



REPSOL



Repsol Digital Program

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HEAD OF DIGITALIZATION PMO



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Digital & Technology are recognized as key levers for Repsol 2018-2020 Strategic Update



Digitalization

Ambitious digital program **to transform the company for the future**

- Incremental FCF by 2022 in €1B/y [€300M/y by 2020]
- Driving cultural change and new ways of working



Technology

Enables the future Repsol: **lower emissions, more efficient, more competitive**

- Industrial assets: Advanced simulation, modelling & control to optimize operations
- Chemicals: Leading-edge materials development
- Commercial: New products & services development
- Upstream: Leading-edge geophysics & simulation / modelling capabilities



Talent

Developing **skills and capabilities** into the **new Repsol culture** to lead the future

- Excellence in talent management, anticipating needs and renewing our abilities, promoting cultural diversity and engagement
- Drive inspirational leadership focused on: Results Orientation, Accountability, Collaboration, Entrepreneurial Attitude



Lean Corporation

Further improve **corporate savings** reaching **9% cost reduction** by 2020

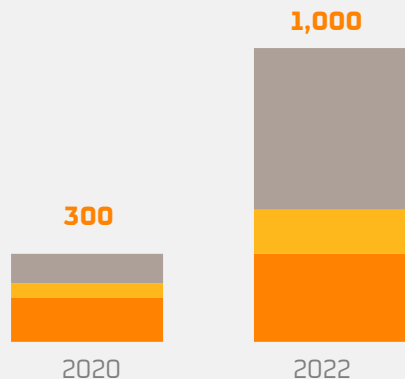
- Digitalization (eg., RPA) and automation
- Organization simplification [expansion of Global Services]
- Company-wide Lean and Agile innovative new ways of working culture

An ambitious Digital plan for Repsol and Downstream

Incremental Pre-tax FCF from Digital Initiatives vs 2017

[M€]

Industrial Commercial E&P & Corporation



Target impact of **€300M in 2020**, and **€1,000M in 2022**, investing more than **€100M/y**

Recurrent impact from 2022 onwards

Positive impact is coming not only from **savings...** but also from **new revenue sources**

In addition to economic impact, Digitalization is bringing a **culture transformation**, in a sustainable way

Our people are at the center of the Program, aligned with its strategic relevance and pushing for its success

Engagement

across all management levels

>90%

OF OUR EMPLOYEES

committed and willing to accept changes in their roles to favor Digitalization

>80%

OF OUR EMPLOYEES

consider Digitalization a top priority

15%

IN DIGITAL INCENTIVES

Digitalization included in both area and individual incentive objectives

+16pp

% OF EMPLOYEES

believing Repsol has a vision for the future that is both easy to understand and meaningful



and we have a **track record** of delivering results in similar situations,

“GO” program delivered results

1 YEAR

BEFORE SCHEDULE



Businesses lead our Program, leveraging structured portfolios and strong governance

ALL BUSINESSES PARTICIPATE, AND PLAY A LEADING ROLE

Businesses lead the transformation



UPSTREAM



INDUSTRIAL



CORPORATION



COMMERCIAL

Digital unit provides capabilities, ensures all businesses participate and a prioritized portfolio

PORTFOLIOS STRUCTURED AROUND STRATEGIC PRIORITIES

Businesses have structured their **Digital Portfolios** around **strategic priorities**



INDUSTRIAL

- Flawless and always safe
- Zero Unexpected Failures
- Autonomous Plan
- End to end business planning



COMMERCIAL

- Integrated Planning and operations
- Analytical Pricing and Loyalty
- Omnichannel customer experience
- Sales workforce Digital enablement
- Commercial New Business Models
- Customer-Driven vision

STRONG GOVERNANCE IN PLACE

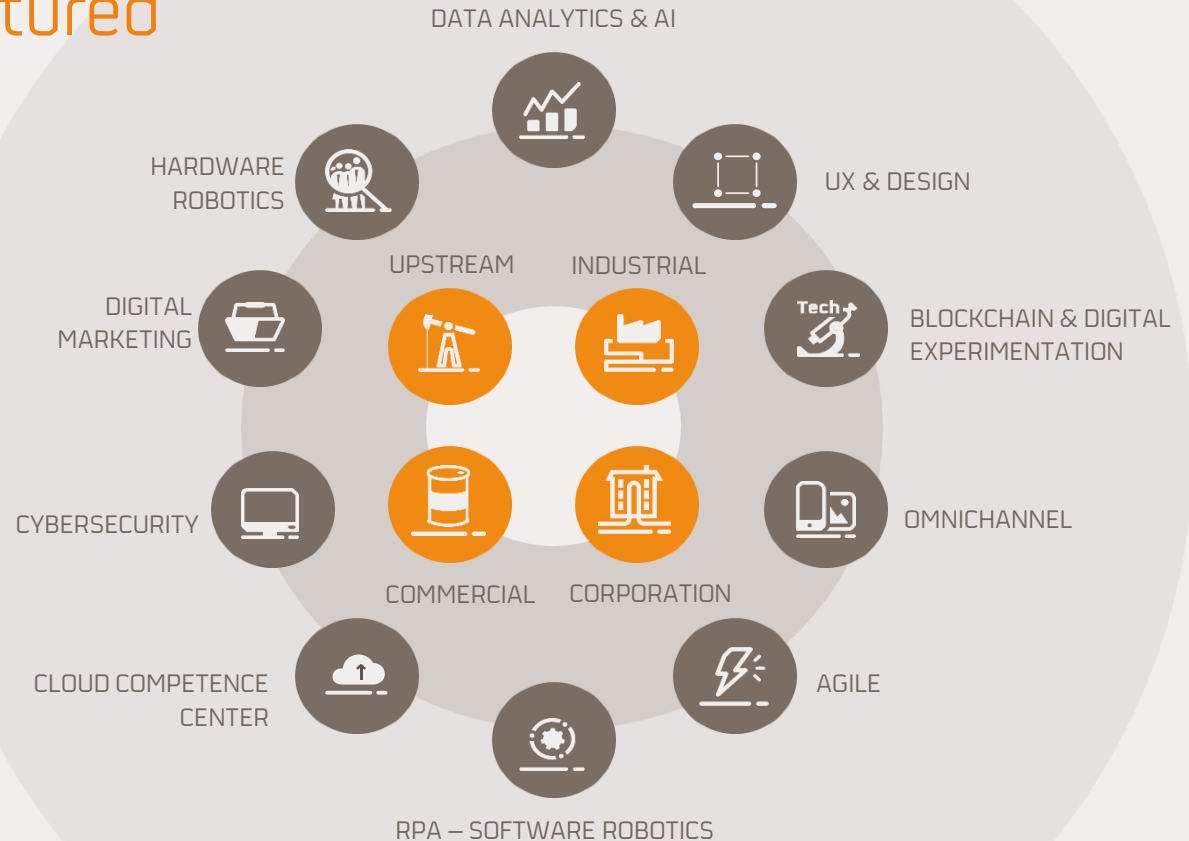
Bi-yearly presentations to the **Board**

