MERCK KGAA, DARMSTADT, GERMANY – Q1 2019 ROADSHOW

Investor Relations

May 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

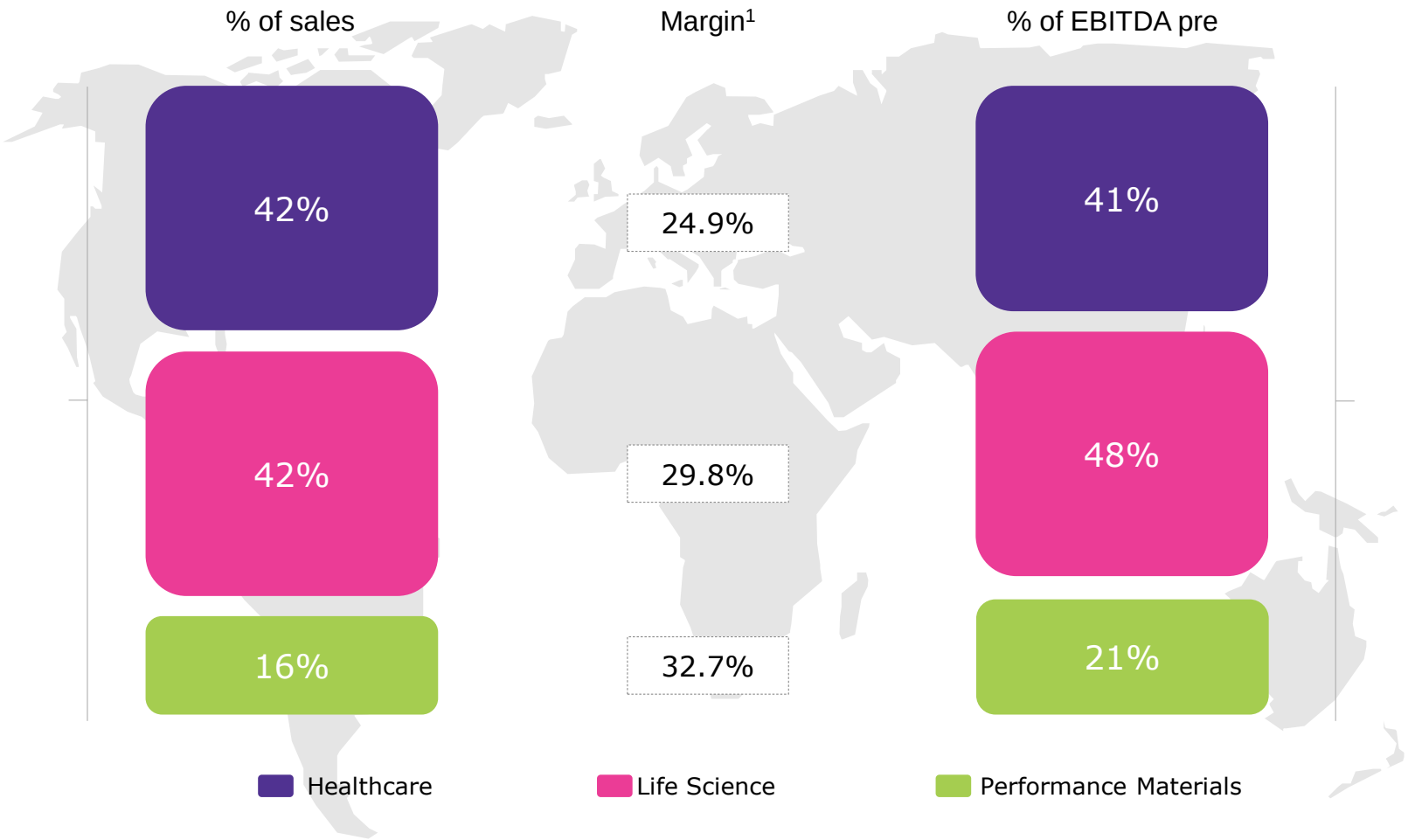
Leading life science company

- 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



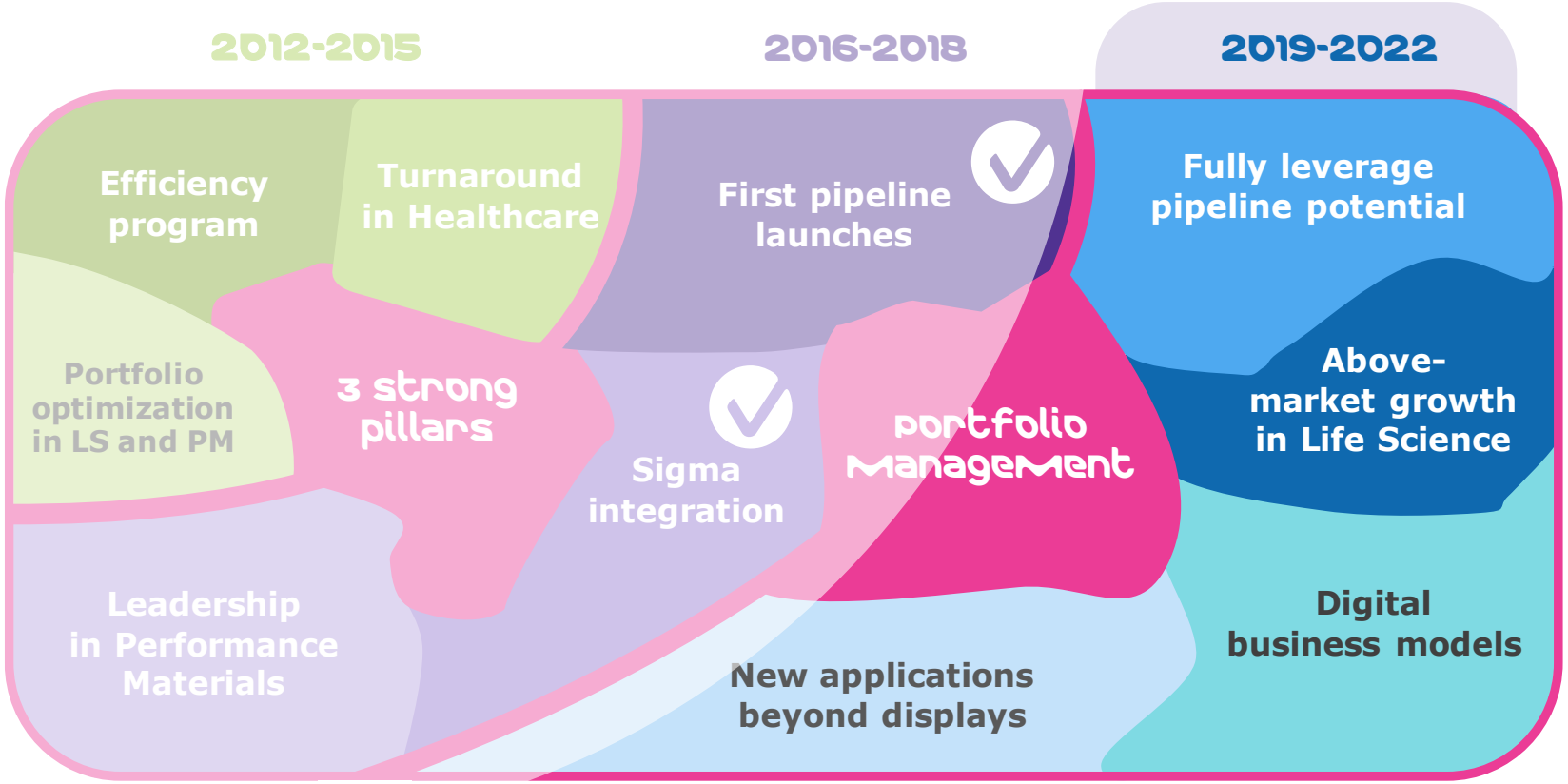
FY 2018
Sales:
€14,836 m

FY 2018
EBITDA pre[2]:
€3,800 m

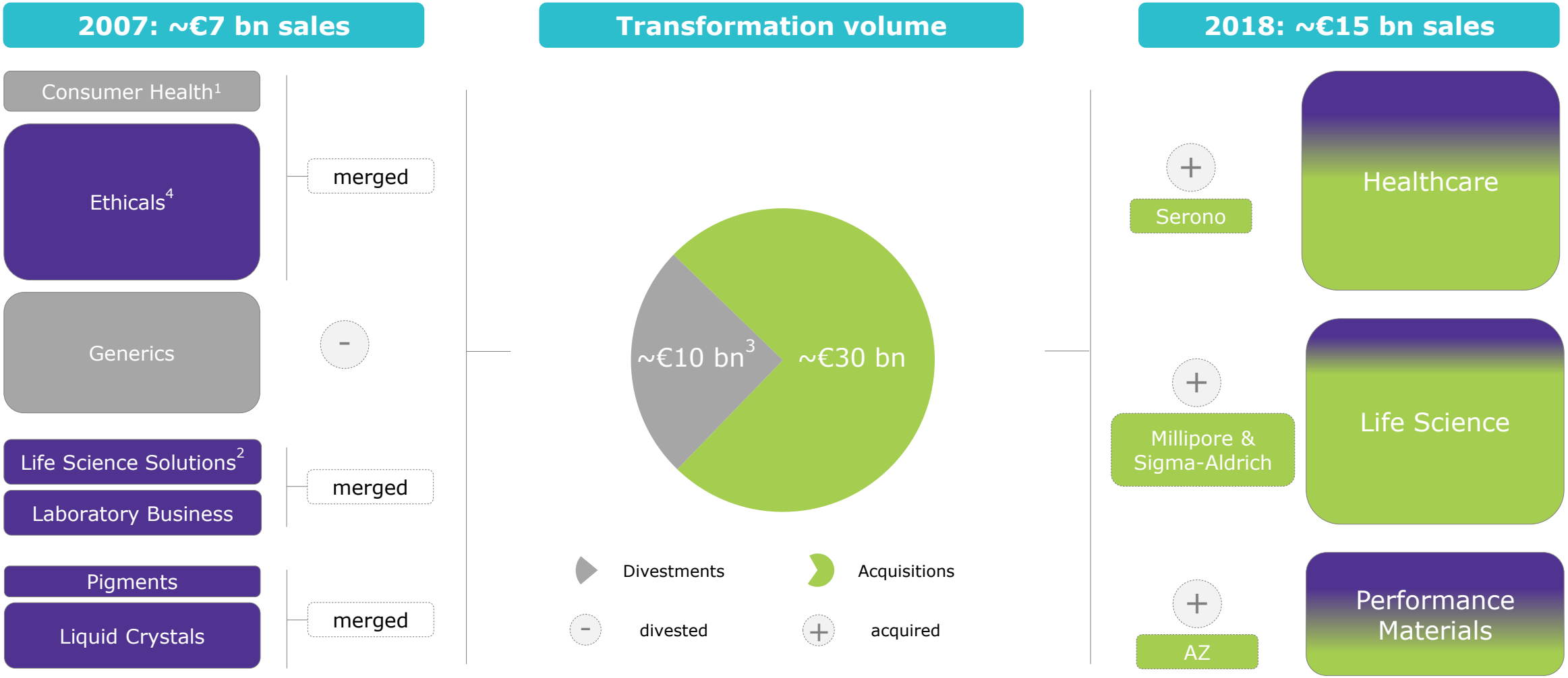
[1]EBITDA pre margin in % of net sales; [2]Including Corporate/Others (-€382 m)

02 TRANSFORMING THE COMPANY

Group
Strategic roadmap 2016-2022

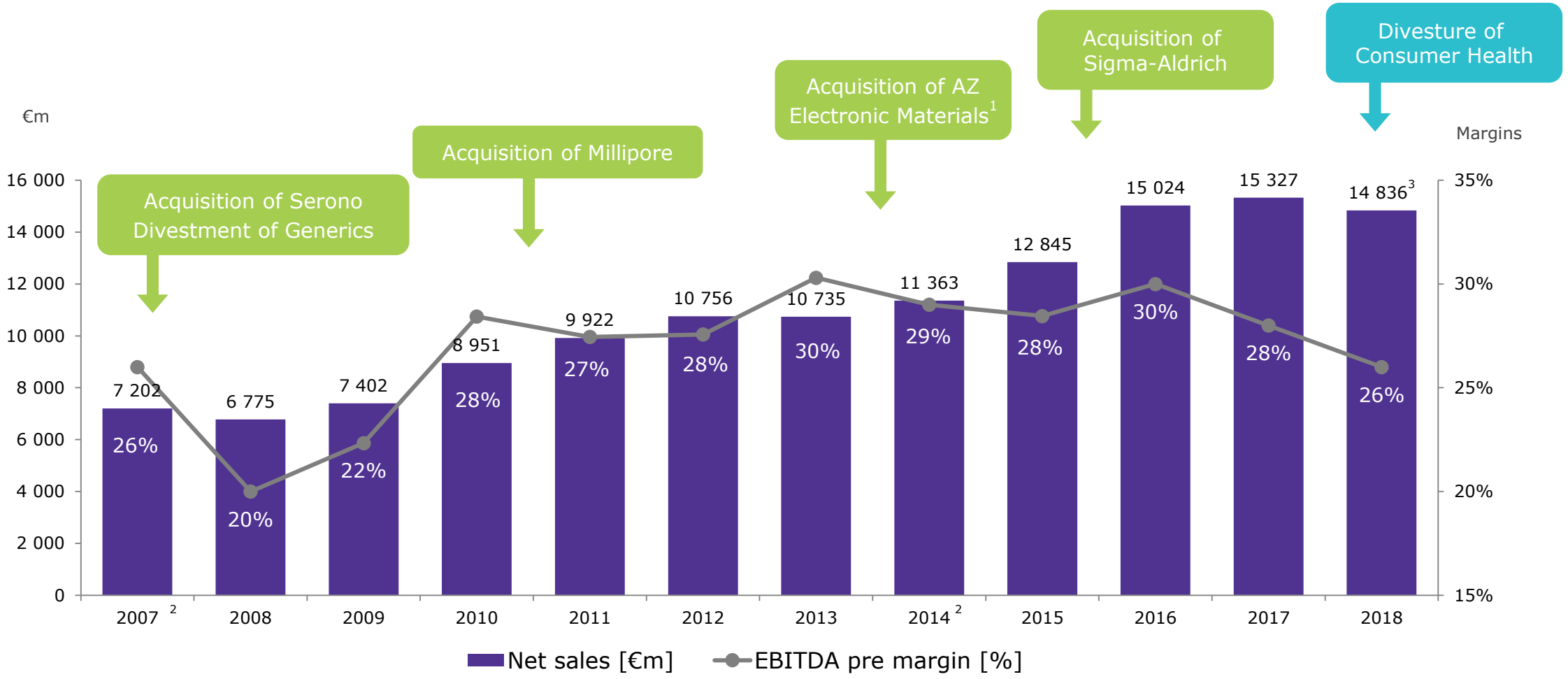


Group
We have added scale and strengthened the attractiveness of our portfolio



[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

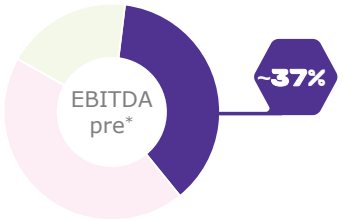


[1]Included since 2 May 2014; [2]2007 and 2014 EBITDA pre margin adjusted for comparability; [3]2018 net sales reflect Consumer Health divesture (reduction of ~ €1 bn net sales p.a.)

Group

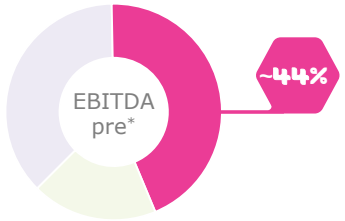
Clear set of priority goals

Healthcare



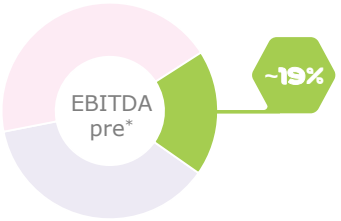
- **Deliver on ambition to keep core business at least stable until 2022**
- **Transition from investment to earnings phase by 2019**
- **Foster successful Bavencio® and Mavenclad® ramp up**
- **Stringent pipeline execution**

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

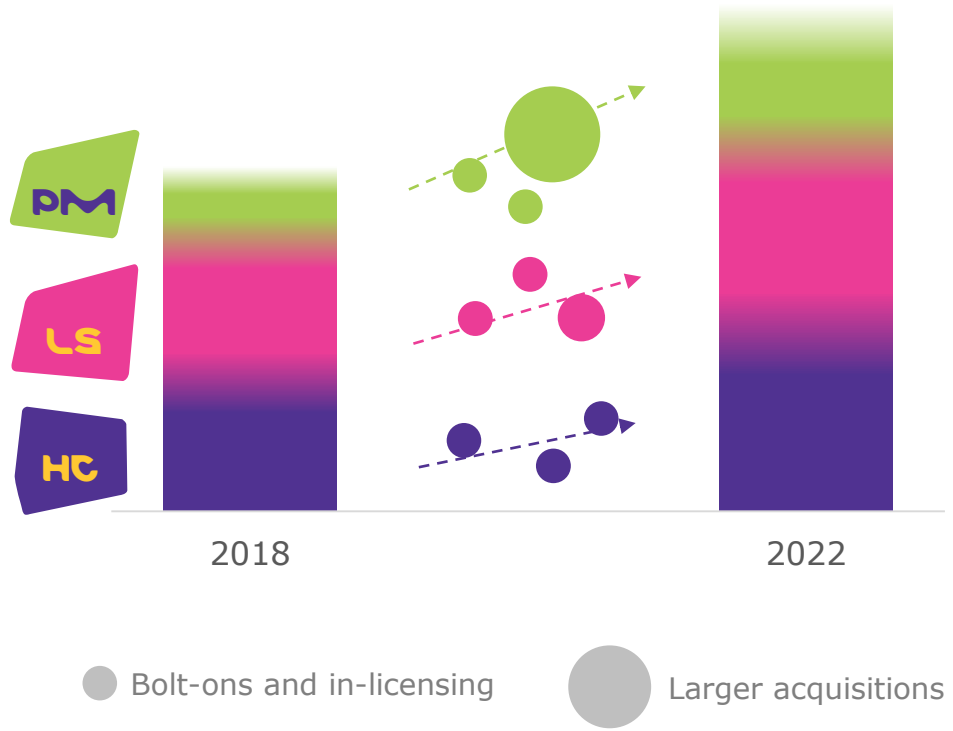
defining portfolio criteria

- 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

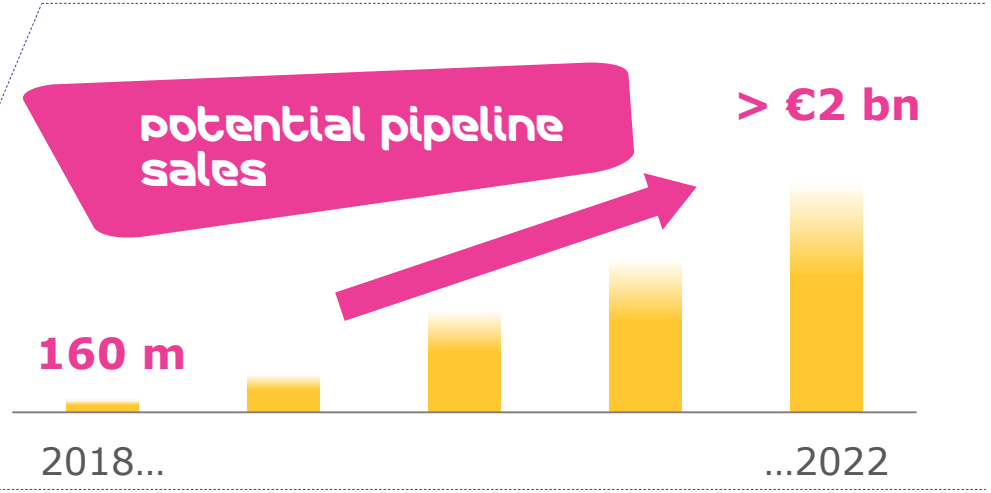
Healthcare

Healthcare is on track to deliver on promising pipeline candidates

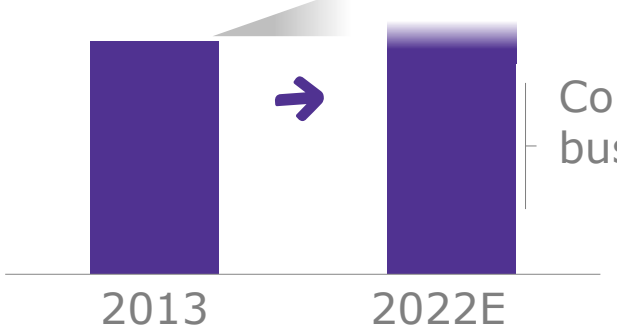
Focus on the pipeline

BAVENCIO® avelumab Injection 20 mg/mL

MAVENCLAD® cladribine tablets



Deliver organic growth



ERBITUX® CETUXIMAB

Rebif®

Glucophage® metformin

Euthyrox®

Concor®

saizen® Somatropina r-hGH

GONAL-f® FOLLITROPIN ALFA

Pergoveris®

OVITRELLE® choriogonadotropin alfa

Cetrotide® CETRORELIX

Crinone® progesterone gel 8%

Merck KGaA
Darmstadt, Germany

Healthcare

Mavenclad® and Bavencio® are ramping up nicely

Global launches gaining traction …

MAVENCLAD®

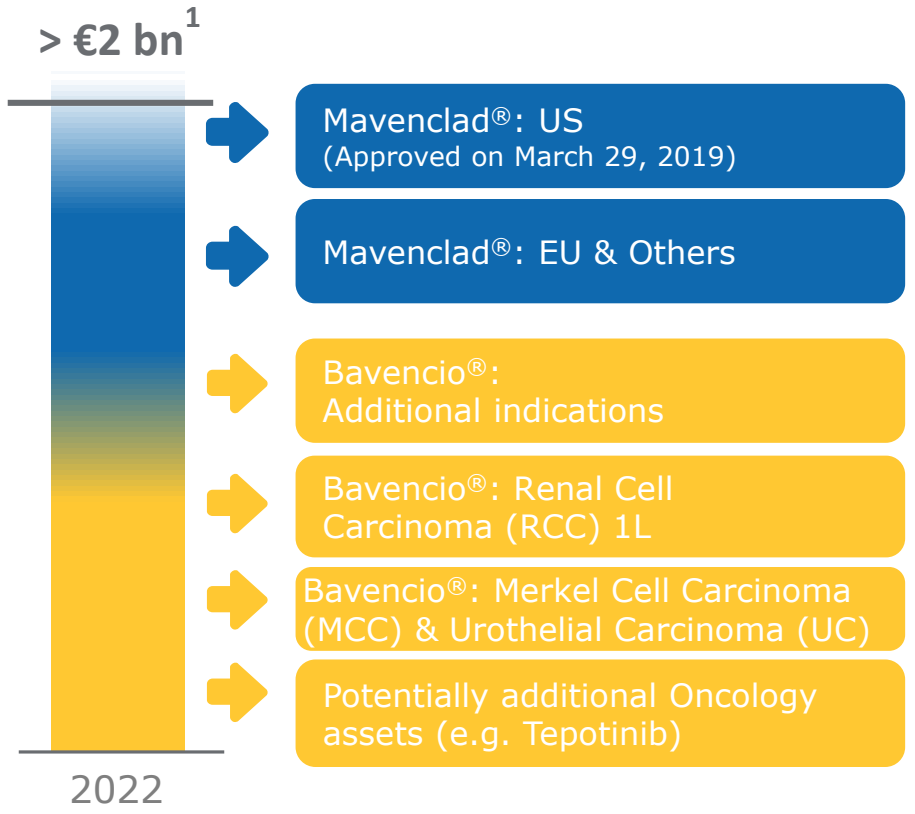
- **Approved in 55 countries** since 2017 (incl. USA, Canada, EU, Australia and Switzerland)
- **Reimbursed in approx. 50% of markets**, payer negotiations ongoing
- **Global peak sales:** 1 – 1.4 bn €
  2019 sales: up to mid-triple-digit m €

UPDATE

BAVENCIO®

- **Approved**: Merkel cell carcinoma (US, EU, JP) and urothelial carcinoma (US)
- **Regulatory submission on track:** Priority Review granted by US FDA, filing validated by EMA, filing submitted in Japan
- **Upcoming Ph III read outs**: Gastric 1L and NSCLC 1L

