



Delivering Value from RealTime Data Infrastructure to achieve Operational Excellence

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Definitions & cautionary note

Reserves: Our use of the term “reserves” in this presentation means SEC proved oil and gas reserves.

Resources: Our use of the term “resources” in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers (SPE) 2P + 2C definitions.

Discovered and prospective resources: Our use of the term “discovered and prospective resources” are consistent with SPE 2P + 2C + 2U definitions.

Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.

Shales: Our use of the term ‘shales’ refers to tight, shale and coal bed methane oil and gas acreage.

Underlying operating cost is defined as operating cost less identified items. A reconciliation can be found in the quarterly results announcement.

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate legal entities. In this presentation “Shell”, “Shell group” and “Royal Dutch Shell” are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words “we”, “us” and “our” are also used to refer to subsidiaries in general or to those who work for them. These expressions are also used where no useful purpose is served by identifying the particular company or companies. “Subsidiaries”, “Shell subsidiaries” and “Shell companies” as used in this presentation refer to companies over which Royal Dutch Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as “joint ventures” and “joint operations” respectively. Entities over which Shell has significant influence but neither control nor joint control are referred to as “associates”. The term “Shell interest” is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in a venture, partnership or company, after exclusion of all third-party interest.

This presentation contains forward-looking statements concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements.

Forward-looking statements are statements of future expectations that are based on management’s current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management’s expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as “anticipate”, “believe”, “could”, “estimate”, “expect”, “goals”, “intend”, “may”, “objectives”, “outlook”, “plan”, “probably”, “project”, “risks”, “schedule”, “seek”, “should”, “target”, “will” and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this presentation, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell’s products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; and (m) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this presentation are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell’s Form 20-F for the year ended December 31, 2016 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward-looking statements contained in this presentation and should be considered by the reader. Each forward-looking statement speaks only as of the date of this presentation, 14-Oct 2019 & 16th OCT-2019, Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this presentation.

We may have used certain terms, such as resources, in this presentation that United States Securities and Exchange Commission (SEC) strictly prohibits us from including in our filings with the SEC. U.S. investors are urged to consider closely the disclosure in our Form 20-F, File No 1-32575, available on the SEC website www.sec.gov. You can also obtain this form from the SEC by calling 1-800-SEC-0330.

About shell

in 2018

81,000

Average number of people we employed

\$53 billion

Cash flow from operating activities

30 million customers

Served every day through 44,000 Shell-branded retail stations

34.3 million tonnes

LNG liquefaction volumes

70+

Number of countries in which we operated



50%

Share of our production that was natural gas

9.5 billion

Litres of biofuels blended in the petrol and diesel we sold

3.7 million

Our production of crude oil and natural gas, in barrels of oil equivalent a day

71 million

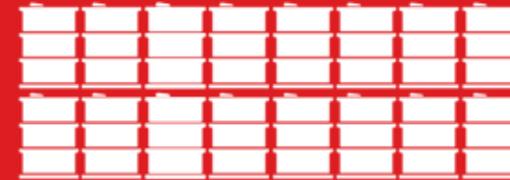
Tonnes of LNG we sold

\$986 million

spent on research and development

\$113 million

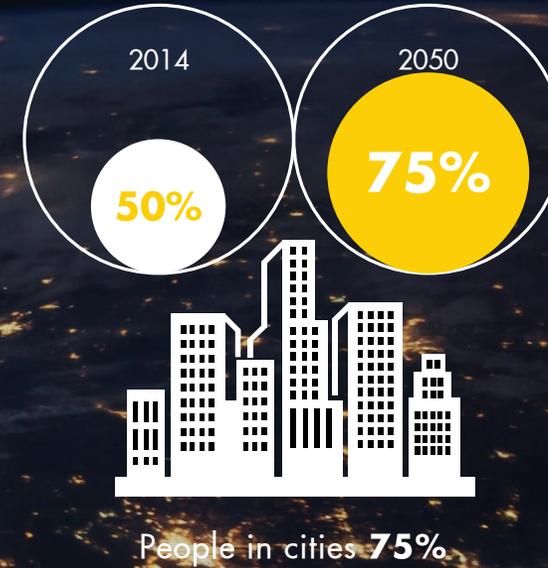
Spent on voluntary social investment worldwide