Quarterly presentations to the **Executive Committee**

Monthly presentations to **top management within businesses**
[1/portfolio, 4/month]

Weekly reviews and ongoing support by **Digital Unit** and **Digital leaders within businesses**

We invest in Digital capabilities, structured around 10 Hubs



We invest in Digital capabilities, structured around 10 Hubs

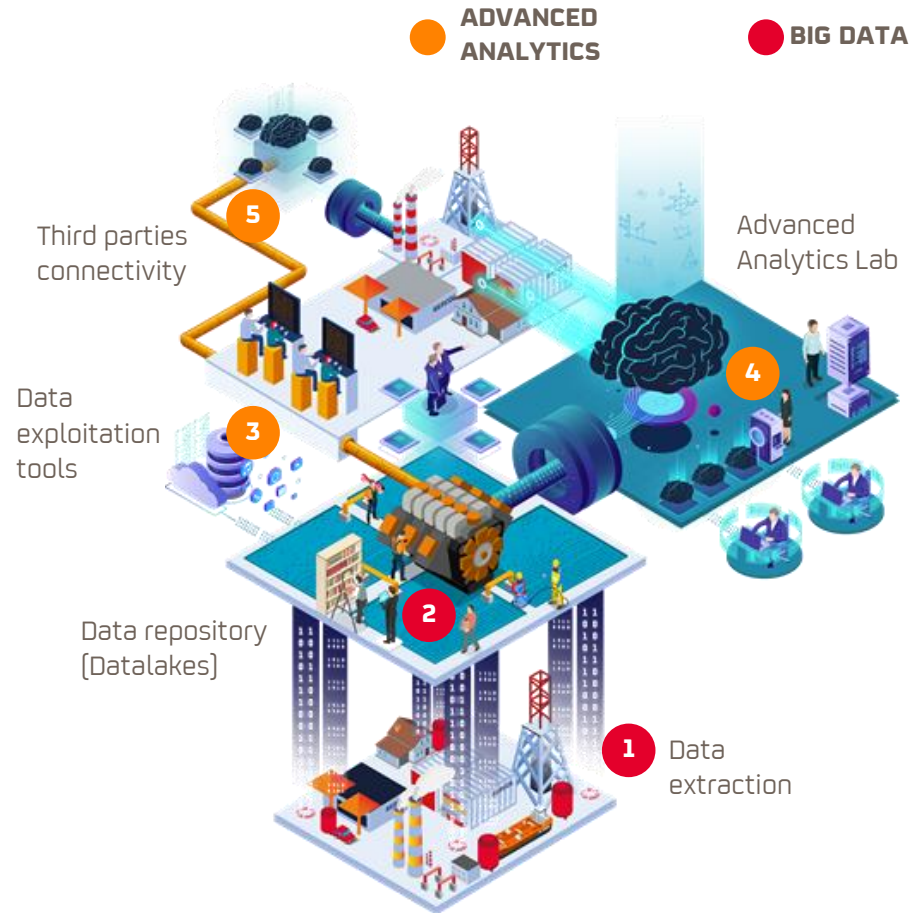
Data Analytics & AI Hub

example metrics and approach

3 PETA BYTES OF DATA

100+ MODELS BEING DEVELOPED

80+ INFORMATION INPUTS



To ensure a sustainable transformation, we leverage new ways of working



AGILE EXECUTION,
with shorter
development cycles
and **faster value
delivery**

~80%
OF CASES
(and growing)
Agile/ other
new method

**FLEXIBLE
ORGANIZATION,**
encouraging
multidisciplinary,
autonomous and
accountable teams

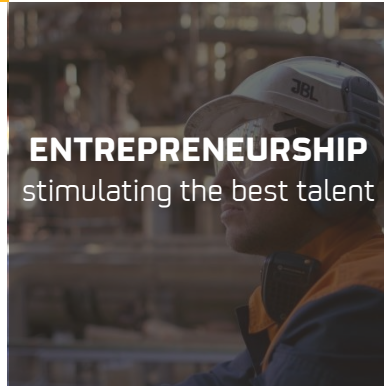
PRODUCT OWNERS
(USERS)

TECHNICAL LEADS,

DEVELOPMENT TEAMS...

Training and
ENABLEMENT

>1000
EMPLOYEES
trained on
Digital topics
hands-on



ENTREPRENEURSHIP
stimulating the best talent

**CONTINUOUS
IMPROVEMENT,**
with customer-
oriented processes

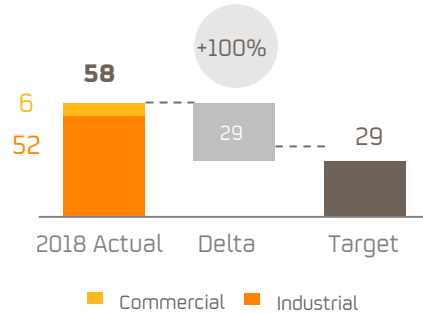
Digitalization is also a prime  example of applying the **Talent** and **Lean** Corporation levers of the 2018-2020 Strategic Update

Progress to date of Digital Program in Downstream

58€M impact

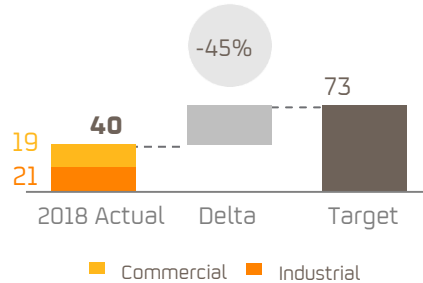
in 2018, well above target

Incremental pre-tax Cash Flow From Operations vs 2017 (€M)