… and supporting €2 bn pipeline sales ambition

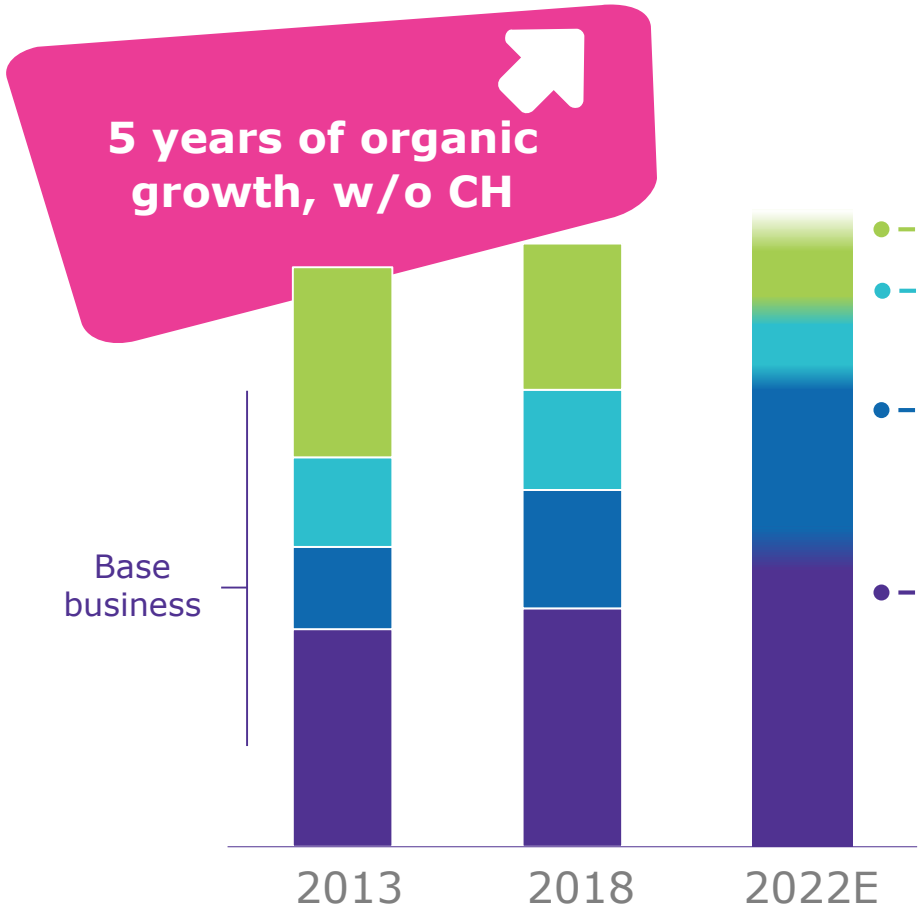


[1] Visualisation for illustrative purposes; Acronyms: FDA = US Food & Drug Administration, EMA = European Medical Agency, NSCLC = Non-small Cell Lung Cancer

Healthcare

Ambition remains 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®
Low single-digit decline

- Driving emerging markets growth
- Mitigate price and competitive pressure in EU by clear Erbitux® franchise positioning

Fertility
Mid single-digit growth

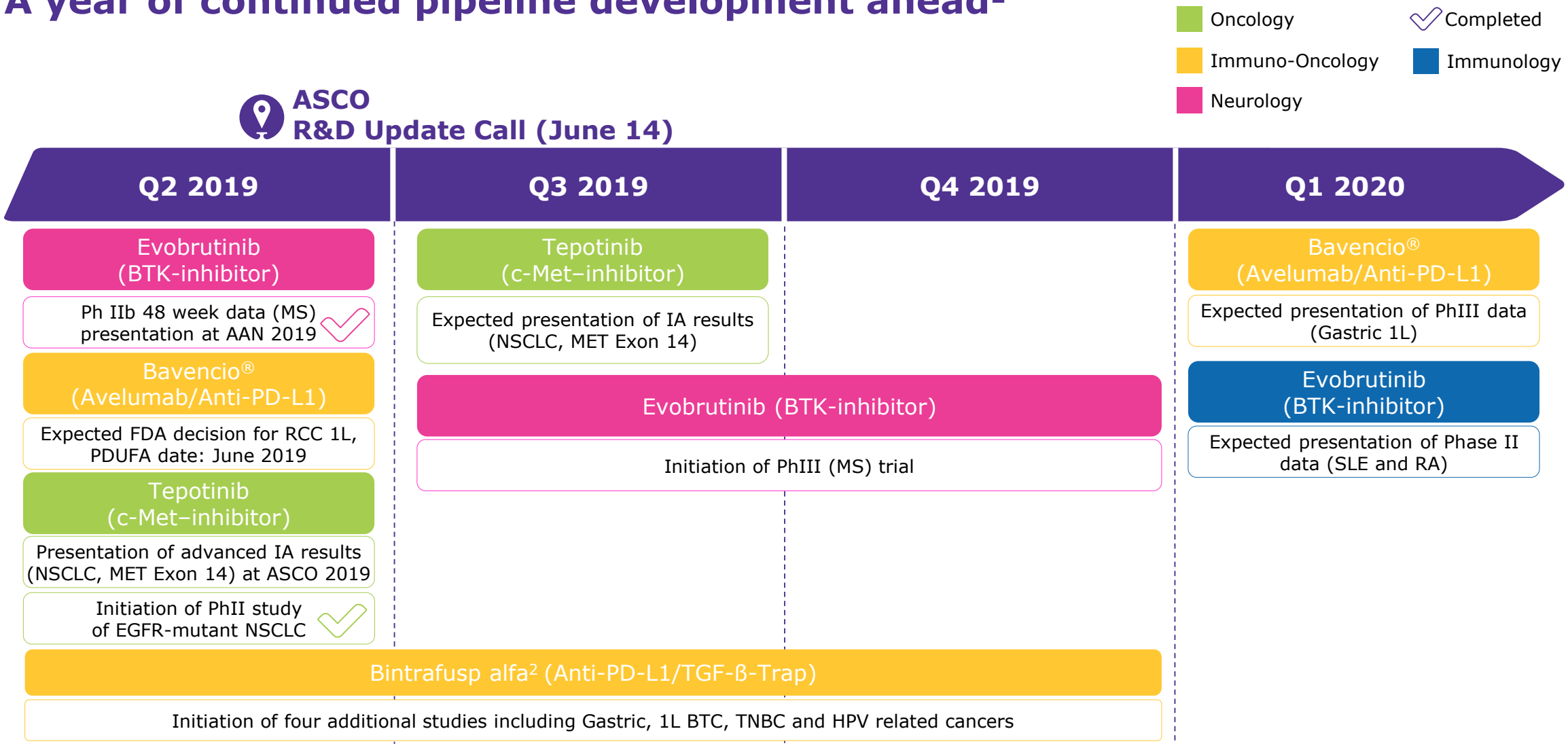
- Drug demand driven by emerging markets growth and demographics
- Differentiation due to coverage of the entire ART portfolio[1]

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

- Emerging markets growth
- Repatriation measures

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

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, RCC = Renal Cell Carcinoma, RA = Rheumatoid Arthritis, SLE = Systemic Lupus Erythematosus, TNBC = Triple-Negative Breast Cancer

04 LIFE SCIENCE

Focus on profitable growth

Life Science

Serving customers across the highly attractive life science industry

RESEARCH
~€45-50 bn
Low single-digit growth

Academic and government institutions

Biopharma R&D

Industry R&D

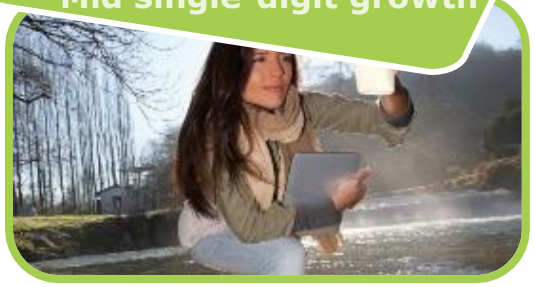
PROCESS
~€50 bn
High single-digit growth

Pharmaceutical companies

Small biotech

Contract manufacturing organizations

APPLIED
~€55 bn
Mid single-digit growth



Diagnostic manufacturers

Clinical testing labs

Food & Beverage manufacturers

~€150 bn* market growing at ~4% CAGR

- Growth in volume of experiments
- Mild growth in academic funding
- Investment in industry R&D

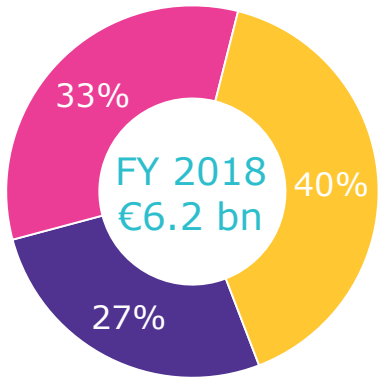
- Drug volume growth
  - from biologics
  - from emerging modalities
- Continued shift to single-use

- Volume growth from
  - Population growth
  - Rise in quality standards
  - Increased testing needs

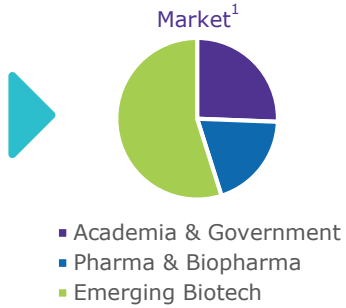
*Source: Merck KGaA, Darmstadt, Germany estimate 2018

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

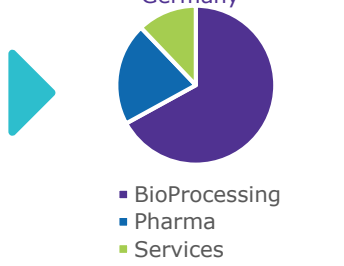
Merck KGaA, Darmstadt, Germany Life Science



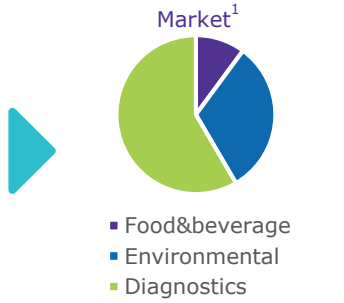
Research Solutions
Low single digit growth



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

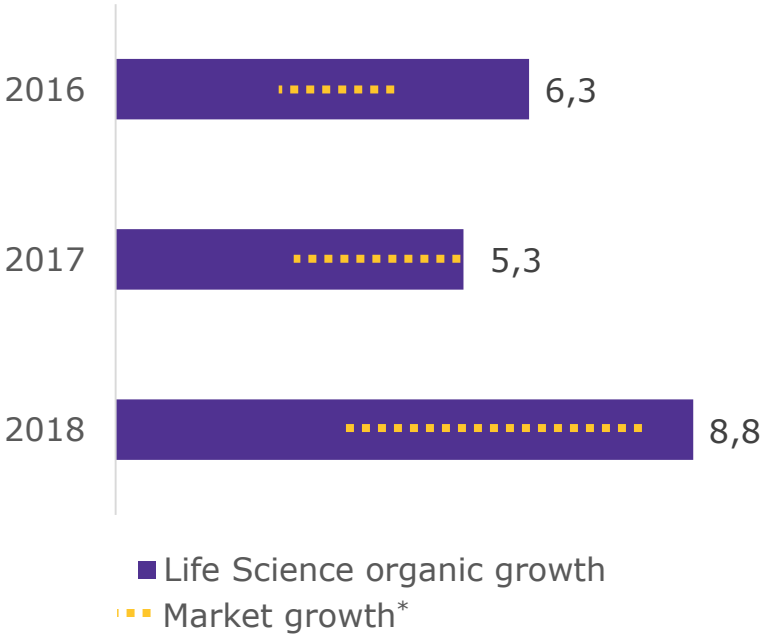
[1]Source: Merck KGaA, Darmstadt, Germany Factbook; [2]Source: PhRMA; [3]CRO = Contract Research Organization; [4]Indicative only; [5]mAbs = monoclonal antibodies; [6]Source: EvaluatePharma September 2018

Life Science

Market leading growth and profitability maintained during integration

Consistent above-market growth

Organic sales growth vs market* [% YoY]

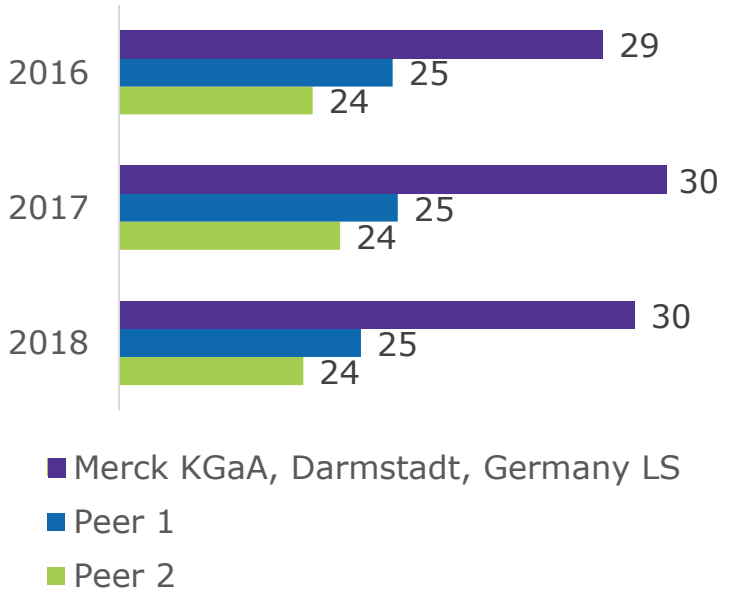


Key industry player

Life Science net sales [€m]

Superior profitability

EBITDA pre margin [%]



Ambition to grow above market through to 2022

Secure leading market position

Maintaining industry-leading margin

*Based on integrated life science peers' performance, analyst reports and Laboratory Products Association report

Merck KGaA
Darmstadt, Germany

Life Science

Portfolio and focus are key drivers of above-market growth

Out-Performance

- Merck KGaA, Darmstadt, Germany grows within the relevant market segments
- Broad range of differentiated products and services
- E-commerce platform

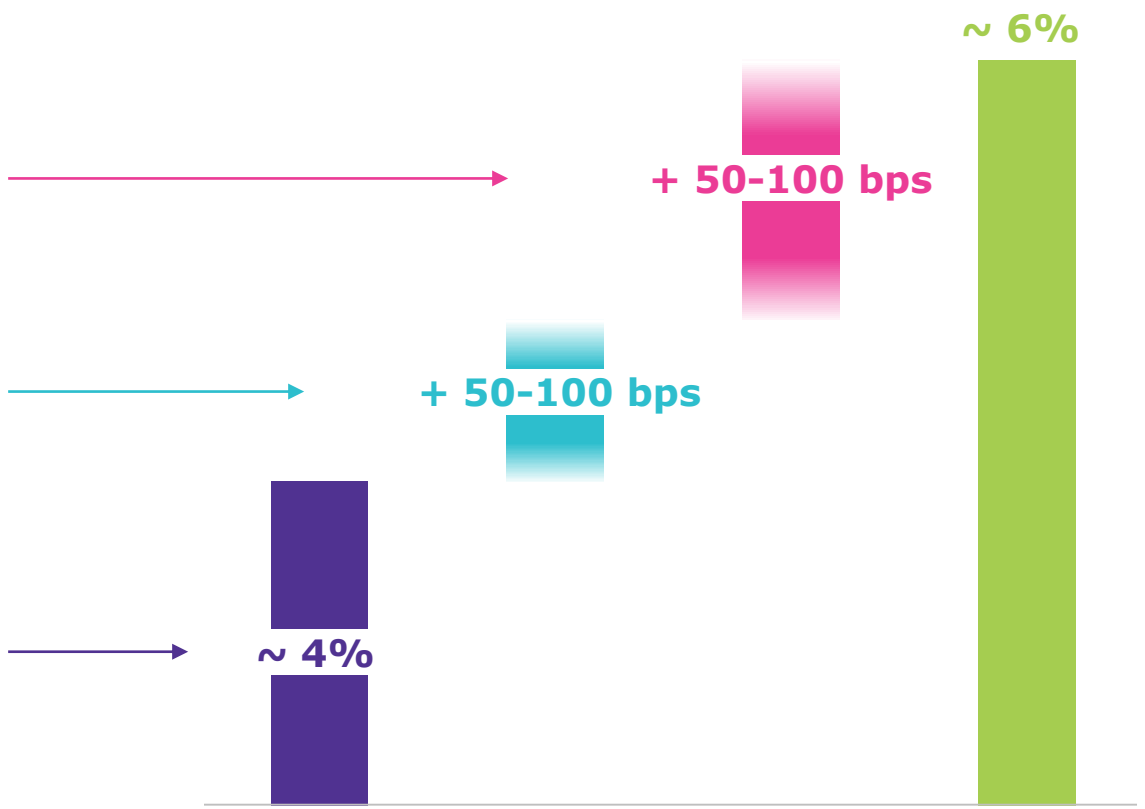
Portfolio advantage

- Merck KGaA, Darmstadt, Germany focuses on higher-growth segments of the market
- E.g. bioprocessing, lab water, diagnostics offerings

Life science market

- The life science industry grows rapidly and develops dynamically

Life Science net sales organic CAGR 2015-2018*



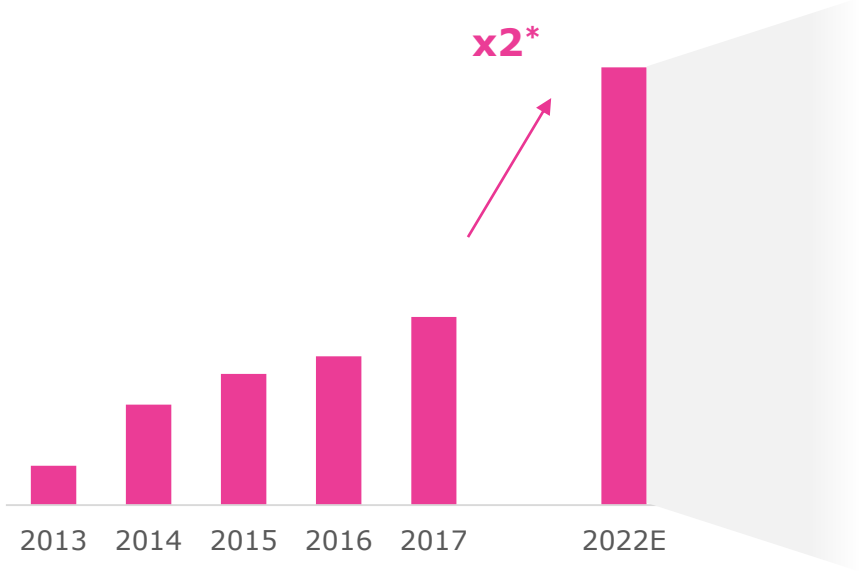
*Indication

Life Science

Innovation underpins Life Science's position as growth engine for us

Products launched after 2013

% of total net sales



Categories of innovation

1 Sustain
Increasing relevance and competitiveness

2 Incremental
Expanding high-value products offering

3 Breakthrough
Creating transfor-mational solutions

Industry trends

Customer requirements, scientific standards and therapies are evolving continuously

Our strong and innovative portfolio ensures well-balanced strategic growth

Innovation pipeline is key to differentiate in the market in order to sustain Life Science's above-market growth trajectory

*Indication

05 PERFORMANCE MATERIALS

Maintaining leadership and innovation

Performance Materials
A leading player in the electronic materials market

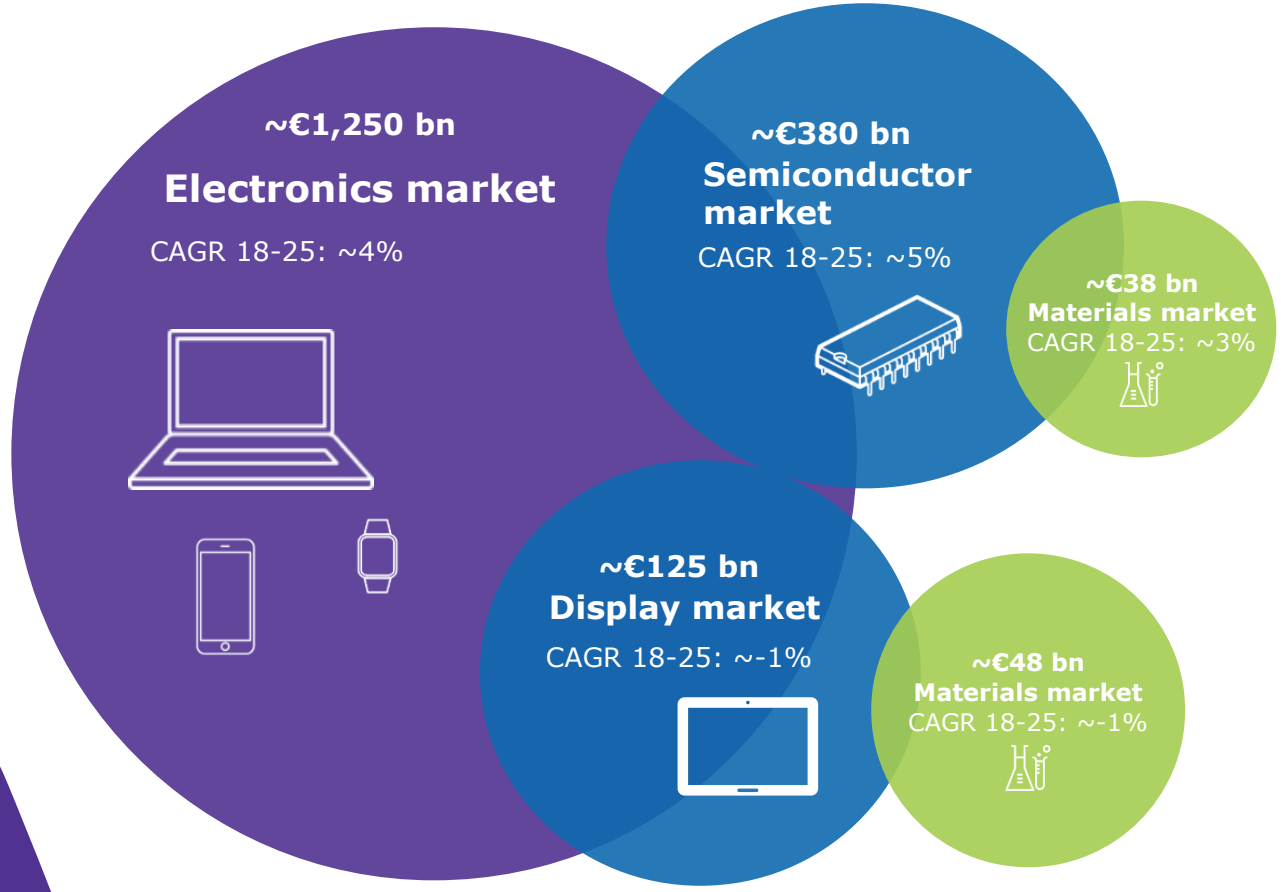
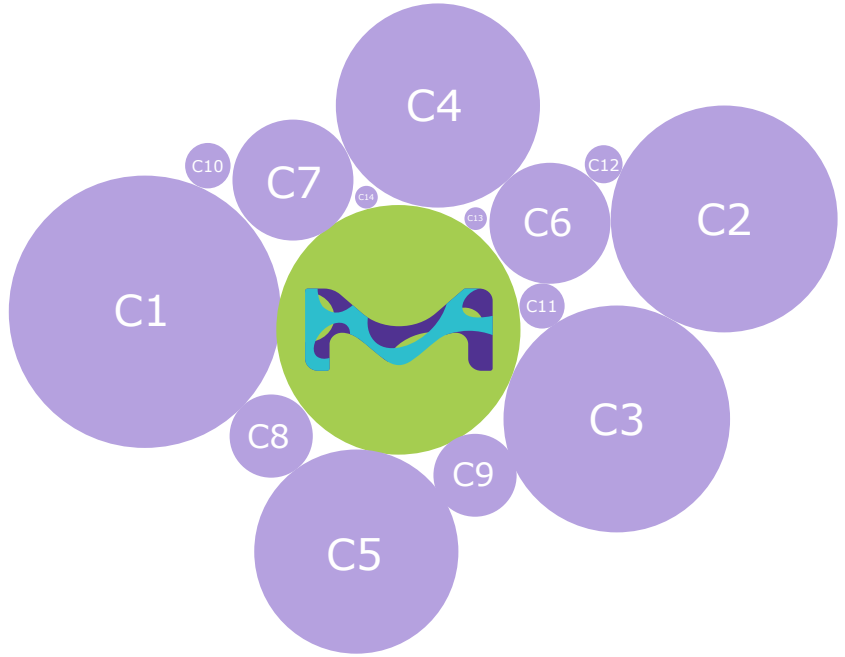


Illustration of the electronics market and thereof its selected sub markets

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

"Bright Future"

5-year transformation program drives long-term performance

Back to organic growth

- Exploit market growth of Semi & Surface
- Manage Liquid Crystal sales decline
- Refocus innovation and life cycle management
- Explore growth in adjacent technologies

2-3% CAGR

Resource allocation & process excellence

- Efficient reallocation/adjustment of resources
- Centralized early research approach
- Rigid R&D portfolio management