1+ million tonnes

Amount of CO₂ captured by Quest CCS facility in 2017

Energy challenge 2050



“Driven by the major forces of the energy transition and digitalisation, we’ll likely see the re-making, over time, of the energy system”

Ben van Beurden

Digitalisation has a role in tackling climate change

ENERGY

Digital technologies can enable the integration of renewables onto the grid, improve efficiency and heighten transparency

FOOD

Digital technologies can help raise productivity and reduce food waste onto the grid, improve efficiency and heighten transparency

HEALTH

Digital technologies will put “a doctor in your pocket,” allowing users to manage their own health via their smart device

LEARNING

Digital technologies can make education accessible, engaging, flexible and affordable

BUILDINGS

Digital technologies will increase comfort and reduce energy and water bills

MOBILITY & LOGISTICS

Digital technologies can help everyone reach their destinations faster, cheaper and safer

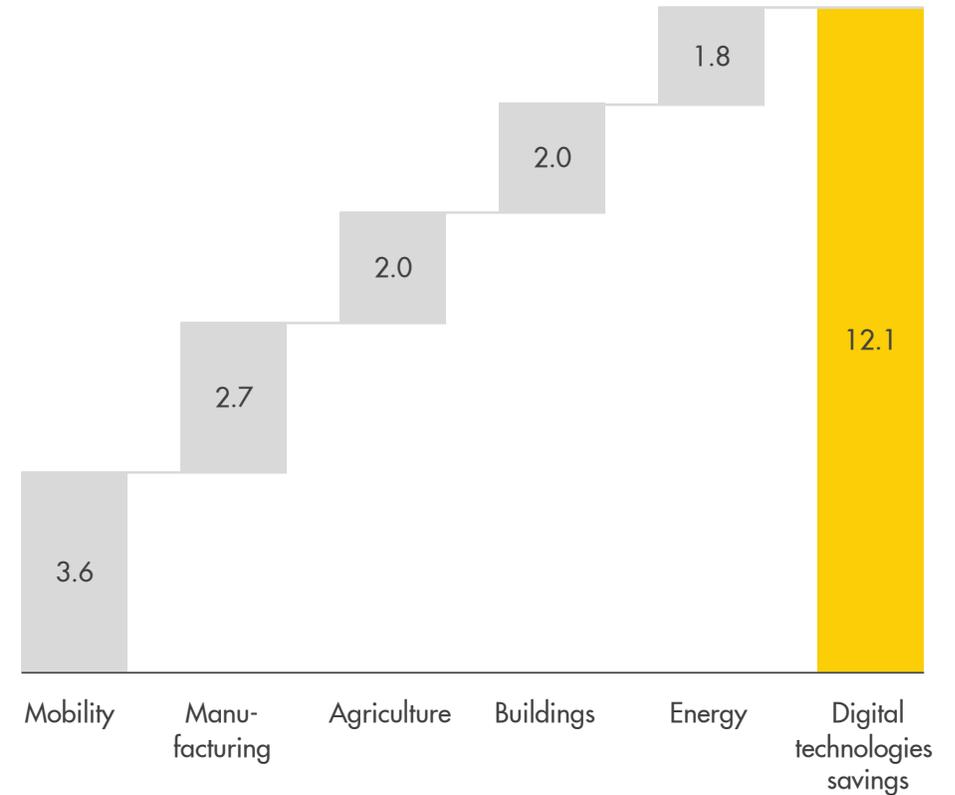
WORK & BUSINESS

Digital technologies enable telecommuting, virtual conferencing and save employees time and money

MANUFACTURING

Digital technologies will place the customer at the center of a user focused service, cutting resource inputs at the same time

mtCO_{2e} abatement potential by sector (2030)



Global sustainability initiative Smarter 2030 report

Digital is not new

But availability of technology, data and capabilities is growing at exponential rate

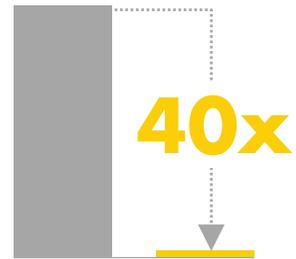
Technology is becoming **faster** and **cheaper** over the past ten years