40€M invested,

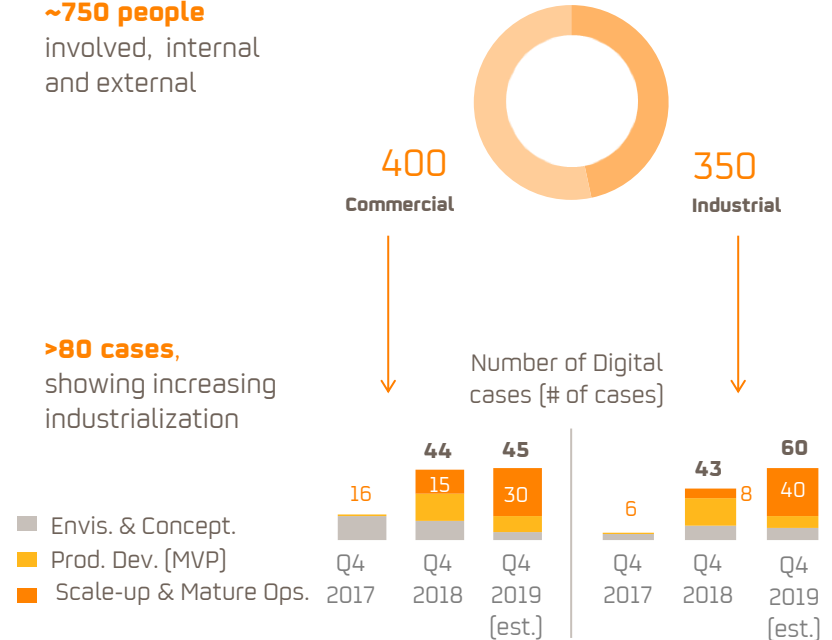
with cost effectiveness above expectations



~750 people

involved, internal and external

>80 cases, showing increasing industrialization



What + IF...
we could invent the future



Four strategic priorities in Industrial Digital portfolio



**FLAWLESS AND
ALWAYS SAFE**



**ZERO UNEXPECTED
FAILURES**



**AUTONOMOUS
PLANT**



**END TO END BUSINESS
PLANNING**

Industrial case examples: Advanced PIMS Optimization

What if...

we improved our crude supply by
both better planning and buying?

Challenge

Improve the **global planning decisions** using a better optimization engine and multi-case analysis; while setting the foundations for other future business planning digital initiatives.

Approach and solution

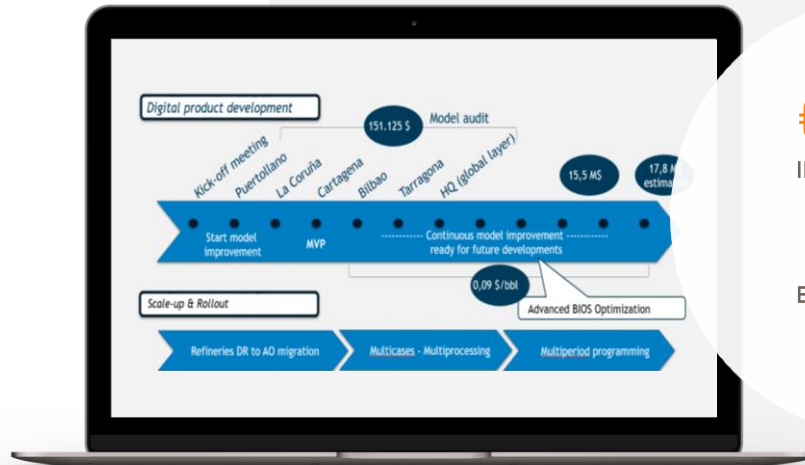
Multi-disciplinary team developing a global model that adapts current planning tool to a **multi-start advanced optimization tool with multi-case sensitivity analysis.**



6 months from
Envisioning to MVP



Joint effort by a
multidisciplinary team
[users, programmers,
supervisors...]



€15M/y

IMPACT IN 2018

> €20M/y

EXPECTED ONWARDS

Industrial case examples: Crude Oil Blending

What if...

we chose the best blending from available crudes?

Challenge

Optimize the crude scheduling process given refinery constraints to provide feasible blending scenarios for the next 30 days; no commercial solution exists in the market, as we are a rare example of multi-crude optionality

Approach and solution

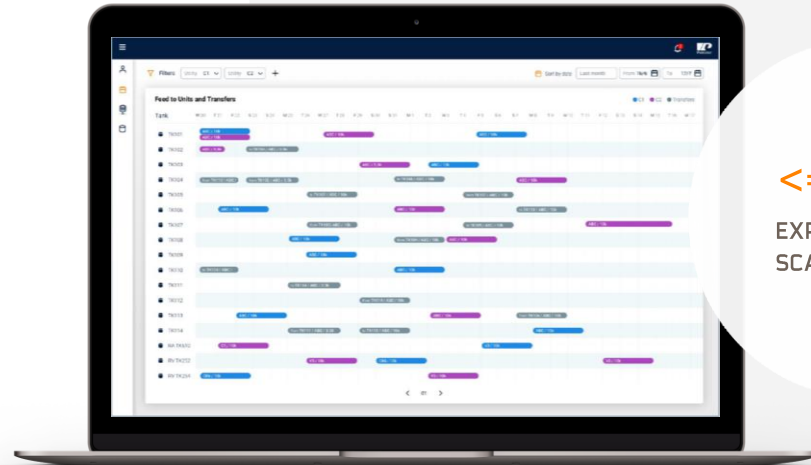
Iterative exploration of possible **analytical approaches**, through an Agile methodology, scaling gradually in complexity
Tool **customized to Repsol's needs**, based on a scenario-generation model and optimization based on user-defined criteria



10 months from
Envisioning to
MVP



Agile development,
increasingly complex
and precise



<€10M/y
EXPECTED AFTER
SCALING-UP

Industrial case examples: Asset Health & Predictive Maintenance

What if...

we increased reliability and optimized maintenance?