~30% Margin

Portfolio Management

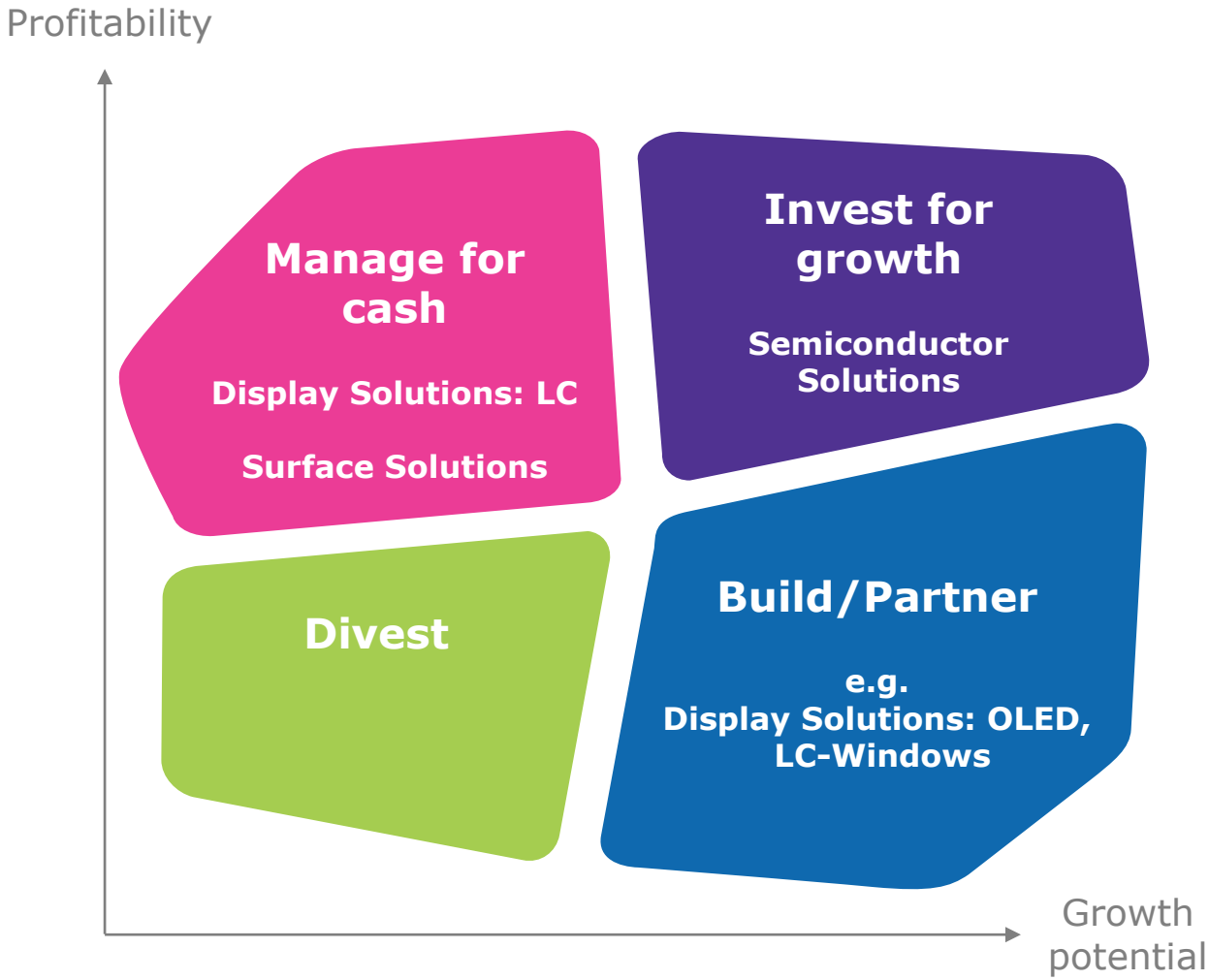
- Continuous review of entire portfolio
- Evaluation of partnering approaches
- Consider inorganic growth options
- Drive solution based business models

cultural change

- Foster customer-centric mindset
- Market-driven innovation
- Enhance a common Performance Materials spirit

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

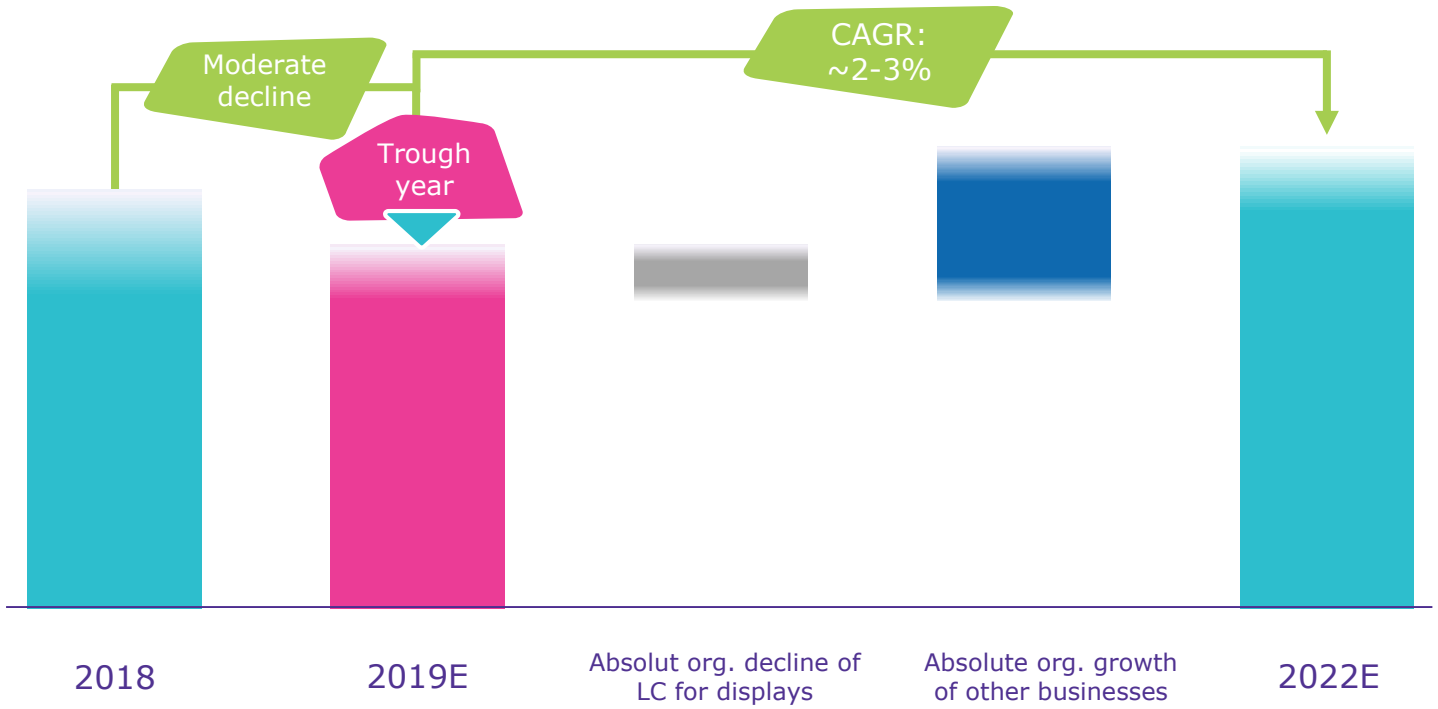
- Early industry cycles with strong potential
- Strictly prioritize and diversify risk

Divest

- Regular review for better strategic owner

Performance Materials will return to sales growth after 2019

Performance Materials sales development, in €m



2019-2022 sales growth trajectory


Semiconductor Solutions

Mid- to high-single digit growth


Surface Solutions

Low-single digit growth


Display Solutions

Low-single digit decline

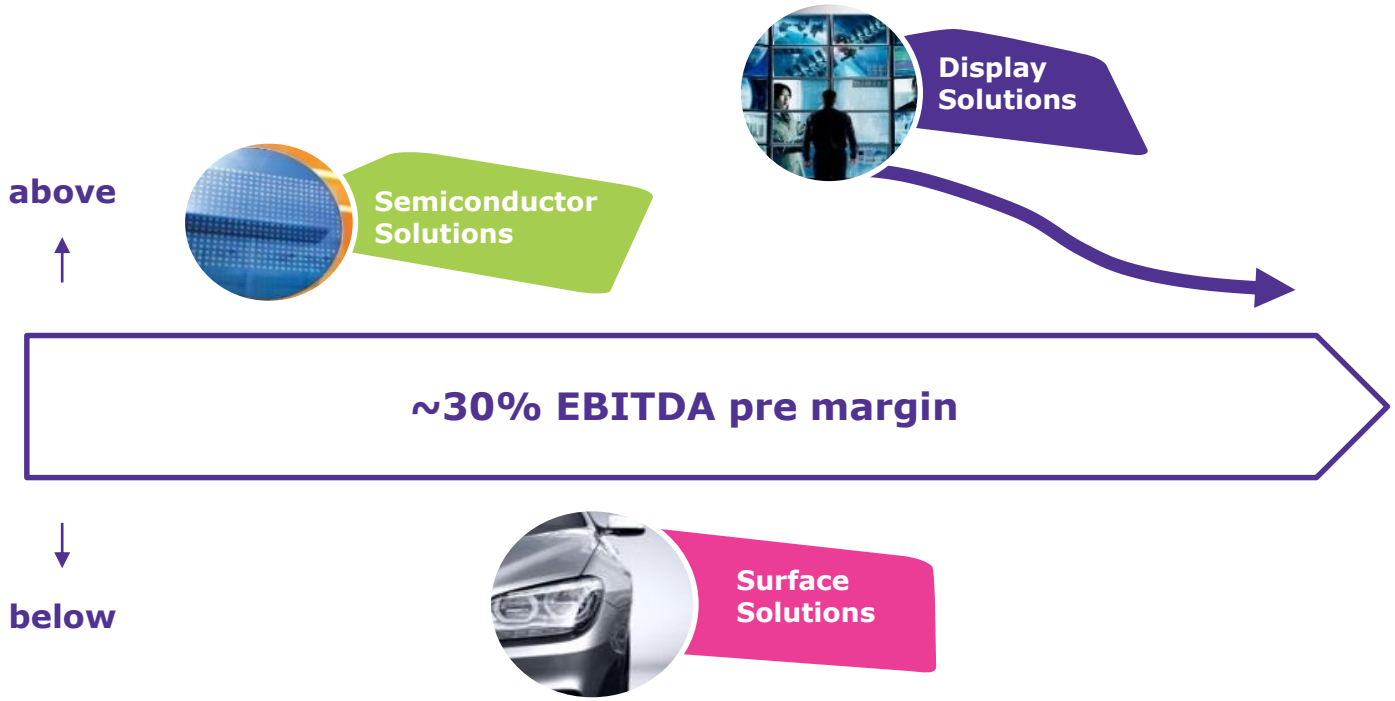
After 2019 sales growth of Semiconductor & Surface Solutions, OLED and Photoresists will overcompensate the decline of Liquid Crystals for displays

Margins of PM will remain around 30% in the long-run

profitability indication

- Display Solutions will adjust towards PM average margin
- Bottom-line management to support margin
- Strong FX exposure will cause fluctuations

EBITDA pre margin indication by business



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®; first contribution from Mavenclad® US by Q2 2019
- Ongoing strength in Life Science with 6% to 7% organic above-market net sales growth and 20-30 bps underlying margin progression
- Successful partnering of bintrafusp alfa with ~€100m of deferred income from upfront payment recognized as other operating income starting Q2 2019
- Income from milestones and management of pipeline (part of operating business in Healthcare) starting to materialize as of Q2 2019
- Lower expected license payments for Erbitux®
- High level of cost consciousness and prioritization
- Adoption of IFRS 16 contributes ~€130m[2] to organic growth YoY
- Positive FX impact: Emerging market currencies remain weak but offset by favorable EUR/USD development (range 2019: 1.13-1.17)

EBITDA[1]-reducing factors

- Slight absolute increase in R&D costs budgeted for Healthcare but 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
- Performance Materials sales and earnings reaching trough due to expected decline in Liquid Crystals

[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. ~€130m YoY contribution from adoption of IFRS 16 (Healthcare ~40%, Life Science ~40%, PM ~10%, CO ~10%); [3]CO guidance 2019: -€420m to -€480m (assuming FX adjusted CO costs -€390m to -€400m)

Group

2019 business sector guidance[1]

Net sales

- Moderate organic growth +4% to +6%
- Base business at least stable organically
- Strong contributions from launches incl. Mavenclad® US

EBITDA pre[2]

- Organic +19% to +23% YoY
- FX -2% to +3% YoY
- ~ €1,820 – 1,950m

Net sales

- Organic growth +6% to +7% above expected market growth
- All businesses contributing; Process Solutions remains main growth driver

EBITDA pre[2]

- Organic +10% to +12% YoY
- FX +0% to +3% YoY
- ~ €2,000 – 2,100m with 20-30 bps[3] underlying margin progression

Net sales

- Moderate organic decline -3% to -6%
- Liquid Crystals benefiting from temporary capacity ramp-up in China

EBITDA pre[2, 4]

- Organic -7% to -11% YoY
- FX +0% to +4% YoY
- ~ €700 – 760m

[1]Divisional guidances are only support to the group guidance and do not have to add up; [2]Incl. ~€130m 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

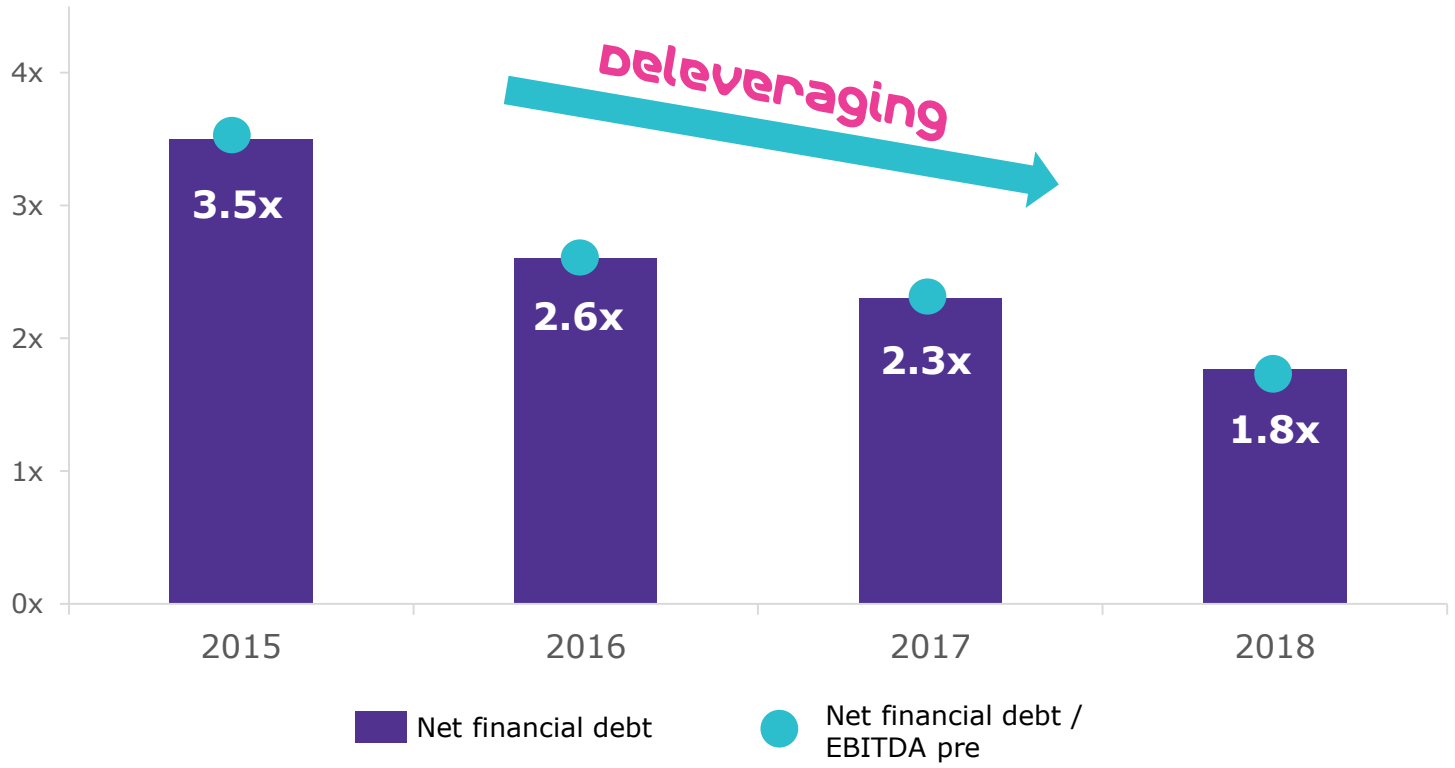
Corporate & Other EBITDA pre*	**~ -€420 – -480 m**
Interest result	**~ -€220 – -240 m**
Effective tax rate	**~ 24% to 26%**
Capex on PPE	**~ €1.1 bn – 1.2 bn**
Hedging/USD assumption	**FY 2019 hedge ratio ~60% at EUR/USD ~1.20**
2019 Ø EUR/USD assumption	**~ 1.13 – 1.17**

*CO guidance 2019: -€420m to -€480m (assuming FX adjusted CO costs -€390m to -€400m)

Strong focus on cash generation to ensure swift deleveraging

Net financial debt[1] and leverage development

[Net financial debt/ EBITDA pre]



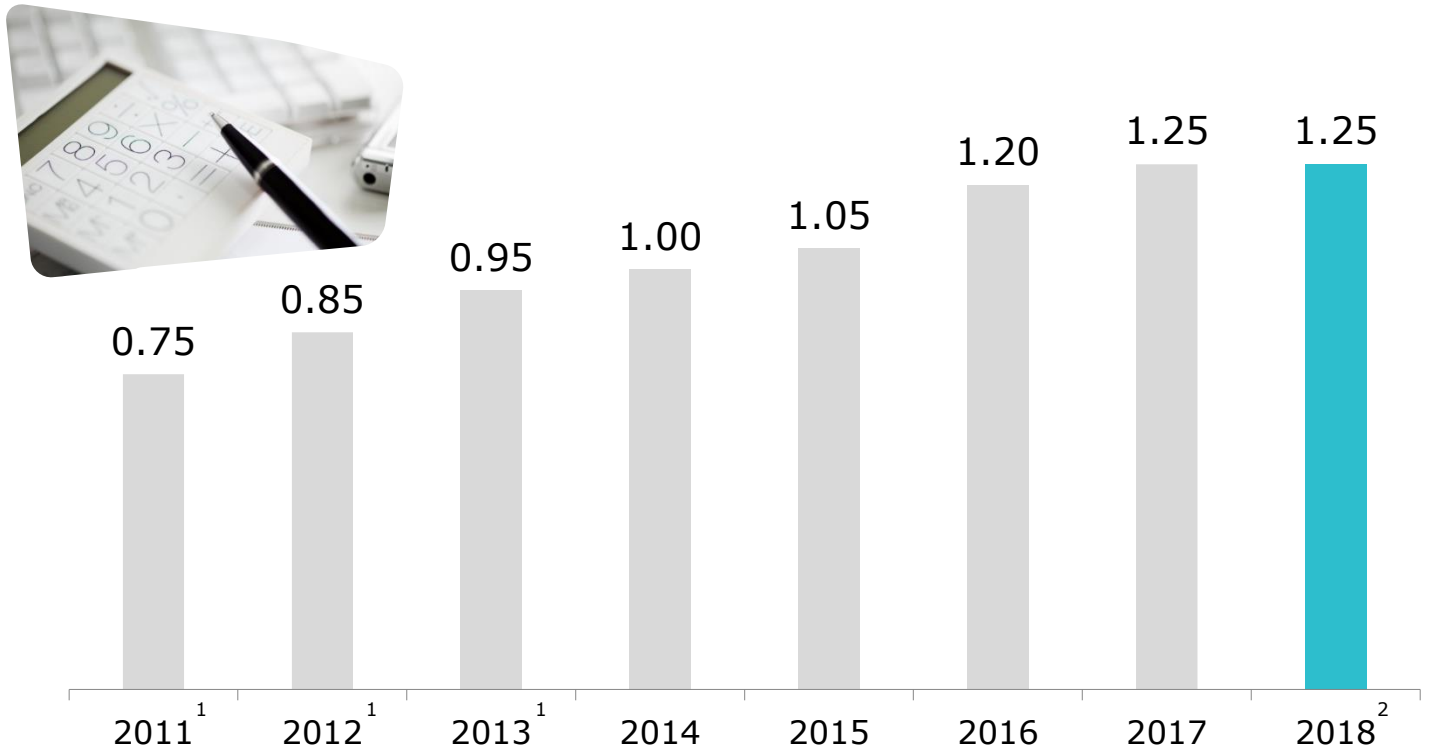
Focus on deleveraging in 2018

- Commitment to swift deleveraging to ensure a strong investment grade credit rating and financial flexibility
- Consumer Health disposal contributed to achieve targeted net debt / EBITDA pre ratio of <2x

[1]Net financial debt (without pensions)

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

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]

evobrutinib
BTK inhibitor
Multiple sclerosis

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

Registration

avelumab
anti-PD-L1 mAb
Renal cell cancer 1L[5]

- 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] The US Food and Drug Administration (FDA) accepted for Priority Review the supplemental Biologics License Application (sBLA) (February 11 2019) and the European Medicines Agency (EMA) validated for review the Type II variation application (March 8 2019) for avelumab in combination with axitinib for patients with advanced renal cell carcinoma.
Pipeline products are under clinical investigation and have not been proven to be safe and effective. There is no guarantee any product will be approved in the sought-after indication.

Merck KGaA
Darmstadt, Germany

Oncology Strategy
Strategy anchored on five foundational pillars

1	**Targeted Oncology**	1. Erbitux: continued leadership in CRC and SCCHN 2. Tepotinib: c-met driven cancers	1. Numerous Erbitux ISTs incl. combination with Avelumab 2. Tepotinib in NSCLC, HCC
2	**Avelumab**	1. Monotherapy as a basis for combinations 2. Establish immunogenic priming in combination or sequence with CT/RT[1] 3. Novel combinations 4. Establish value of unique molecular characteristics (ADCC)	1. NSCLC 1L (high intensity) 2. Maintenance in UC 1L, gastric 1L 3. Avelumab + Inlyta (RCC 1L) 4. Unique combinations leveraging ADCC
3	**IO bi-functionals**	Engineer or access platforms where biology is best addressed by a bi-functional approach	• TGF-beta trap/anti-PD-L1 • Anti-LAG-3/anti-PD-L1 • NHS-IL 12
4	**DNA Damage Response inhibitors**	Establish leadership in DDR and leverage synergies across portfolio (immuno-oncology plus emerging platforms)	• DNA-PK-i • ATR-i • ATM-i
5	**Emerging Platforms**	Invest in complementary technologies within focus discovery areas	• Antibody-Drug-Conjugates (ADC, e.g. partnership with Mersana/Sutro)

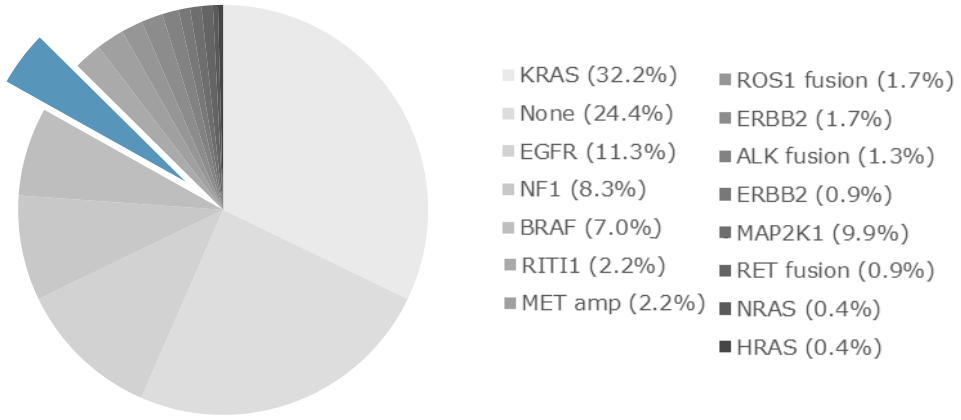
[1]Acronyms: CT = Chemotherapy, RT = Radiotherapy, ATM = Ataxia-Telangiectasia Mutated, ATR = Ataxia Telangiectasia and Rad3, DNA-PK = DNA-dependent Protein Kinase, RCC = Renal Cell Carcinoma, MCC = Merkel Cell Carcinoma, NSCLC = Non-small Cell Lung Cancer, DLBCL = Diffuse Large B-cell Lymphoma, UC = Urothelial Cancer

Tepotinib: Highly selective c-met inhibitor

There is currently no approved therapy targeting METex14 and/or c-met amplification

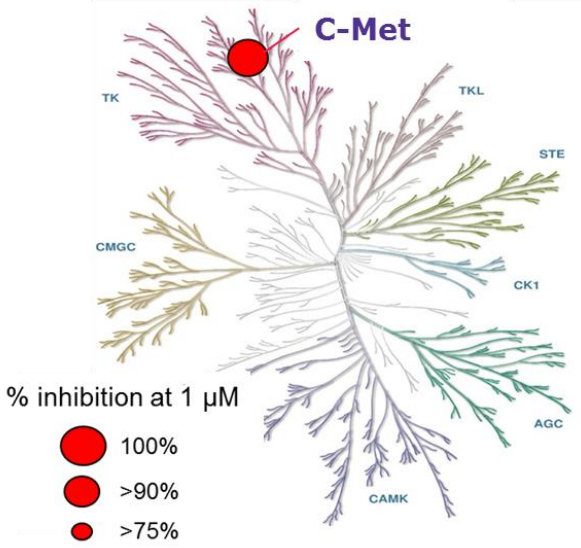
Oncogenic drivers in lung adenocarcinoma[1]

- MET-mutations are clinically **unique molecular subtypes** of NSCLC
- MET exon 14 alteration confer oncogene addiction in **~3% of NSCLC**
- **No approved therapy** specifically targeting METex14 and/or c-Met amplification



Selectivity Profile[2]

