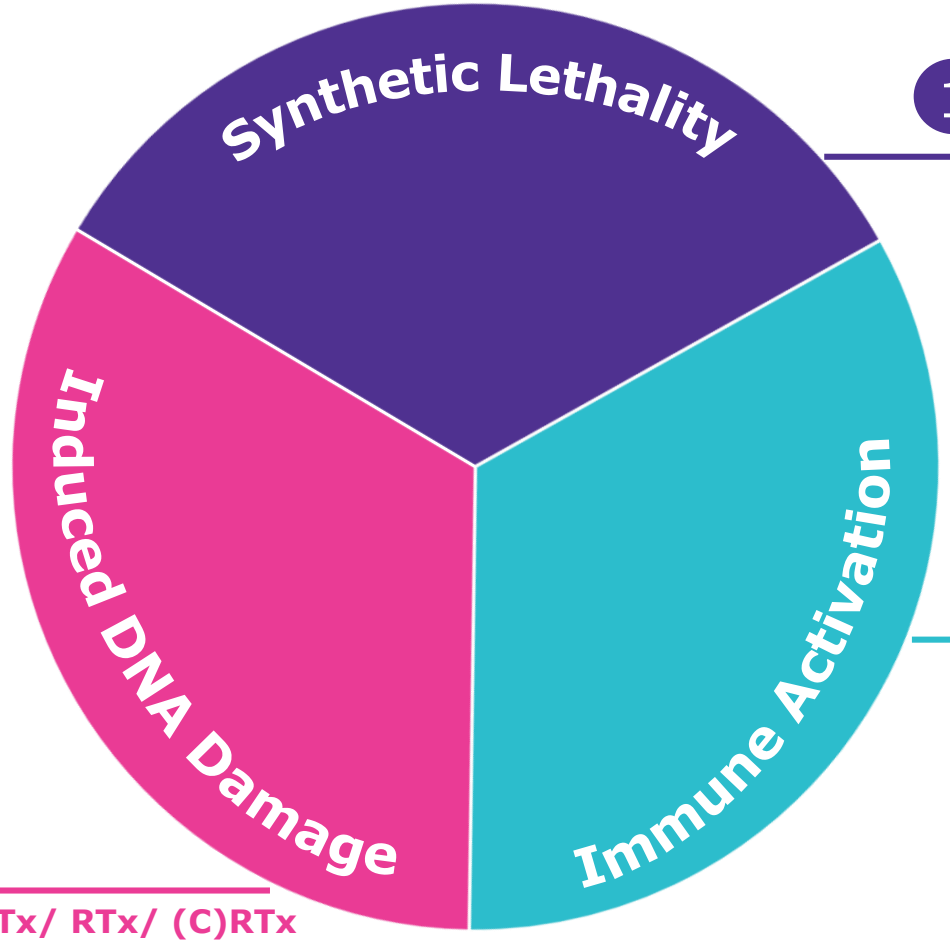
Acronyms: ATM = Ataxia-Telangiectasia Mutated, ATR = Ataxia Telangiectasia and Rad3, DNA-PK = DNA-dependent Protein Kinase, PARP = Poly ADP Ribose Polymerase

DNA Damage Response (DDR)
Development is focused on three foundations

Differentiating aspects of cancer DDR that can be targeted therapeutically[1]:

- **Loss of one or more DDR pathways**
- **Increased levels of replication stress**
- **Increased levels of endogenous DNA damage**

Increased Immunogenicity



1
Monotherapy
DDRi + DDRi (incl. PARP)
Grow the DDR class, building on PARPs

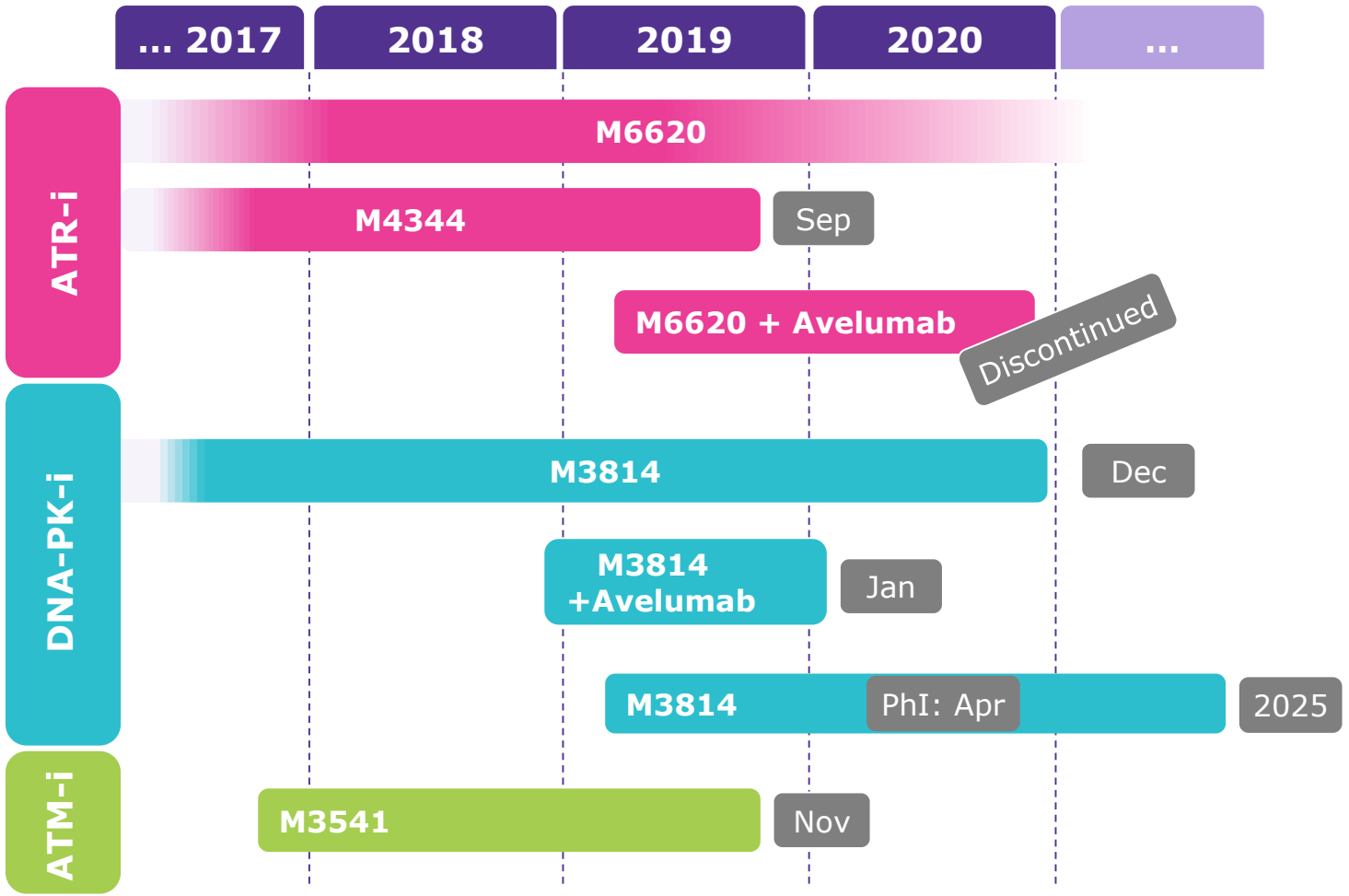
2
DDRi + IO
Differentiate future IO treatments

3
DDRi + CTx/ RTx/ (C)RTx
Improve efficacy in post-IO landscape

[1] adapted from M. O'Connor, Targeting the DNA Damage Response in Cancer, *Molecular Cell Review*, November 2015; Acronyms: IO = Immuno-Oncology, CT = Chemotherapy, DDRi = DNA Damage Response inhibitor, RT = Radiotherapy, (C)RT = Chemo-radiotherapy

DNA Damage Response (DDR)

Clinical program targets three major DDR pathways, in mono- and combination (incl. Avelumab)



Estimated primary completion[1]	
M6620	M6620 CT combinations in various settings
M4344	Phase I dose escalation ongoing for mono- and combination therapy (with CT)
M6620 + Avelumab	Phase II study discontinued No effect on other Avelumab or ATRi studies
M3814	One study completed (mono), one study ongoing (Phase I + Ib expansion, combination with RT/ CRT)
M3814 +Avelumab	Phase I dose escalation initiated (+Avelumab with/without palliative RT), advanced solid tumors
M3814	Phase I/II study initiated for locally advanced rectal cancer (with CRT)
M3541	Phase I dose escalation ongoing in combination with RT

[1] Estimated primary completion date acccording to clinicaltrials.gov as of September 13, 2019, timelines are event-driven and may change; Acronyms: ATM = Ataxia-Telangiectasia Mutated, ATR = Ataxia Telangiectasia and Rad3, DNA-PK = DNA-dependent Protein Kinase, CT = Chemotherapy, RT = Radiotherapy, CRT = chemoradiotherapy, NSCLC = Non-small Cell Lung Cancer, SCLC = Small-cell Lung Cancer, TNBC = Triple Negative Breast Cancer

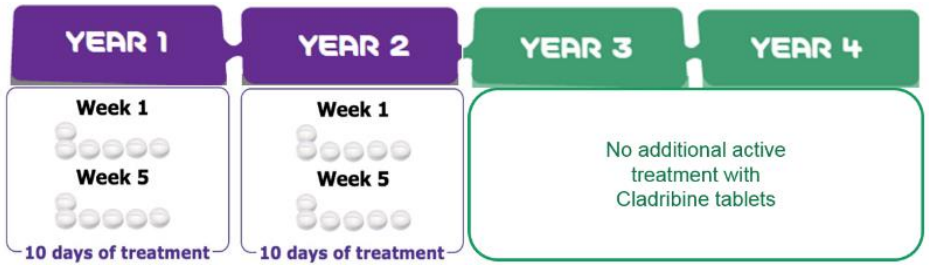
Mavenclad

Mavenclad could change the MS treatment paradigm

Selective immune reconstitution therapy (SIRT)[1]

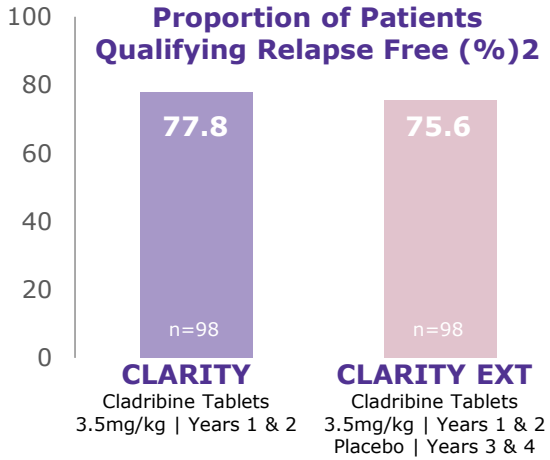
Selective reduction in B & T lymphocytes…

…followed by reconstitution



Unique posology: max. 20 days of oral treatment[3]

4 years disease control with treatment over 2 years[2]



Low monitoring requirements[4]

[1] Giovannoni G. Neurotherapeutics 2017; Nov 22 [Epub ahead of print] | Wiendl H et al. Neurology 2017;89:1098–100 | Weindl H. Nat Rev Neurol 2017; Sept 8 [Epub ahead of print]
[2] Giovannoni G et al. N Engl J Med 2010;362:416–26 | Giovannoni G et al. Mult Scler Aug 1 [Epub ahead of print] [3] Maximum of 20 days of oral dosing over 2 years with no further treatment required in the next 2 years. For important safety information, refer to the abbreviated Prescribing Information | Oral, weight-based dosing. For an average patient weighing 67 kg. Recommended treatment over 2 years. One treatment course per year, followed by observation for another 2 years. Each treatment course consists of two treatment weeks, one at the beginning of the first month and one at the beginning of the second month of the respective year | MAVENCLAD® EU SmPC, September 2017 | Giovannoni G et al. N Engl J Med 2010;362:416–26 [4] MAVENCLAD® EU SmPC September 2017 | Screening must be performed prior to initiation of therapy in Year 1 and Year 2. Vaccination of antibody-negative patients is recommended prior to initiation of Cladribine Tablets. AE, adverse event; HBV, hepatitis B virus; HCV, hepatitis C virus; MRI, magnetic resonance imaging; NEDA, no evidence of disease activity; TB, tuberculosis

Merck KGaA
Darmstadt, Germany

Mavenclad

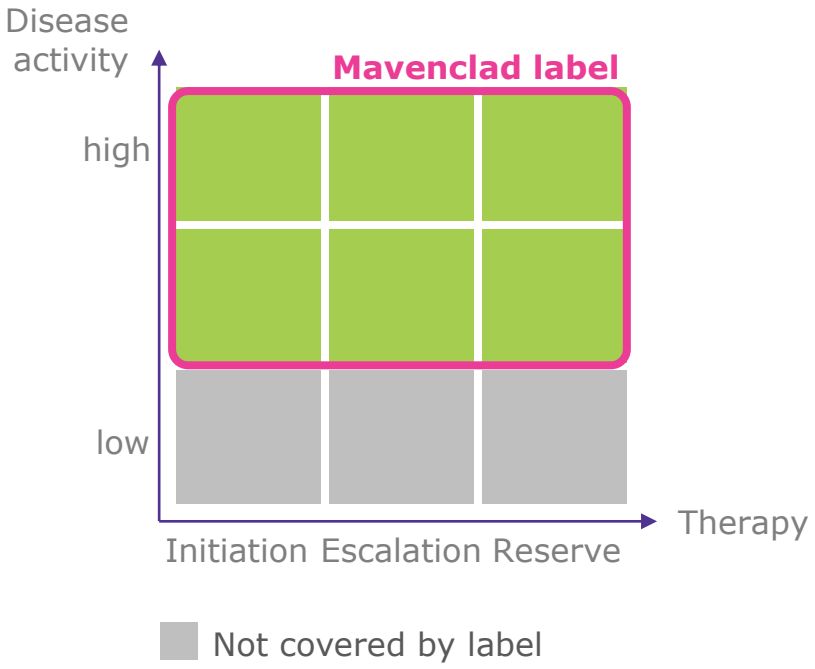
Mavenclad's attractive label in Europe supports integrated franchise strategy

Mavenclad label covers 60-70% of patients with RRMS[1] within the MS[1] patient population in Europe

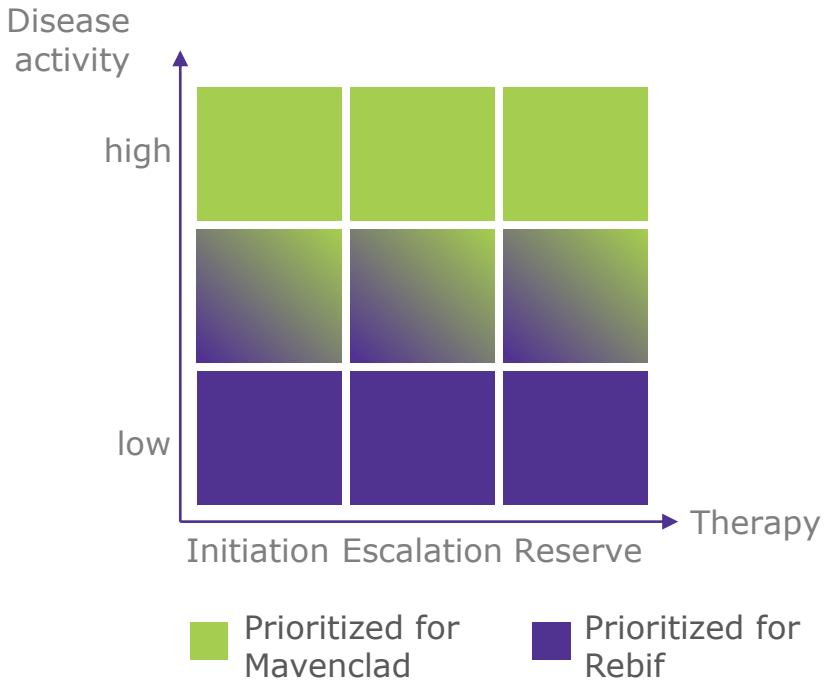
Merck's KGaA, Darmstadt, Germany overall NDD franchise will cover a broad MS patient pool