Challenge

Support & guide reliability management by having a **precise and integral vision of assets' reliability** status and counting with analytic tools to **optimize both short- and mid-term maintenance plans**

Approach and solution

Multi-disciplinary team working on an agile approach, leading to a **centralized management environment** integrated with all relevant maintenance systems that determines assets' health status through a newly defined indicator, and indicates **best actions**



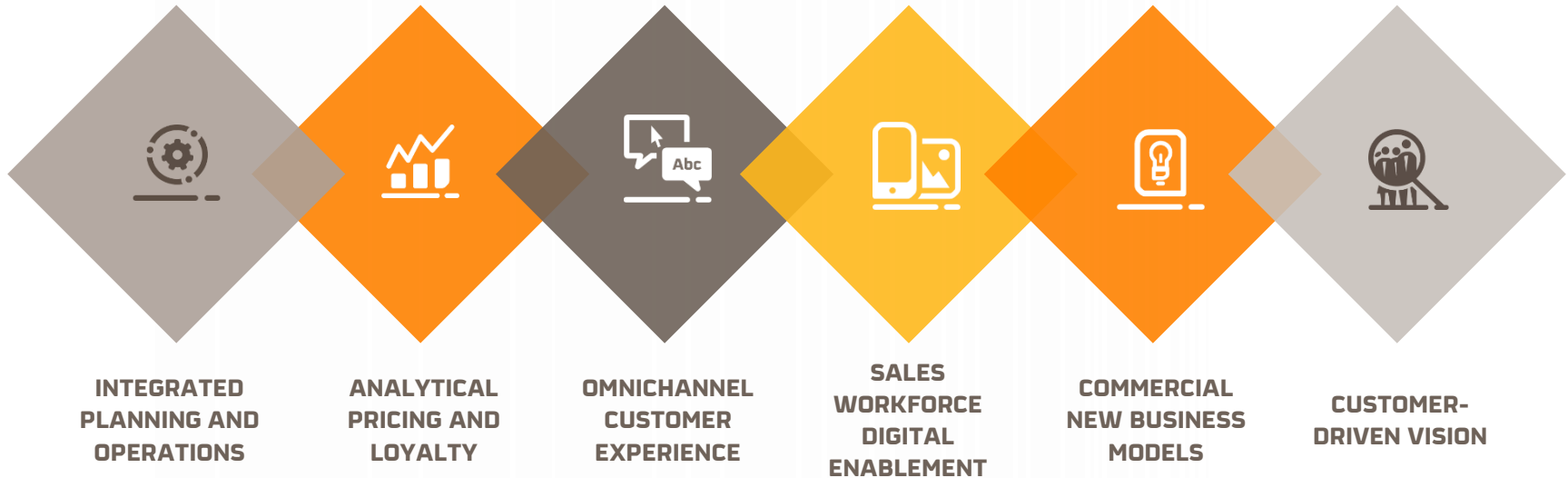
10 months from Envisioning to MVP



Reinforces **culture** of reliability and optimized maintenance



Six strategic priorities in Commercial Digital portfolio



Commercial case examples: Offer Personalization models

What if...

we could personalize our prices and offers to each of our client's preferences?

Challenge

Personalize pricing and promotions in Retail Stations to individual client's preferences, profile and price sensitivity

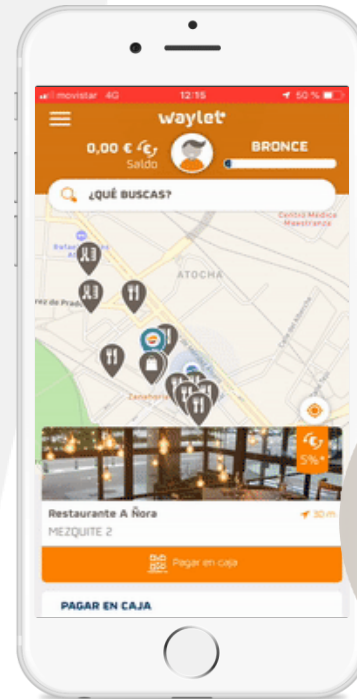
Deploy personalized offers **across all relevant channels** (Waylet, email, ticket)

Approach and solution

Leveraged **vast amount of customer transactional data** from loyalty programs [+6.5M customers & 100M transactions/year] to distill client's behavior and profile

Developed **advanced machine learning** models to predict customers future behavior and select optimal pricing

Developed **omnichannel offer** personalization solution, integrated with points of sales, Waylet and email, allowing personalized offers to reach clients from different channels



4 months from
Envisioning to MVP



Increased **client
engagement
and loyalty**

>€15M

EXPECTED AFTER
SCALING-UP

Commercial case examples: Digital Sales Workforce

What if...

we enable our sales workforce
with new Digital tools?

Challenge

Leverage new Digital tools to increase **sales workforce effectiveness**, optimize key sales processes and boost customer data management (e.g. understand behavior, anticipate needs...)

Approach and solution

Analyzed current sales workforce, client pain-points (manual processes, etc.) and latent needs through interviewing and shadowing

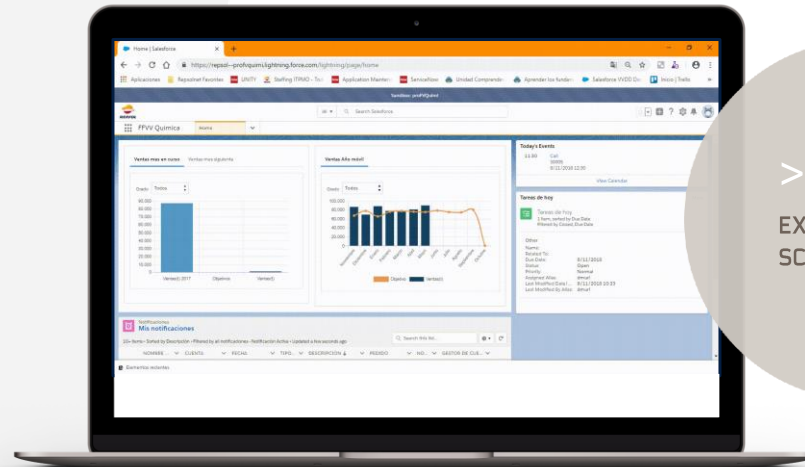
For each business, designed **new sales processes and Digital platform** based on Salesforce



3 months from
Envisioning to
MVP



Automated previously
manual tasks and provided
intuitive access to
customer's **real-time data**



>€5M/y
EXPECTED AFTER
SCALING-UP

Commercial case examples: Network Portfolio Optimizer

What if...

we are able to leverage individual client data
in renegotiations with our Dealers?

Challenge

Leverage analytics to understand degree of **customer-loyalty** to Repsol in customer base of each DoDo retail station and assess real value to Repsol of each dealer contract.