Data is **growing exponentially**

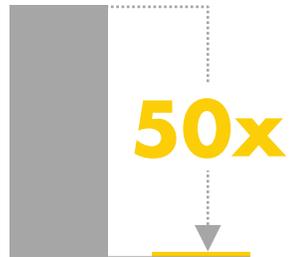
COST OF SENSORS



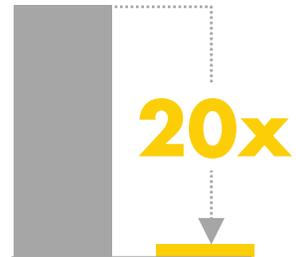
COST OF BANDWIDTH



COST OF PROCESSING POWER

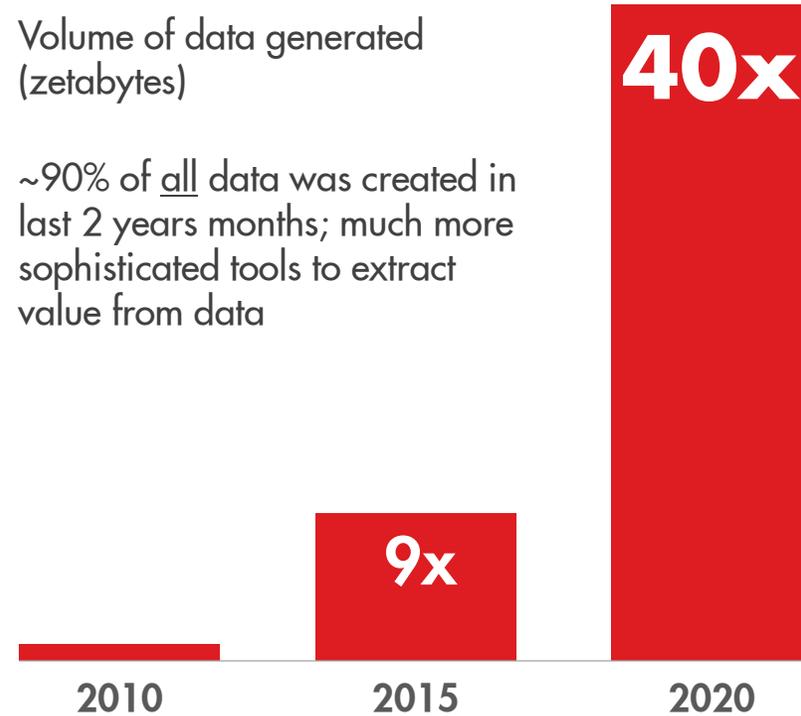


COST PER MB OF CLOUD INFRASTRUCTURE