Integrated franchise strategy

MS patient population[2]



RRMS patients, EU-5[3]



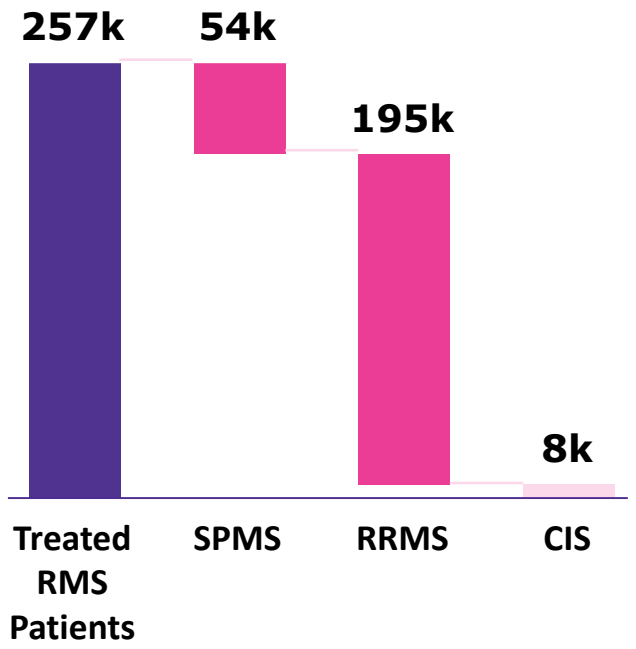
- At patient level: Rebif and Mavenclad are **highly complementary**
- At physician level: High overlap
- Franchise infrastructure investment benefits both brands

[1] Approved by EMA for treatment of highly active relapsing multiple sclerosis; Abbreviations: RRMS = Relapsing-Remitting Multiple Sclerosis; [2] Source: Merck KGaA, Darmstadt, Germany; [3] Source: Merck KGaA, Darmstadt, Germany, Ipsos; As of May 2019, Mavenclad was approved in 55 countries globally and reimbursed in half

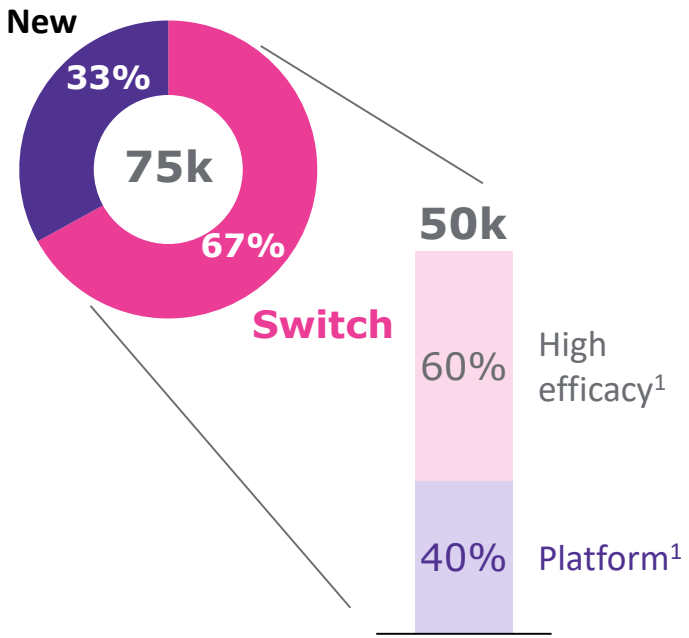
Mavenclad

On March 29, the FDA approved Mavenclad for the treatment of adults with relapsing-remitting (RRMS) and active secondary progressive disease (SPMS)

Treated RMS patients in US



Dynamic RMS treated patients



Mavenclad addresses clear medical needs

- **Previously treated** patients represent the vast majority of the dynamic patient pool
- **Lack of efficacy** is the predominant driver of switching, hence observed "high-efficacy" share of switches
- **Intolerance** also drives switching, though to a lesser degree, and results in switches between classes

→ Novel mechanism and unique oral short-course regimen of **Mavenclad addresses these needs**

Source: Decision Resource Group, MS Epidemiology Overview, October 2017; [1] High efficacy includes Ocrevus, Tysabri, Lemtrada, Gilenya – platform includes all other approved agents

Evobrutinib - Unmet needs remain in the treatment of RMS patients

First BTK-inhibitor to show clinical proof-of-concept in RMS[1]

Unmet needs in RMS

Need for new mechanisms to control disease

- **Approx. 50% of patients with RMS continue to have ongoing disease activity** over 2 years even when treated with the most effective agents
- **Agents in phase 3** development and registration for MS are **"me-too" mechanisms**

Need for higher efficacy oral therapies

- 5 approved therapies considered "higher efficacy", only **2 of which are oral**
- No approved oral therapy with **efficacy on progression vs an active control**

Opportunity to advance on benefit-to-risk

- **Systemic side effects** of therapies limit patient acceptance and compliance
- All approved higher efficacy therapies **associated with elevated risk of infection**

Evobrutinib in RMS

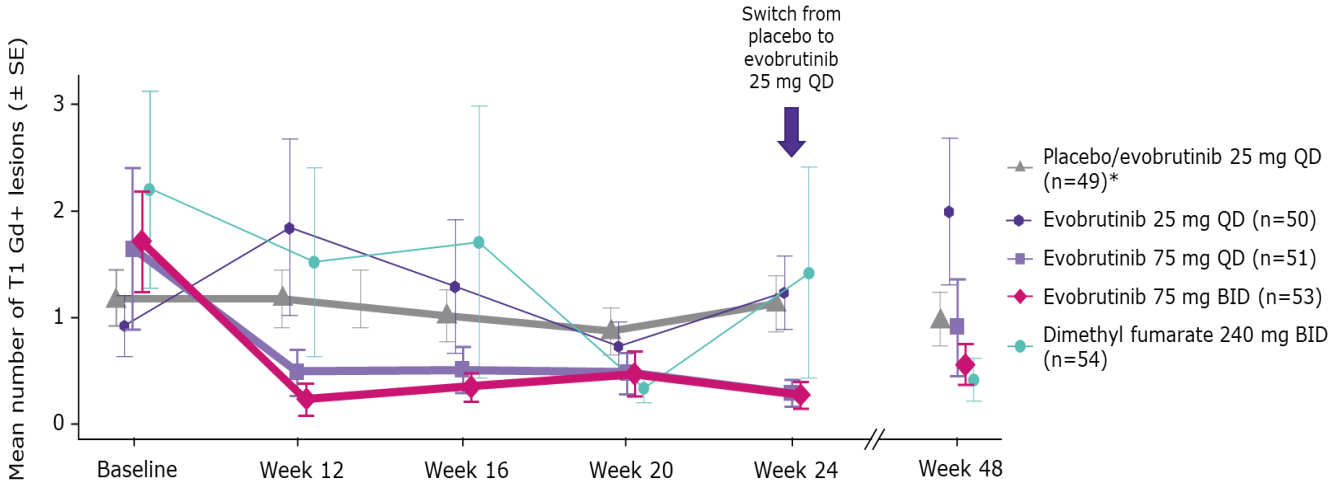
- **Novel dual mechanism** – thought to address the **innate and adaptive immune compartments** with the prospect of both **peripheral and CNS** effects
- **Robust effect on MRI and relapses** in Phase II randomized control trial (RCT) over 48 weeks
- **No systemic side effects** (e.g. GI disturbance)
- **No elevation in infections** seen over 48 weeks in RCT Phase II
- **Rapid reversibility of inhibition on treatment discontinuation** allows for treatment sequencing and risk management
- Phase III program designed to **maximize registrational success** and to fully elucidate **potential of evobrutinib mechanism** through sub- and ancillary studies

[1] Motalban et al., "Efficacy and Safety of the Bruton's Tyrosine Kinase Inhibitor Evobrutinib (M2951) in Patients with Relapsing Multiple Sclerosis over 48 Weeks", presented at AAN 2019

Evobrutinib

48 week data from Ph II randomized placebo-controlled trial robustly inform Ph III trial design[1,2]

48 week data: Primary endpoint (T1 Gd+ lesion reduction) maintained[1,2]



Safety[1,2]

Generally well tolerated over 52 weeks:

- **Transaminase elevations predominantly mild:** Some grade 3–4 events observed; all had their onset within the first 24 weeks of the study
- **All transaminase elevations asymptomatic** and reversible upon withdrawal of evobrutinib
- **No serious opportunistic infections or lymphopenia**

Robust foundation for Ph III

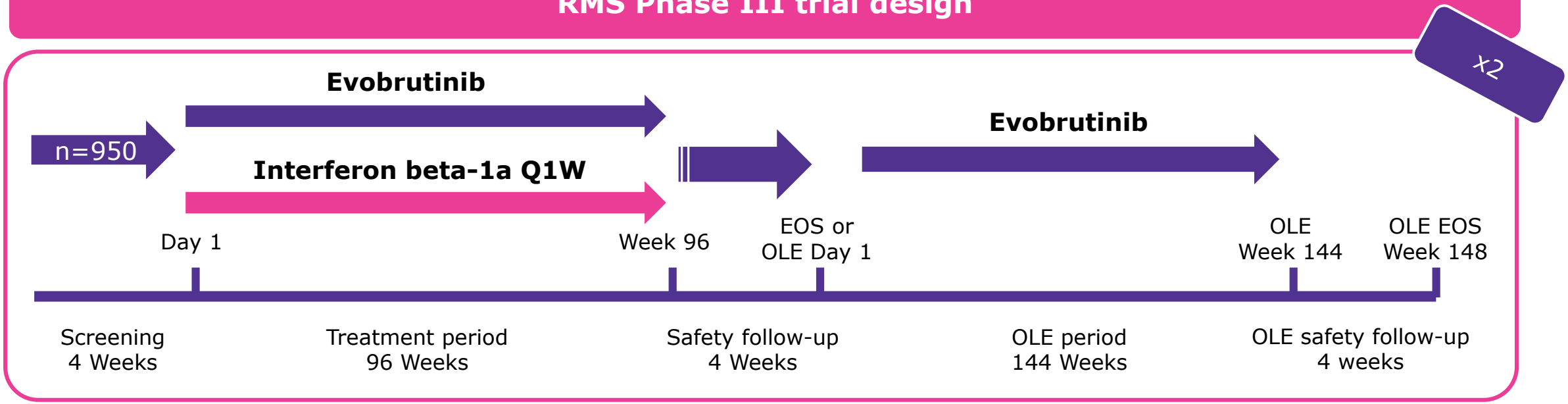
- **Robust effect on Relapse Rate -** ARR reduction maintained over 48 weeks with Evobrutinib 75mg BID (0.11 at 48 weeks)
- **Rapid Reduction in Mean number of T1 Gd+ lesions -** Early onset at Week 12 and persistence to Week 48 in the evobrutinib 75 mg BID arm
- **No new safety signals**
- **Results support further clinical development of evobrutinib in RMS**

[1] Motalban et al., "Efficacy and Safety of the Bruton's Tyrosine Kinase Inhibitor Evobrutinib (M2951) in Patients with Relapsing Multiple Sclerosis over 48 Weeks", presented at AAN 2019; [2] Montalban et al., „Placebo-Controlled Trial of an Oral BTK Inhibitor in Multiple Sclerosis" published in NEJM, May 2019

Evobrutinib

Phase III trial recently started, with goal to rapidly advance BTKi into clinical practice

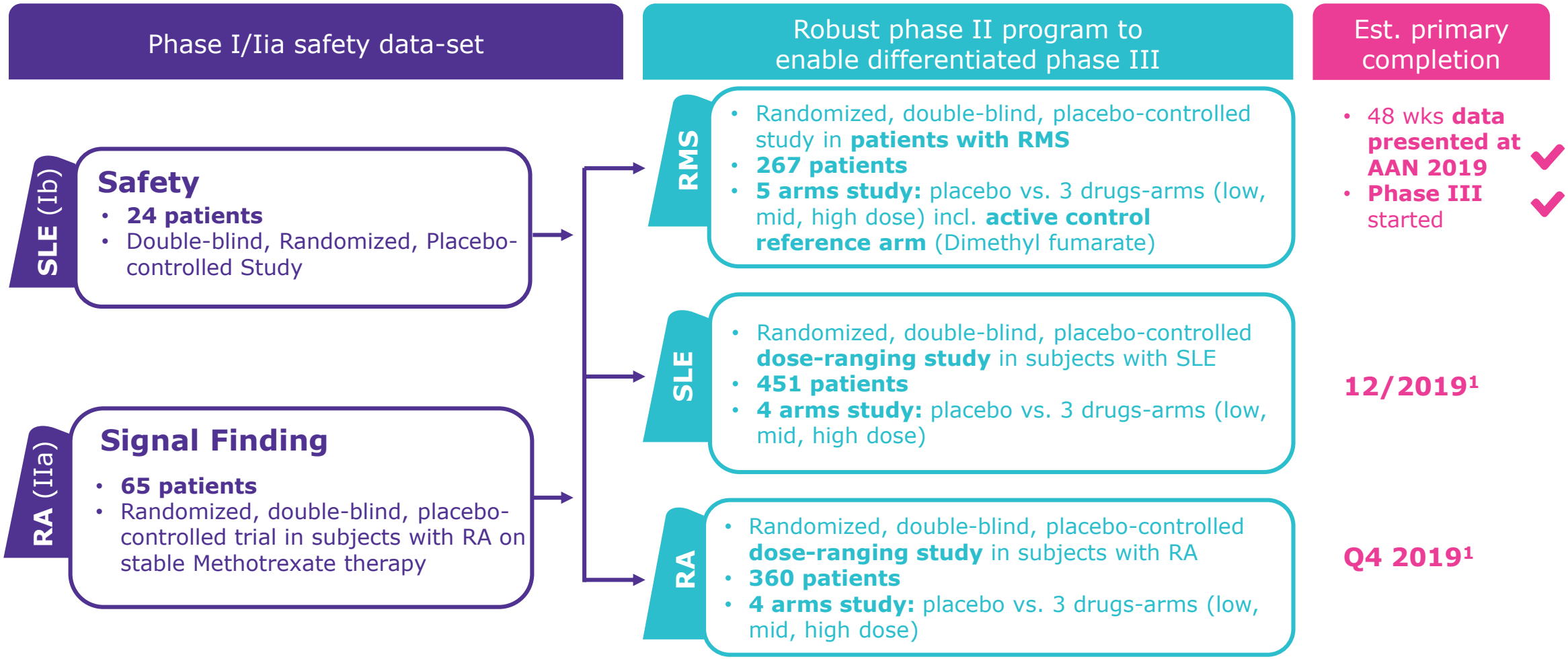
RMS Phase III trial design



- Eligible participants will be **randomized 1:1** in Phase 3
- **Two parallel phase 3 studies** to be conducted to support registration
- Core + ancillary study program will **robustly characterize impact of Evobrutinib** on measures of RMS disease including both **novel and unique measures relevant to its presumed MOA**

Acronyms: EOS = End Of Study, OLE = Open-Label Extension, Q1W = administered once weekly