Provide data-driven insight to Repsol Sales workforce to guide **contract negotiations**

Approach and solution

Built **analytical model** that simulates loyal customers behavior and estimates real impact of losing a DoDo service station

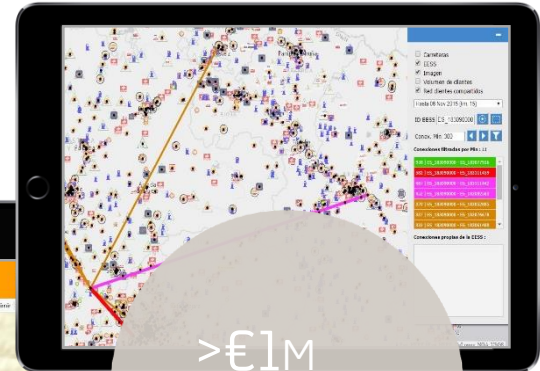
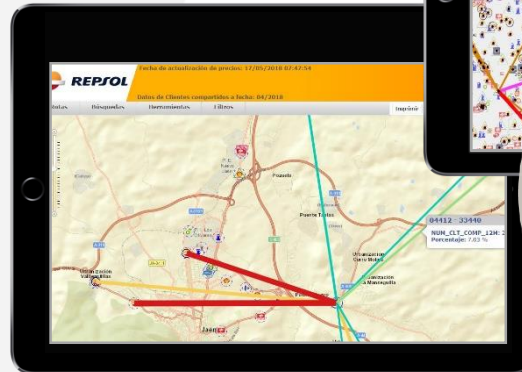
Salesforce trained in real economics and bargaining power



6 months from
Envisioning to MVP



Advanced analytics
used to model
customer behavior



>€1M
EXPECTED AFTER
SCALING-UP





Technology and Corporate Venturing

Jaime Martín Juez

TECHNOLOGY & CORPORATE VENTURING CORPORATE DIRECTOR

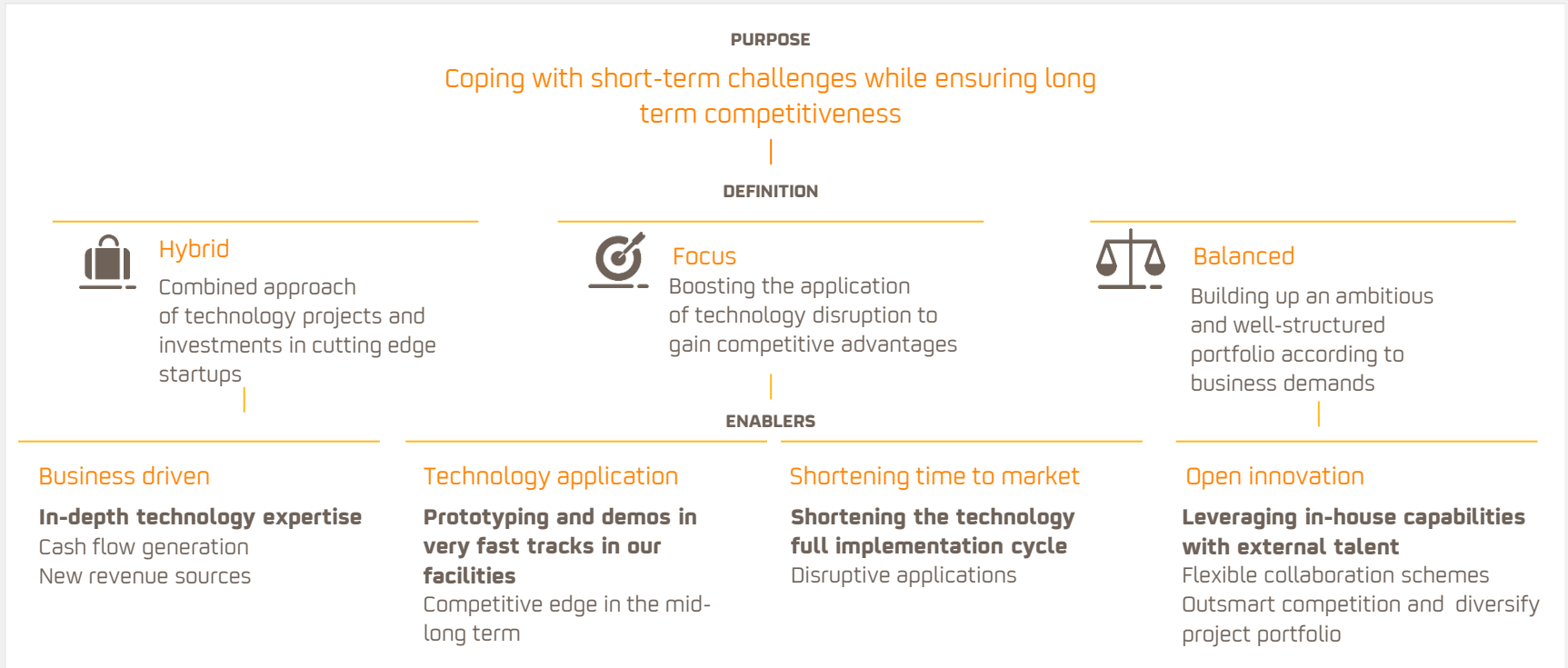


AGENDA

- Vision
- Balanced Portfolio
- Development Capabilities
- Model
- Investment Tools
- Use Cases
- Light-duty road segment

Vision

Combining R&D and Corporate Venturing (CV) capabilities



Balanced Portfolio

As a key lever to anticipate current and future energy scenarios

HORIZON 1 (H1)

93

PROJECTS

Tech support focus on current operations and products to strengthen the operating margin



HORIZON 2 (H2)

107

PROJECTS

Tech developments to create growth options to businesses



INVESTMENT

Accessing to external talent to increase the impact of current H1 and H2 projects and position Repsol in certain technology fields