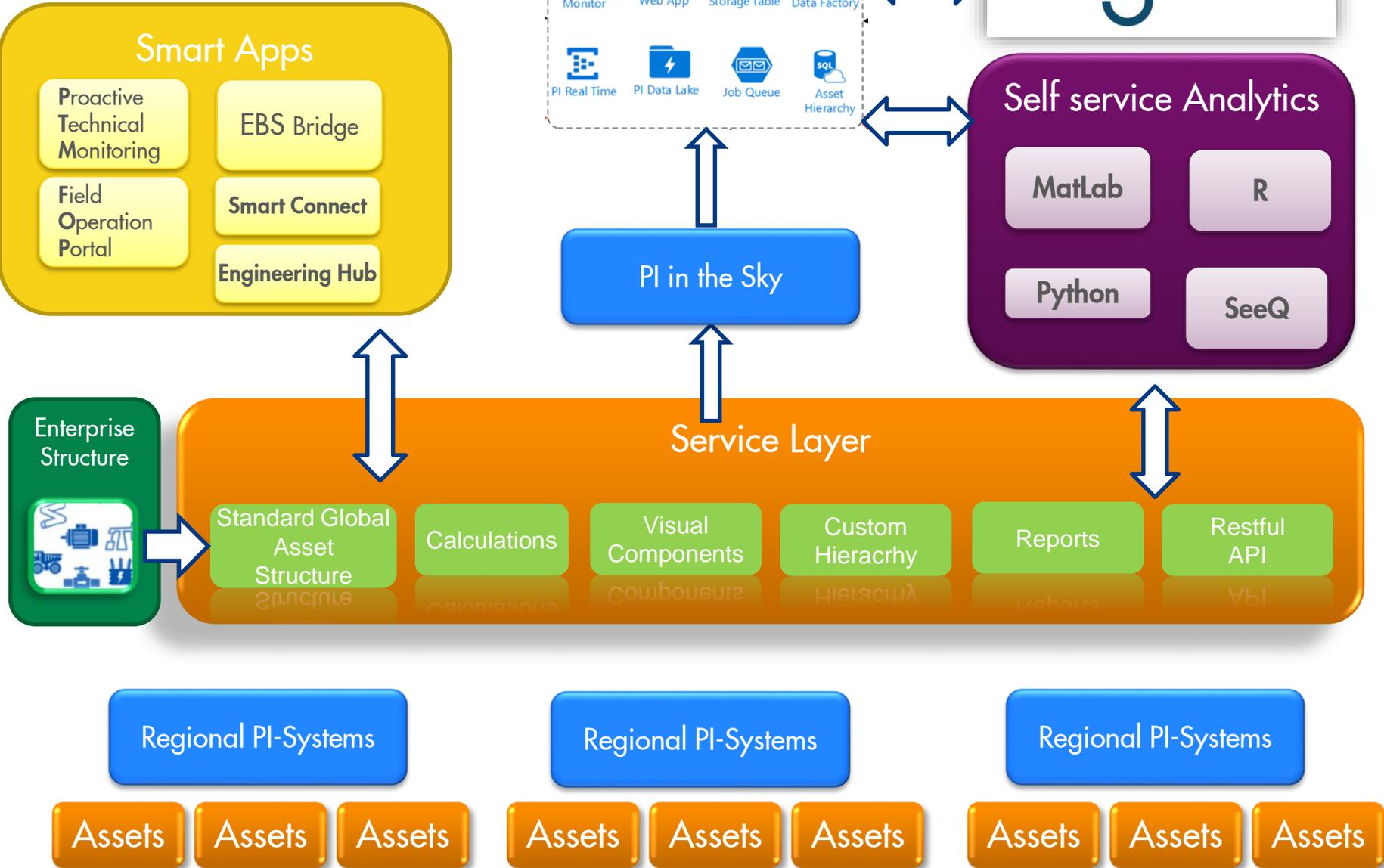


Volume of data generated (zetabytes)

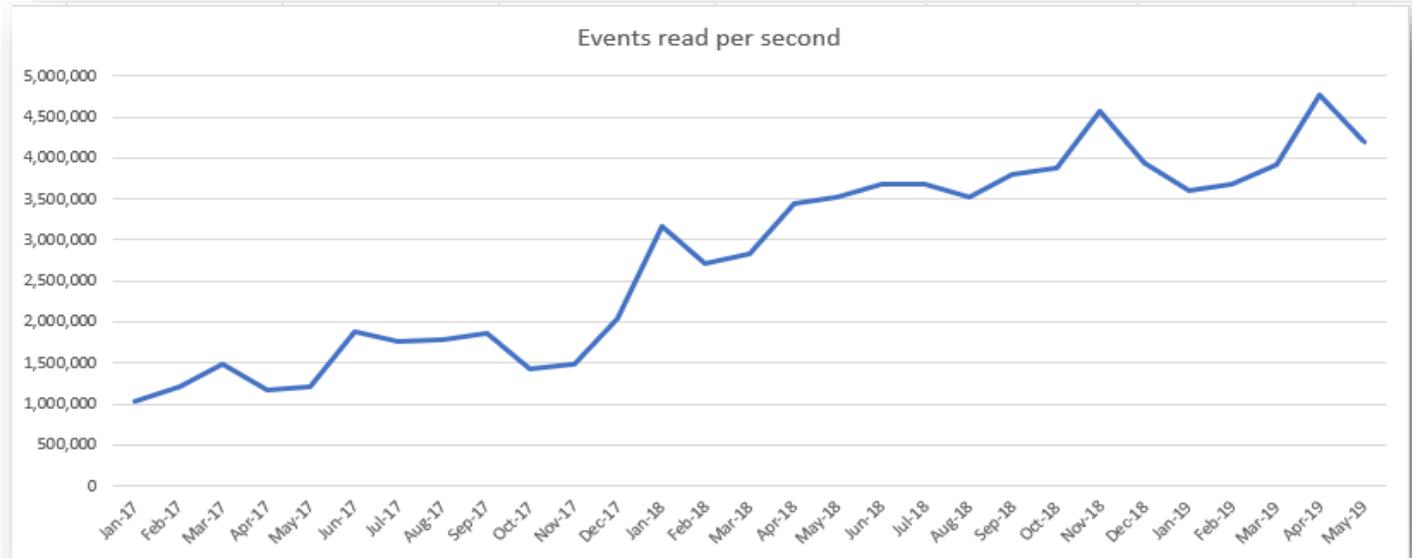
~90% of all data was created in last 2 years months; much more sophisticated tools to extract value from data