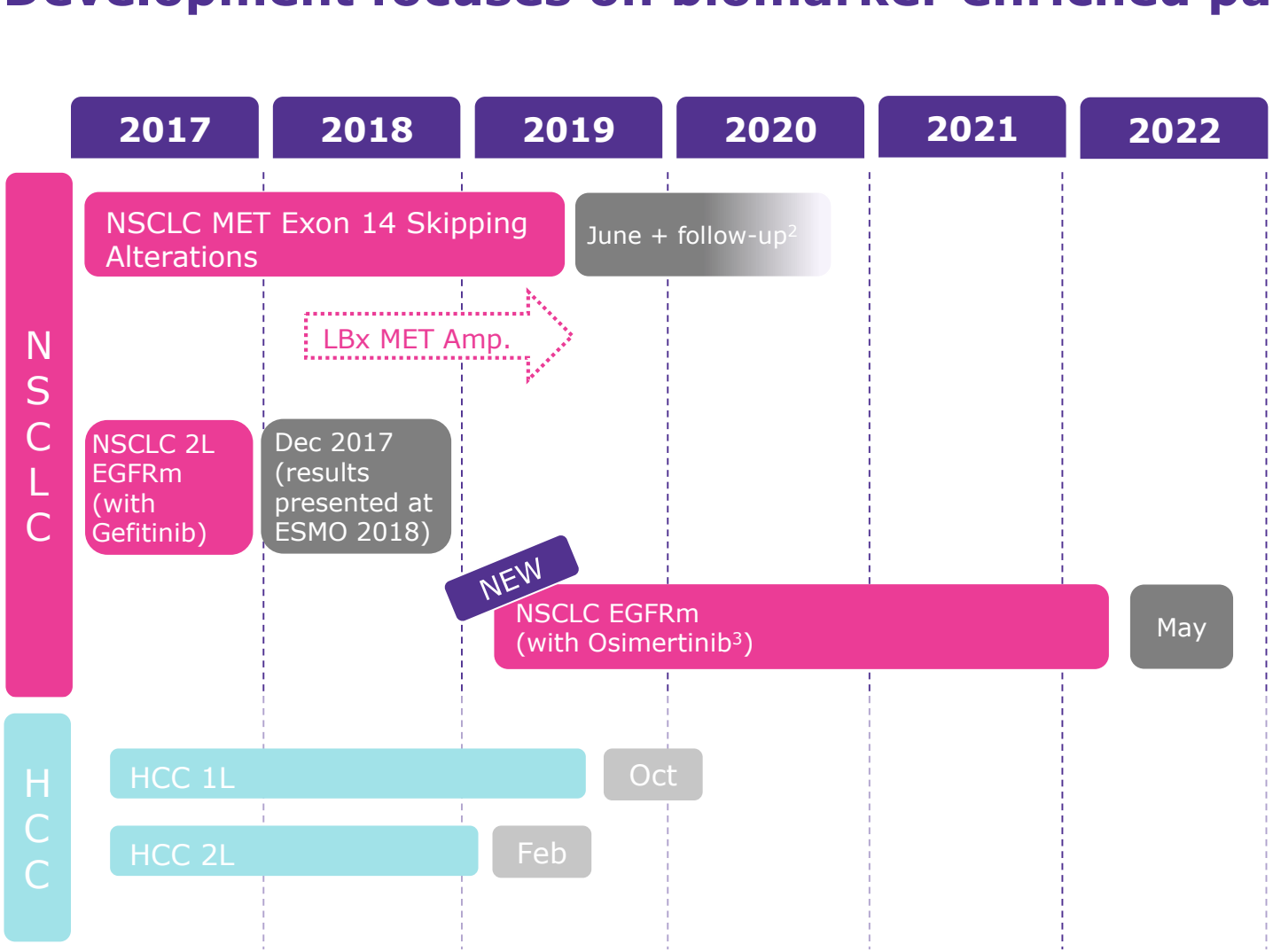
- ATP competitive, **reversible small molecule** c-Met inhibitor[3]
- **Highly selective** according to preclinical benchmarking[2]
  - In panel of >240 kinases, only c-Met inhibited at 1 µM
  - >90% inhibition of phospho-c-Met levels (tumor biopsy)



[1] Cancer Genome Atlas Nature 2014;511:543-50; [2] Merck KGaA, Darmstadt, Germany data on file; [3] Bladt et al, 2013

Merck KGaA
Darmstadt, Germany

Tepotinib: Program overview
Development focuses on biomarker enriched patient populations



Advanced interim results @ ASCO 2019

- Clinical activity demonstrated (interim)
- Planned enrollment: 120 (est.) – liquid and tissue; currently > 110 patient enrolled
- Pr. endpoint: Confirmed ORR (Independent)

NSCLC 2L EGFRm (with Gefitinib):
- Enrollment: 70 (act.)
- Comparator: Pemetrexed + Cisplatin/ Carboplatin
- Pr. endpoint: PFS (Investigator)

NSCLC EGFRm (with Osimertinib):
- Enrollment: 90 (est.), single-arm
- Pr. endpoint: Dose Limiting Toxicities and Objective Response (Independent)

- **Primary endpoint met**
- Enrollment: 90 (act.)
- Pr. endpoint: TTP (Independent)

- **Primary endpoint met**
- Enrollment: 49 (act.; failed sorafenib)
- Pr. endpoint: PFS status 12 weeks (Investigator)

[1] Timelines are event-driven and may be sbject 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®

Tepotinib: Interim Phase II results

Encouraging signs of activity seen in patients with advanced NSCLC harboring METexon14-skipping mutations

Advanced interim results @ ASCO 2019

VISION Study Design[1]

- **Patient population:**
  - Patients with advanced/metastatic NSCLC (all histologies) that are METexon 14-skipping mutation-positive
  - 46 patients treated
  - Based in EU, US and Japan
  - 1L, 2L and 3L treatment
- **Treatment:** Tepotinib 500mg QD
- **Primary endpoint:** ORR (IRC)
- **Secondary endpoints:** ORR (investigator assessed), safety, duration of response, progression-free survival and overall survival

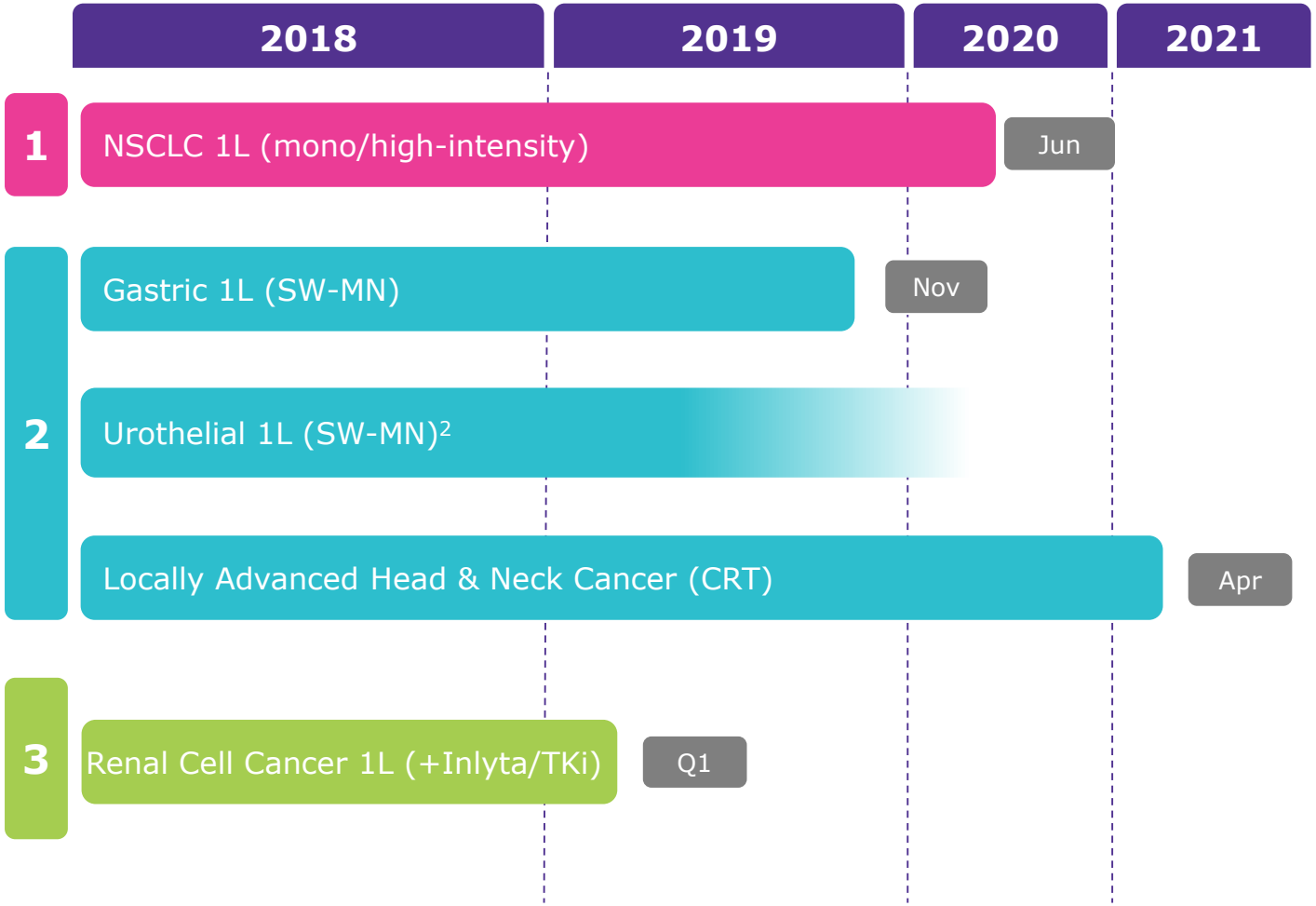
Interim results presented at the World Conference on Lung Cancer (WCLC) 2018[1,2]

- **Encouraging signs of activity**
- **ORR to date** based on independent review (35.0%) and investigator assessment (57.5% incl. two CR)
- **Median duration of response** based on investigator assessment is 14.3 months (95% CI: 3.7, nd)
- **Safety:** well tolerated, most common side effects were peripheral edema and diarrhea

Tepotinib 500 mg[2]	Investigator	Independent
Complete response	2 (5.0)	0 (0)
Partial response	21 (52.5)	14 (35.0)
Stable disease	6 (15.0)	11 (27.5)
Progressive disease	5 (12.5)	8 (20.0)
Non-evaluable	6 (15.0)	7 (17.5)
ORR n (%)	23 (57.5)	14 (35.0)
DCR: n (%)	29 (72.5)	25 (62.5)

[1] Felip E et al., "Phase II Data for the MET Inhibitor Tepotinib in Patients with Advanced NSCLC and METexon14-Skipping Mutations", presented at WCLC 2018; [2] Combined analysis (n=40); efficacy analysis includes patients having at least 2 post-baseline assessments or who discontinued treatment for any reason (n=40)

Avelumab: Program overview
Ongoing studies – Five Phase III trials



Leverage potential of unique molecular characteristics (ADCC)

Investigate potential of immunogenic priming (incl. combination and sequencing with CT/CRT)

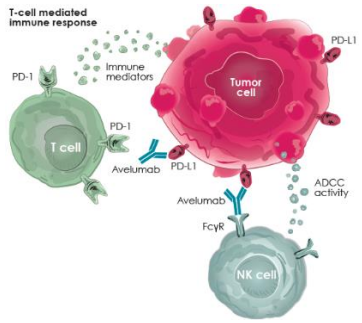
Proprietary combinations

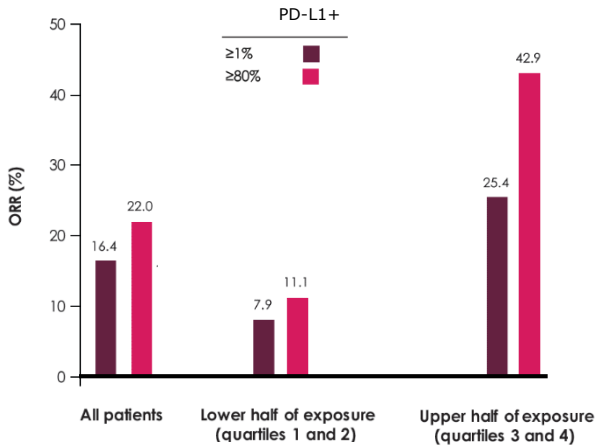
[1] Estimated primary completion date according to clinicaltrials.gov as of May 10, 2019, timelines are event-driven and may be subject to change; [2] Estimated primary completion being reprojected; Acronyms: NSCLC = Non-small Cell Lung Cancer, CT = Chemotherapy, CRT = Chemoradiotherapy, MN = Maintenance, SW = Switch, TKi = Tyrosine Kinase inhibitor

Avelumab: NSCLC 1L

Assessing potential efficacy upside in mono-therapy[1]

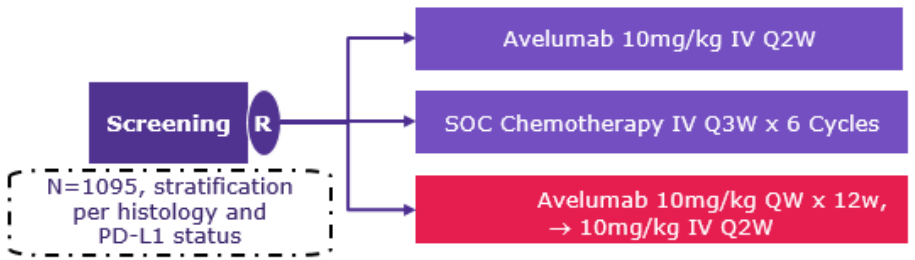
NSCLC 2L+: exposure response





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**

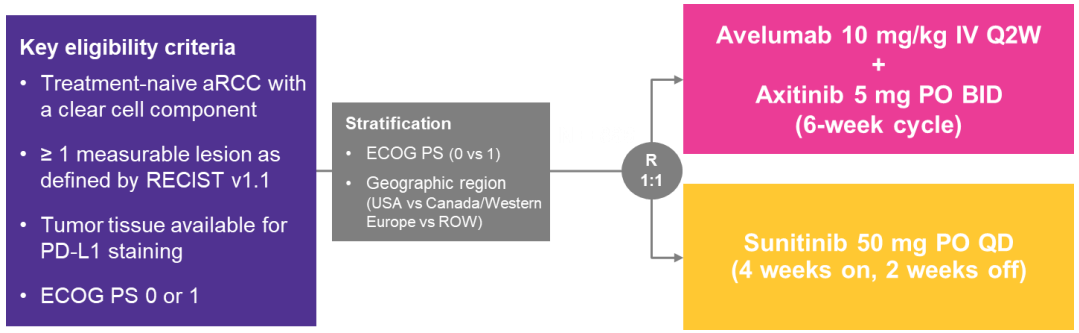
[1] Abstract No. 9086. Presented at the 53rd ASCO Annual Meeting; June 2-6, 2017; Chicago, IL, USA: Exposure–response and PD-L1 expression analysis of second-line avelumab in patients with advanced NSCLC: data from the JAVELIN Solid Tumor trial; Acronyms: ORR = Overall Response Rate

Avelumab: Renal Cell Carcinoma (RCC) 1L

sBLA submission accepted and priority review granted by the FDA with feedback expected in June 2019

Phase III JAVELIN Renal 101 Study[1]

- **Primary objective:** to demonstrate the superiority of avelumab + axitinib compared with sunitinib for either PFS or OS in patients with PD-L1+ tumors in RCC
- **Patient population:** 886 patients with advanced RCC across all risk groups, 63% PD-L1+
- **Study Design:**



Regulatory Achievements & Next Steps

- **December 2017:** Breakthrough Therapy Designation granted by the US FDA
- **September 2018:** Announcement of positive topline results as part of a planned interim analysis at ESMO 2018, followed by decision to pursue a regulatory submission in the US based on PFS data
- **February 2019:**
  - FDA accepts sBLA and grants Priority Review
  - Filing submitted to Japanese health authorities
- **March 2019:**
  - European Medicines Agency (EMA) validates application

By June 2019: Expected FDA decision

Study continues as planned for OS

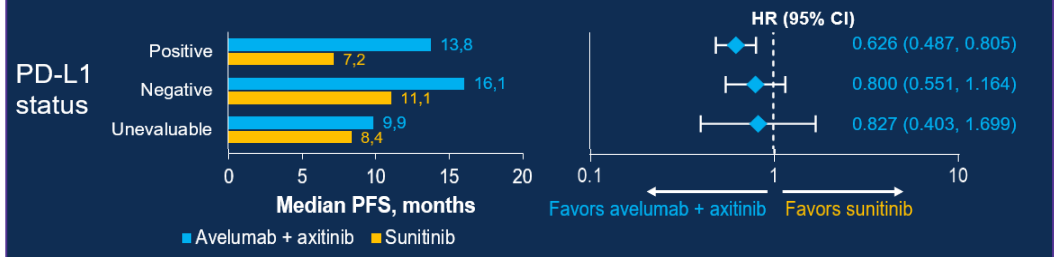
[1] Choueiri et al., „Subgroup analysis from JAVELIN Renal 101: outcomes for avelumab + axitinib vs sunitinib in advanced renal cell carcinoma ", presented at ASCO GU 2019; Acronyms: ESMO = European Society of Medical Oncology, FDA = US Food & Drug Administration, OS = Overall Survival, PFS = Progression-free Survival, sBLA = supplemental Biologics License Application

Avelumab: Renal Cell Carcinoma 1L

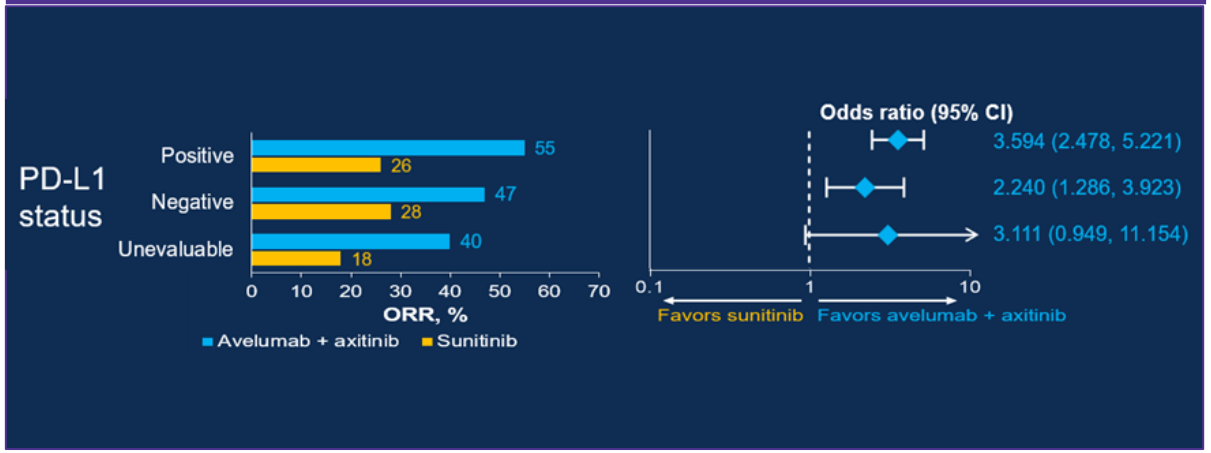
Subgroup analysis presented at ASCO GU[1] 2019 shows PFS and ORR benefit regardless of PD-L1 status and in all prognostic risk groups

Progression Free Survival (mPFS)

	PFS (Risk groups per IMDC)[2,4]		
	Favorable	**Intermediate**	**Poor**
Competitor A	2.18 (1.29-3.68)	0.82 (0.64-1.05)	
Avelumab – Axitinib (JAVELIN)	**0.54 (0.32-0.91)**	**0.74 (0.57-0.95)**	**0.57 (0.38-0.88)**
Competitor B	0.81 (0.53-1.24)	0.70 (0.54-0.91)	0.58 (0.35-0.94)



Objective Rate of Response (ORR, all-comers)



Prognostic risk groups (IMDC/% of patients) [3,4]

Favorable/intermediate/poor:

- JAVELIN: **21%**/61%/16%
- Competitor B: **32%**/55%/13%

Safety & Discontinuation (all-comers) [3,4]

Safety (% patients, 3-5 TRAEs)

- Avelumab-Axitinib: 57%
- Competitor B: 63%

Discontinuation (% patients):

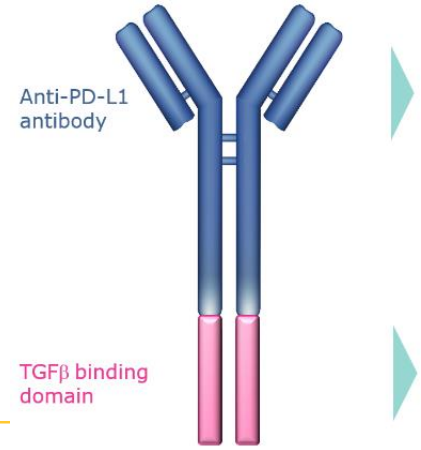
- Avelumab-Axitinib: 4%
- Competitor B: 8.2%

[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

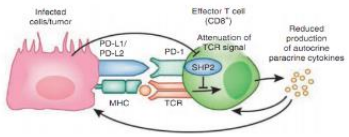
Bintrafusp alfa[1] (M7824)
An innovative first-in-class bifunctional fusion protein leading the TGF-β immuno-oncology field

Mode of action

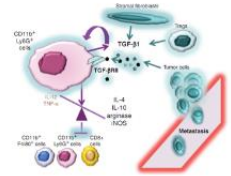
- Innovative **first-in-class bifunctional fusion protein** designed to simultaneously target two immune suppressive pathways (blocking PD-L1 and reducing TGF-β signaling)
- Demonstrated **superior anti-tumor activity in pre-clinical study** compared to anti-PD-L1 alone, and anti-PD-L1 and TGF-β given 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

Bintrafusp alfa (M7824)

Updated data presented at ESMO 2018 defined the next steps for the clinical development program

NSCLC 2L

- **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]

Next steps — **Two additional NSCLC trials** initiated in Q2 2019 (see next slide for details)

Biliary Tract Cancer (BTC)

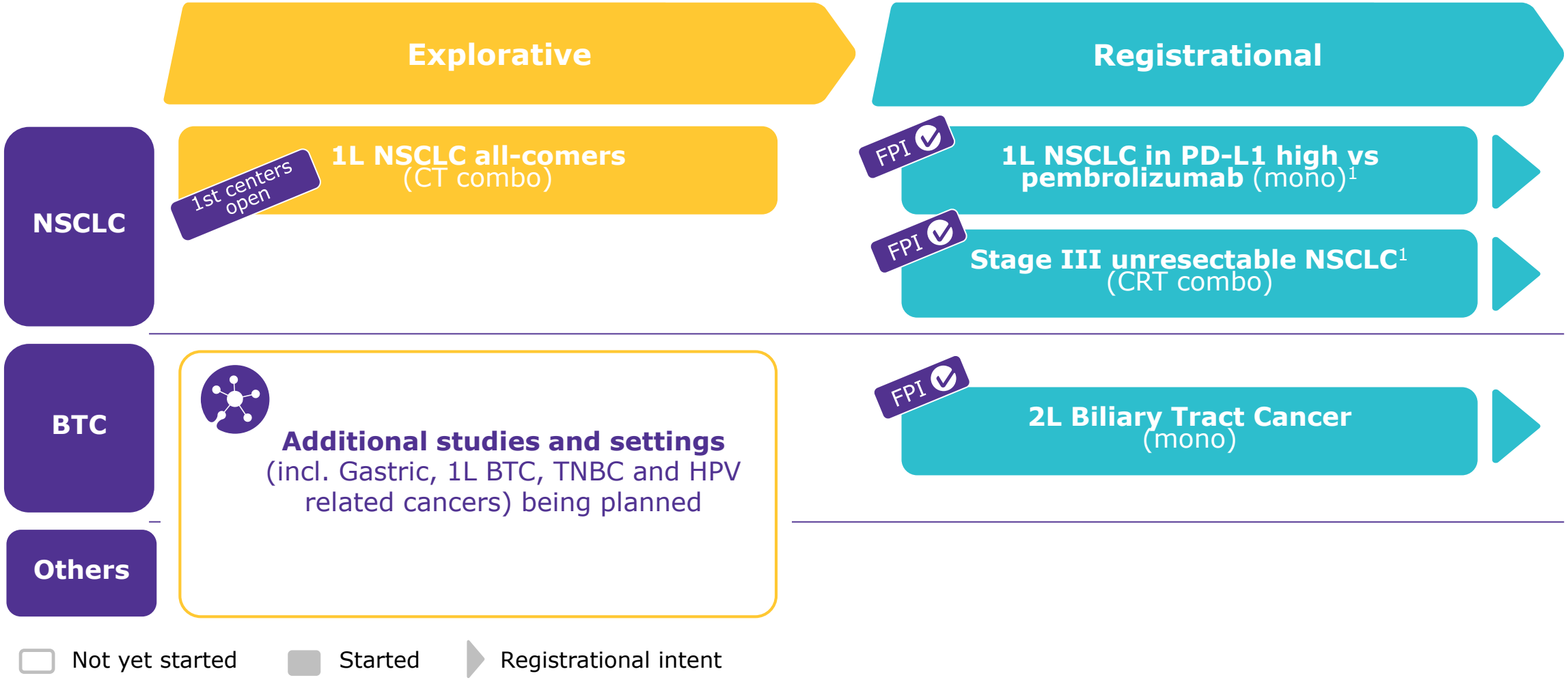
- **Need:** Few available treatment options (no 2L standard of care)[4]
- **Results: Encouraging activity[5]** in 30 Asian patients with pretreated biliary tract cancer
- **ORR[5]:** 20% (IRC assessment). Median DoR was NR (range, 8.3–13.9 months) with confirmed responses ongoing in all patients
- **Overall 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[4])
- Responses observed **irrespective of PD-L1 expression levels[5]**
- **Orphan Drug Designation** granted by FDA in December 2018

Next steps — **Additional 2L BTC study** initiated in Q1 2019 (see next slide for details)

[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] Lamarca A, et al. Ann Oncol. 2014;25(12):2328–2338; [5] Yoo et al., Poster presented at the 43rd European Society for Medical Oncology Annual Meeting, Munich, October 19–23, 2018; Acronyms: DoR = Duration of Response, NSCLC = Non-small Cell Lung Cancer, NR = Not Relevant

Bintrafusp alfa (M7824)