84€M

INVESTMENT IN
TECHNOLOGY IN 2018



85€M

CORPORATE VENTURING
2016-2020

200

PROJECTS

230

RESERCHERS

20

PATENTS FILLED

190

ALLIANCES



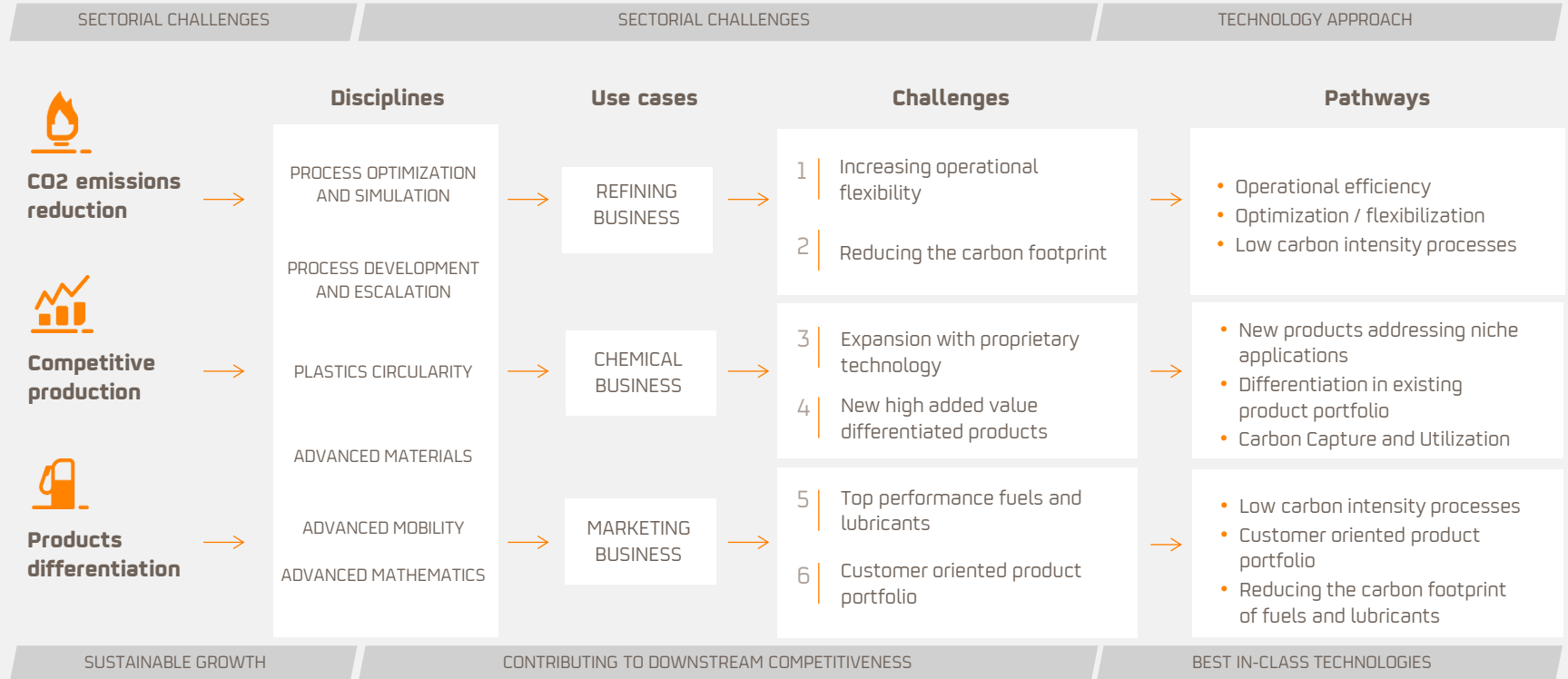
100\$M

OGCI*2017-2026

* OGCI – Oil and Gas Climate Initiative

Development capabilities

Tackling sectorial challenges through best in class applied technology and exploring disruptive approaches



Model

Combining R&D focus with a venturing approach

Technology Downstream disciplines

PROCESS OPTIMIZATION AND SIMULATION

- Increase **crude processing** flexibility
- Improve **catalysts**: activity & selectivity
- Develop **advanced biofuels**
- Develop the production of **Green hydrogen**

PROCESS DEVELOPMENT AND ESCALATION

- Develop biological, thermochemical and lipid platforms for **advanced Bios and alternative raw materials**
- Increase flexibility of **FCC/coker units**
- Produce **PO and derivatives**
- New processes and feeds for **base oils, extender oils** and **waxes** production

PLASTICS CIRCULARITY

- **Biodegradable bioplastics** and differentiated **polyolefins**
- Chemical **recycling** and **biological valorization** of waste into high value chemicals
- New materials for improve recyclability properties

ADVANCED MATERIALS

- Enlarging **CO2 polymers** portfolio
- **Develop materials**: additive manufact
- Develop of **UHMWPE** process
- **Develop lightweight** material: auto
- Optimization of **polyol** technology
- Produce **polymer-based** high performance materials

ADVANCED MOBILITY

- Improve LPG, fuels and **lubricants** formulation and characterization
- Develop **additives** for differentiated products
- Develop **low sulfur marine fuels**

ADVANCED MATHEMATICS

- Support **digital wins**
- **Differentiated algorithms** for decision-making processes
- Ad-hoc **mathematical models** and numerical methods applying A.I.

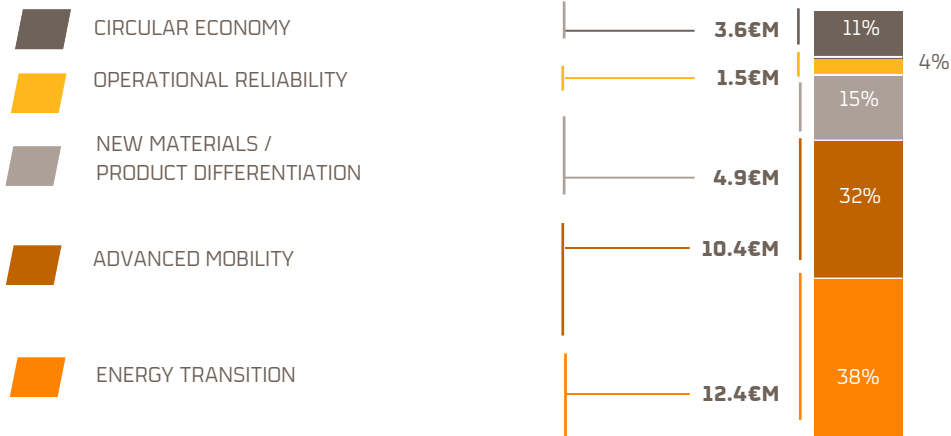
Investment tools

Leveraging on startups to increase corporate agility and access to best in class innovation

DOWNSTREAM INVESTMENT FOCUS

KEY FIGURES

CORPORATE VENTURING FUND



2016-2020 FUND*

33€M

16 INVESTMENTS

OGCI FUND

(Oil and Gas Climate Initiative)

- 5 ENERGY EFFICIENCY
- 6 METHANE EMISSIONS
- 7 CARBON CAPTURE, USE AND STORAGE (CCUS)

- Internal combustion engines
- Methane leaks emissions, valves and industrial 3D motion intelligence systems
- CO₂ uses, catalysts, post combustion CO₂ capture, etc.