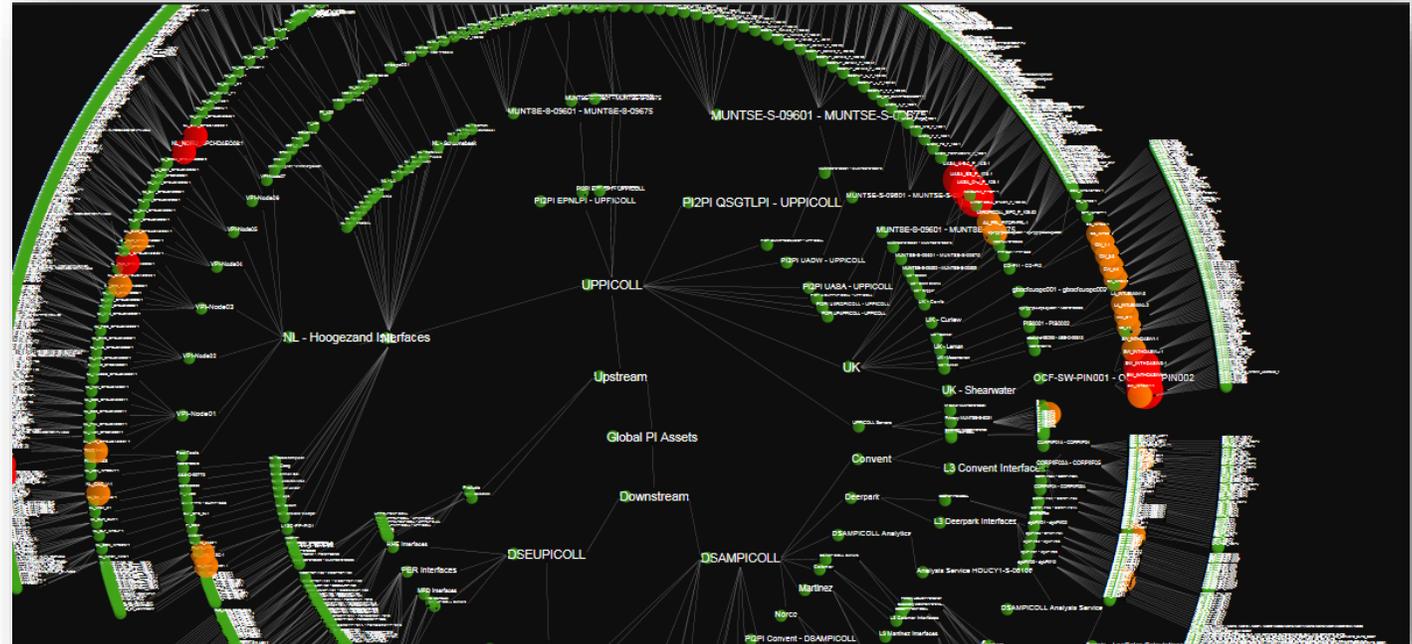
High Level RT Architecture



PI System in numbers



- ALL SHELL BUSINESSES ARE CONNECTED TO PI**
- ✓ Downstream
 - ✓ Upstream
 - ✓ Projects & Technology
 - ✓ Integrated Gas
 - ✓ Unconventional Resources
 - ✓ Shell Trading
 - ✓ Pipeline