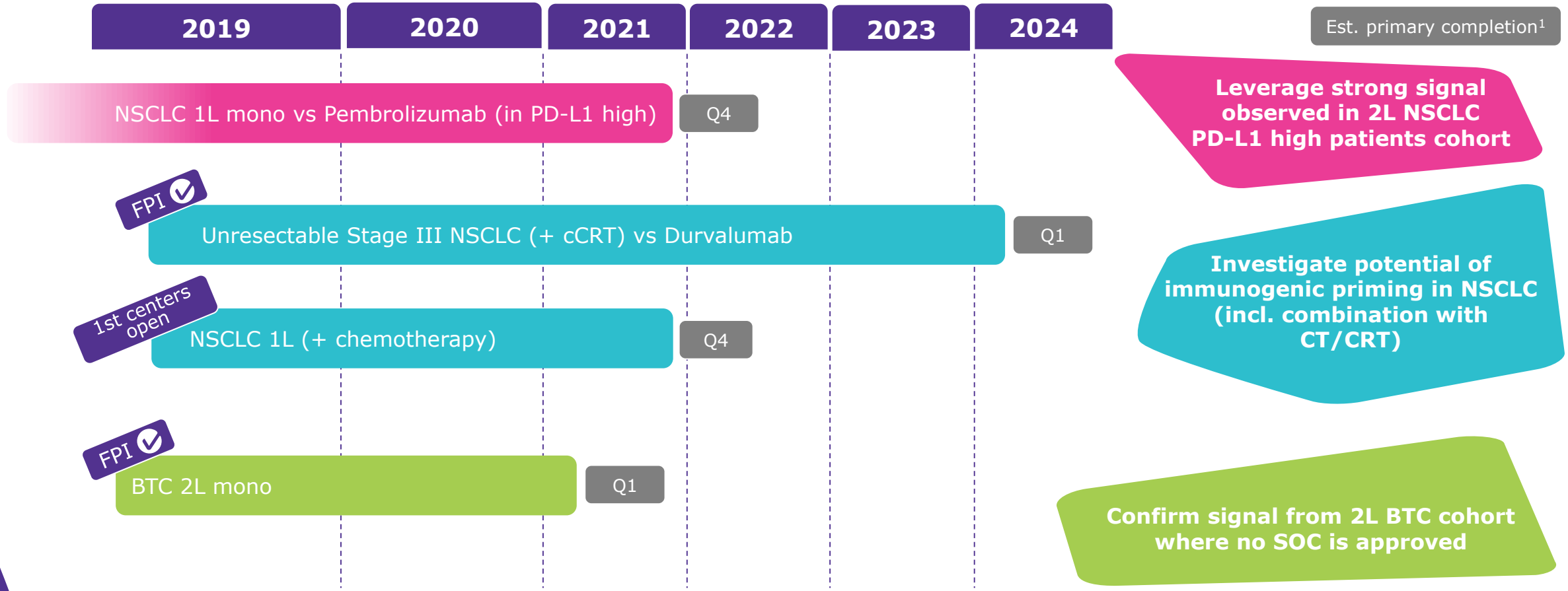
Eight high priority immuno-oncology clinical development studies ongoing or expected to commence in 2019



[1] randomized controlled trials; Acronyms: CT = Chemotherapy, CRT = Chemoradiotherapy, NSCLC = Non-small Cell Lung Cancer, BTC = Biliary Tract Cancer, TNBC = Triple-Negative Breast Cancer, FPI = First Patient In

Bintrafusp alfa (M7824)

Program overview: Two additional studies recently started



[1] Estimated primary completion date according to clinicaltrials.gov as of May 12, 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

Bintrafusp alfa (M7824)
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

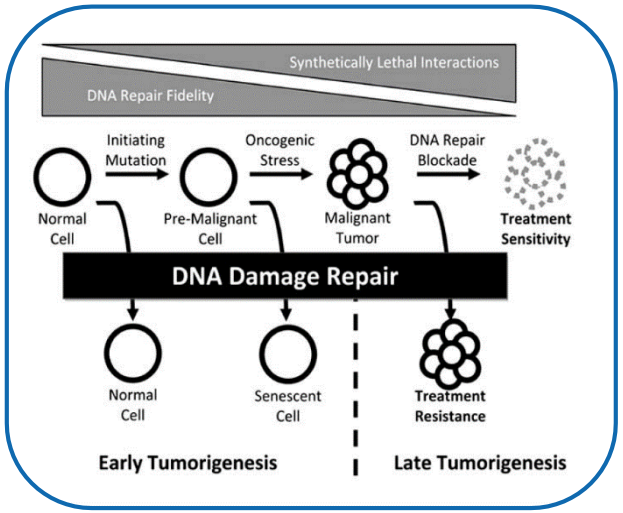
- Development (up to €500 m)
- Approval
- Commercial

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

profit & cost sharing

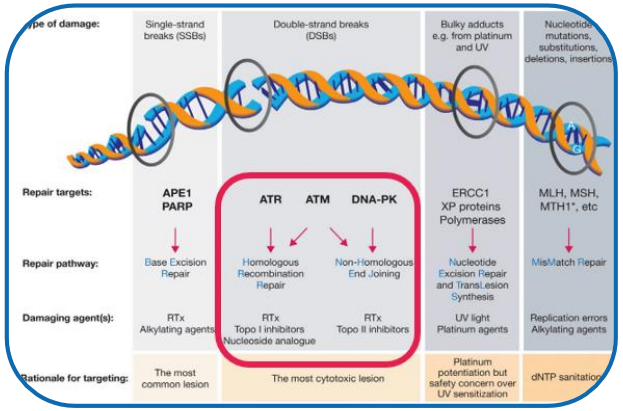
- **Profits & Costs:** Shared equally on a global basis
- **Sales:** Merck KGaA, Darmstadt, Germany to recognize sales in the United States, GSK to recognize sales ex-US

DNA damage response (DDR)
Complete portfolio supporting leadership in a potentially disruptive class



Genomic instability: a hallmark of late stage cancers[1]

- DNA damage response (DDR) keeps genetic information intact
- In many cancers DDR pathways are defected, leading to greater dependency on remaining functional DDR pathways
- Preferentially inhibiting remaining DDR pathways can result in cancer cell death ("synthetic lethality")



Amplifying cytotoxic effects of conventional and novel cancer treatments potentially bears combination potential

1. Inhibitor portfolio targets lead pathways of double stranded breaks and replication stress response – enabling unique synergies
2. ESMO 2018: leading DNA-PK-I (M3814) found safe and tolerable in a Phase I study with limited activity in monotherapy. Dose escalation in combination with palliative and curative intent RT ongoing[2]

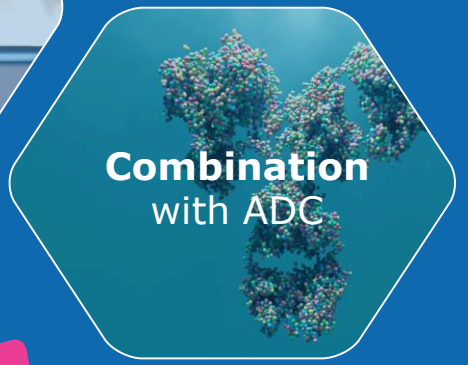
[1] Sources: O'Connor, Molecular Cell, 2015; Benjamin et al., Current Drug Targets, 2010, 11, 1336-1340; [2] "Safety, Clinical Activity and Pharmacological Biomarker Evaluation of the DNA-Dependent Protein Kinase (DNA-PK) Inhibitor M3814: Results from Two Phase I Trials", P.M. Mau-Sørensen, ESMO 2018; Acronyms: ATM = Ataxia-Telangiectasia Mutated, ATR = Ataxia Telangiectasia and Rad3, DNA-PK = DNA-dependent Protein Kinase

DNA damage response (DDR)
Broad combination potential across multiple mechanisms

At least **50%** of all cancer patients receive some type of **RADIATION** therapy (NCI 2016)

At least **70%** of all cancer patients receive some type of **CHEMOTHERAPY** (NCI 2016)

Significant share of patients to be treated with **CHECKPOINT INHIBITORS**



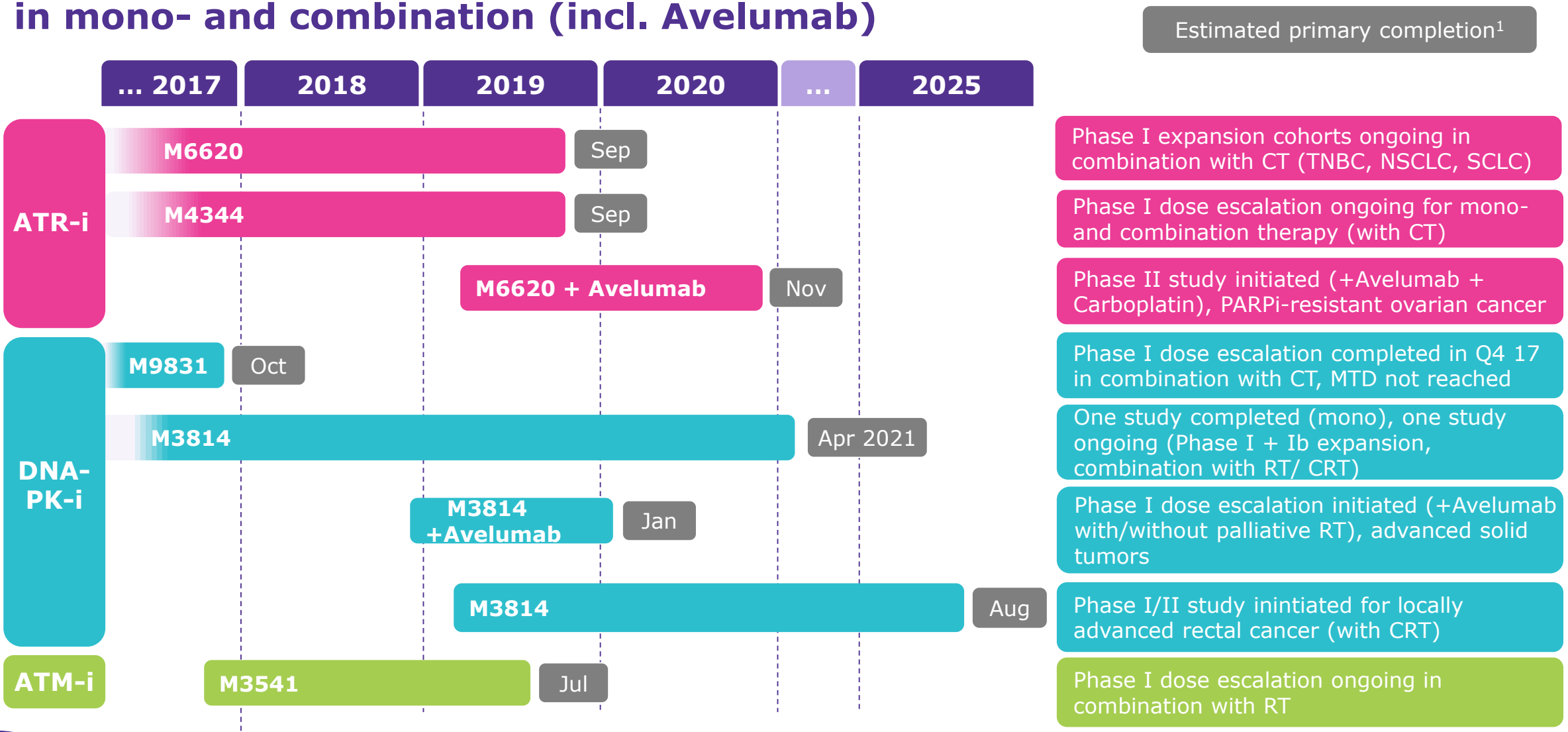
DNA-PK

ATM

ATR

DNA damage response (DDR)

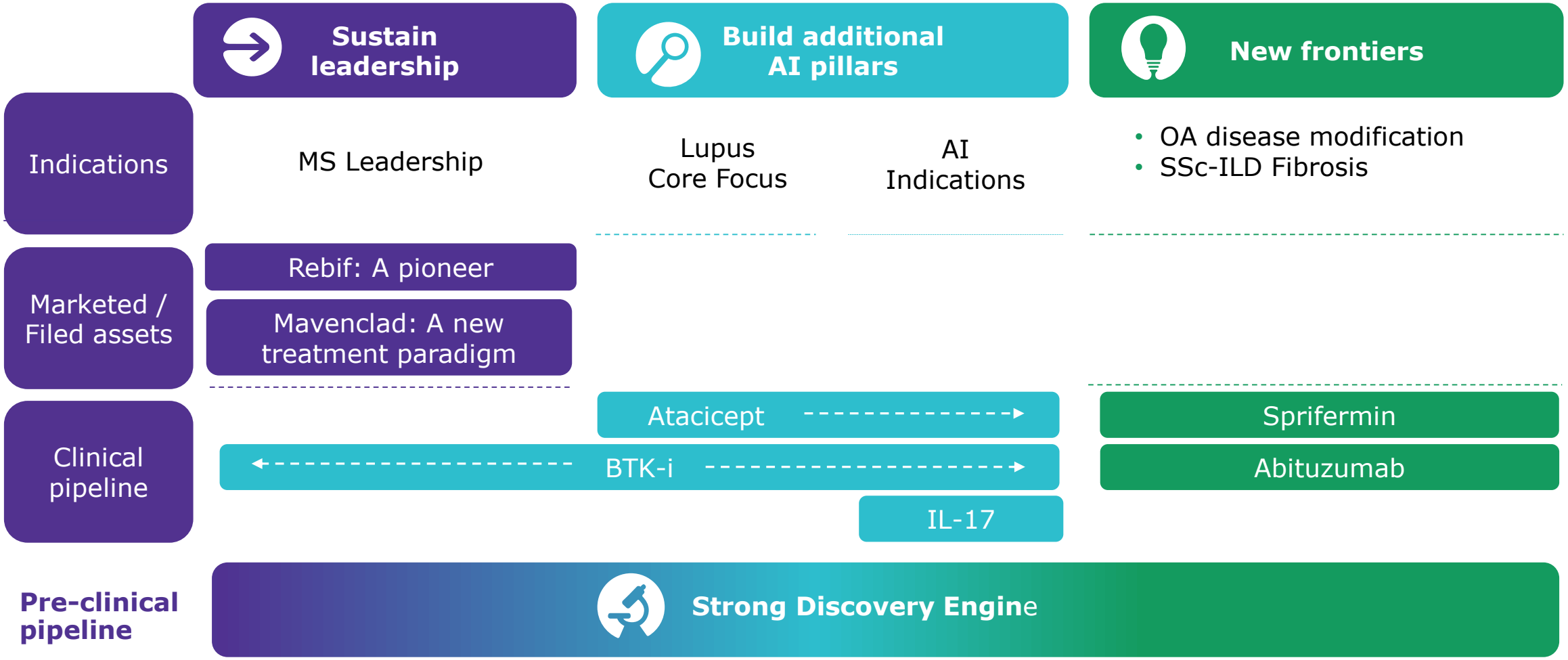
Clinical program targets three major DDR pathways, in mono- and combination (incl. Avelumab)



[1] Estimated primary completion date acccording to clinicaltrials.gov as of May 12, 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, MTD: Maximum Tolerated Dose

Merck KGaA
Darmstadt, Germany

Immunology
Strategy is anchored on leadership in selected disease areas

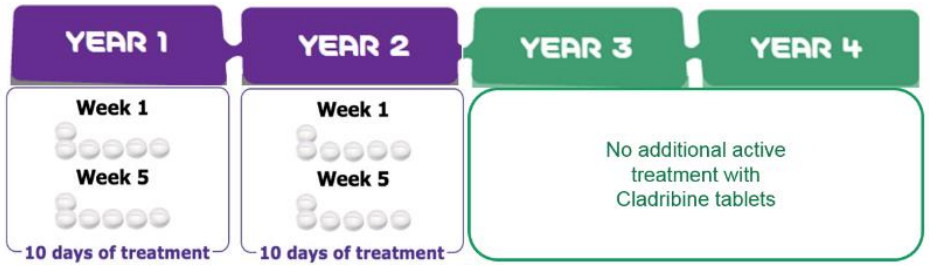


Immunology
Mavenclad could change the MS treatment paradigm

Selective immune reconstitution therapy (SIRT)[1]

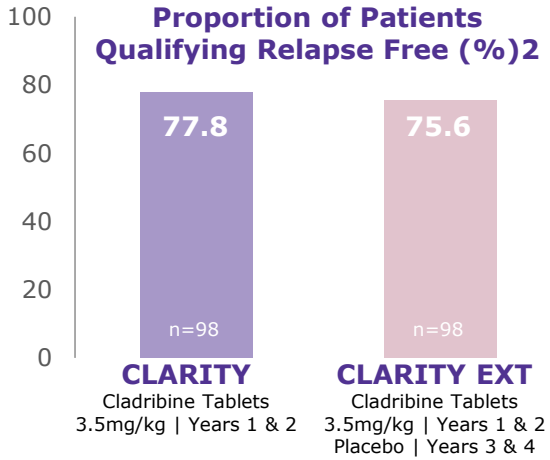
Selective reduction in B & T lymphocytes…

…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

Immunology

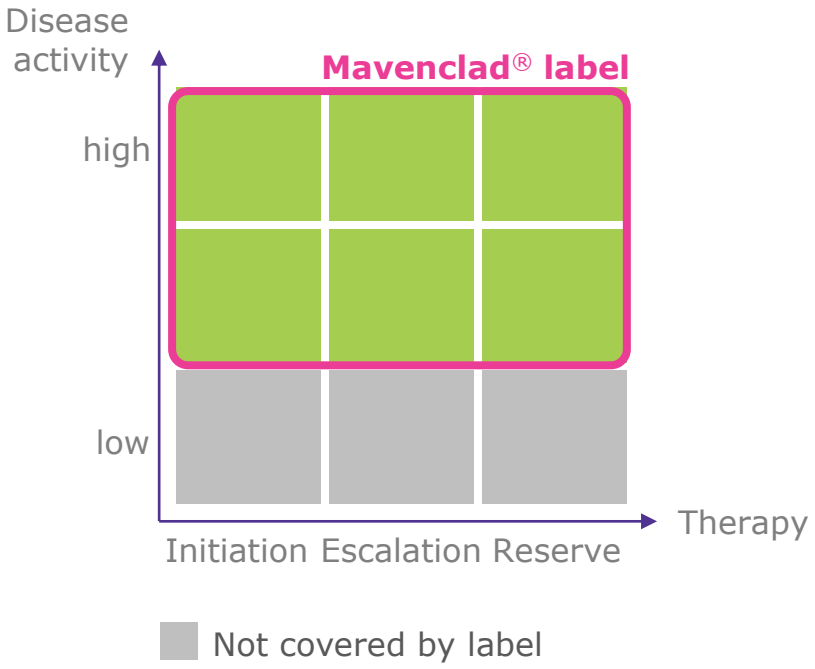
Mavenclad®'s attractive label in Europe supports integrated franchise strategy

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

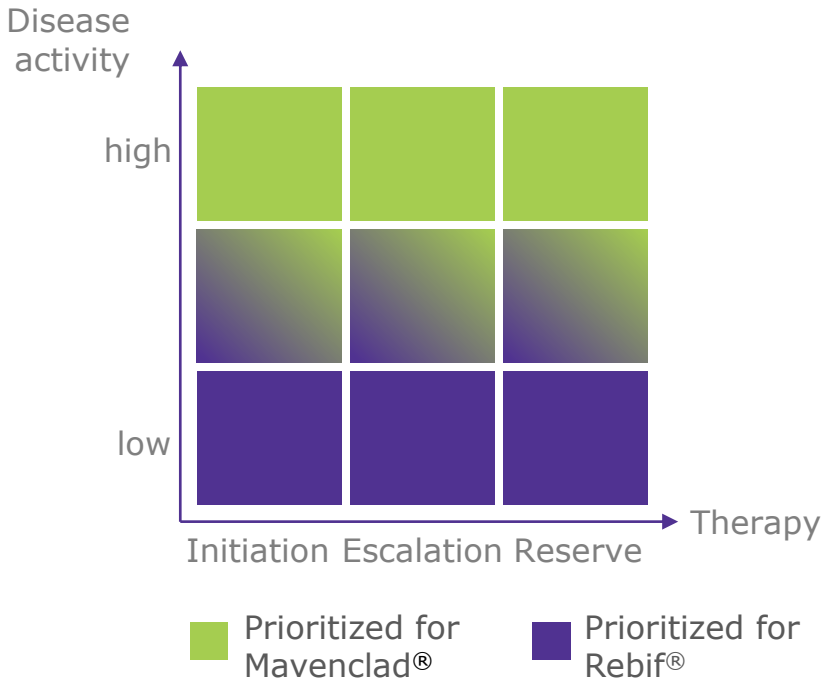
Merck's KGaA, Darmstadt, Germany overall NDD franchise will cover a broad MS patient pool

Integrated franchise strategy

MS patient population[2]



RRMS patients, EU-5[3]



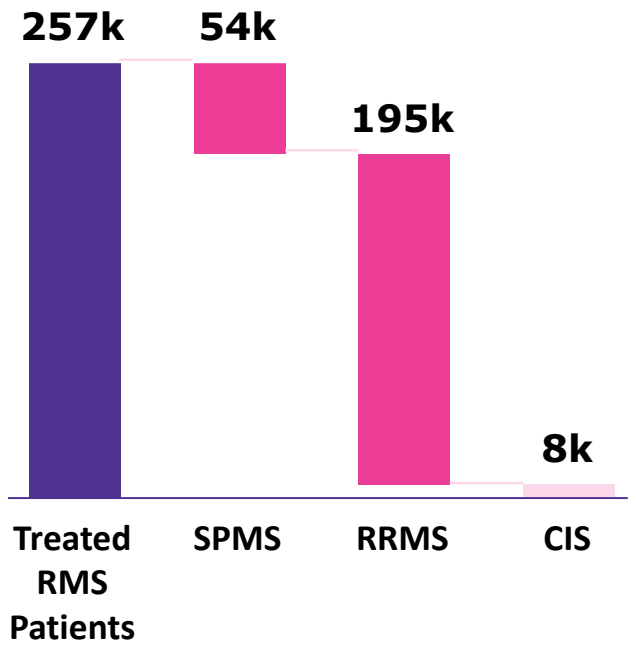
- At patient level: Rebif ® and Mavenclad® are **highly complementary**
- At physician level: High overlap
- Franchise infrastructure investment benefits both brands

[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

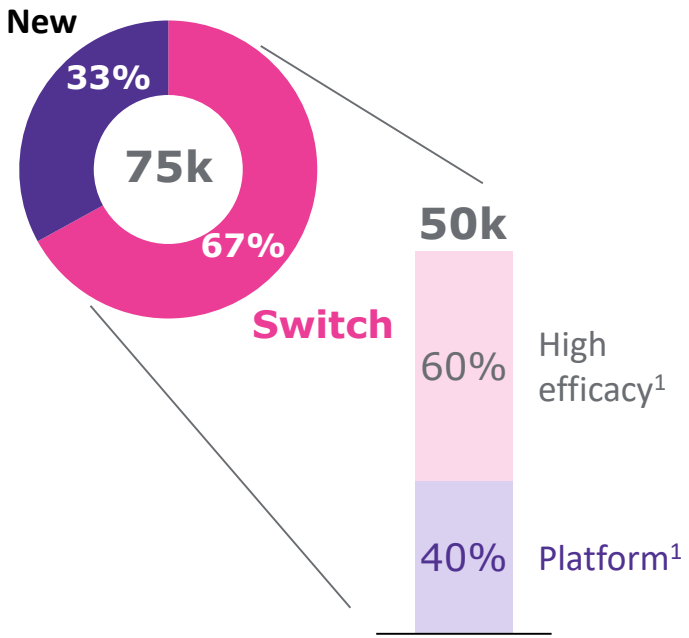
Immunology

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

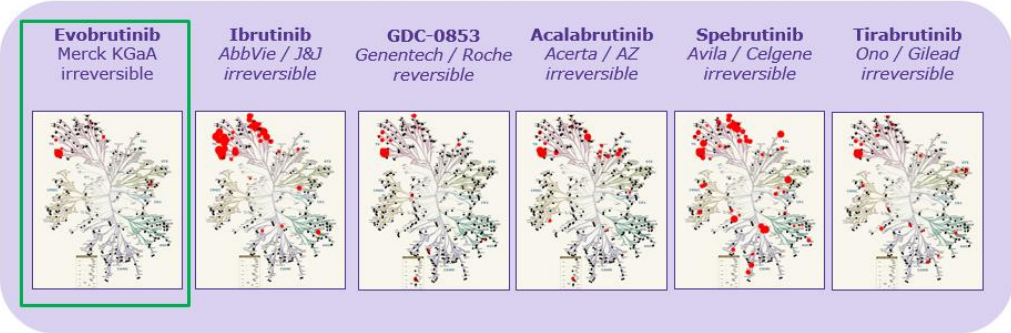
- **Previously treated** patients represent the vast majority of the dynamic patient pool
- **Lack of efficacy** is the predominant driver of switching, hence observed "high-efficacy" share of switches
- **Intolerance** also drives switching, though to a lesser degree, and results in switches between 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
Highly selective BTK inhibitor to be explored as chronic therapy

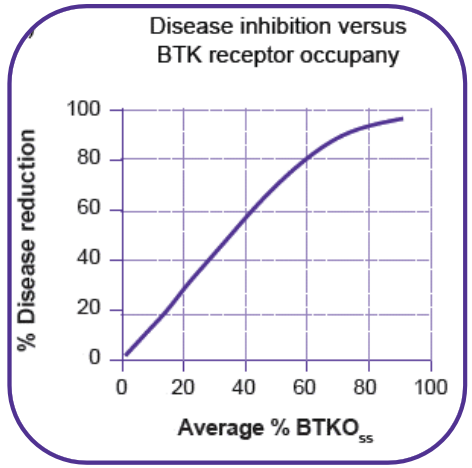
Safety: Promising kinase selectivity may minimize off-target effects[1]



- Greater selectivity vs. in-class competitors in kinase screen (>270 kinases)
- Besides BTK, two more kinases inhibited (vs. 25 off-target kinases by others)
- Kinase selectivity may result in lower AE rate vs. existing treatments

Efficacy: Oral, highly efficacious in pre-clinical models[1]

- Evobrutinib is a covalent binding antagonist that inhibits signal transduction in B cells without B cell depletion
- Occupancy/efficacy correlation: average BTK occupancy of >80% correlated with near complete inhibition of disease activity[1]
- Clinical benefit of addressing B cell biology demonstrated by anti-CD20 targeting agents
- Insights from phase IIa trial (RA) leveraged in broad clinical development program (three phase IIb trials in MS[2], SLE, and RA)