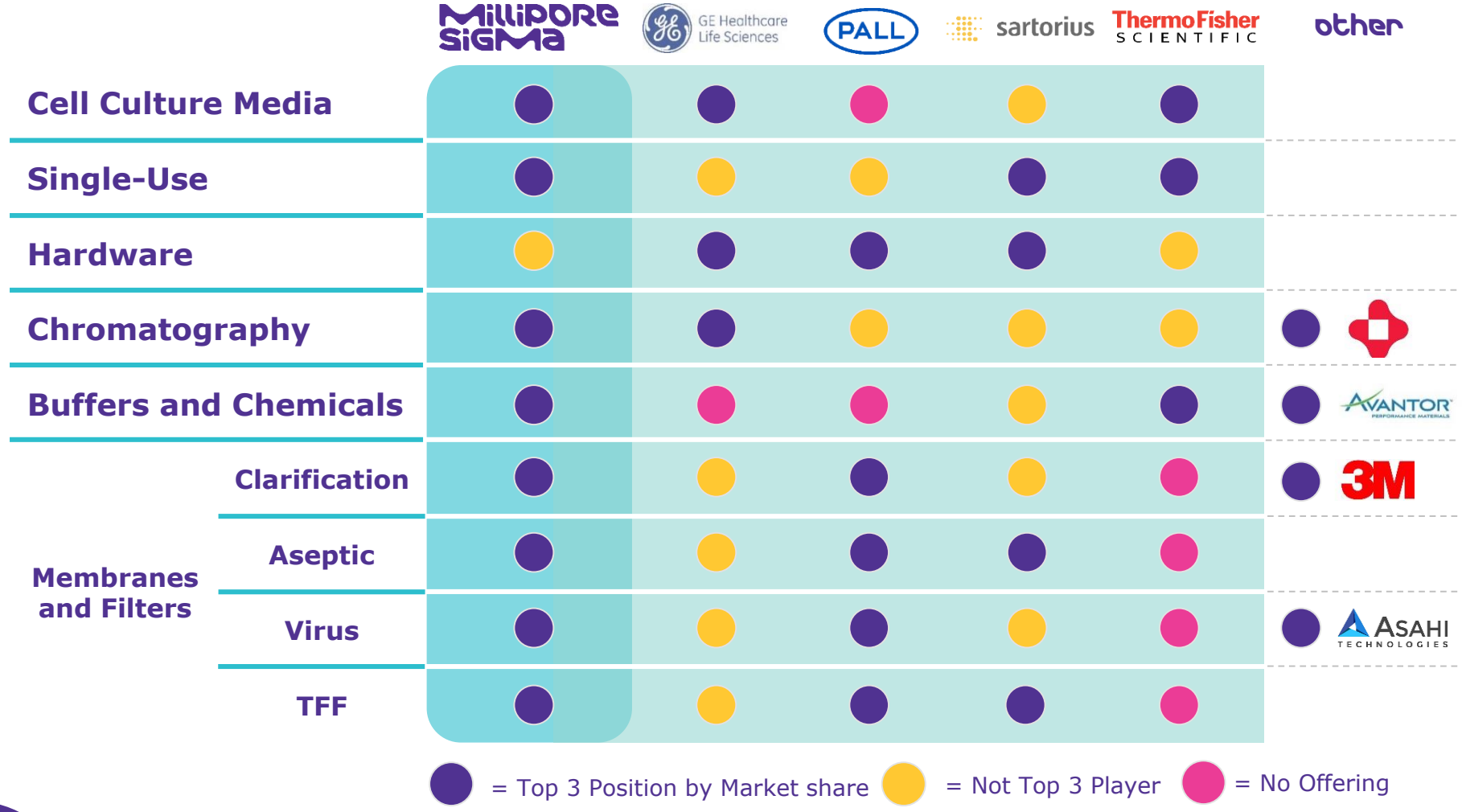
Evobrutinib
Comprehensive development plan across immune-mediated diseases



All timelines are event-driven and may be subject to change; 1: Data read-out expected in H1 2020

Process Solutions
We are the only company to span the entire value chain of our customers

2018 Market share position estimate[1]



Life science has a leading position in 8 out of 9 critical steps

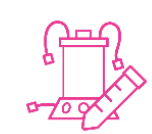
[1] Based on internal Life Science market research; TFF = tangential flow filtration

Process Solutions

Next-generation bioprocessing on the cards

Today's process & portfolio

Make



CHOZN
Cell Line

Ex-Cell® Advanced™
media

Mobius®
bioreactor

Clarisolve®
Depth Filters

Eshmuno®
Chrom. resin

purify

Viresolve®
Pro Solution

ProSep®
Ultra Plus Resin

Opticap®
Filters

Launched 2018

Pellicon®
Ultrafiltration Cassettes

Durapore®
Filtration

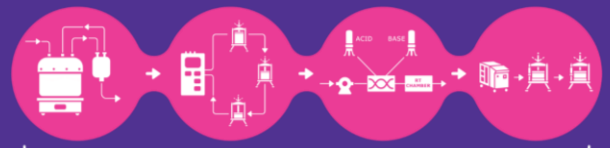
Launched 2018

Millipak®
Final Fill Filter

BioReliance ® | **cGMP SOLUTIONS & SERVICES** | **EMPROVE®**

Tomorrow's process

mAb process intensification 2017 - 2020+



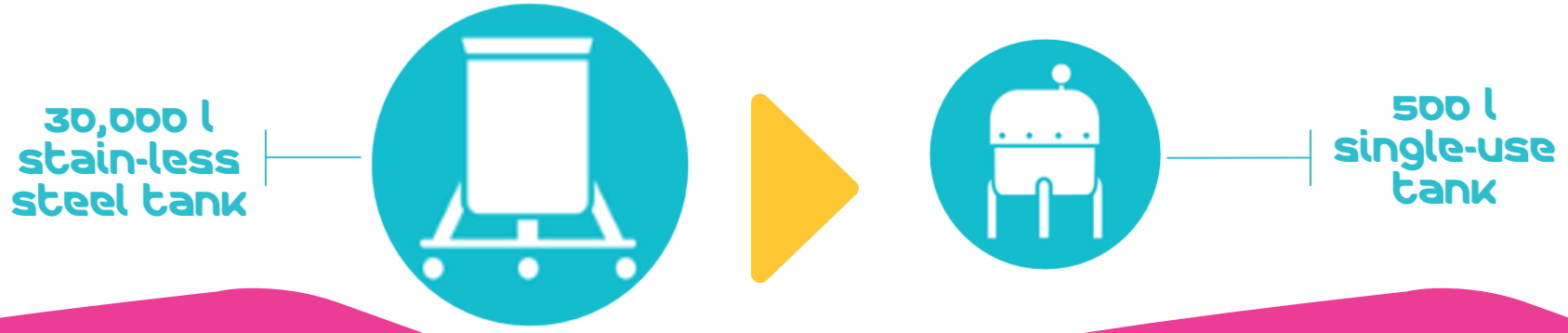
continuous processing >2025

Continuous bioprocessing will …

- be an evolution in mAb bioprocessing
- take time to establish
- leverage the present
- lead to hybrid solutions

Process Solutions

Our single-use technologies drive flexibility in modern bioprocessing



Traditional Multi-use facility	
CAPEX* required	**~$500 m to $1 bn**
Time to construct	**5 to 10 years**
Change over time	**4 weeks**
Footprint	**~>70,000 m²**

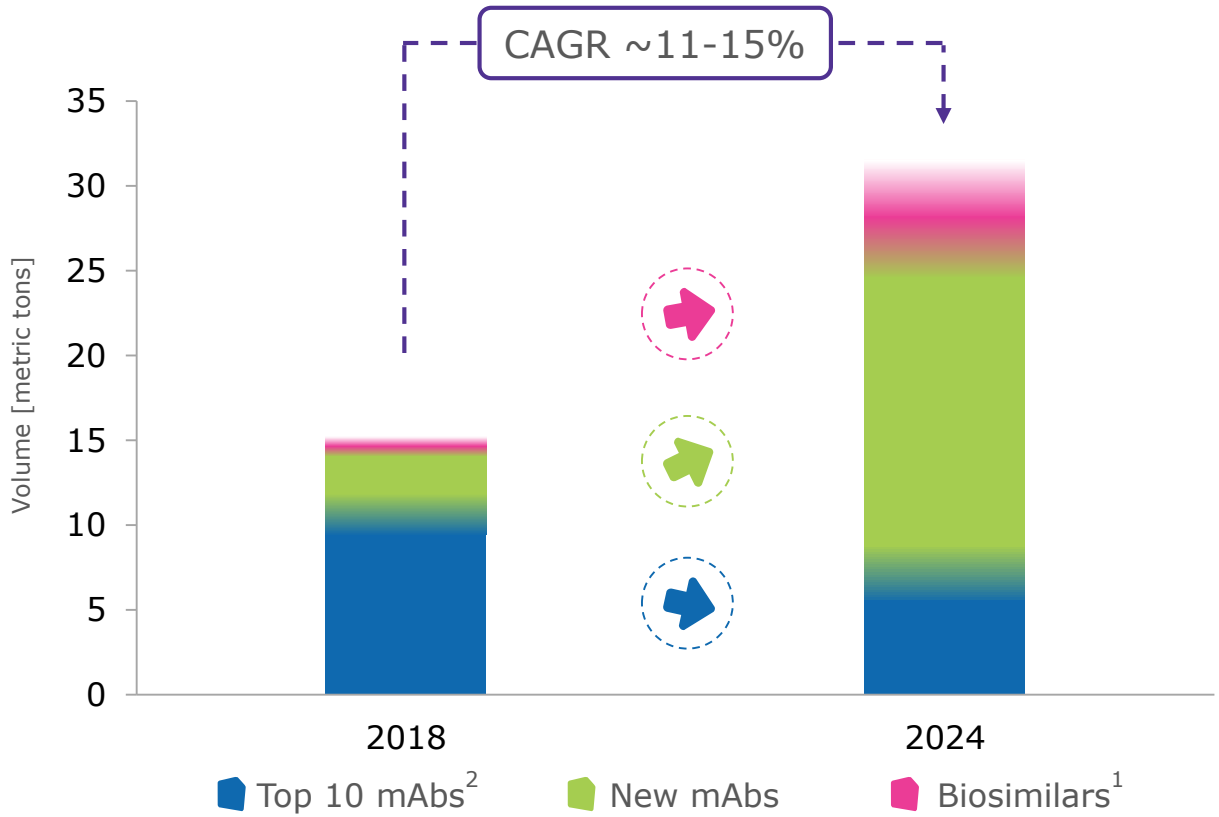
Innovative single-use facility	
CAPEX required	**$20 m to $100 m**
Time to construct	**1.5 years**
Change over time	**0.5 days**
Footprint	**~11,000 m²**

Strong demand for single-use technologies and Process Solutions' broad offering was and will remain a key source of growth for Life Science

*CAPEX = Capital Expenditure

Democratization of mAbs market will drive diversification, change, variability

mAb volume projections 2018 to 2024



Market development

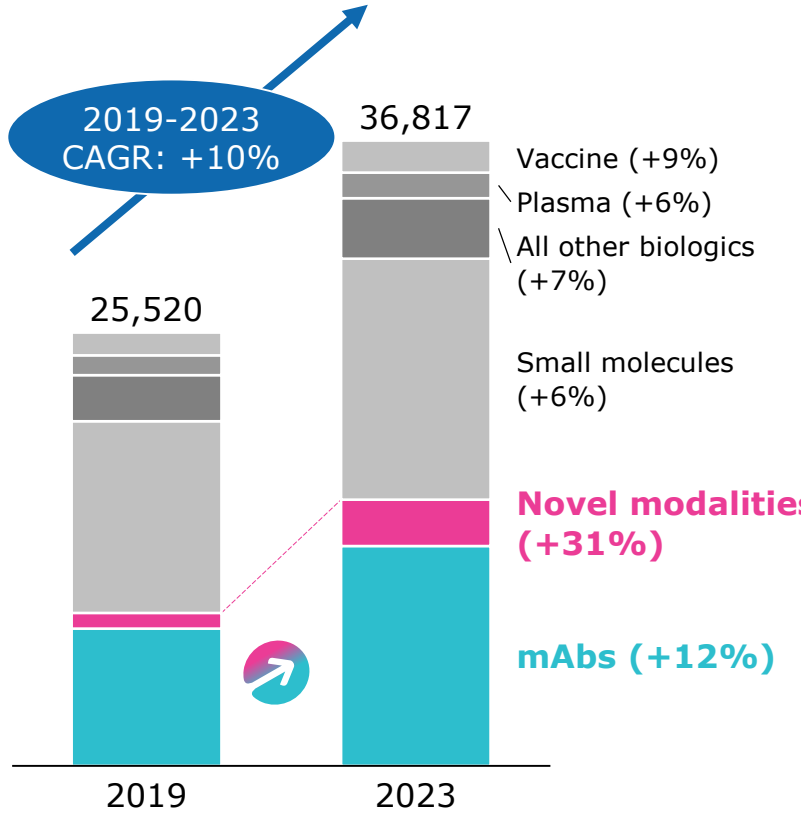
- Overall mAbs market will grow ~11-15% CAGR
- Top 10 originator mAbs represent ~ 60% of market volume today and will decline to ~20% in 2024
- Biosimilars will gain share

[1]Biosimilars scaling factor = 2.8 based off internal estimates and McKinsey analysis; [2]Top 10 mAbs by 2017 volume, includes Enbrel.
Source: EvaluatePharma | Sept 2018; mAbs = Monoclonal antibodies

Life Science

Proccess Solutions: Growth opportunities beyond mAbs

Growth potential by segment
Accessible market [€m], 2019-2023 CAGR[1]



- **Diversifying products and services** in line with the new modalities coming to the market: fusion biologics, viral and gene therapies, cellular therapies
- **Leading technologies:** investments over 15 years, 20 granted CRISPR patents
- **Services:** investments in CDMO capacity for Viral Vector Manufacturing, and HP-API

- **Leading technologies:** Single Use and BioContinuum™ for intensified and continuous bioprocessing
- **Services:** Contract manufacturing for biotechs at 3 global sites

Growth market - China

- **Half of world-wide early stage mAb market** by 2022
- **A leading country** in clinical trials

- **Increased investments** into **Nantong and Wuxi manufacturing sites**
- **China's first BioReliance® End-to-End Biodevelopment Center** opened in Shanghai in 2017

1: Evaluate Pharma market research; Novel modalities include VGT, Cell Therapy and Stem Therapy; Acronyms: CDMO = Contract Development and Manufacturing Organization, CRISPR = Clustered Regularly Interspaced Short Palindromic Repeats, HP-API = Highly Potent Active Pharmaceutical Ingredients
ased on internal Life Science market research; TFF = tangential flow filtration

Applied Solutions

Broad offering across the dynamic cell and gene therapy value chain

understand → prove → deliver →

Merck KGaA, Darmstadt, Germany offering

Develop **cutting-edge tools** for scientists to

- Uncover **foundational understanding**, e.g. CRISPR patent grants in 7 geographies
- **Modify** genetic functions, e.g. CRISPR/Cas 9 tools, library and reagents, ZFN

Create **cell lines and cell models** for testing **safety and efficacy**

- Pharmacokinetics (ADME)
- Toxicology testing
- Potency model
- Examples: primary human hepatocytes, Intestine, liver and kidney assays

- Offer cGMP clinical and commercial manufacturing, e.g. manufacture **viral vectors**
- Improve the **supply chain of cell therapy**, e.g. cell and gene therapy products and services

Merck KGaA, Darmstadt, Germany is a supplier of novel products and services with a strong IP portfolio to meet the rapidly growing demand for novel therapies

Abbreviations: CRISPR = Clustered Regularly Interspaced Short Palindromic Repeats; VGT = Virology and Gene Therapy, ZFN = zinc finger nuclease; ADME = absorption, distribution, metabolism, and excretion; GMP = good manufacturing practice

Research Solutions

Leading e-Commerce and operational excellence to serve customers

unique customer experience

Hundreds of thousands of products

SEARCH

Articles, protocols and peer reviewed papers

SCIENTIFIC CONTENT

Real-time pricing and availability

ORDER

Highly reputable e-commerce platform

#1 in Life Science for web traffic

Ranking of websites:*

sigmaaldrich.com	**No. 1**
thermofisher.com	No. 2
fishersci.com	No. 3
vwr.com	No. 4
emdmillipore.com	**No. 5**

>100 M unique visits

>€ 1.5 Bn sales

>30% of Merck KGaA, Darmstadt, Germany eCommerce orders contain products from former Sigma AND Millipore