PI System Technology Roadmap

Right Data of Known Quality



Collectives provides one view of the truth



PI Data Quality tooling ensures that the quality of all critical data is visible and managed

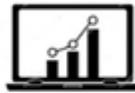


AF Structure ensures the right data can be found and calculations replicated



PI in the Sky replicates critical data securely in the cloud

Integrated in a Meaningful Way



PI Vision allows speedy visualisation of data wherever and whenever the user needs. Local, remote, laptop or mobile



Seeq offers powerful analytics at the fingertips of engineers to find relationships in data



AF Analytics to replace PE and ACE for templating calculations

To Make Timely Decisions



PI Event Frames gives the capability to set alerts when significant conditions occur



Integration and Collaboration through connected tools like **PTM Hub**, **Smart Connect**, **Smart Perform** allow fast decisions. PI



Manual Logger for remote data entry for operators.

Prerequisite for enabling data for Advanced Analytics

Contextualize the Data

One-Stop-Shop for RT Data

Ownership of Data

Data Quality

Availability & Performance

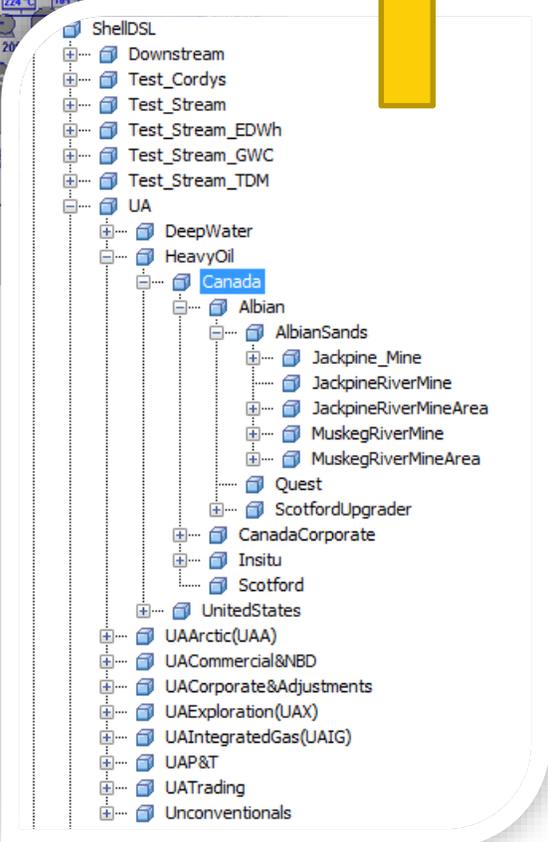
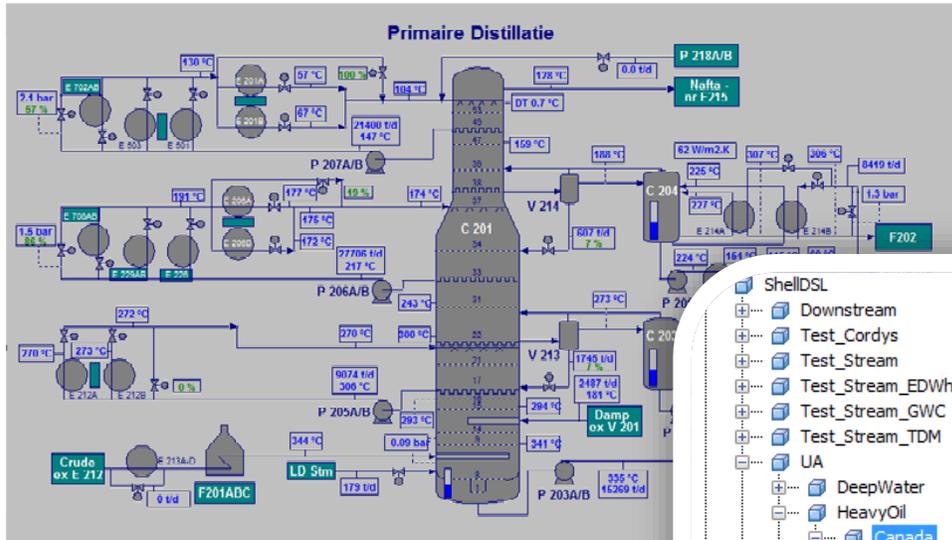
Scalability