2017-2026 FUND

100\$M

11 PARTNERS**

* Corporate Venturing fund calculations include the following legacy projects: Silence, PPI and Graphenea

** Shell, BP, Total, ENI, Equinor, Saudi Aramco, Petrobras, Oxy, Chevron, and Exxon

Use Cases

Refining business

DISCIPLINES Process optimization and simulation | Process development and escalation | Advanced mathematics

	BUSINESS CHALLENGE	TECHNOLOGY APPROACH	OUTCOMES
H1	Increasing the operational flexibility of our industrial assets without compromising operational excellence and reliability .	<ul style="list-style-type: none">▪ Chemometric characterization to optimize the crude slate selection.▪ Advanced models for planning.▪ Catalysts performance studies to maximize operation cycles and reliability.	<ul style="list-style-type: none">▪ Up to 10% potential refining margin gain by increasing opportunity crudes processing capacity (5%/bbl discount).▪ Potential 1-3% increase in the refining margin through optimization under uncertainty in key parameters.
H2	Reducing the carbon footprint of our products and operations	<ul style="list-style-type: none">▪ Design of processing strategies for advanced biofeeds to comply with REDII▪ Circular economy using feeds obtained by transforming plastic waste. <p>Creation of an analytic framework for the evaluation of CO2 reduction technologies:</p> <ul style="list-style-type: none">▪ Increasing the energy efficiency of industrial complexes.▪ Utilities optimization.	<ul style="list-style-type: none">▪ Definition of processing strategies in existing hydrogenation units based on feedstock quality.▪ Assessing pyrolysis technologies assessment to convert MSW or plastics into valid feedstock <ul style="list-style-type: none">▪ Up to 2% energy savings through energy recovery.▪ Potential energy efficiency gains in utility networks through use maximization and purge reduction.▪ Potential -20% emissions through green hydrogen from electrolysis or PEC.

Use Cases

Chemical business

DISCIPLINES Process development and escalation | Plastics circularity | Advanced materials

	BUSINESS CHALLENGE	TECHNOLOGY APPROACH	OUTCOMES
H1	Increasing the operational flexibility of our industrial assets without compromising operational excellence and reliability .	<ul style="list-style-type: none">▪ POSM process development: supporting current facilities & new units using Repsol's proprietary technology.	<ul style="list-style-type: none">▪ Conceptual design of new improvements in POSM technology included in Repsol Technology Package for international licensors.
H2	Obtaining a differentiated product portfolio providing higher margins.	<ul style="list-style-type: none">▪ Creation of a differentiated materials portfolio for additive manufacturing [3D print].▪ Development of a portfolio of higher added value lightweight automotive materials.▪ Creation of a portfolio of nanomaterials.	<ul style="list-style-type: none">▪ Newly designed cellular materials with modified polymer matrix and/or formulation maintaining mechanical performance with up to 30% less weight.
	Improving the circularity of processes by increasing the use of waste as raw materials.	<ul style="list-style-type: none">▪ Expanding the portfolio of CO2 polymers with a lower reliance of fossil feedstock.▪ Creation of biodegradable polyolefins	<ul style="list-style-type: none">▪ New CO2 (25-30%w) based polymers for niche applications such as adhesives, sealing and impact modifier.

Use Cases

Advanced mobility business

DISCIPLINES Advanced mobility

	BUSINESS CHALLENGE	TECHNOLOGY APPROACH	OUTCOMES
H1	<p>Commercializing top performance fuels and lubricants in present markets.</p>	<ul style="list-style-type: none">▪ Formulating new products with advanced characterization and simulation tools.▪ Fitting commercial additive packages to create a differentiated product portfolio.	<ul style="list-style-type: none">▪ Fuel differentiation to support expansion in the network of services stations in Mexico.▪ Upgrade of mineral lubricants with Group III basestocks .▪ Homologation and put into service of advanced, long drain lubricants for Wärtsilä, Caterpillar and Jenbacher engines .▪ Development of ultra high performance fuels and lubricants for the Repsol Honda MotoGP team.
H2	<p>Marketing new products for new applications.</p> <p>Reducing the carbon impact of products.</p>	<ul style="list-style-type: none">▪ Developing new liquid fuels▪ Introducing alternative fuels for new uses▪ Minimizing CO2 emissions during production and use of our products	<ul style="list-style-type: none">▪ Development of a New RON 100 gasoline in the Spanish Market.▪ New low viscosity lubricant grades with fuel economy attributes for automotive applications▪ New heavy-duty fuel economy lubes with CO2 evidences based on fleet trials

Use Cases

Specialized products

DISCIPLINES Process development and escalation | Plastics circularity

BUSINESS CHALLENGE

TECHNOLOGY APPROACH

OUTCOMES

H1

Optimizing production processes for lubricant basestocks and specialties.

Improving reliability of production assets.

- Consulting in industrial processes improvement.
- Testing **alternative feedstock**.

- **Alternative crude oils** to produce basestocks being tested to offer opportunities to optimize production.
- Alternative feedstock evaluated to produce **TDAE**.

H2

Differentiating specialties to high margin, low environmental impact products.

- **Differentiating specialties** to high margin, low environmental impact products.

- **New TDAE process** developed to start up in 2021 to produce **40,000 t/y** of high quality extender oil. Now in basic engineering phase for Cartagena refinery.

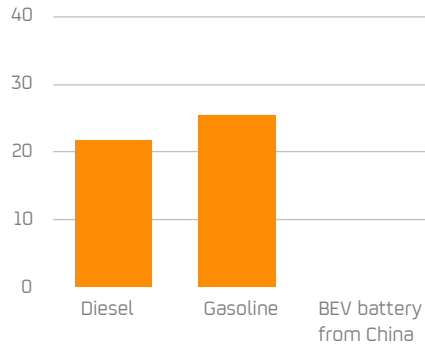
Light-duty road segment

Currently, three **methods** are used to measure greenhouse gases (GHG) from vehicles, providing very different views of the same issue

■ End of life ■ Use in energy production ■ In use tailpipe ■ Battery manufacturing ■ Vehicle manuf. (excl. battery)

Tailpipe emissions (Tank to Wheel)

GHG emissions [t]

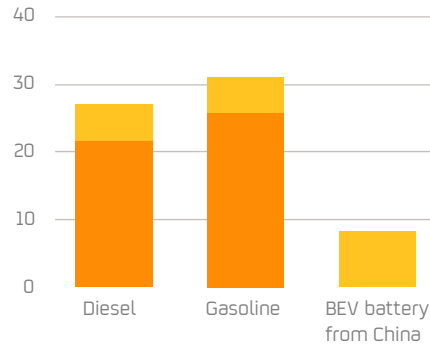


GHG emissions considered:

- From the tailpipe of the vehicle.