Impeccable supply chain

>300K products

~13 M lines shipped per year

~90% fill rate globally

>80% of lines shipped within 24-48 hours in Western Europe and North America

*Alexa report, global, all sectors – Web traffic ranking June 2018: sigmaaldrich.com = Rank 3,361, thermofisher.com = Rank 3,935, fishersci.com = Rank 17,473, vwr.com = Rank 27,061, emdmillipore.com = Rank 29,637

Semiconductor Solutions
Key enabler for digital trends

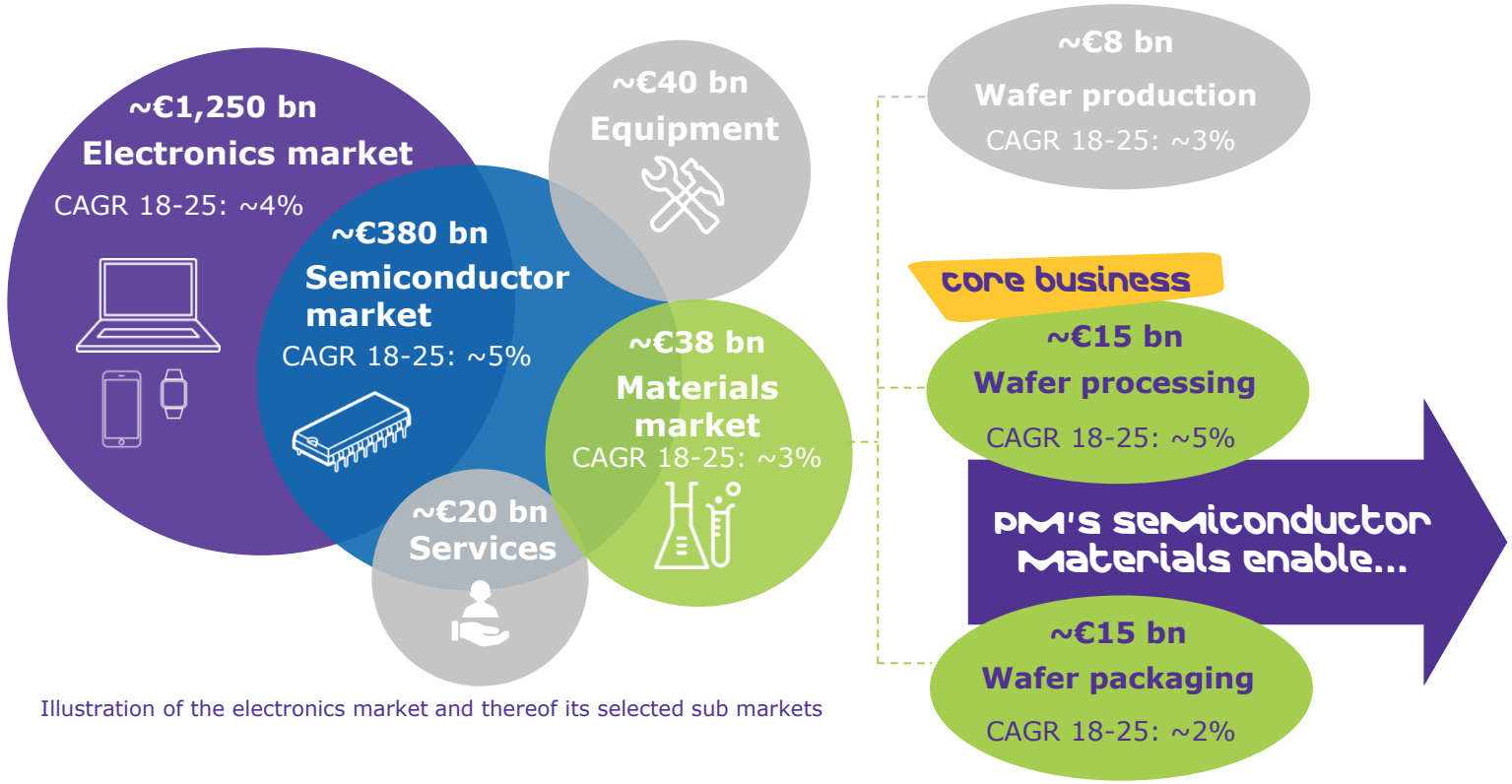


Illustration of the electronics market and thereof its selected sub markets

...customer needs

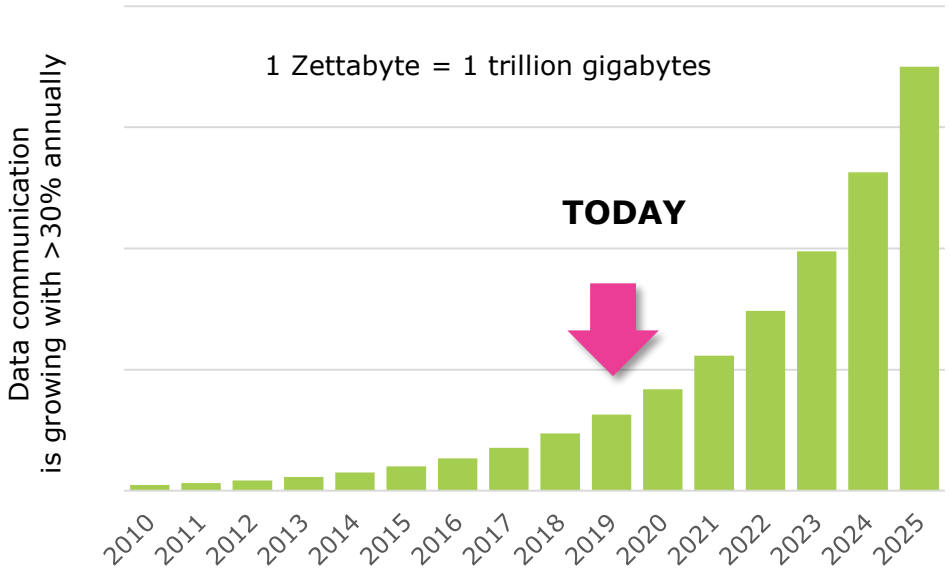
- Smaller structures beyond limitations of existing technologies
- Higher memory capacity, faster processing speed, less power consumption
- Improved yield and lower processing costs

Performance enhancing materials will benefit over-proportionately from attractive semiconductor growth rate of 5% CAGR

Performance Materials
Semiconductor Solutions – Data explosion driving secular growth

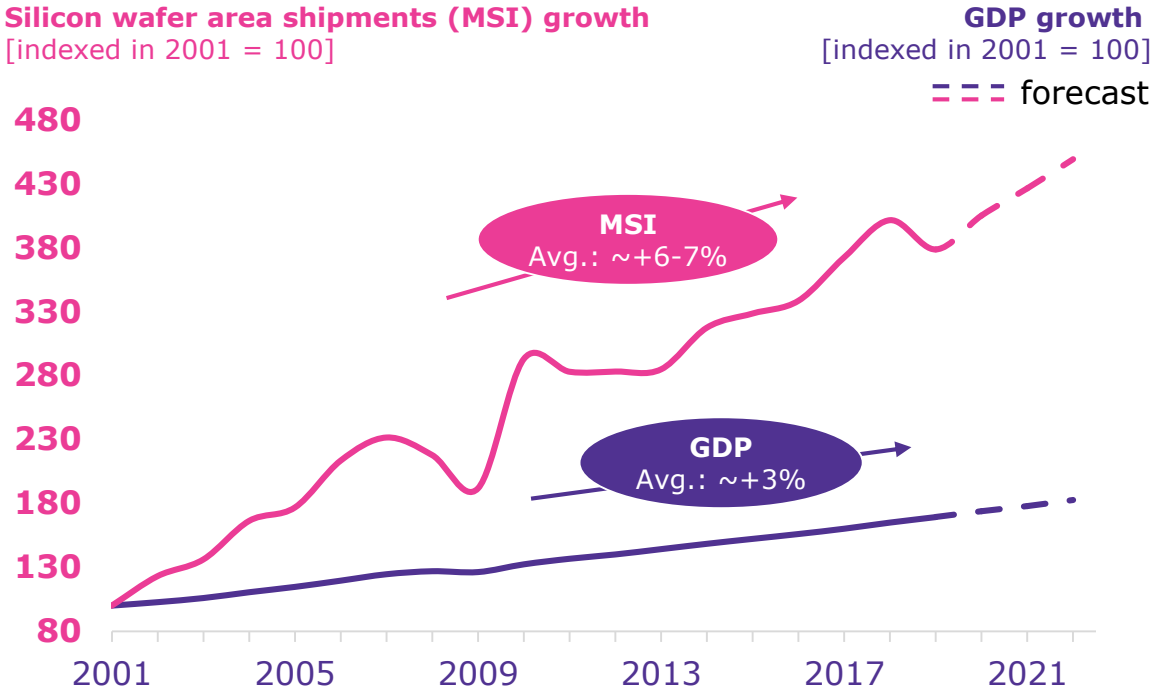
End-market – Data driving growth of electronics industry[1]

Size of global data sphere in zettabytes[1]



- Data **volumes growing at >30% annually**
- **Driving the digital revolution** as semiconductors are required for data processing and storage

Silicon wafer area shipments– Sustainable long-term growth[2]



- Silicon wafer area shipments (MSI) **strongly correlated with semiconductor market growth**
- **MSI expected to return to growth as of 2020**

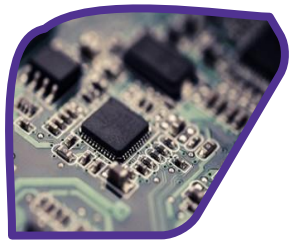
Semiconductor Solutions
Enabler of key technology trends

Lithography materials

Innovation focus: Enabling structures in nodes smaller than 14 nm

Dielectric materials

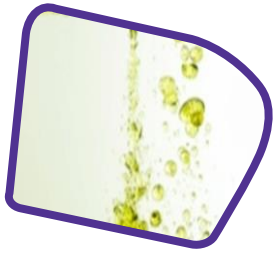
Enabling cost-efficient production of the newest memory generations



Conductive Pastes

Electrically conductive materials for use in the manufacture of advanced electronic devices

- **Smaller structures by materials enabling Moore's law**
- **Higher memory capacity, faster processing speed, less power consumption**
- **Improved yield and lower processing costs**

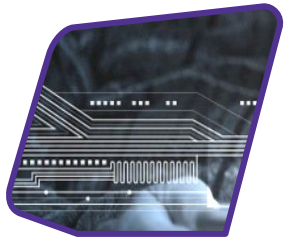


Process materials

Supporting the manufacturing process for all kinds of IC devices, e.g. IoT

Silica materials

Innovation focus: High removal rate in CMP without defects



Deposition Materials

Next Generation Deposition materials for ALD and CVD

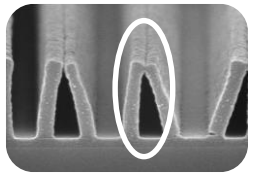
Newest generation of smartphones

Servers enabling Big Data

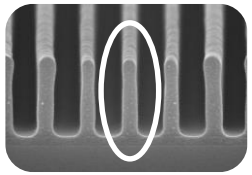
Wearables and other devices for Internet of Things

Expanding the limits of how small you can go

Pattern collapse

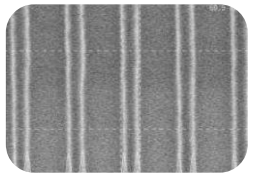


AZ FIRM® rinse materials



As lines get narrower and closer together in advanced chip generation, lines tend to "stick" due to surface tension.

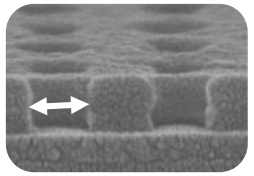
Lithography limitation



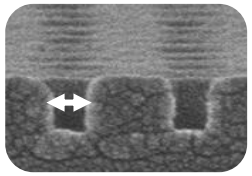
Directed self-assembly (DSA)

Block copolymer can generate small lines or contact holes by self-assembly. This allows miniaturization without expensive new equipment.

Wide features



AZ Relacs® shrink materials



Shrink materials "shrink" the gap between lines and, hence, allow the manufacture of narrower features otherwise not possible.

Merck KGaA, Darmstadt, Germany delivers highly innovative solutions for complex customer problems

Semiconductor Solutions

Overcoming technology barriers – supporting continued progression of technological mega trends

Market drivers and technological trends

Miniaturization: Devices are becoming smaller with better performance
- Need for enabling materials to reduce size (Moore's law)

Mobility: Everyone is continuously connected without direct power supply
- More chips needed for local energy production
- Energy storage → smaller batteries with higher density

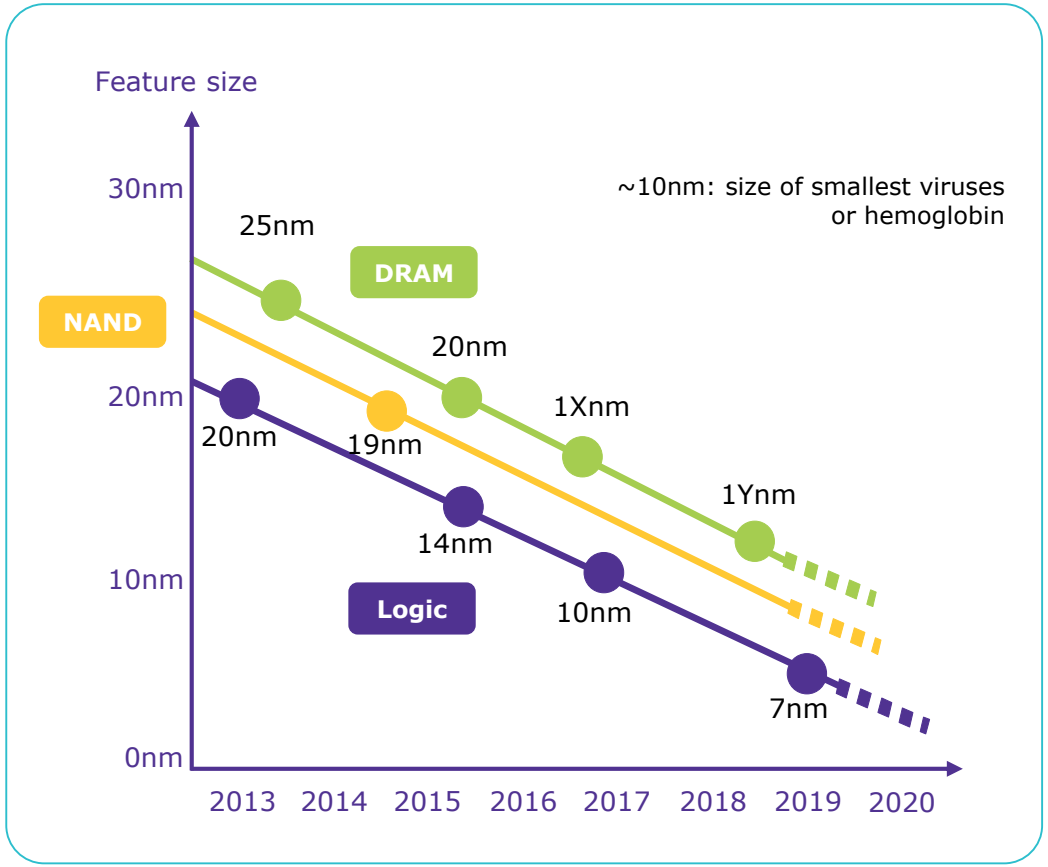
Internet of Things: Everything is continuously connected
- More gadgets and devices that include chips
- Increasing amount of communication and sensor chips

Big Data: Increasing need for intelligent data storage
- Switch from hard disk drives (HDD) to solid state drives (SSD)

Selected competitors

- Tokyo Ohka Kogyo
- Nissan Chemicals
- Dow Electronic Materials
- JSR

Feature sizes in memory market develop as predicted by Moore's law[1]