[1] "Pharmacodynamic Modelling of BTK Occupancy versus Efficacy in RA and SLE Models Using the Novel Specific BTK Inhibitor M2951" Abstract #4342; EULAR 2016
[2] 24-week placebo controlled and 24-week blinded extension phases completed

Evobrutinib
First BTKi demonstrating clinical proof-of-concept in relapsing multiple sclerosis (RMS)[1]

48 weeks data presented at AAN 2019

Study Background

- **Design:** Randomized, double-blind, placebo-controlled study in patients with RMS
- **Patient disposition:** 267 patients (91% completed 24 weeks of treatment, 85% completed 48 weeks)
- **5 arms:** Placebo vs. 3 drugs-arms (low, mid, high dose[2]) incl. open-label reference arm (dimethyl fumarate, 240 mg BID)
- **Primary endpoint:** Gadolinium enhancing T1 (T1 Gd+) lesions measured at weeks 12, 16, 20 and 24 in comparison to patients receiving placebo
- **Duration:** 24 week primary analysis followed by a 24 week blinded extension

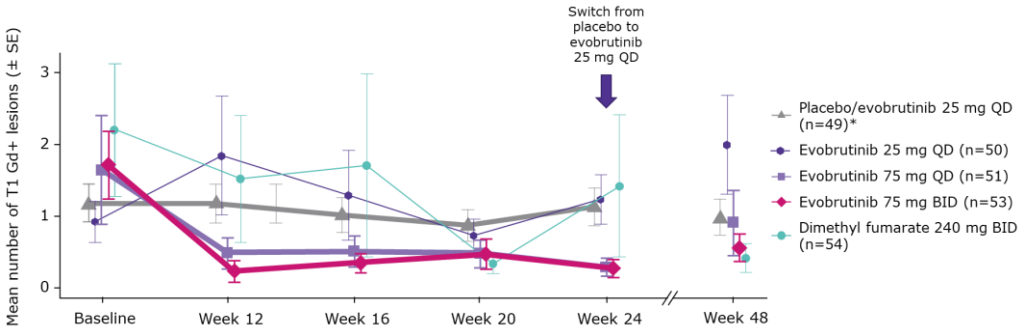
48 week data presented at AAN 2019 & published in the NEJM[4]: Lesion reduction maintained, with no new safety signals

Primary endpoint (T1 Gd+ lesion rate ratio vs placebo, measured at weeks 12 -24):

- Evobrutinib 25 mg QD: 1.45
- Evobrutinib 75 mg QD: 0.30
- Evobrutinib 75 mg BID: 0.44

→ **Reduction in mean number of T1 Gd+ lesions seen at Week 12 persisted out to Week 48 in the evobrutinib 75 mg BID arm**

Mean number of T1 Gd+ lesions by visit (mITT)



*Patients switched from placebo to evobrutinib 25 mg QD for the second 24-week treatment period
All available scans are included in this figure, including those collected within 3 weeks after high dose corticosteroid use

Key secondary endpoint (ARR, Annualized Relapse Rate, 24 wks → **48 wks):**

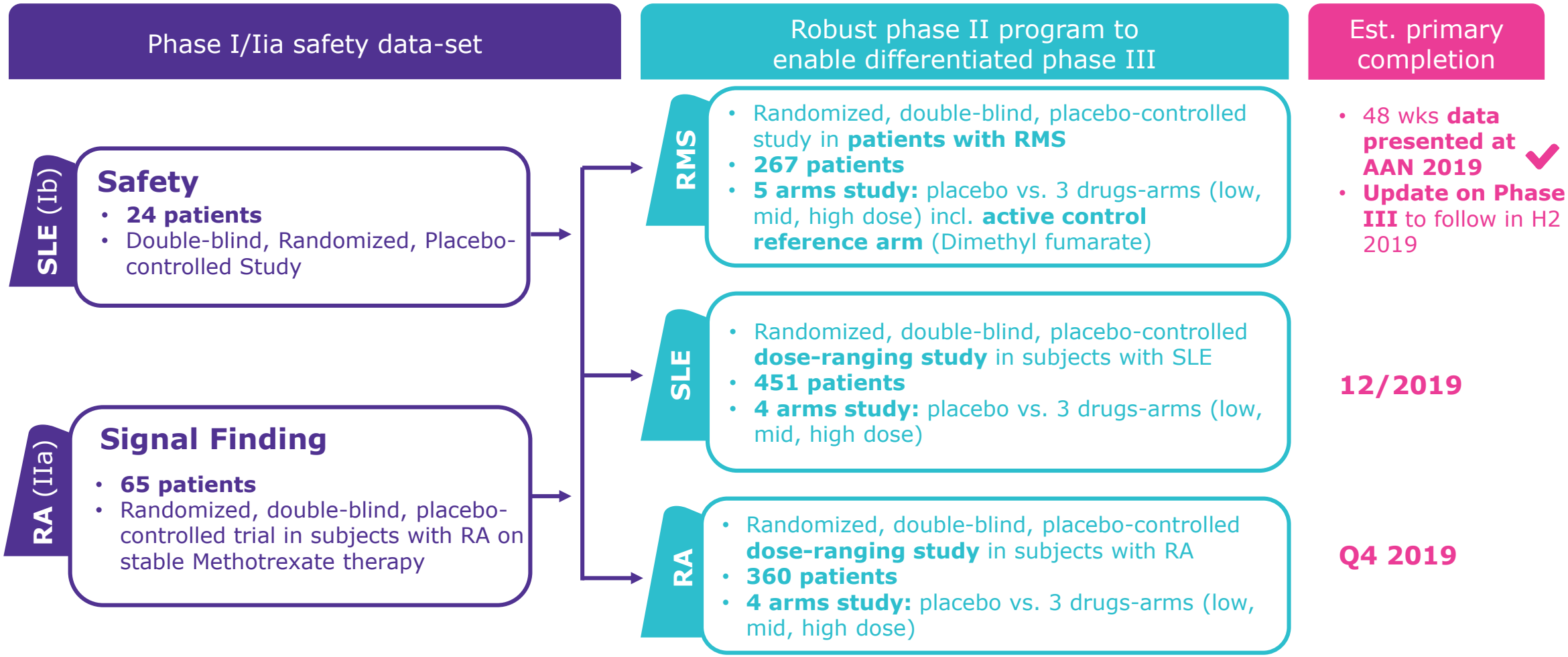
- Placebo: 0.37 → **0.37**
- Dimethyl fumarate: 0.20[3] → **0.14**[3]
- Evobrutinib 25 mg QD: 0.57 → **0.52**
- Evobrutinib 75mg QD: 0.13 → **0.25**
- Evobrutinib 75mg BID: 0.08 → **0.11 (Magnitude of AAR reduction maintained)**

Safety:

- Well tolerated, no treatment associated infections, infestations or lymphopenia observed
- Elevated transaminase levels observed were reversible, asymptomatic, had an onset within 24 weeks of treatment initiation
- **No new safety signals were identified over 52 weeks**

[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]evobrutinib 25 mg QD, 75mg QD and 75mg BID; [3] One patient considered an outlier, when accounted for the performance of dimethyl fumarate was in line with previous studies; [4] Montalban et al., „Placebo-Controlled Trial of an Oral BTK Inhibitor in Multiple Sclerosis" published in NEJM, May 2019

Evobrutinib
Comprehensive development plan across immune-mediated diseases

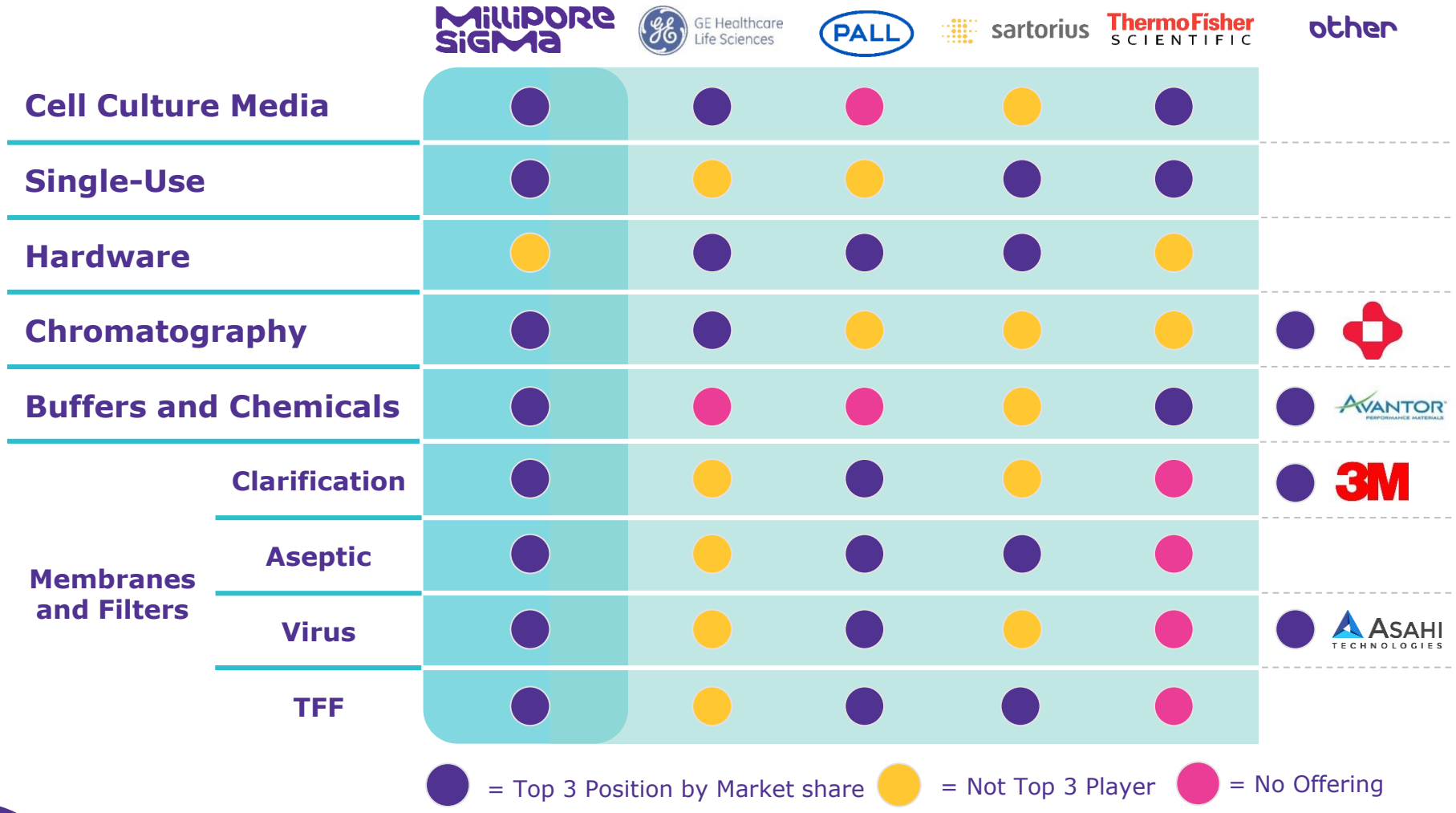


All timelines are event-driven and may be subject to change.

Process Solutions

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

2017 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

purify

CHOZN Cell Line

Ex-Cell® Advanced™ media

Mobius® bioreactor

Clarisolve® Depth Filters

Eshmuno® Chrom. resin

Viresolve® Pro Solution

ProSep® Ultra Plus Resin

Opticap® Filters

Launched 2018

Pellicon® Ultrafiltration Cassettes

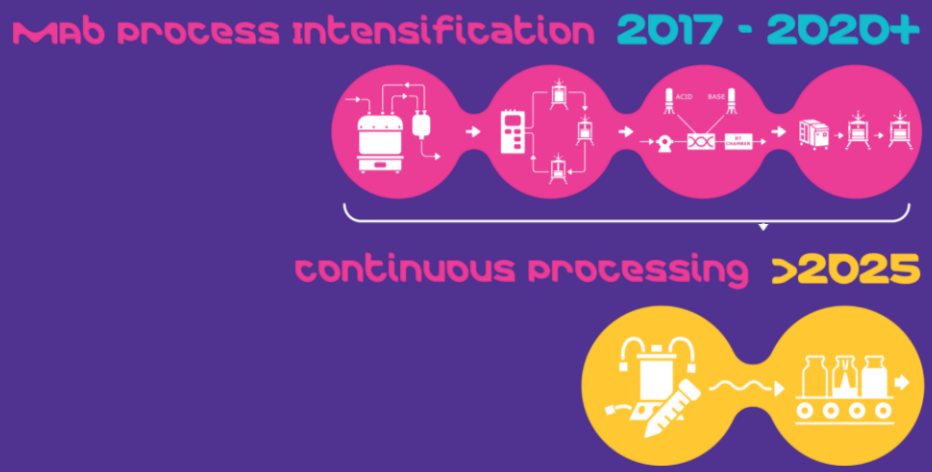
Durapore® Filtration

Launched 2018

Millipak® Final Fill Filter

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

Tomorrow's process

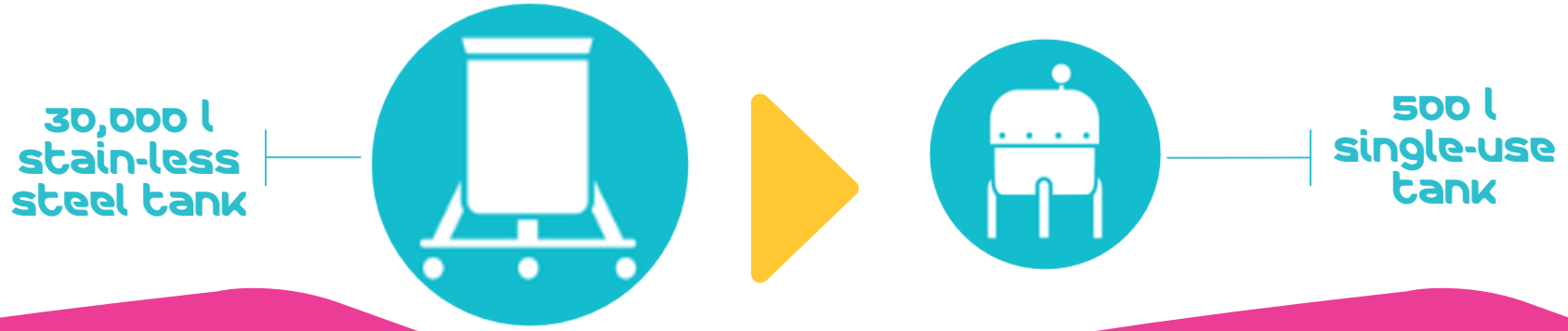


Continuous bioprocessing will …

- 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**

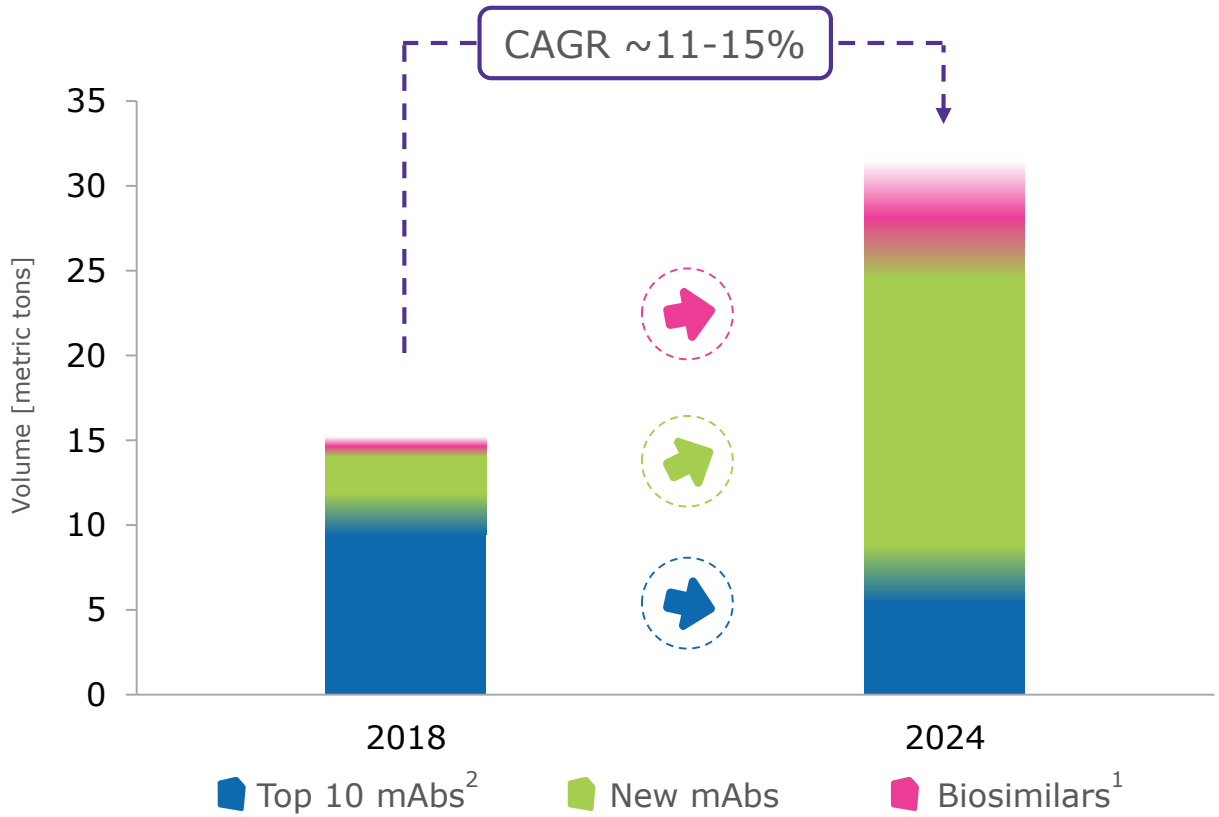
Innovative single-use facility	
CAPEX required	**$20 m to $100 m**
Time to construct	**1.5 years**
Change over time	**0.5 days**
Footprint	**~11,000 m²**

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

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 EMD 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

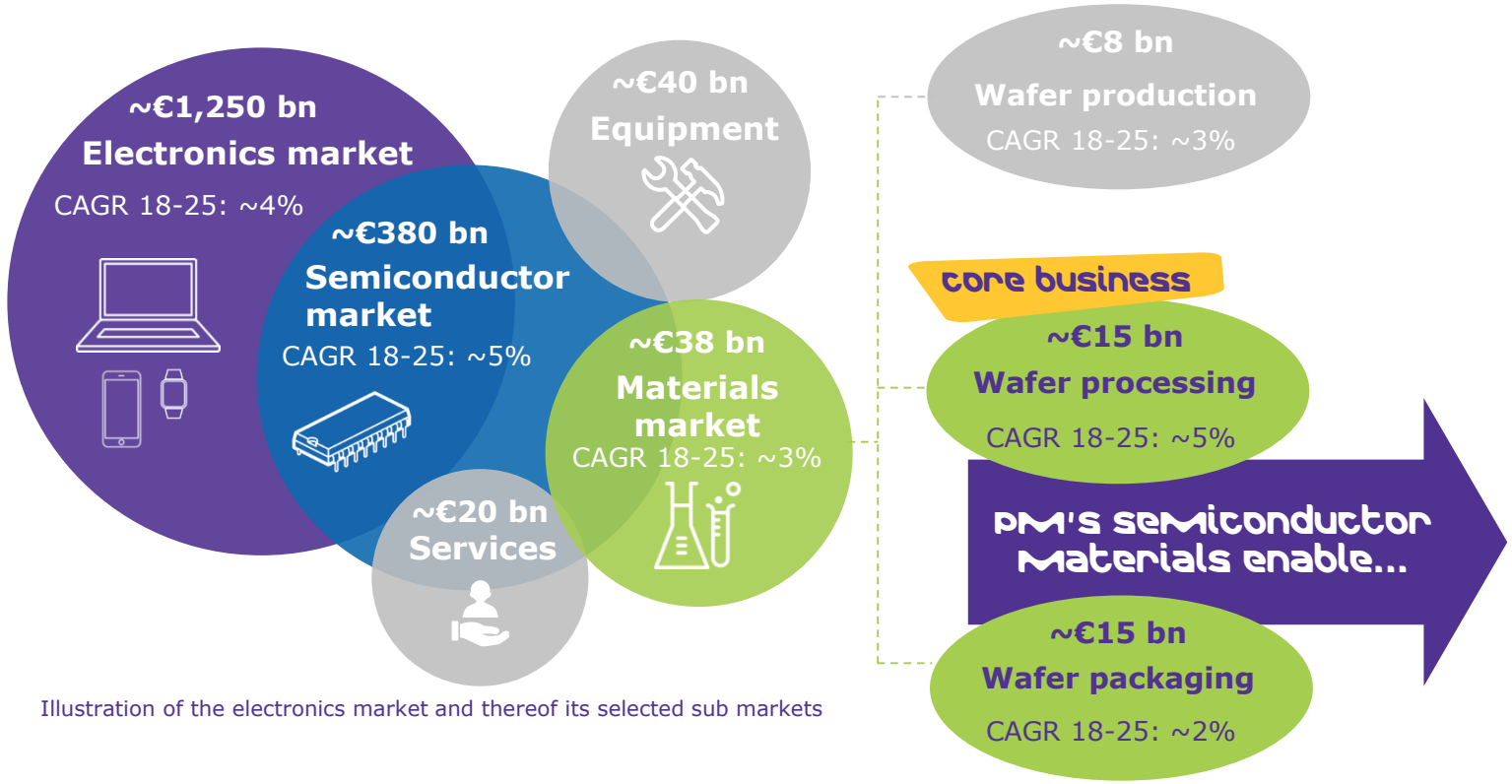


Illustration of the electronics market and thereof its selected sub markets

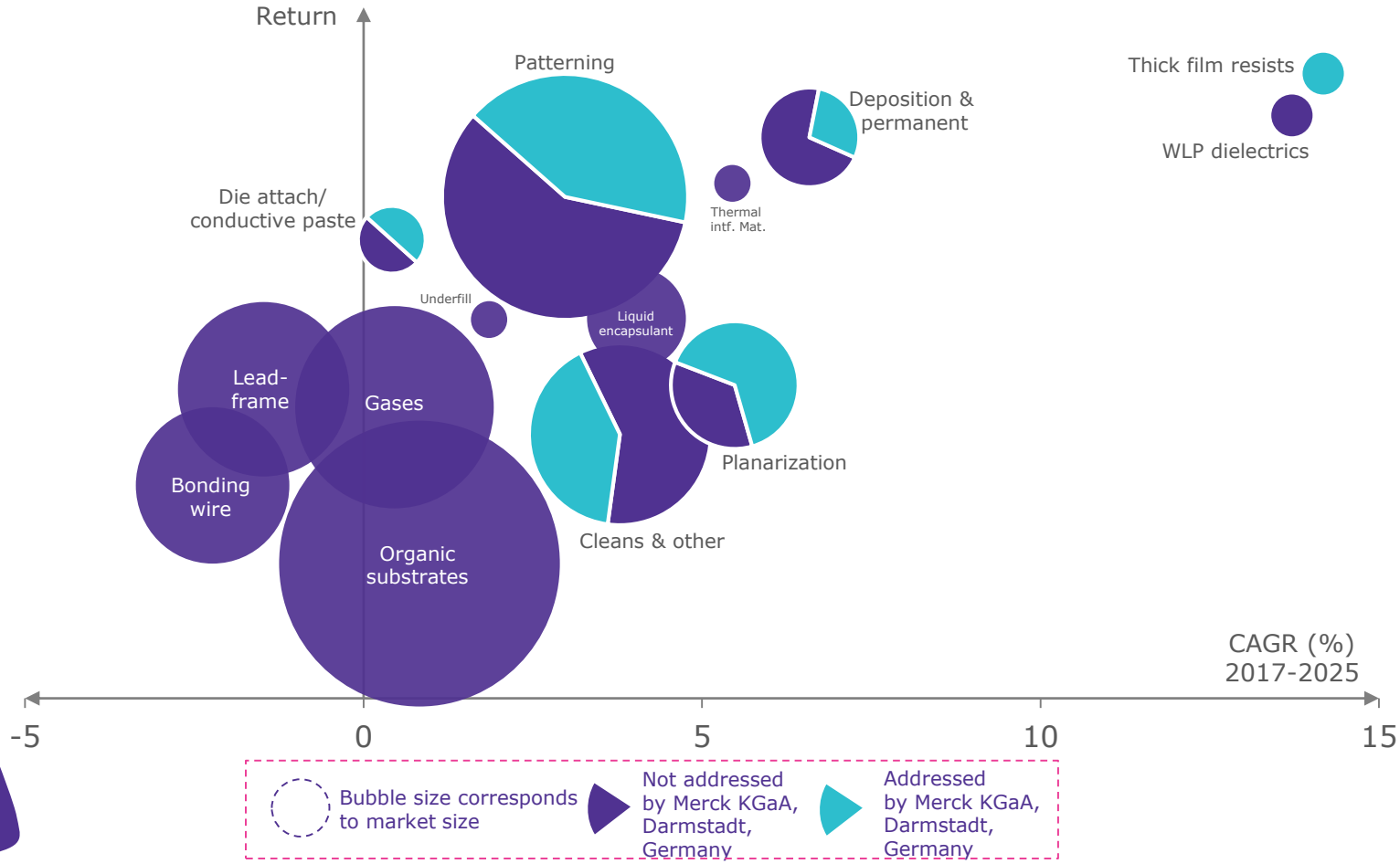
...customer needs

- 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

Semiconductor Solutions
Well positioned in highly attractive market segments

Market landscape of wafer processing and packaging materials



Market positioning

- Positioned in attractive sub-segments
- Focus on enabling material solutions with small part in bill of materials
- Address innovative technologies through collaborative R&D
- Above-market growth
- Opportunities to increase footprint