Well to Wheel

GHG emissions [t]

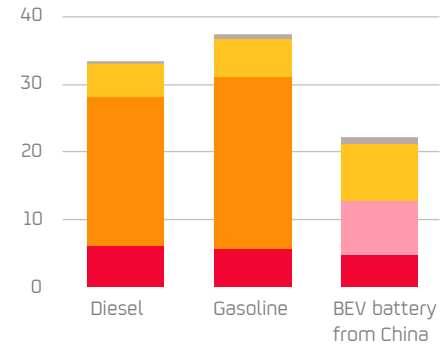


GHG emissions considered:

- From the tailpipe of the vehicle.
- From fuel or electricity production for vehicle use.

Life Cycle Analysis

GHG emissions [t]



GHG emissions considered:

- From the tailpipe of the vehicle.
- From fuel or electricity production for vehicle use.
- From vehicle and battery manufacturing and end-of-life [recycling and scrappage].

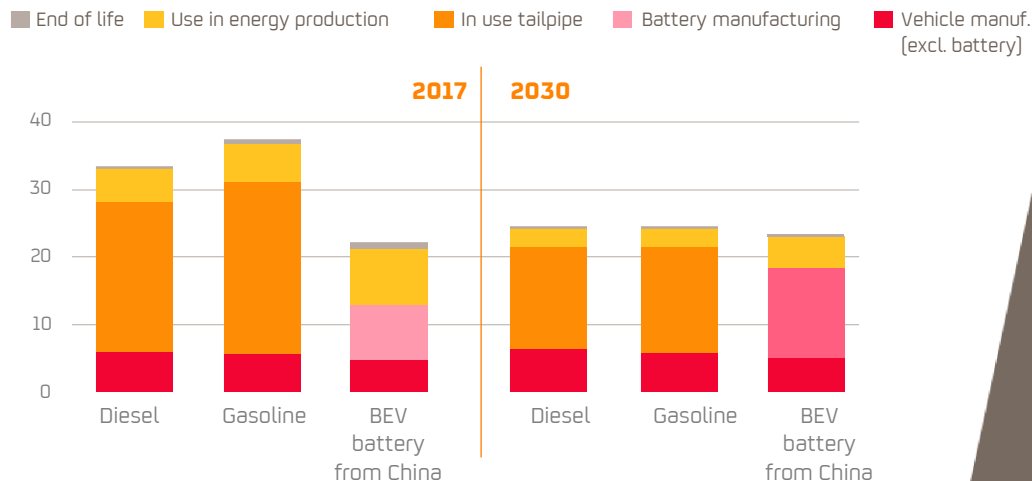
Life Cycle Analysis includes all the relevant contributions for a global issue like greenhouse gases

Light-duty road segment

Greenhouse gases: **trends** towards 2030

Life Cycle Analysis

GHG emissions (t)



Improvements in efficiency of ICE vehicles and GHG emissions from liquid fuels could level life cycle emissions across all powertrains

From 2017 to 2030, the following trends are expected for each powertrain with the overall effect on GHG emissions shown in the graph:

Internal combustion engine (ICE) vehicles (diesel and gasoline)

- ICE vehicle efficiencies will improve [26% and 33% respectively].
- Well to Tank emissions for diesel and gasoline fuels will be reduced [25% expected].
- 2nd generation biofuels will be in the market [14% by energy expected].

Battery electric vehicles

- Battery capacities will increase in order to gain vehicle range.
- Electricity mixes both in Europe and China will evolve towards more renewable generation [wind and solar PV] and less coal, decreasing emissions in battery manufacturing [per kWh] and vehicle use.

Data from internal Repsol study with the following main assumptions. Segment C vehicles. Life 160000 km. ICE vehicles represented with real fuel consumption for "2017" and corrected fuel consumption for "2030" based on FEV (2015). BEV represented with real electricity consumption for "2017" and no improvement in "2030" due to increase in weight caused by increased battery size. Vehicle use is assumed in EU and battery manufacturing site is China. Electricity mixes in "2017" and "2030" extracted from IEA WEO (2018). Battery size for "2017" 43.3 kWh and for "2030" 85.0 kWh. A recently published analysis by Volkswagen (2019) comparing VW Golf diesel and BEV models concludes that BEV emits 18% less GHG than diesel. A recently published study by IFO (2019) comparing a Tesla Model 3 with a Mercedes C-class (diesel and CNG versions) concludes that BEV emits 19.5% more GHG when used in Germany.



A photograph of a modern building with a glass facade, partially obscured by a large, semi-transparent orange geometric shape on the left. The building's windows reflect the sky and surrounding environment. The orange shape has a white arrow-like cutout pointing towards the building.

Annex

Commercial cases cover all strategic priorities



PPSS



DD.SS



CHEMICAL



LPG



LAS



E&G



PERU

1 Integrated Planning and operations

- Mom
- Suggested offering
- DIM

- Control Tower
- Track&Trace Chemical

- NACE

- Track & Trace LAE
- Blockchain UNLAE

- Invoice autom.
- Remote measuring
- Sales mgmt.
- Workforce monitor.

2 Analytical Pricing and Loyalty

- Personalized offering
- Pricing EE.SS.
- Portfolio optim.
- Franchise analytics
- New campaign model
- Data monetization

- Pricing VV.DD.

- NoW 4.0
- Six Senses

- Pricing GLP
- LPG Finder

- Pricing UNLAE

- E&G Digital acquisition [Mirai]
- Churn Reduction

- Advanced pricing oil
- Pricing non-oil

3 Omnichannel customer experience

- Loop
- CRC Transformation
- Waylet 2.0

- Omnichannel residential

- Web Portal Chemical

- Omnichannel LPG

- Portal Web
- Infinity
- Amazon channel
- International Portal LPG

- Integration MdP RedSys
- Fleet platform
- Autogas invoicing

Commercial cases cover all strategic priorities



PPSS



DD.SS



CHEMICAL



LGP



LAS



E&G



PERU

4 Sales workforce Digital enablement

- Workforce enablement
VVDD

- Workforce enablement
Chemical
- ATD

- Workforce enablement
GLP

- Workforce enablement
UNLAE

- Professional workfor.
- Payment collection
- Receipt automatiz.
- Customer experience

5 Integrated Planning and operations

Wible; Fleet mgmt. system; Ibil; PSD2; Distributed generation; Roadmap SSII; Energy Management System

6 Customer-Driven vision

Global Customer

Note: Not exhaustive



REPSOL