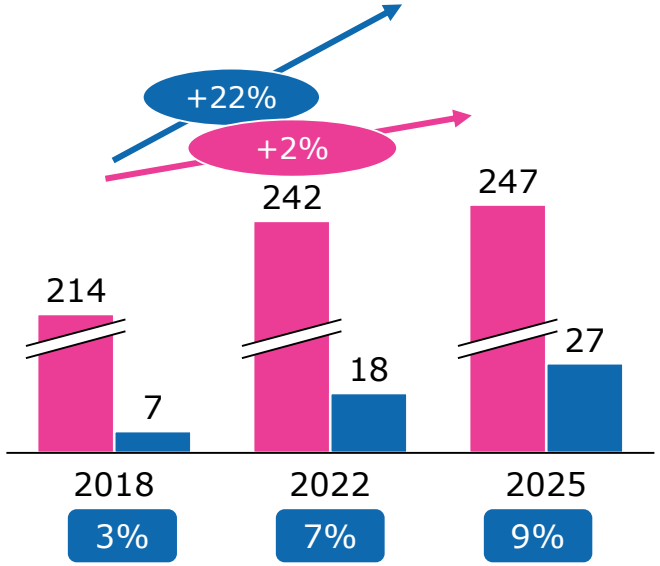
[1]Source: ASML, Merck KGaA, Darmstadt, Germany Customer Timelines, Abbreviations: DRAM = Dynamic Random-Access Memory, NAND Flash Memory

Performance Materials

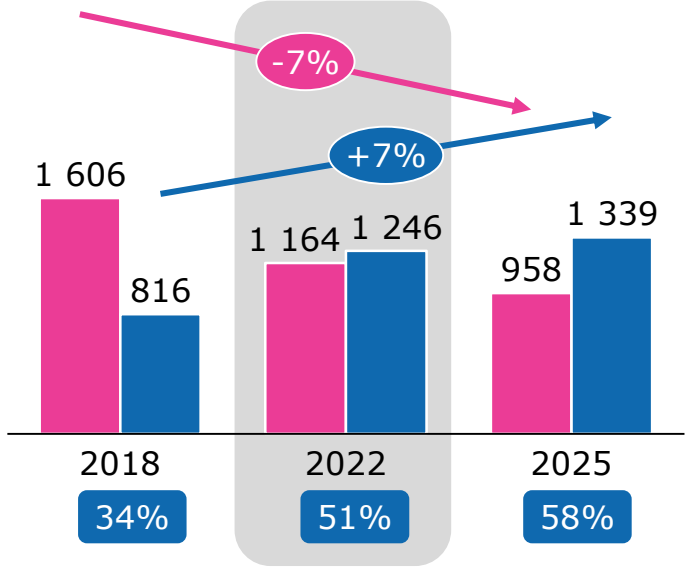
Display Solutions - OLED material market to exceed LC material market by 2022

Liquid Crystals OLED

Display shipment area[1] [km²]



Addressable material market[2] [€m]



- **Continued growth** across all technologies
- **OLED growing faster than LCD,** but **LCD to command 90+% area share** for forseeable future

- **Material value** per OLED display **higher** than in LCD
- **OLED material market** to **exceed LC material market by 2022**, but market split between **many more players**

x% OLED shipment area / addressable material market [in % of total]

Portfolio Role

Manage for cash

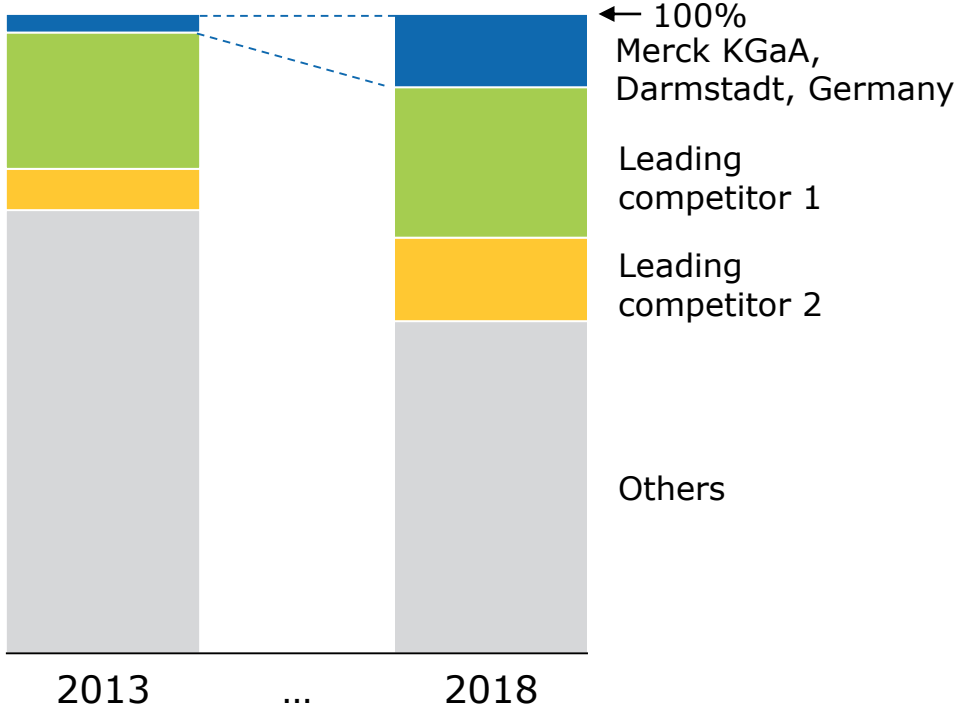
Liquid Crystals
Surface Solutions

Invest for growth

Semiconductor Solutions
OLED

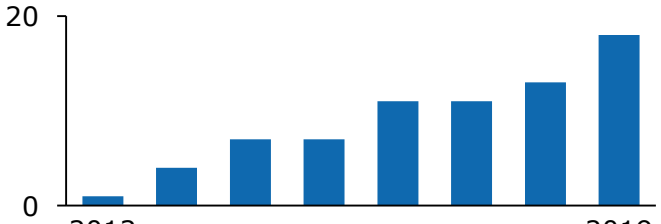
Performance Materials
OLED – A major driver of topline growth with significant potential

Market share (value) nearly quadrupled in 5 years[1]



Maintaining global top 3 position through …

Continuous portfolio development:



# of Merck KGaA, Darmstadt, Germany OLED materials in mass production with annual revenues >€1 m

Strategic partnerships:

UNIVERSAL DISPLAY CORPORATION

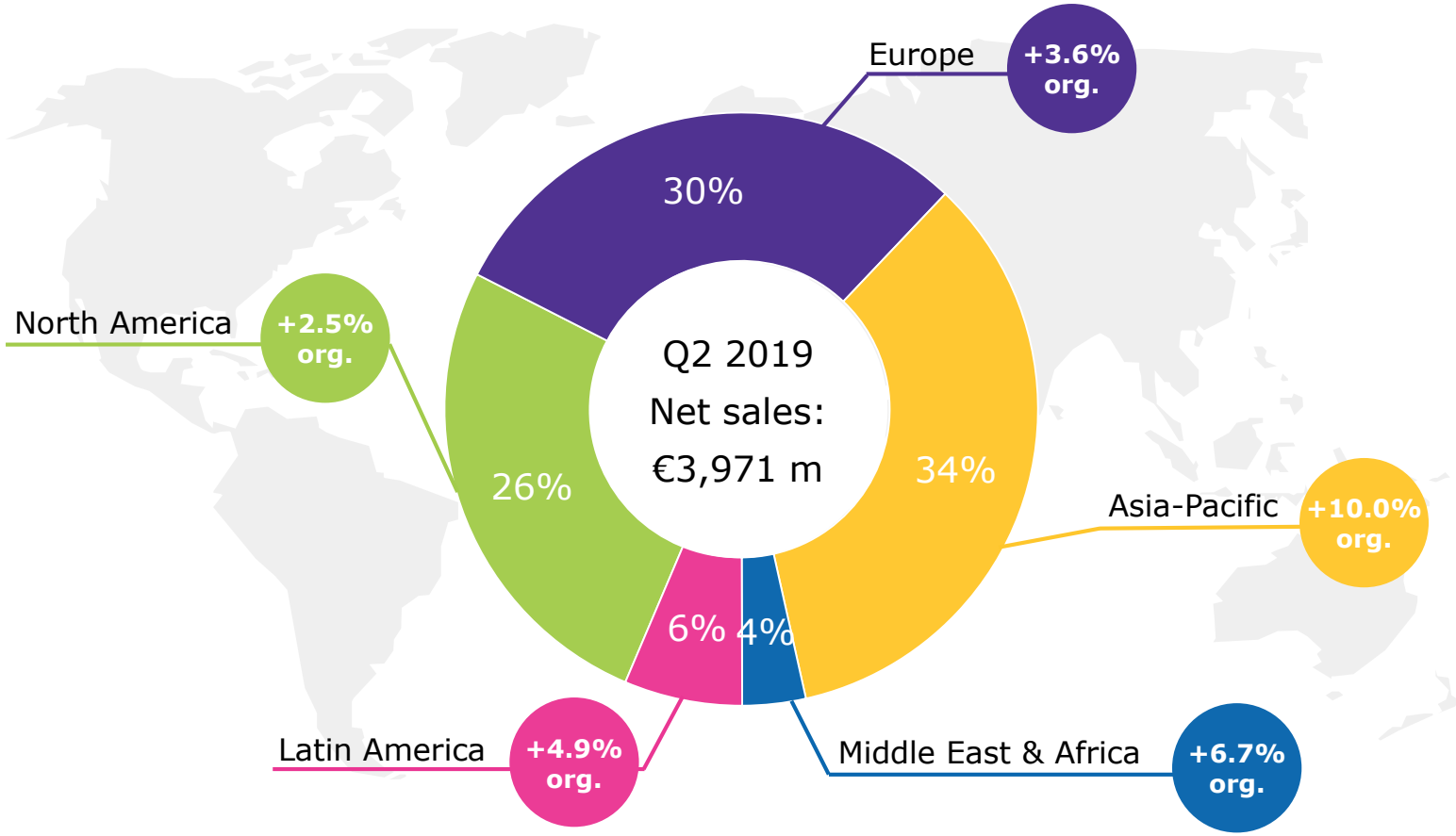
Idemitsu Kosan

Proximity to the customer:

- 2015: Opening of **OLED development center Korea**
- 2018: Opening of **OLED technology center China**
- 2018: Strategic cooperation with **important Chinese customer**

Organic growth driven by all regions

Regional breakdown of net sales [€m]



Regional organic development

- Strong APAC due to double-digit growth of Glucophage®, Erbitux® and OLED; Life Science with ongoing strong demand
- Europe driven by strong demand in Life Science; strong Mavenclad® ramp-up overcompensates Rebif® decline
- North America reflects double-digit growth of Process Solutions, Fertility and Mavenclad® ram-up, outweighing double-digit decline of Rebif®
- Solid performance in LATAM due to strong Life Science, Erbitux and N&I franchise
- Middle East and Africa driven by strong Rebif® and Glucophage®

Acronyms: APAC – Asia-Pacific; MEA – Middle East & Africa; LATAM – Latin America

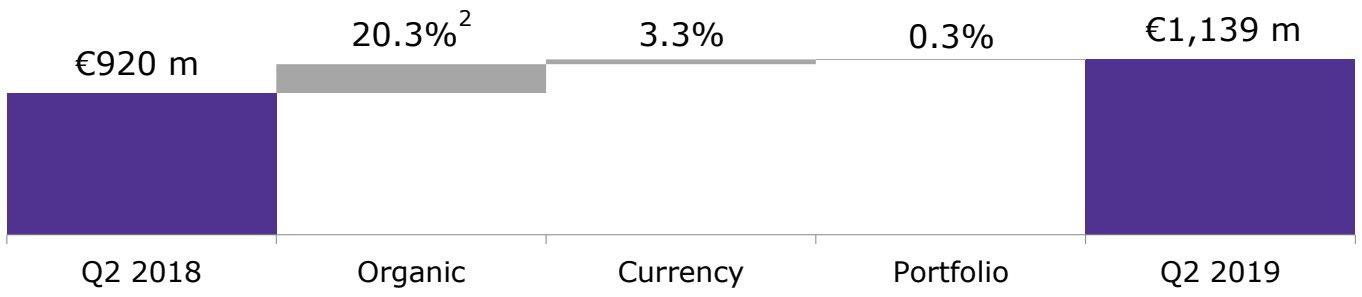
Life Science and Healthcare drive organic growth supported by FX tailwinds

Q2 2019 YoY net sales

	Organic	Currency	Portfolio	Total
Healthcare	5.2%	0.7%	0.0%	**5.9%**
Life Science	9.0%	2.1%	-0.6%	**10.5%**
Performance Materials	-2.0%	2.4%	0.0%	**0.4%**
Group	5.6%	1.5%	-0.2%	**6.9%**

- Solid growth in Healthcare reflects stable core business and increasing contributions from Mavenclad® and Bavencio®
- Above-market organic growth in Life Science due to strong demand across all businesses and regions
- Performance Materials reflects lower LC due to reduced China ramp-up support and softer market demand in Semiconductor and Surface Solutions; OLED again strong

Q2 YoY EBITDA pre



- Increased organic EBITDA pre driven by milestone payments and deferred income in HC as well as ongoing strong performance of LS
- Positive FX impact on EBITDA pre due to EUR/USD development and last years' ARS[1] devaluation burdened by hedging losses

[1]ARS – Argentine peso; [2]Thereof IFRS 16 effect with +3.5% (+€32 m);
Totals may not add up due to rounding

Q2 2019: Overview

Key figures

[€m]	Q2 2018	Q2 2019	Δ
Net sales	3,714	**3,971**	6.9%
EBITDA pre *Margin (in % of net sales)*	920 *24.8%*	**1,139** *28.7%*	23.8%
EPS pre	1.23	**1.54**	25.2%
Operating cash flow	367	**743**	102.2%

[€m]	Dec. 31, 2018	June 30, 2019	Δ
Net financial debt	6,701	**7,829**	16.8%
Working capital	3,486	**3,866**	10.9%
Employees	51,749	**53,051**	2.5%

Comments

- Net sales growth driven by Life Science and Healthcare
- EBITDA pre & margin reflect Peg-Pal (~€75 m) and Bavencio® (~€35 m) milestones, GSK deferred income (~€30 m) and strong performance of LS
- Strong operating cash flow due to higher profit after tax and GSK upfront payment
- Working capital reflects increased business activity and FX
- Higher net financial debt mainly due to IFRS 16 adoption, dividends and temporary investment of cash proceeds from CH divestment

Totals may not add up due to rounding.