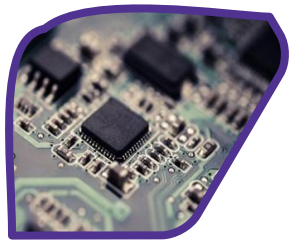
Semiconductor Solutions
Enabler of key technology trends

Lithography materials

Innovation focus: Enabling structures in nodes smaller than 14 nm

Dielectric materials

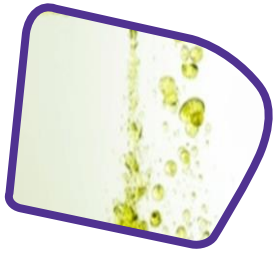
Enabling cost-efficient production of the newest memory generations



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**

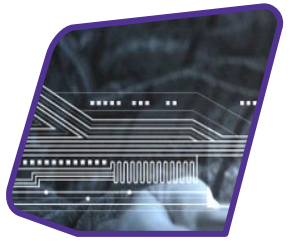


Process materials

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

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

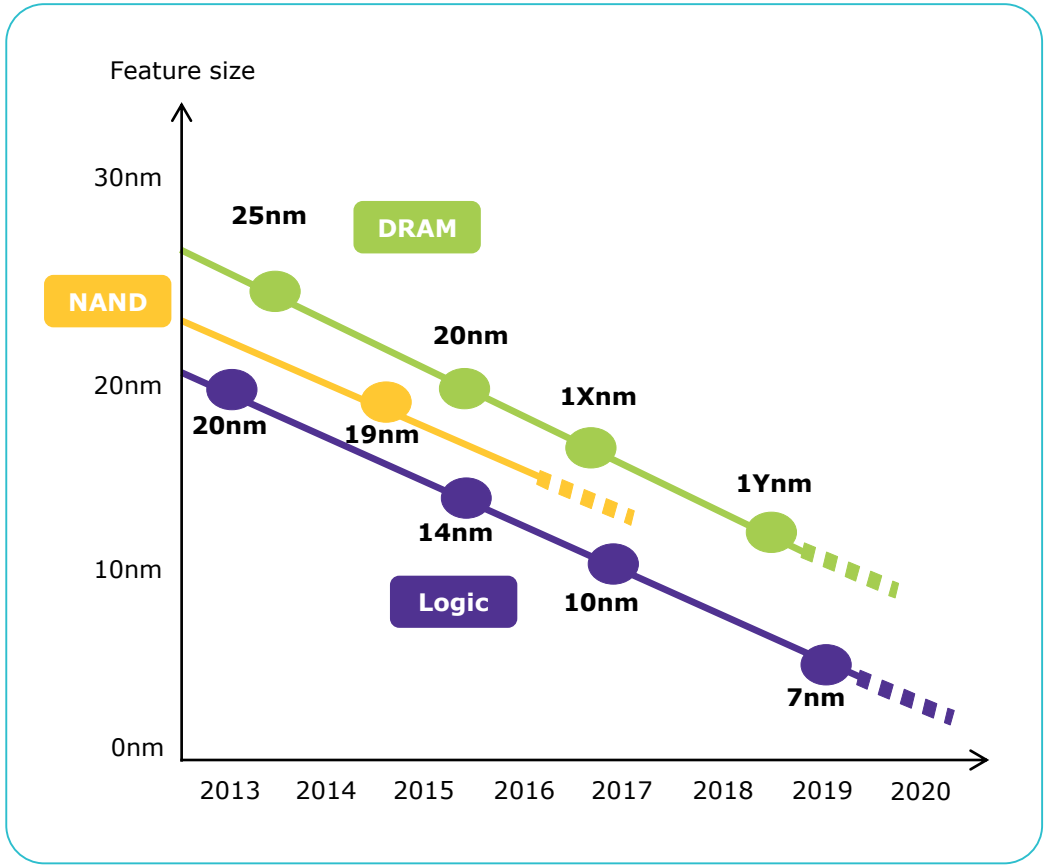
Internet of Things: Everything is continuously connected
- More gadgets and devices that include chips
- Increasing amount of communication and sensor chips

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

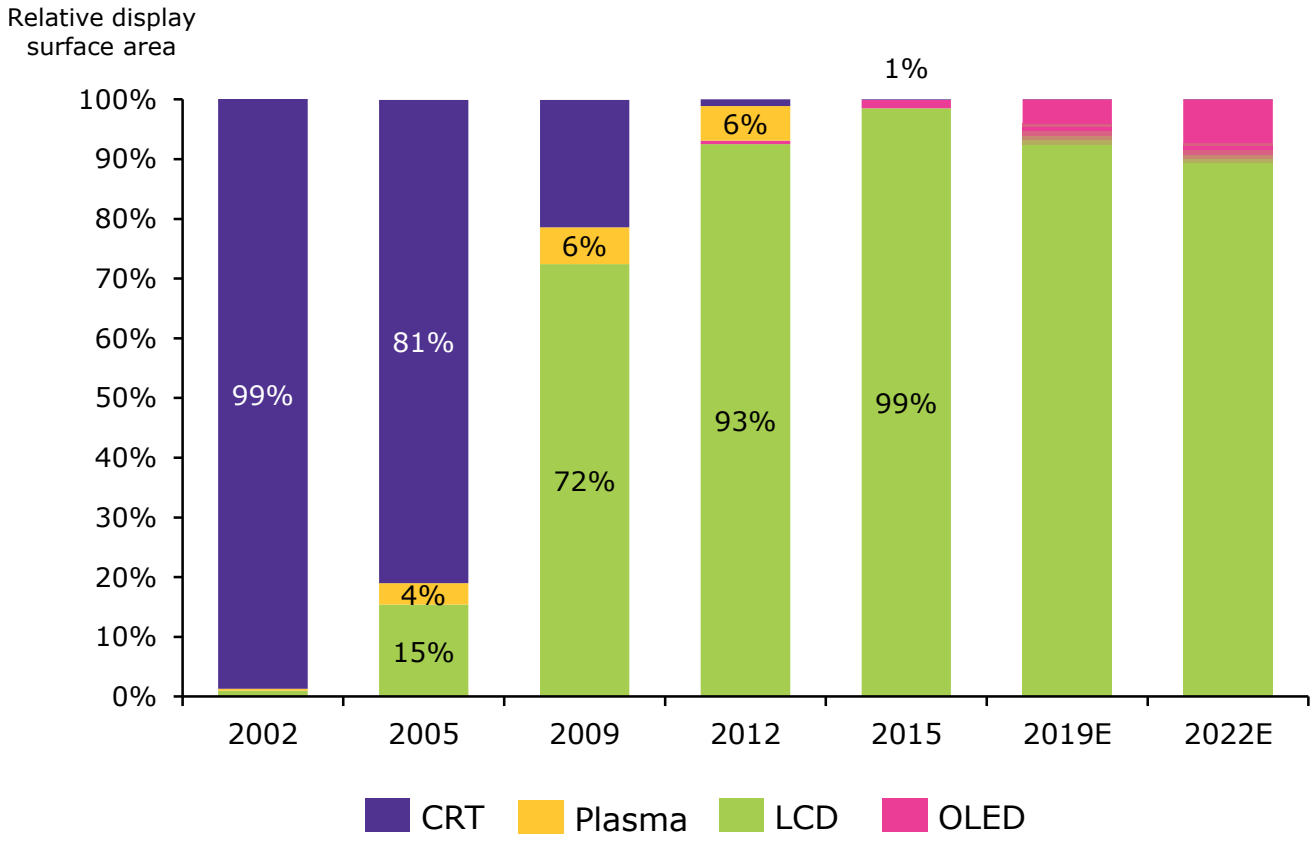
Feature sizes develop as predicted by Moore's law



Merck KGaA
Darmstadt, Germany

Display Solutions
Liquid crystals are clearly the dominant display technology

Market share by display technology



Rationale for LCD leadership

For consumers:

- Price
- Thinner frames
- Higher resolution in all sizes
- Proven track record of extreme reliability

For manufacturers:

- Price and scalability
- Production costs and capacities

LCD progress creates higher techno-logical and commercial entry barriers

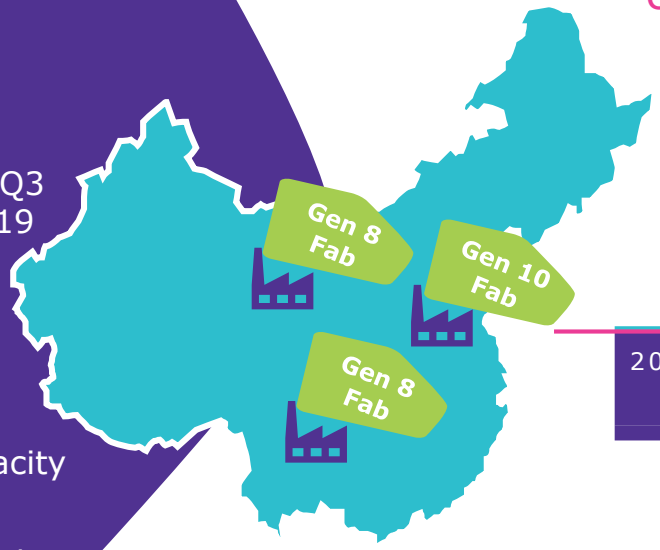
OLED share will increase in mobile applications

Source: IHS display long term demand forecast tracker Q4 '17

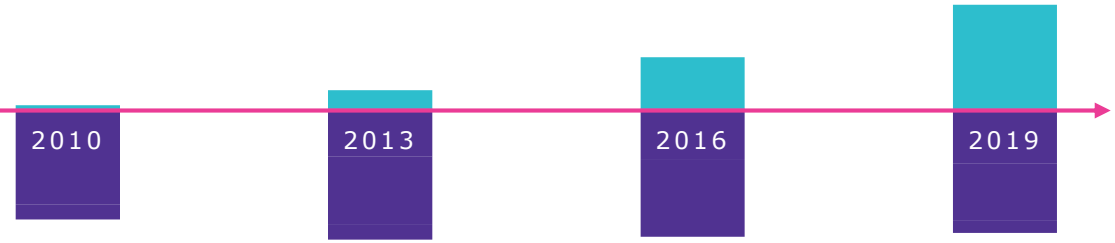
Performance Materials: Liquid crystals currently benefitting from new display-panel plant capacity ramp up projects

Temporary nature

- Accelerated ramp up of Chinese panel production facilities
- Projects supporting LC business since Q3 2018 and expected to last until H1 2019
- Increased market share during ramp up phase, but dual sourcing afterwards highly probable
- Overcapacity in 2018 due to massive capacity ramp up in China, global capacity is expected to consolidate in 2019
  - ➢ Some manufacturing capacity might be converted to OLED or might be taken off



Share of global display production capacities by region [km²]*



Japan, Taiwan & South Korea combined

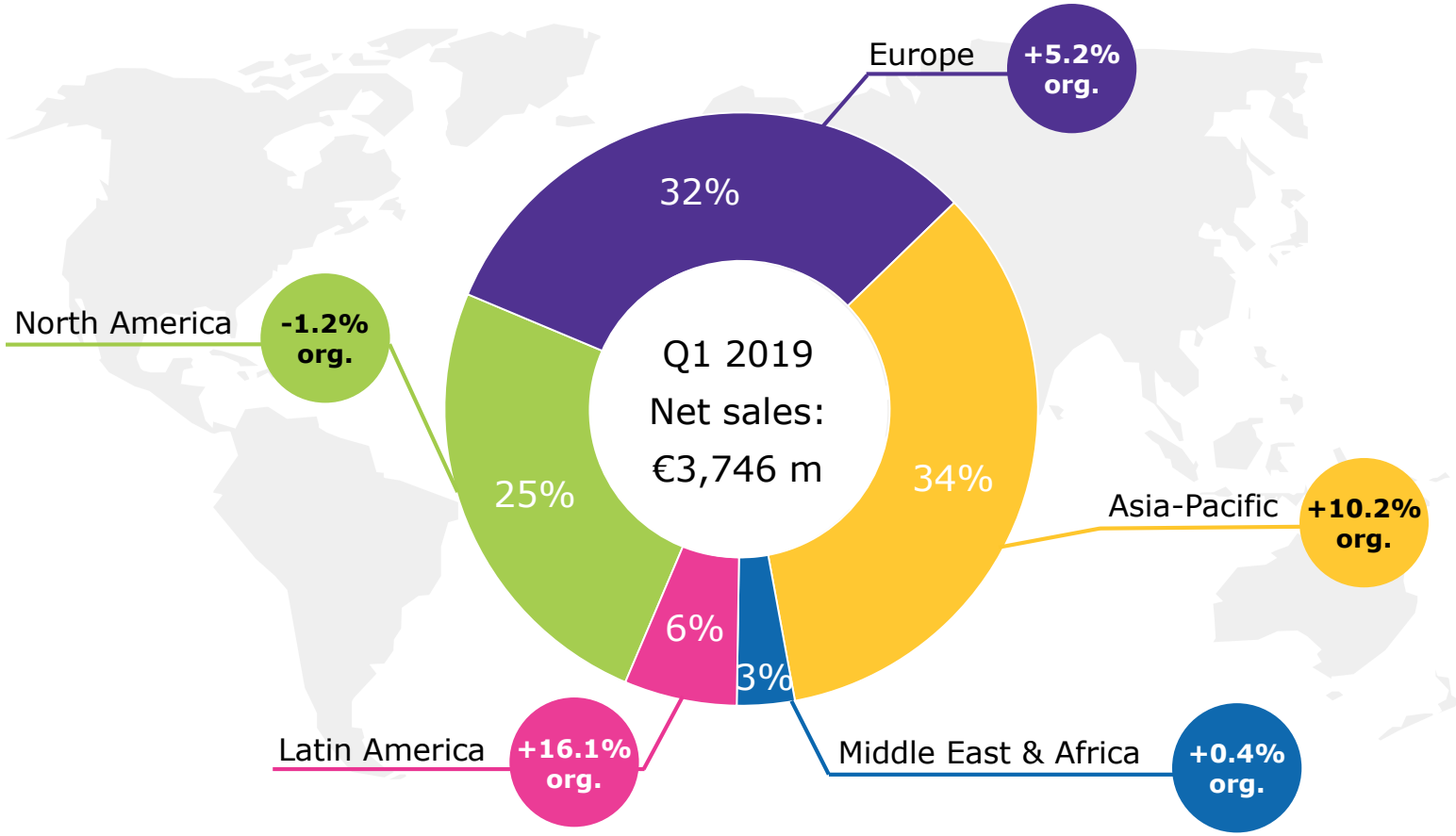
China

Overall LC materials market decline in value with mid- to high-single digit CAGR until 2025 confirmed

Source: AMOLED and LCD supply-demand-equipment tracker Q2'18
*Capacity estimation based on 100% utilization and 100% yield

Organic growth driven by Asia-Pacific, Europe and Latin America

Regional breakdown of net sales [€ m]



Regional organic development

- Strong growth in APAC fueled by double-digit growth of Life Science, Glucophage®, Erbitux® and OLED; LC still benefitting from temporary capacity ramp-up in China
- Europe with solid growth due to ongoing strong demand in Life Science; strong Mavenclad® ramp-up offsets Rebif® decline
- North America reflects robust demand in Life Science offset by double-digit decline of Rebif®
- Double-digit growth in LATAM due to strong demand for General Medicine and Life Science
- About stable Middle East and Africa driven by solid demand in Life Science offsetting softer Healthcare

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

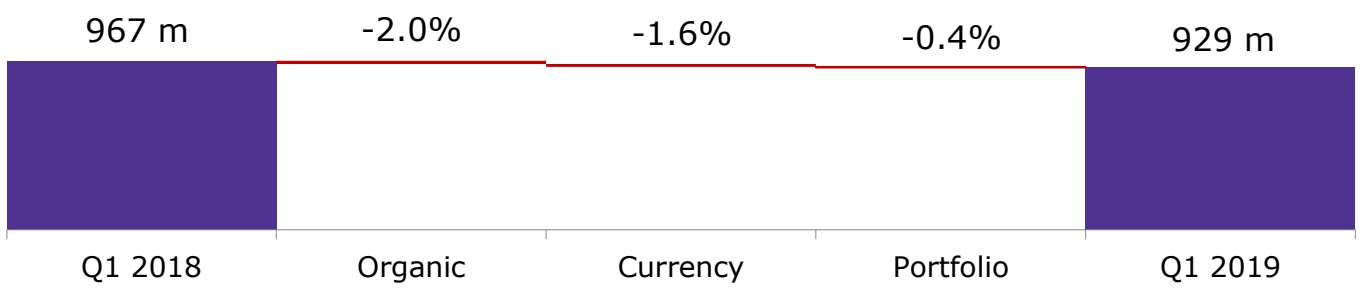
All business sectors drive organic growth supported by FX tailwinds

Q1 2019 YoY net sales

	Organic	Currency	Portfolio	Total
Healthcare	2.9%	0.4%	0.0%	**3.2%**
Life Science	9.4%	2.8%	-0.5%	**11.7%**
Performance Materials	3.2%	3.9%	0.0%	**7.1%**
Group	5.7%	2.0%	-0.2%	**7.5%**

- Healthcare growth driven by General Medicine, Fertility, Mavenclad® and Bavencio®, offsetting strong Rebif® decline
- Life Science with above-market growth driven by all business units
- Performance Materials still driven by temporary LC uptake and ongoing strong demand for OLED; softer market demand for Semiconductor Solutions

Q1 YoY EBITDA pre



- Lower organic EBITDA pre reflects strong performance of LS offset by last year milestone payment in HC and ongoing LC price decline
- Negative FX impact on EBITDA pre due to hedging losses related to EUR/USD development

Totals may not add up due to rounding

Q1 2019: Overview

Key figures

[€m]	Q1 2018*	Q1 2019	Δ
Net sales	3,486	**3,746**	7.5%
EBITDA pre *Margin (in % of net sales)*	967 *27.7%*	**929** *24.8%*	-4.0%
EPS pre	1.33	**1.13**	-15.4%
Operating cash flow	380	**493**	29.5%

[€m]	Dec. 31, 2018	March 31, 2019	Δ
Net financial debt	6,701	**7,089**	5.8%
Working capital	3,486	**3,782**	8.5%
Employees	51,749	**52,140**	1.0%

Comments

- Net sales reflect organic sales growth across all business sectors fueled by FX tailwinds
- EBITDA pre & margin decrease due to hedging losses and LC price decline; last year contained Peg-Pal milestone (€50 m)
- Lower EPS pre driven by impairment of asset from F-star collaboration (~€27 m) and D&A from IFRS 16 effect (~€32 m)
- LY operating cash flow driven by higher income tax payments
- Working capital reflects increased business activity
- Higher net financial debt mainly due to IFRS 16 reclassification

*LY numbers have been adjusted, due to Consumer Health disposal;
Totals may not add up due to rounding.

Healthcare: Solid core business and strong Mavenclad weighed down by last year's Peg-Pal milestone payment

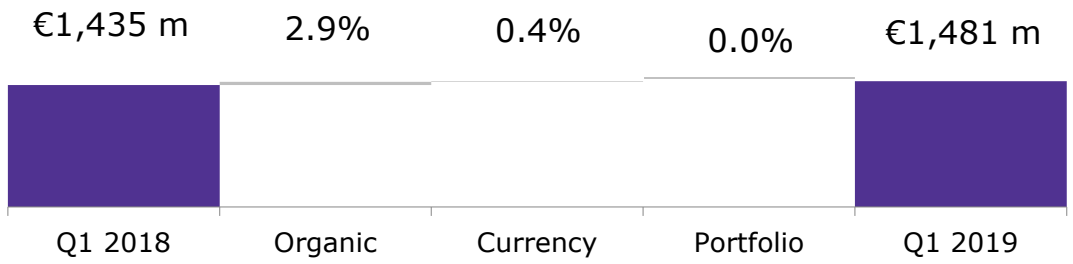
Healthcare P&L

[€m]	Q1 2018*	Q1 2019
Net sales	1,435	**1,481**
Marketing and selling	-550	**-550**
Administration	-77	**-88**
Research and development	-379	**-380**
EBIT	195	**128**
EBITDA	379	**329**
EBITDA pre	381	**332**
Margin (in % of net sales)	*26.6%*	***22.4%***

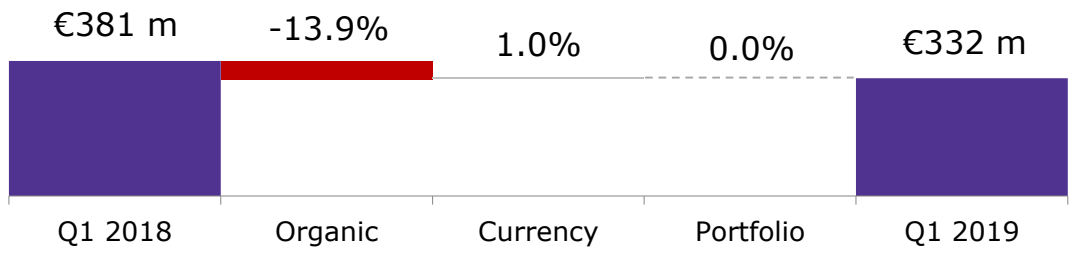
Comments

- Organic growth driven by double-digit growth of General Medicine and ongoing strong demand in Fertility
- Mavenclad® with continued strong uptake and U.S. approval in March 2019, mitigating ongoing Rebif® decline
- Bavencio® ramp-up on track; Erbitux® benefitting from China reimbursement, still facing ongoing competition and price pressure in major markets
- Flat M&S reflects pre-launch investments attributable to Mavenclad® and Bavencio® as well as investments to drive growth in China offset by lower investments in mature products
- Last year EBITDA pre higher due to Peg-Pal milestone payment (€50 m)

Net sales bridge



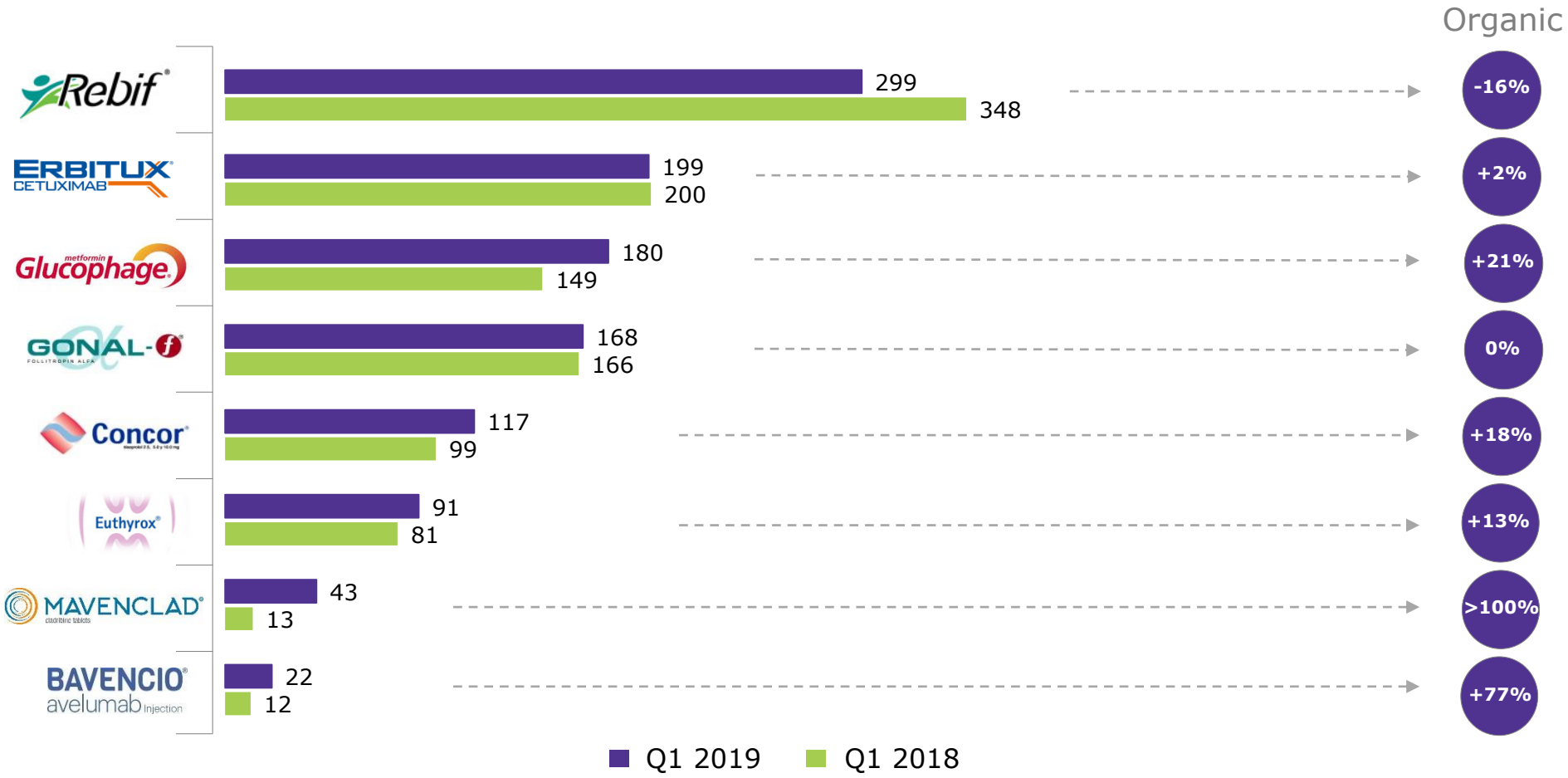
EBITDA pre bridge



Totals may not add up due to rounding;
*LY numbers have been adjusted, due to Consumer Health disposal.