Healthcare: Underlying profitability increases vs. Q1 driven by organic performance and cost discipline, further boosted by non-recurring business-related income

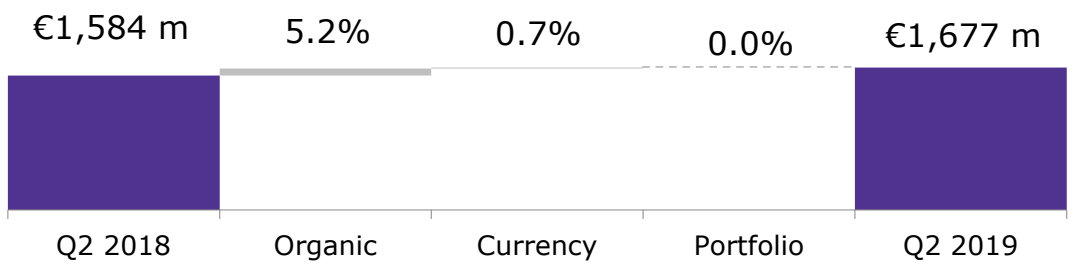
Healthcare P&L

[€m]	Q2 2018[1]	Q2 2019
Net sales	1,584	**1,677**
Marketing and selling	-592	**-599**
Administration	-82	**-84**
Research and development	-407	**-395**
EBIT	155	**345**
EBITDA	338	**523**
EBITDA pre	379	**528**
Margin (in % of net sales)	*23.9%*	***31.5%***

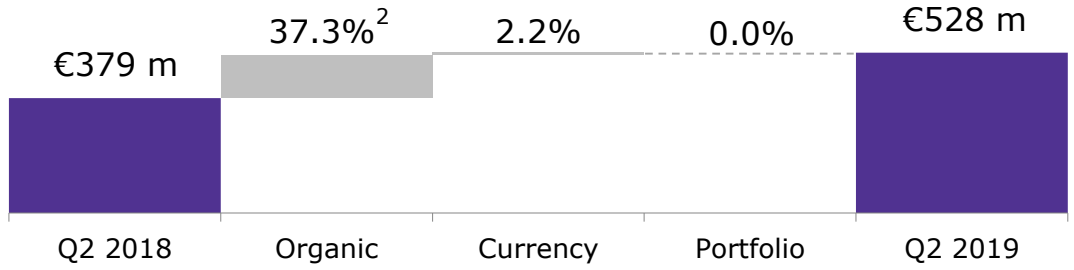
Comments

- Solid growth in Healthcare driven by General Medicine, Mavenclad®, Erbitux®, Fertility and Bavencio®, more than offset strong Rebif® decline
- Mavenclad® with continued strong uptake supported by initial U.S. sales following approval (+41% vs. Q1)
- Bavencio® on track; Erbitux® benefiting from China reimbursement, still facing ongoing competition and price pressure in major markets
- R&D below prior year due to stringent project prioritization
- Higher EBITDA pre driven by Peg-Pal (~€75 m) and Bavencio® (~€35 m) milestone as well as GSK deferred income (~€30 m), sequential underlying[3] margin increase

Net sales bridge



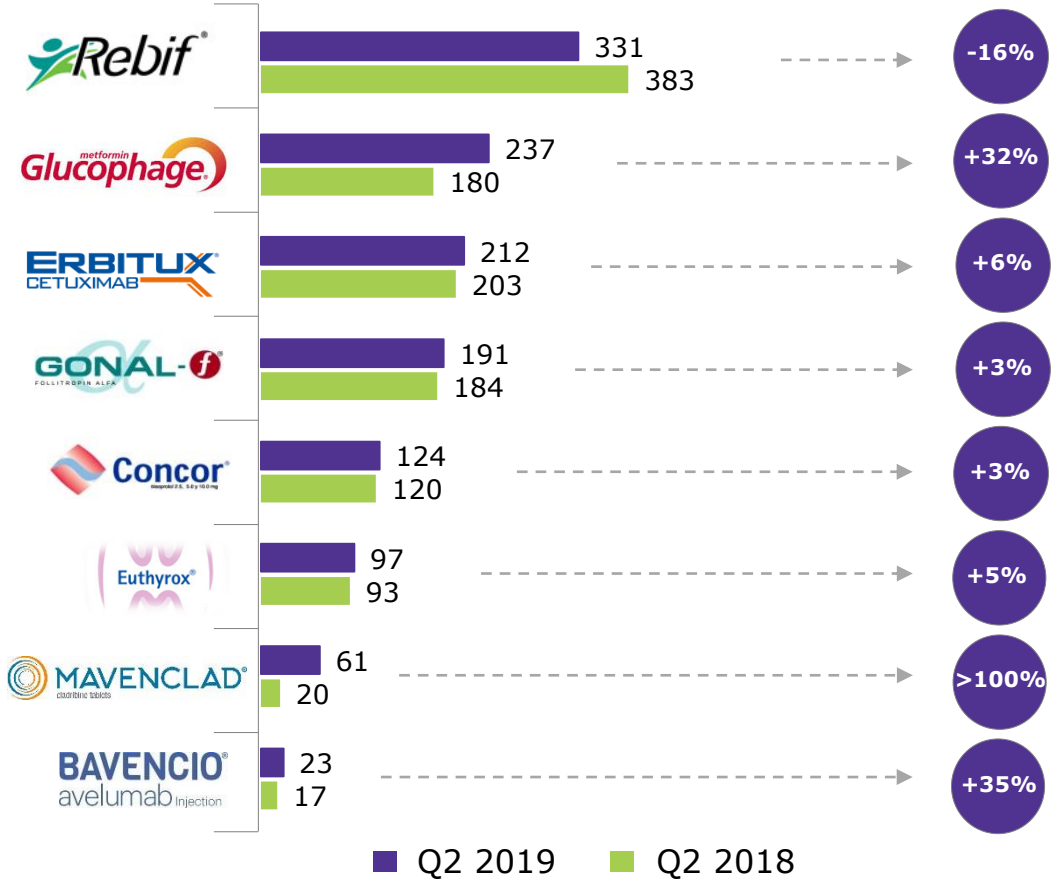
EBITDA pre bridge



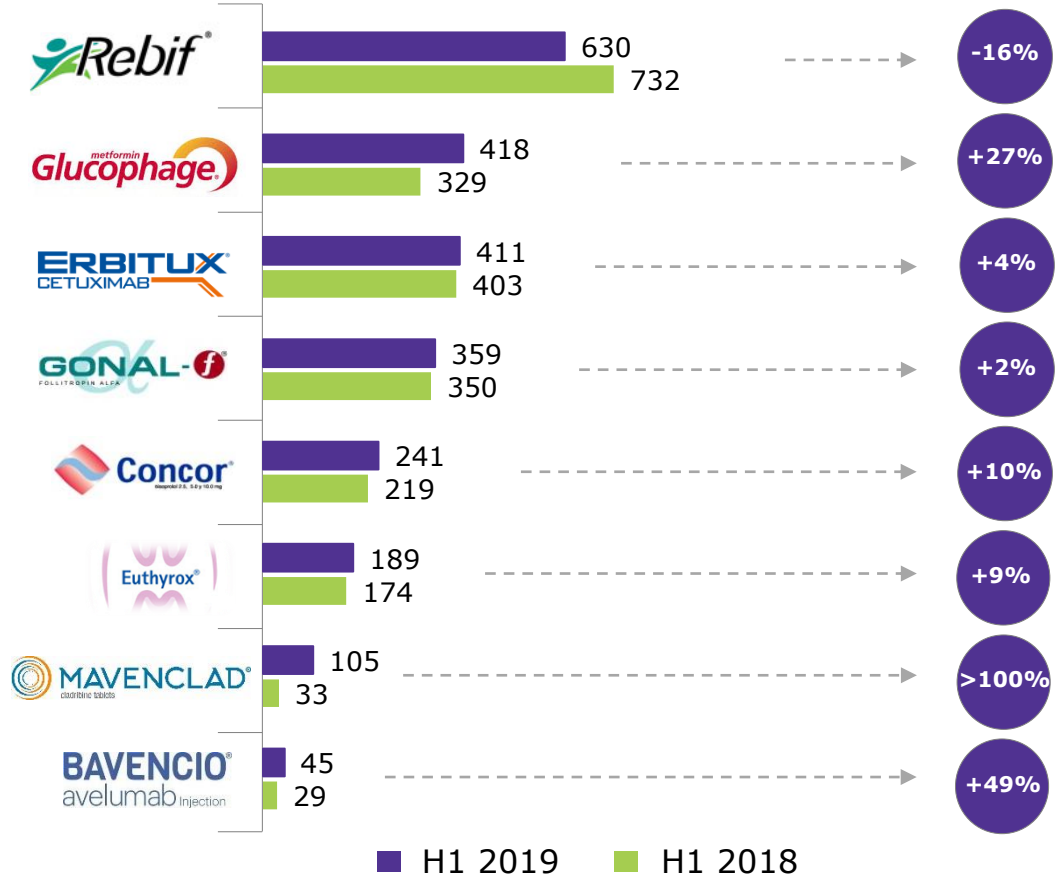
[1]LY numbers have been modified, due to disclosure changes of adjustments; [2]Thereof IFRS 16 effect with +3.2% (+€12 m);[3]EBITDA pre adjusted for €140 m non-recurring income; Totals may not add up due to rounding

Healthcare organic growth by franchise/product

Q2 2019 organic sales growth [%] by key product [€m]

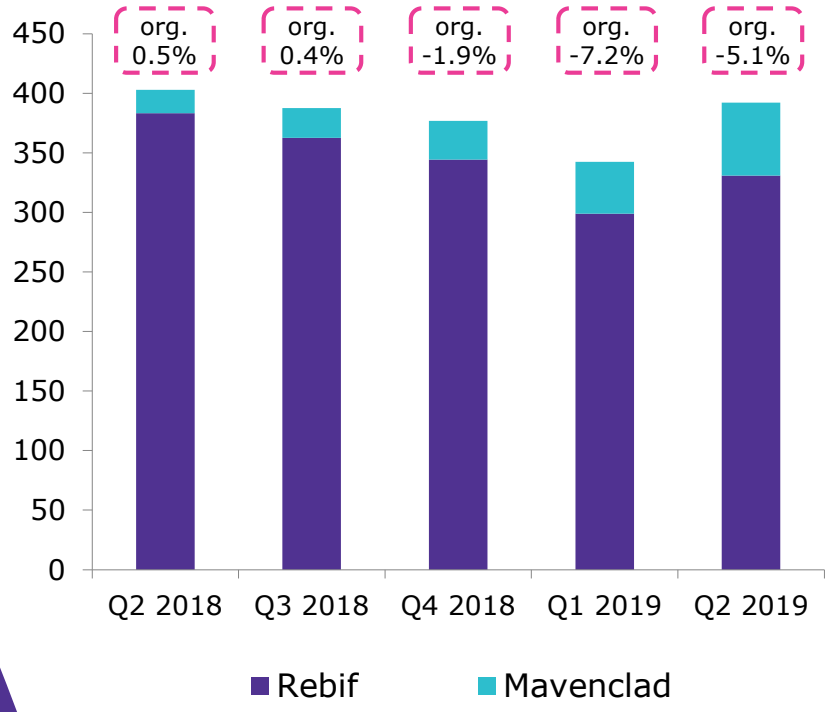


H1 2019 organic sales growth [%] by key product [€m]

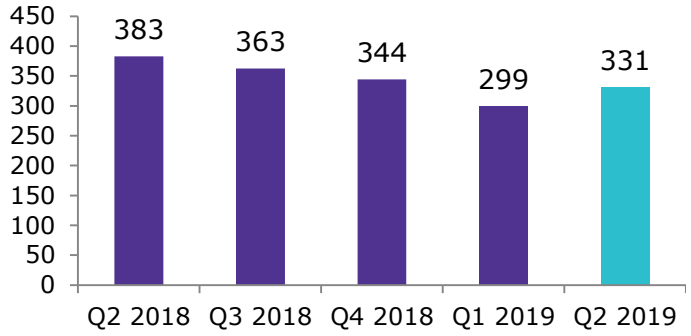


Neurodegenerative Diseases: Strong growth of Mavenclad® still overcompensated by Rebif® decline

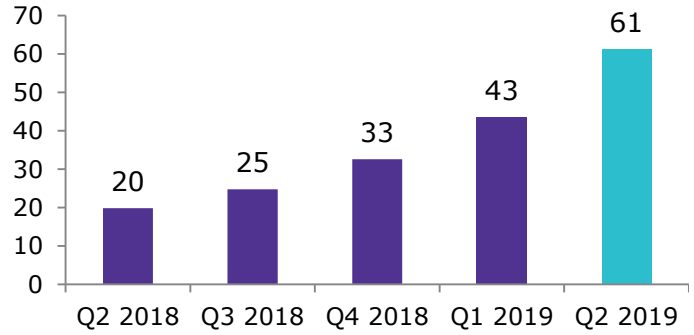
Sales development NDI, [€m]



Rebif® net sales, [€m]



Mavenclad® net sales, [€m]



- Rebif® sales of €331 m in Q2 2019 reflects organic decline of -16.1% mitigated by FX effect of +2.5%
- U.S. and European volume decline mainly due to competition
- U.S. decline in line with IFN market dynamics

Mavenclad® launch on track with increasing contribution

FY 2019 guidance of up to mid triple-digit €m

NDI = Neurodegenerative Diseases & Immunology; IFN = Interferon

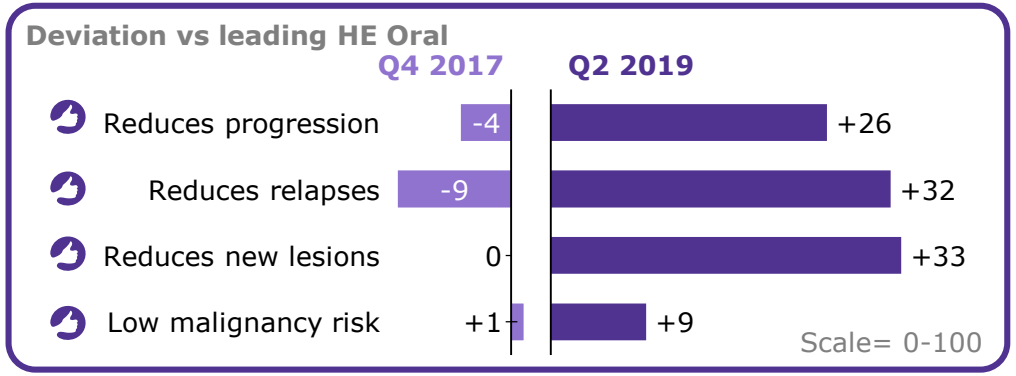
Multiple Sclerosis: Mavenclad® launch continues to make progress with sales +41% Q2 vs Q1 2019

Global Launch Update

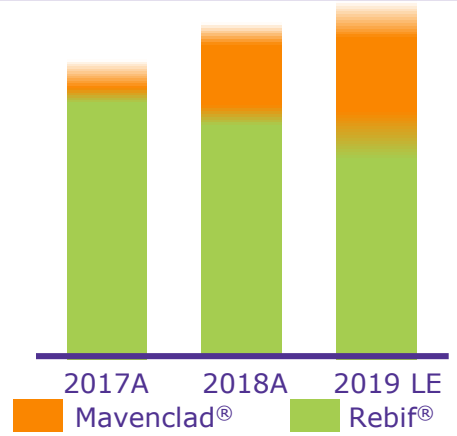
- **Approval in 61 countries with reimbursement in ~50% to date, consistent with expectations**
- **>3,000 neurologists have now prescribed Mavenclad®**
- **Advancing clinical perception:** relative perception vs approved high-efficacy agents continues to improve across major launch markets
- **Increasing share of high-efficacy dynamic patients (new + switch)[1] in major launch markets vs LY**
  - Germany: from 9% to 14% (Q1/18 vs Q1/19)[2]
  - UK: from 8% to 20% (Q1/18 vs Q1/19)[3]
- **Increasing use in earlier lines of therapy in major launch markets:** ~30% of starts are treatment naïve[5]; Switches predominantly from platform orals & platform injectables
- **MS Franchise in early launch markets returning to growth:** Mavenclad® complementing Rebif® to drive franchise growth

On track for up to mid-triple digit m€ sales in 2019

Improved clinical perception versus leading HE oral (Germany)[4]



- **MS Franchise sales evolution (Germany)**
- **Rebif maintaining share in IFN class**
- **Mavenclad competing in HE class**

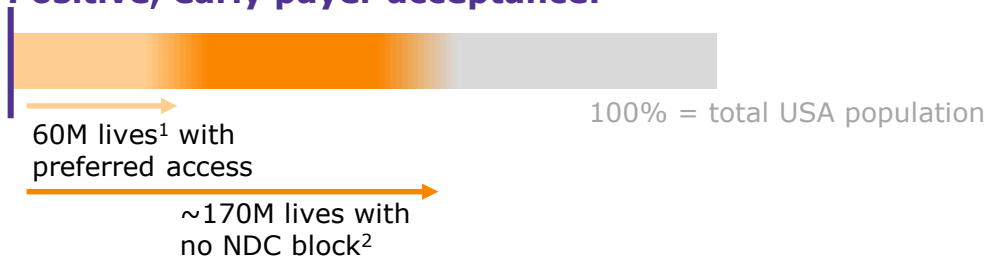


[1]High efficacy treatments include MAV, Gil, Ocr, Tys, Lem; [2]IQVIA LRx data; consolidated retail + hospital data; [3]IQVIA – fully consolidated Q1/19 data; [4]Global MAVENCLAD ATU, DE neurologists (n=62), bar charts indicate difference between Mavenclad® and leading HE oral: positive numbers imply Mavenclad® strength vs. competitor; [5]excludes US prescriptions