Healthcare organic growth by franchise/product

Q1 2019 organic sales growth [%] by key franchise/products [€ m]



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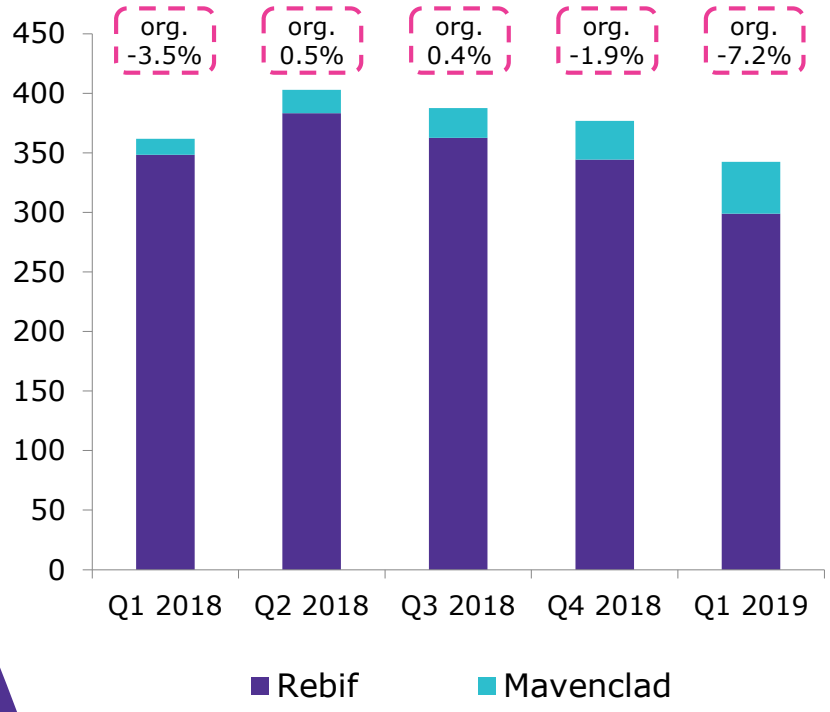
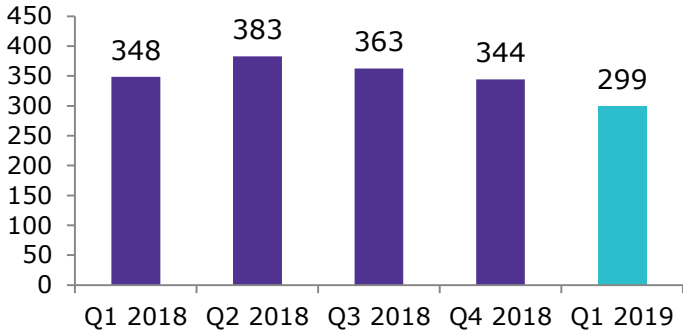
Darmstadt, Germany

Neurodegenerative Diseases: Strong growth of Mavenclad® mitigates Rebif® decline

Sales development NDI, [€m]

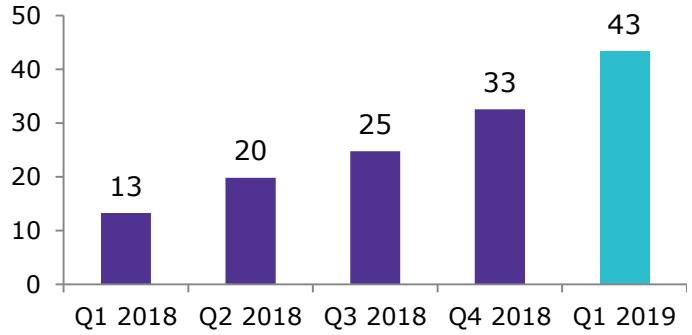


Rebif® net sales, [€m]



- Rebif® sales of €299 m in Q1 2019 reflects organic decline of -16.4% mitigated by FX effect of +2.1%
- U.S. and European volume decline mainly due to competition
- U.S. decline in line with IFN market dynamics

Mavenclad® net sales, [€m]



Mavenclad® launch on track with increasing contribution

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

NDI = Neurodegenerative Diseases & Immunology; IFN = Interferon

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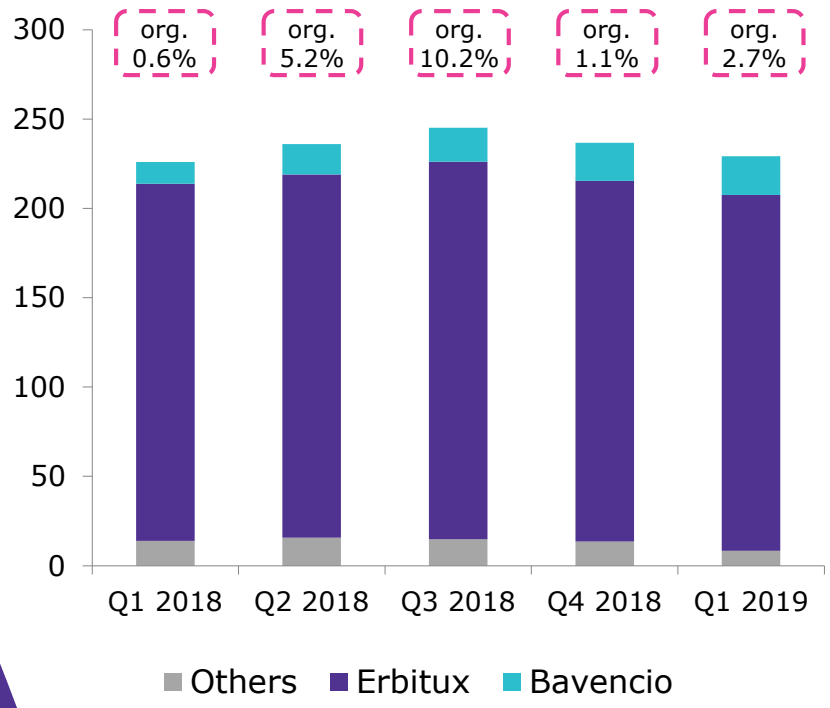
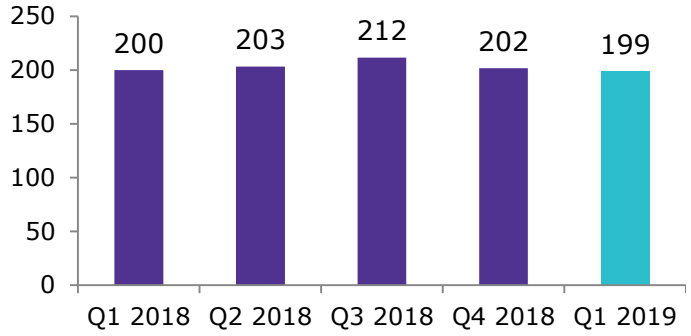
Darmstadt, Germany

Oncology: Organic growth driven by Bavencio® ramp up and strong demand for Erbitux® in China

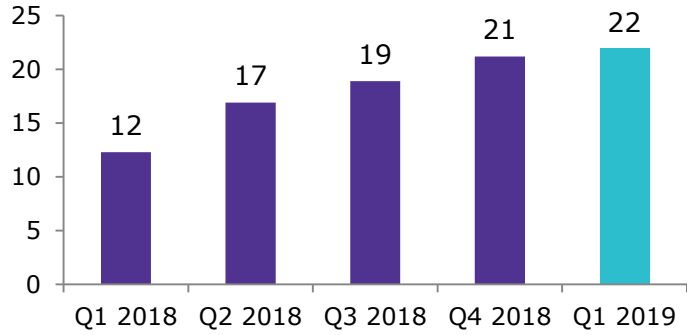
Sales development Oncology, [€m]



Erbitux® net sales, [€m]



Bavencio® net sales, [€m]



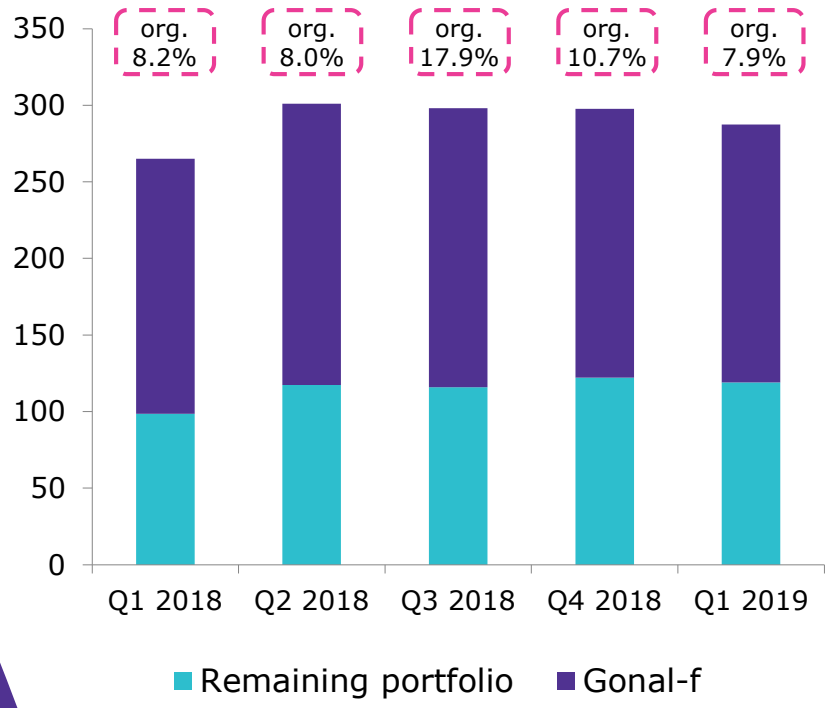
- Absolute sales almost stable with €199 m (org. 1.6%; FX -1.9%)
- Decline in Europe reflects ongoing competition, price reductions and shrinking market size
- MEA decline driven by tender phasing due to importation permit
- APAC with organic growth mainly driven by strong demand in China due to reimbursement recognition

Bavencio® with strong market position in MCC

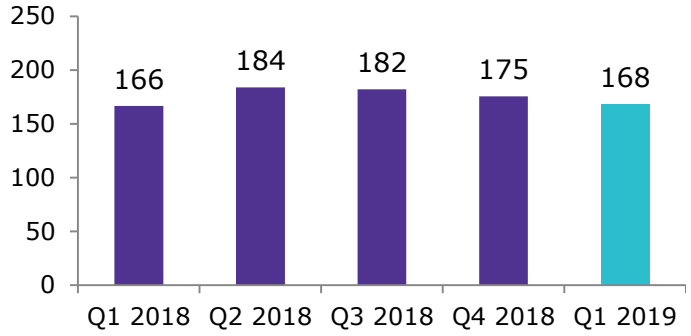
FY 2019 guidance of high double-digit €m

Fertility: High single digit organic growth reflects ongoing strong demand across the portfolio

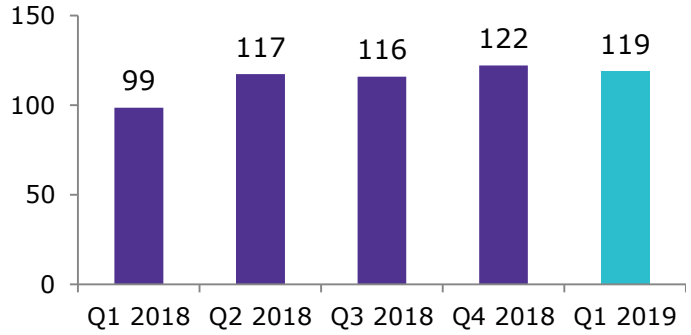
Sales development Fertility, [€m]



Gonal-f® net sales, [€m]



Remaining portfolio net sales, [€m]

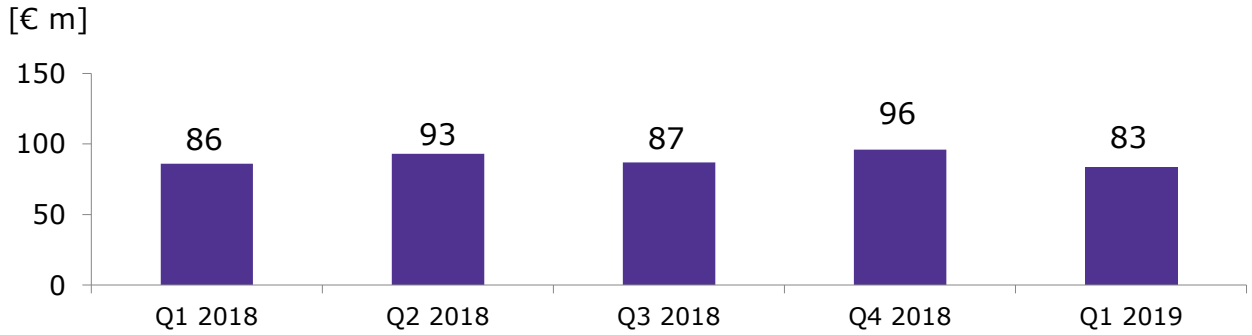


- Fertility posts high single digit growth driven by growth across all regions, mainly Europe and APAC
- Gonal-f® about stable reflecting tough comps last year
- Remaining portfolio shows ongoing strong demand, especially in China and Europe
- Continued and successful launch of Pergoveris® pen in 13 European countries

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

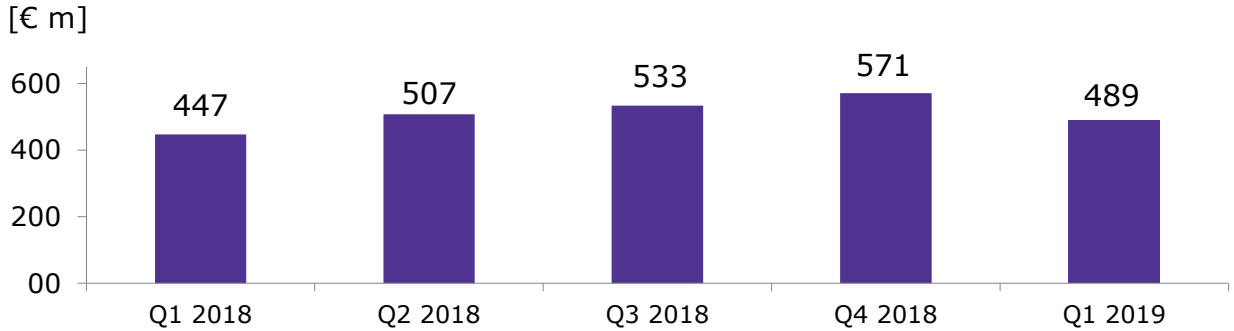
Sales evolution

Endocrinology



Organic
-3.0% org.

General Medicine*



Organic
+11.7% org.

Q1 2019 organic drivers

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

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

*includes "CardioMetabolic Care & General Medicine and Others

Life Science: Strong organic sales growth across all businesses drives margin expansion

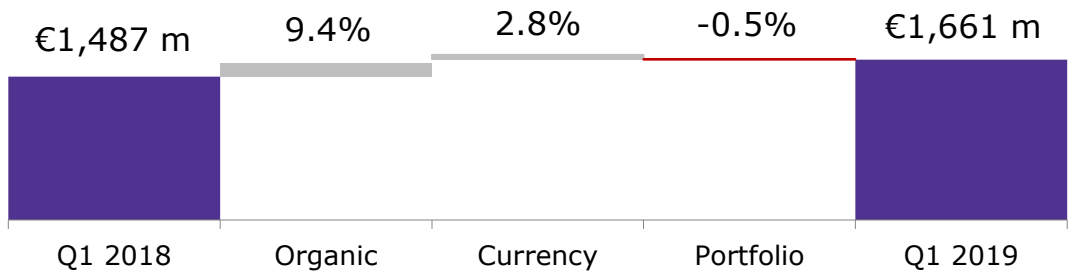
Life Science P&L

[€m]	Q1 2018	Q1 2019
Net sales	1,487	**1,661**
Marketing and selling	-409	**-470**
Administration	-78	**-88**
Research and development	-59	**-62**
EBIT	273	**313**
EBITDA	442	**507**
EBITDA pre	455	**516**
Margin (in % of net sales)	*30.6%*	***31.0%***

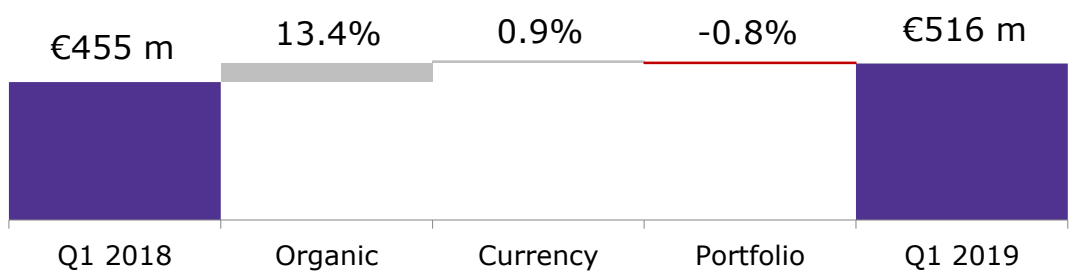
Comments

- Ongoing strong demand in Process Solutions with double-digit growth driven by all businesses and all major regions
- Applied Solutions shows high-single digit growth fueled by all businesses across all regions, especially Advanced Analytical and Lab Water
- Research Solutions posts moderate organic growth fueled by ongoing strong demand for lab chemicals and workflow tools across all regions
- M&S increase reflects volume growth, investments in eCommerce and strategic initiatives
- EBITDA pre reflects strong topline and IFRS 16 effect

Net sales bridge



EBITDA pre bridge



Totals may not add up due to rounding

Performance Materials: Organic growth mainly driven by ongoing strong demand for OLED and support from LC capacity ramp-up and low comps

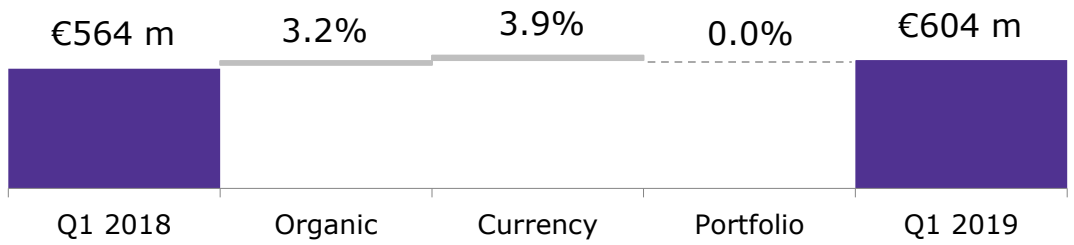
Performance Materials P&L

[€m]	Q1 2018	Q1 2019
Net sales	564	**604**
Marketing and selling	-60	**-66**
Administration	-22	**-23**
Research and development	-59	**-72**
EBIT	136	**95**
EBITDA	192	**157**
EBITDA pre	196	**193**
Margin (in % of net sales)	*34.7%*	***31.9%***

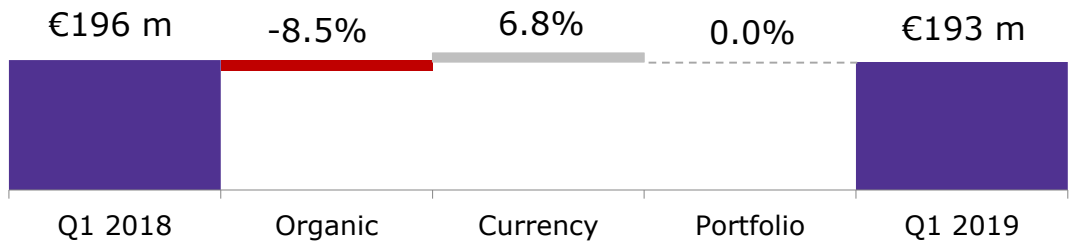
Comments

- Performance Materials with moderate organic growth reflecting strong demand for OLED, LC support from new panel plant ramp-up projects in China and low comps
- About stable Semiconductor Solutions reflects observed market slowdown
- Increased R&D due to provisions related to Bright Future program; underlying decrease in R&D reflecting cost control
- EBITDA pre reflects negative business mix and ongoing Liquid Crystals price decline

Net sales bridge



EBITDA pre bridge



Totals may not add up due to rounding

Reported figures

Reported results

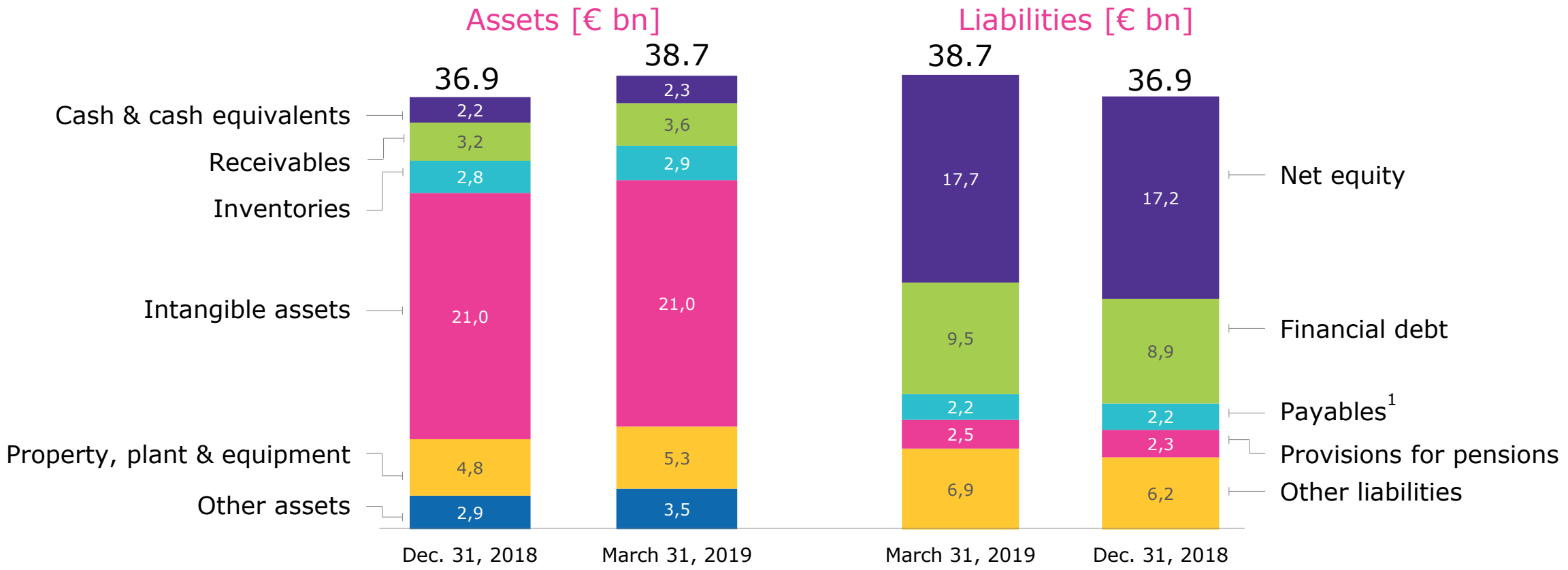
[€m]	Q1 2018*	Q1 2019	Δ
EBIT	502	**379**	-24.6%
Financial result	-61	**-113**	83.9%
Profit before tax	441	**266**	-39.6%
Income tax	-108	**-67**	-37.8%
Effective tax rate (%)	*24.5%*	***25.2%***	
Net income	341	**189**	-44.7%
EPS (€)	0.78	**0.43**	-44.9%

Comments

- Lower EBIT reflects hedging losses and LC price decline; last year EBIT included Peg-Pal milestone
- Lower financial result driven by revaluation of F-Star purchase option (-€45 m)
- Effective tax rate within guidance range of ~24-26%
- Lower net income and EPS reflect lower financial result and lower EBIT

*LY numbers have been adjusted, due to Consumer Health disposal.

Balance sheet – Changes due to IFRS 16 adoption



- Property, plant and equipment increase mainly driven by IFRS 16 adoption
- Other assets reflect temporary investment of cash proceeds from Consumer Health disposal
- GSK collaboration included in receivables and other liabilities

- Increase in equity driven by currency translation effects and profit after tax (equity ratio of 45.7%)
- Higher financial debt due to IFRS 16 reclassification of lease liabilities

[1]Includes refund liabilities;
Totals may not add up due to rounding

Cash flow statement

Q1 2019 – cash flow statement

[€m]	Q1 2018	Q1 2019	Δ
Profit after tax	342	**190**	-152
D&A	428	**474**	46
Changes in provisions	17	**100**	83
Changes in other assets/liabilities	-235	**-89**	146
Other operating activities	-10	**-5**	5
Changes in working capital	-161	**-178**	-17
Operating cash flow	380	**493**	113
Investing cash flow	-213	**-329**	-116
thereof Capex on PPE	-228	**-209**	19
Financing cash flow	-3	**-3**	0

Totals may not add up due to rounding

Cash flow drivers

- Profit after tax in line with lower EBIT
- D&A increase mainly due to IFRS 16 reclassification
- Changes in provisions driven by build up for transformation program
- Changes in other assets/liabilities reflects lower income tax payment
- Increased investing cash flow due to temporary investment of cash proceeds from Consumer Health disposal

Adjustments in Q1 2019

Adjustments in EBIT

[€m]	Q1 2018		Q1 2019	
	Adjustments	thereof D&A	Adjustments	thereof D&A
Healthcare	3	0	3	0
Life Science	13	0	9	0
Performance Materials	3	0	35	0
Corporate & Other	24	0	28	0
Total	43	0	76	0

Totals may not add up due to rounding

Financial calendar

Date	Event
August 8, 2019	Q2 2019 Earnings release
November 14, 2019	Q3 2019 Earnings release
March 5, 2020	FY 2019 Earnings release

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