Multiple Sclerosis: Mavenclad® gaining momentum in the first 13 weeks of launch in the USA

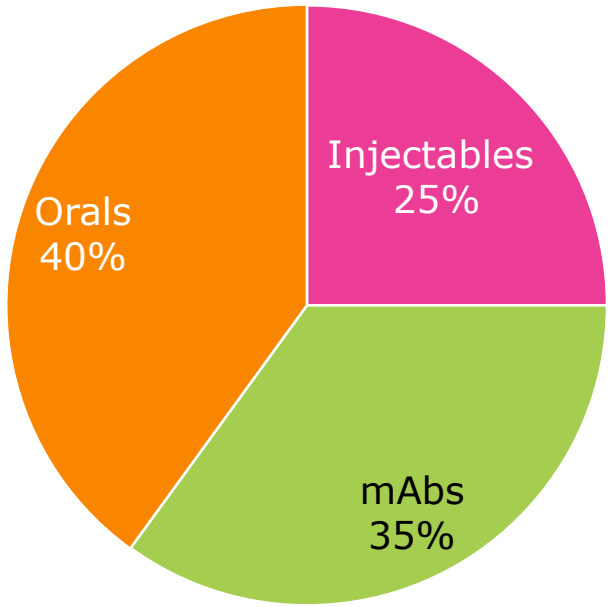
Payer & Physician Feedback

- **Positive, early payer acceptance:**



- **Strong physician access** resulting in **leading share of voice[3]**
- **86% of neurologists willing to prescribe Mavenclad®[4]**
- **~ 3% high efficacy dynamic share in RRMS,** and **~11% high efficacy dynamic share in SPMS/other** (new + switch, April to June)[3]
- **Broad spectrum of early adopters:** both neurologists from **academic centers** and from **community practices** initiating patients on Mavenclad® (equal proportions to date)
- **Mavenclad®'s novel mechanism, posology, and efficacy profile** have made it a **candidate for switches from all approved agents**

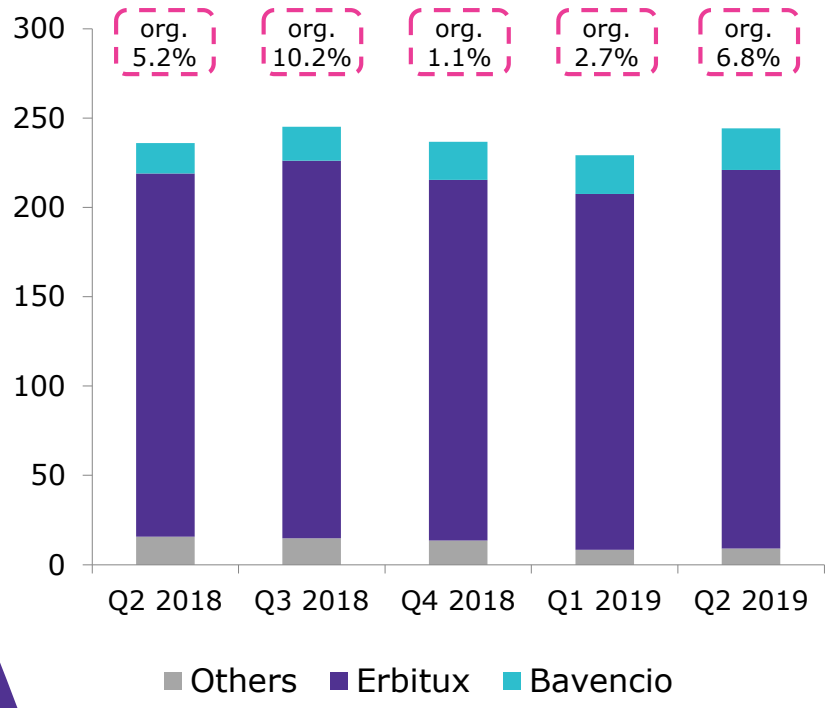
Source of Prescription[5]



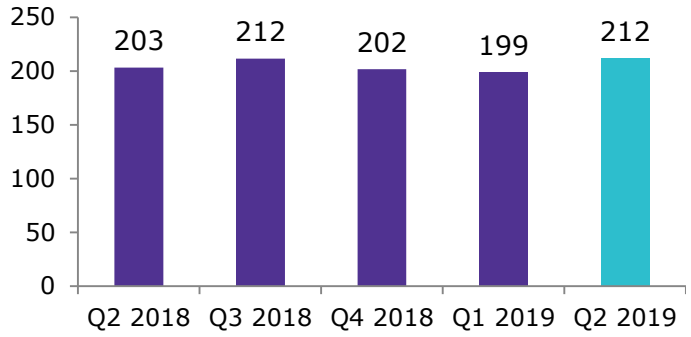
[1]Appropriate USA patients as per MAVENCLAD FDA label; [2]The NDC (National Drug Code) is a unique product identifier code for all drugs in the USA;
[3]IQVIA/BrandImpactRx rolling 3 months end June: MAVENCLAD ranked 2nd across full panel on SOV, and shares reflecting NWRx, HE incl. Tys, Gil, Ocr, May, Mav, Lem;
[4]Spherix Global Insights RealTime Dynamix – MS Q2/19; [5]Company data based on MAVENCLAD patient support program "MS Life Lines"

Oncology: Solid organic growth reflects strong demand for Erbitux® in China and Bavencio® ramp up

Sales development Oncology, [€m]

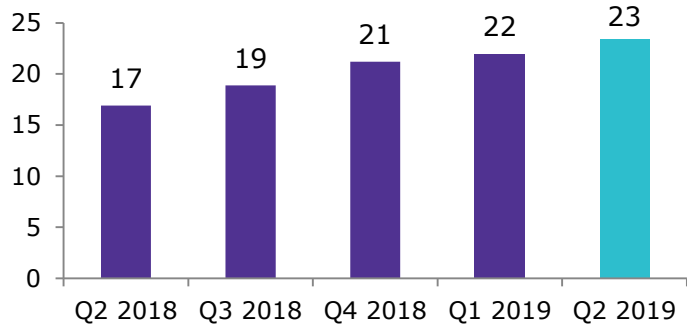


Erbitux® net sales, [€m]



- Absolute sales of €212 m reflect solid growth (org. 5.7%; FX -1.5%)
- Decline in Europe reflects ongoing competition, price reductions and shrinking market size
- LATAM strong, while MEA affected by tender phasing due to import permit
- Strong APAC driven by China reimbursement recognition

Bavencio® net sales, [€m]



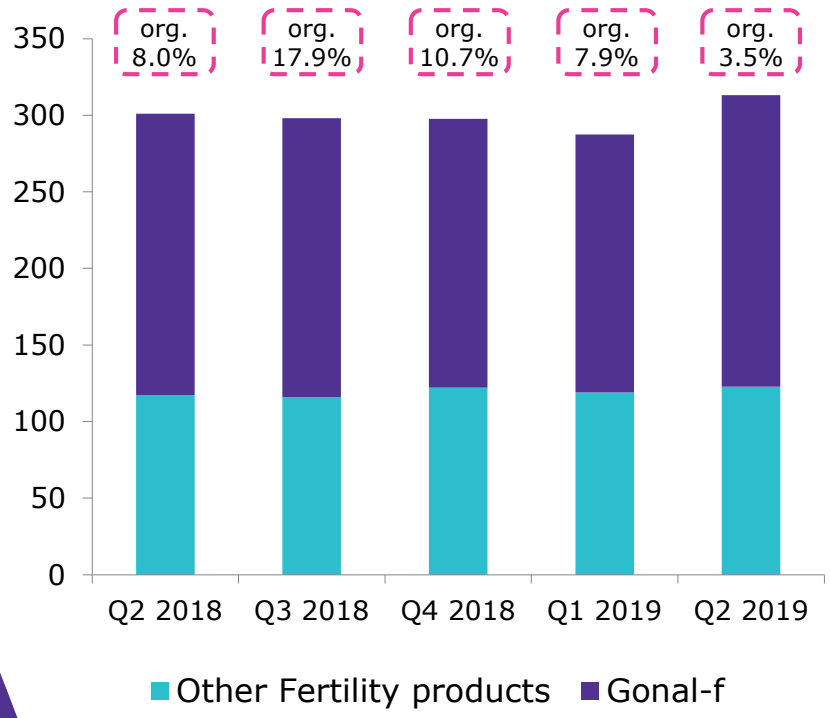
Bavencio® approved for RCC in US mid May 2019

FY 2019 guidance of high double-digit €m

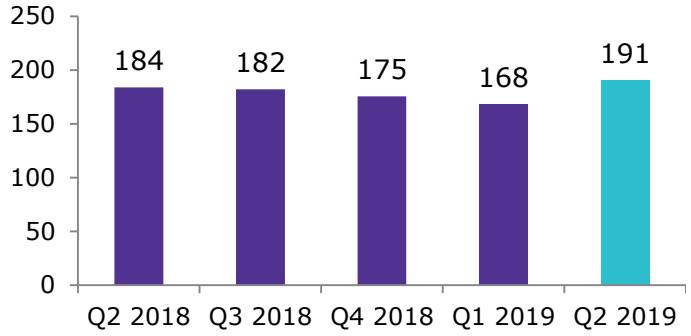
Merck KGaA
Darmstadt, Germany

Fertility: Moderate organic growth driven by ongoing demand for Gonal-f in the U.S.

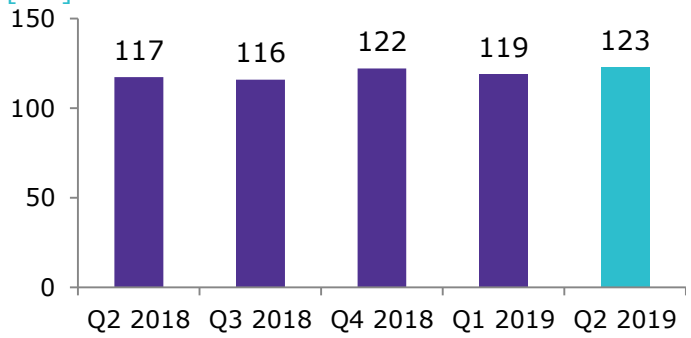
Sales development Fertility, [€m]



Gonal-f® net sales, [€m]



Other Fertility products net sales, [€m]

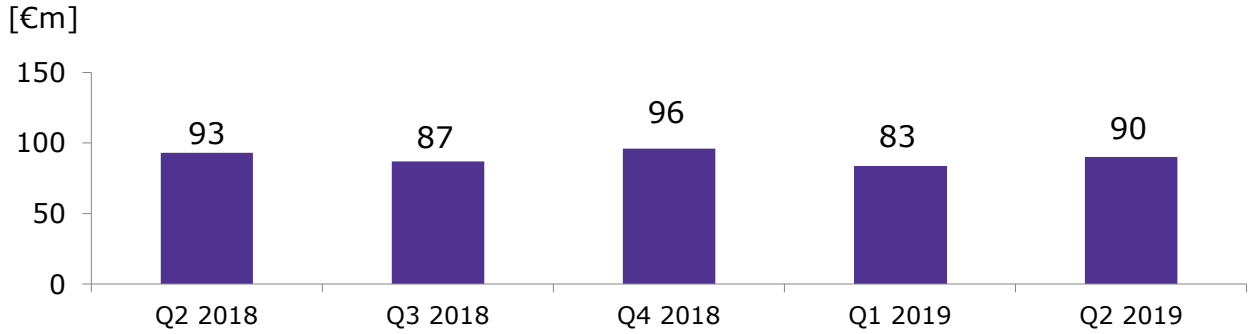


- Fertility franchise posts moderate organic growth driven by North America and APAC
- Gonal-f® absolute sales reflect moderate growth posting €191 m (org. 2.8%; FX 0.9%)
- Gonal-f® driven by ongoing strong demand in the U.S. despite tough comps last year
- Other Fertility products with solid growth driven by APAC and Europe

Double digit organic growth of General Medicine fueled by China and LATAM

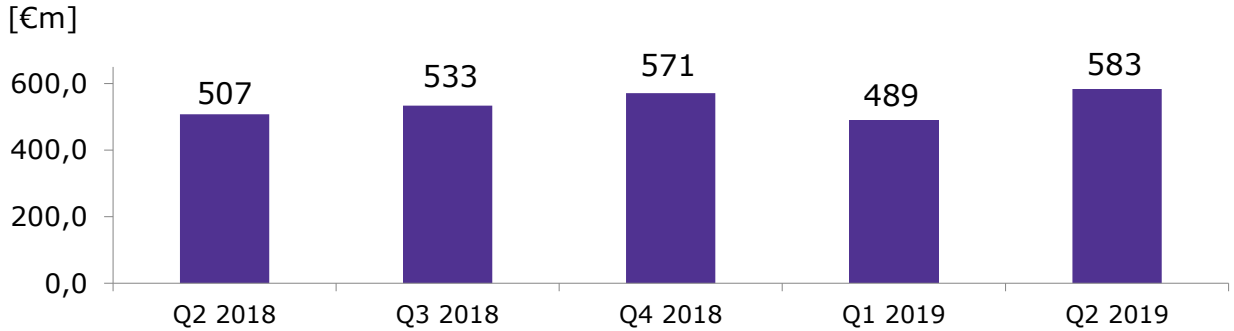
Sales evolution

Endocrinology



Organic
-3.4% org.

General Medicine*



Organic
+12.0% org.

Q2 2019 organic drivers

- Endocrinology declines organically due to lower demand and higher sales deductions in the U.S. mitigated by higher demand in LATAM and APAC

- General Medicine reflects double digit growth of Glucophage®, ongoing strong demand for Concor® and Euthyrox® driven by China and LATAM

*includes CardioMetabolic Care & General Medicine and Others

Life Science: Strong organic growth fueled by all businesses

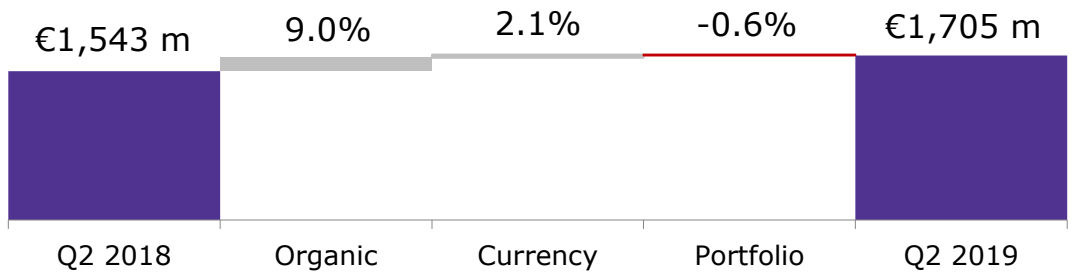
Life Science P&L

[€m]	Q2 2018[1]	Q2 2019
Net sales	1,543	**1,705**
Marketing and selling	-452	**-490**
Administration	-65	**-68**
Research and development	-61	**-69**
EBIT	254	**322**
EBITDA	442	**518**
EBITDA pre	452	**533**
Margin (in % of net sales)	*29.3%*	***31.3%***

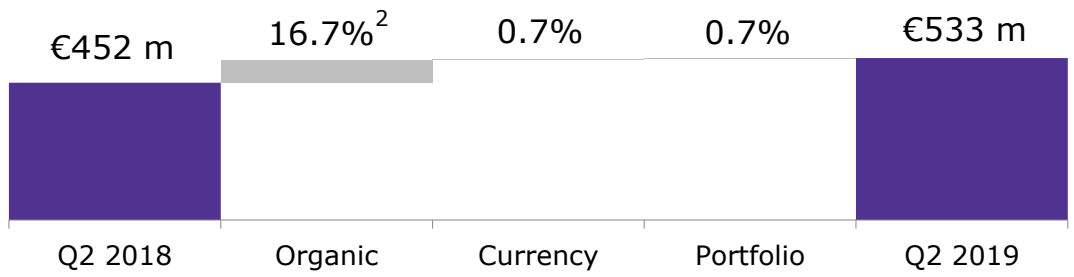
Comments

- Process Solutions with continued strong demand: double-digit growth in all major business fields, especially single-use
- Advanced Analytical and Lab Water main contributor to Applied Solutions solid organic growth, all business segments and regions contributing
- Moderate organic growth of Research Solutions due to ongoing strong demand for lab chemicals and workflow tools, especially in APAC and NA
- M&S increase reflects volume growth and investments in eCommerce
- EBITDA pre and margin increase driven by strong top-line

Net sales bridge



EBITDA pre bridge



[1]LY numbers have been modified, due to disclosure changes of adjustments; [2]Thereof IFRS 16 effect with +2.8% (+€12 m);
Totals may not add up due to rounding

Performance Materials: Reduced China support for Liquid Crystals mitigated by strong demand for OLED, amid market slowdown in Semiconductor and Surface

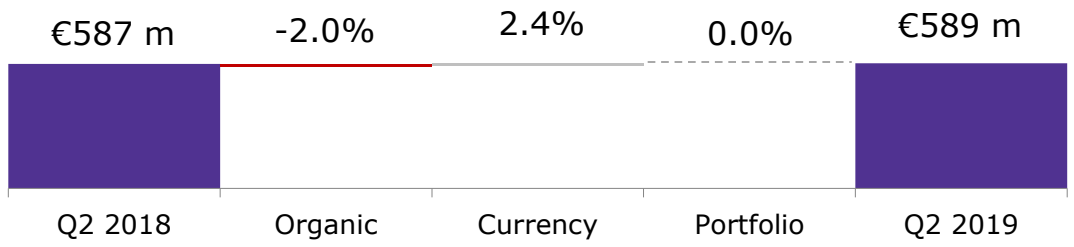
Performance Materials P&L

[€m]	Q2 2018[1]	Q2 2019
Net sales	587	**589**
Marketing and selling	-61	**-66**
Administration	-27	**-25**
Research and development	-59	**-74**
EBIT	131	**100**
EBITDA	192	**161**
EBITDA pre	196	**190**
Margin (in % of net sales)	*33.4%*	***32.3%***

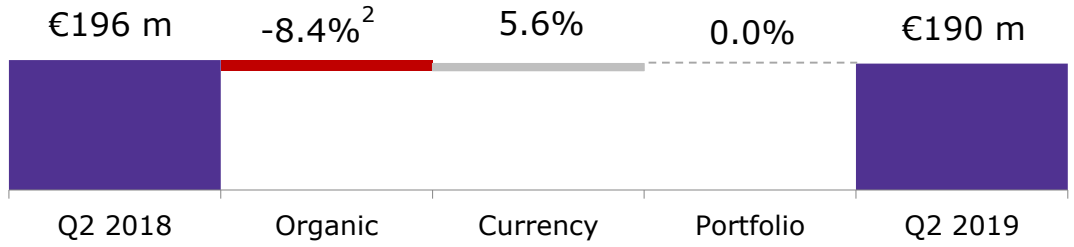
Comments

- About stable Display Solutions sales driven by strong demand for OLED, almost offset by decline in LC due to deceleration of China ramp-up support
- Softness of Semiconductor Solutions reflects market slowdown
- Surface Solutions below prior year due to weak automotive market
- Provisions related to Bright Future program drive M&S and R&D increase; adjusted for EBITDA pre - decrease in R&D reflecting cost control
- EBITDA pre impacted by ongoing liquid crystal price decline and slowing China ramp up contribution as well as reduced fixed cost leverage due to softness in Surface Solutions and Semiconductor Solutions

Net sales bridge

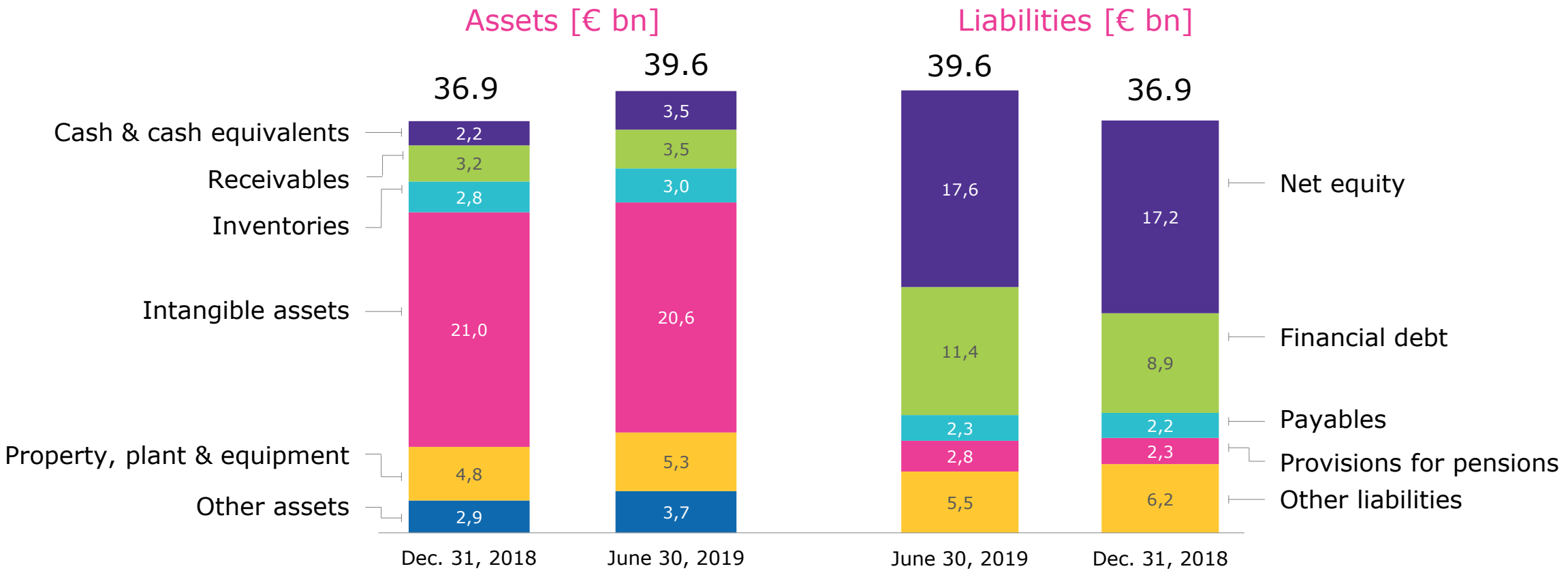


EBITDA pre bridge



[1]LY numbers have been modified, due to disclosure changes of adjustments; [2]Thereof IFRS 16 effect with +1.3% (+€3 m);
Totals may not add up due to rounding

Balance sheet – Reflecting bond placements and IFRS 16 adoption



- Higher cash & cash equivalents driven by bond placements (€1.5 bn)
- Property, plant and equipment increase mainly due to IFRS 16 adoption
- Other assets reflect temporary investment of cash proceeds from Consumer Health divestment

- Increase in equity reflects profit after tax (equity ratio of 44.4%)
- Higher financial debt due to bond placements (€1.5 bn) and IFRS 16 reclassification of lease liabilities
- Increase of provisions for pensions reflects decline in interest rate

Totals may not add up due to rounding

Reported figures

Reported results

[€m]	Q2 2018	Q2 2019	Δ
EBIT	392	**618**	57.6%
Financial result	-65	**-61**	-5.4%
Profit before tax	328	**557**	70.0%
Income tax	-84	**-136**	62.8%
Effective tax rate (%)	*25.5%*	***24.4%***	
Net income*	247	**471**	90.8%
EPS (€)	0.57	**1.08**	89.5%

Comments

- Increased EBIT due to Peg-Pal and Bavencio® milestones, GSK deferred income as well as strong top-line contribution from Life Science
- Effective tax rate within guidance range of ~24-26%
- Higher net income and EPS reflect higher EBIT

*From continuing and discontinued operations;
Totals may not add up due to rounding

Cash flow statement

Q2 2019 – cash flow statement

[€m]	Q2 2018	Q2 2019	Δ
Profit after tax	251	**471**	220
D&A	448	**453**	5
Changes in provisions	34	**-47**	-80
Changes in other assets/liabilities	-243	**-26**	217
Other operating activities	25	**-51**	-76
Changes in working capital	-148	**-58**	90
Operating cash flow	367	**743**	375
Investing cash flow	-200	**-870**	-671
thereof Capex on PPE	-168	**-165**	3
Financing cash flow	-295	**1,244**	1,539

*LTIP – long-term incentive plan;
Totals may not add up due to rounding

Cash flow drivers

- Profit after tax in line with higher EBIT
- Changes in provisions driven by LTIP* adjustment
- Changes in other assets/liabilities reflects GSK upfront and Peg-Pal milestone payment
- Changes in working capital driven by increased trade accounts payable
- Increased investing cash flow due to temporary investment of cash proceeds from Consumer Health divestment
- Higher financing cash flow reflects the issuance of new hybrid bonds (€1.5 bn)

Adjustments in Q2 2019

Adjustments in EBIT

[€m]	Q2 2018		Q2 2019	
	Adjustments	thereof D&A	Adjustments	thereof D&A
Healthcare	40	0	5	0
Life Science	26	16	15	0
Performance Materials	5	1	29	0
Corporate & Other	26	0	16	0
Total	97	17	65	0

Totals may not add up due to rounding

ESG

We are working on ambitious goals

environment

Climate

We endeavor to reduce direct and indirect emissions to mitigate our impact on the climate.

Waste

We consider it fundamental to both prevent and recycle as much of our waste as possible.

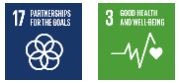
Water

For us, sustainable water management means not negatively impacting the aquatic ecosystems

social

Product safety

Product safety is one of our top priorities: From safe handling of hazardous substances to ensuring patient safety.



Employees

We aim to be an attractive employer, encouraging creativity and development under ideal working conditions.

Access to Medicine

We support a variety of initiatives that improve access to health particularly for people in low- and middle-income countries.

governance

Growth & Profit sharing

Our growth results from innovations and acquisitions strengthening our position in important markets, supported by strong cash-flow, long-term margins of >30% and a conservative but reliable dividend.

Risk management

We are focusing on a diversified business model: Our 3 sectors have pioneering knowledge to develop products to improve life for patients, further the success of our customers and meet global challenges.

Steering

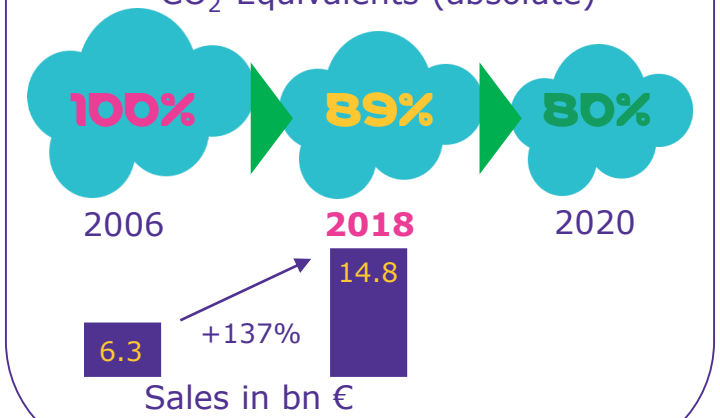
Our core values along with the external regulations lead to business-guiding charters and principles for our responsible governance, documented in our Corporate Responsibility strategy and report.

Emissions, Water, Waste reduced despite growing business

Emission-Target:

- Growth-independent reduction of Group's greenhouse gas emissions of 20% until 2020 vs. 2006
- Despite sales growth of 137% 2006 vs. 2018 we achieved a 11% reduction of CO_2 equiv.
- We still confirm our goal for 2020 expecting positive impact from latest initiatives, e.g. process optimizations and change to renewable energy

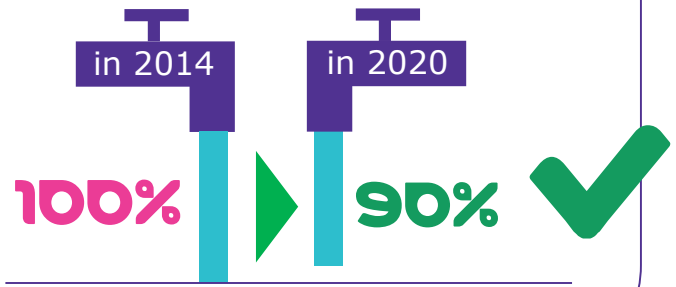
CO_2-Equivalents (absolute)



Water-Target:

- At 24 sites with relevant water use in areas of high water stress we aim to cut water consumption by 10% until 2020 vs. 2014
- 2018, we lowered our water consumption by 11% resulting from sustainable water management and re-usage
- All pharmaceutical manufacturing facilities have wastewater treatment plants

Water consumption
in water stress areas

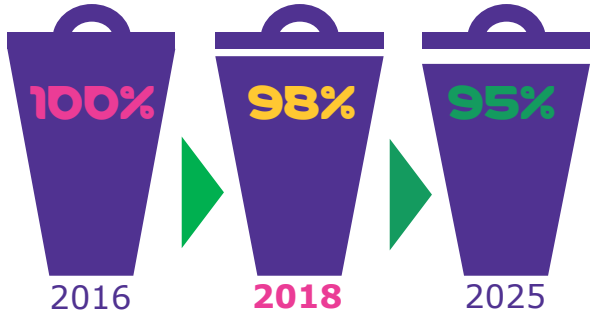


2018: -11%

Waste-Target:

- We reduce waste and recycle as much as possible - we aim to reduce the environmental impact of our waste by 5% until 2025 compared to 2016
- The Company Waste Score allows us to compare the amount of waste our sites are producing
- We ensure that raw materials are recycled and that unrecyclable waste is discarded

Merck KGaA, Darmstadt,
Germany Waste Score



External stakeholders valuate our engagement

In 2018, **Our share was again included in STOXX Global ESG Leaders Index**, a sustainability index that assesses companies based on key environmental, social and governance criteria.

Merck KGaA, Darmstadt, Germany was confirmed as a constituent of the **Ethibel Sustainability Index (ESI) Excellence Europe** in 2018, calculated and managed by Standard & Poor's.

We were ranked on **4th place at Vigeo Eiris** among its peer companies and is a **Euronext Vigeo Europe 120** member since 2015, including companies with high performance in 38 sustainability drivers.

We received **Gold status in 2019**, among the **top 1% of companies.**

EcoVadis examines 45,000 suppliers from 150 countries. The rating focuses is highly valued by customers and suppliers.

Since 2008, Our shares have been included in the **FTSE4Good Index**, measuring the performance of companies demonstrating strong ESG practices

In the **2018 Access to Medicine Index** we maintained **4th place** (9th in 2012, 6th in 2014 and 4th place in 2016).

The ranking appreciates us supporting low and middle income countries.

In 2018, **Oekom** research AG gave us a "B-" rating which means we have once more achieved **prime status.**

Participation in CDP (formerly Carbon Disclosure Project) since 2008.

CDP Climate: In 2018, we scored "C" (2017: B).

CDP Water: In 2018 we received a "B-" (2017: B).

2018, **Sustainalytics** awarded us 79 out of 100 points, putting us among the **leading pharmaceutical companies:** high marks in CG, community outreach, and environmental performance.

Financial calendar

Date	Event
November 14, 2019	Q3 2019 Earnings release
March 5, 2020	FY 2019 Earnings release
April 24, 2020	Annual General Meeting
May 14, 2020	Q1 2020 Earnings release

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Darmstadt, Germany

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