Market Standard

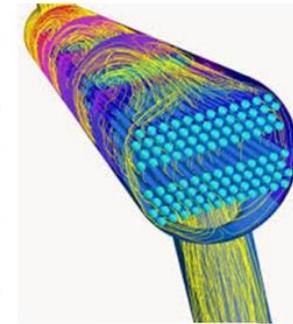
Build once deploy Globally



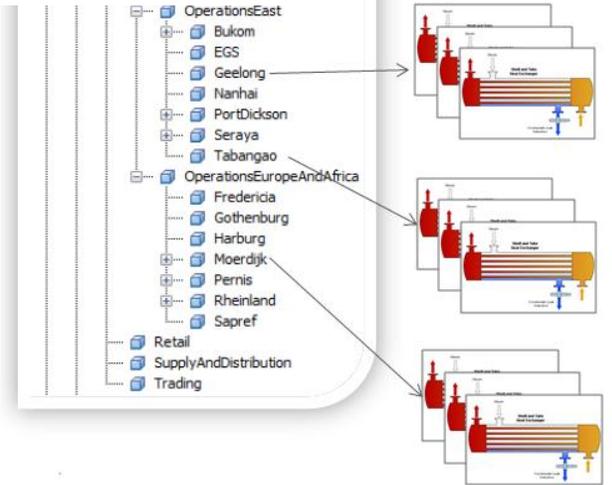
Data contextualization for Integration & Standardization



- Input Temperature hot Flow
- Input Temperature cold Flow
- Output Temperature hot Flow
- Output Temperature cold Flow
- High Temperature
- Low Temperature
- Debiet
- Shells/Passes
- Surface
- Type Heatexchanger



- OHTC – Overall Heat Exchange coefficient
- E-Factor
- Power Capacity Heatexchanger



PI Server Asset Framework Analytics

Shell central structure

Template based calculations per equipment

calculations visible via standard clients

The screenshot displays the PI Server Asset Framework Analytics interface. On the left, a hierarchical tree under 'Elements' shows the structure of the plant, including various units and equipment. A green box highlights the 'Shell central structure' at the top level. Another green box points to the 'Calculations' folder under 'DIPA-900', indicating 'Template based calculations per equipment'. A third green box points to the 'Analyses' tab at the bottom, stating 'calculations visible via standard clients'. On the right, the 'Heatexchanger E-901A (E-901A OHTC)' details are shown. A table lists various parameters categorized into 'Calculated Variables', 'Input CMN.CLMTD', 'Input CMN.OHTC', and 'Input PER.HTXDIPA'. A green box on the right points to the 'Calculated Variables' section, labeled 'Output Parameters on Facility Element Level'. Another green box points to the 'Input PER.HTXDIPA' section, labeled 'Input Parameters on Facility Element Level'.

Name	Value
Category: Calculated Variables	
CLMTD	21.008952741719426
E-Factor	0.70936263513308473
OHTC	91.761400739499749
Power Capacity Heatexchanger	722.929099368798 kW
Category: Input CMN.CLMTD	
Input Temperature Cold Flow	59.3944473266602 °C
Input Temperature Hot Flow	89.0111083984375 °C
Output Temperature Cold Flow	67.4651947021484 °C
Output Temperature Hot Flow	80.9417724609375 °C
Shells/Passes	1
Type Heatexchanger	Sandtype
Category: Input CMN.OHTC	
Surface	375 m2
Category: Input PER.HTXDIPA	
Debiet DIPA	22.7689799556026 kg/s
High temperature	89.0111083984375 °C
Low temperature	80.9417724609375 °C

Output Parameters on Facility Element Level

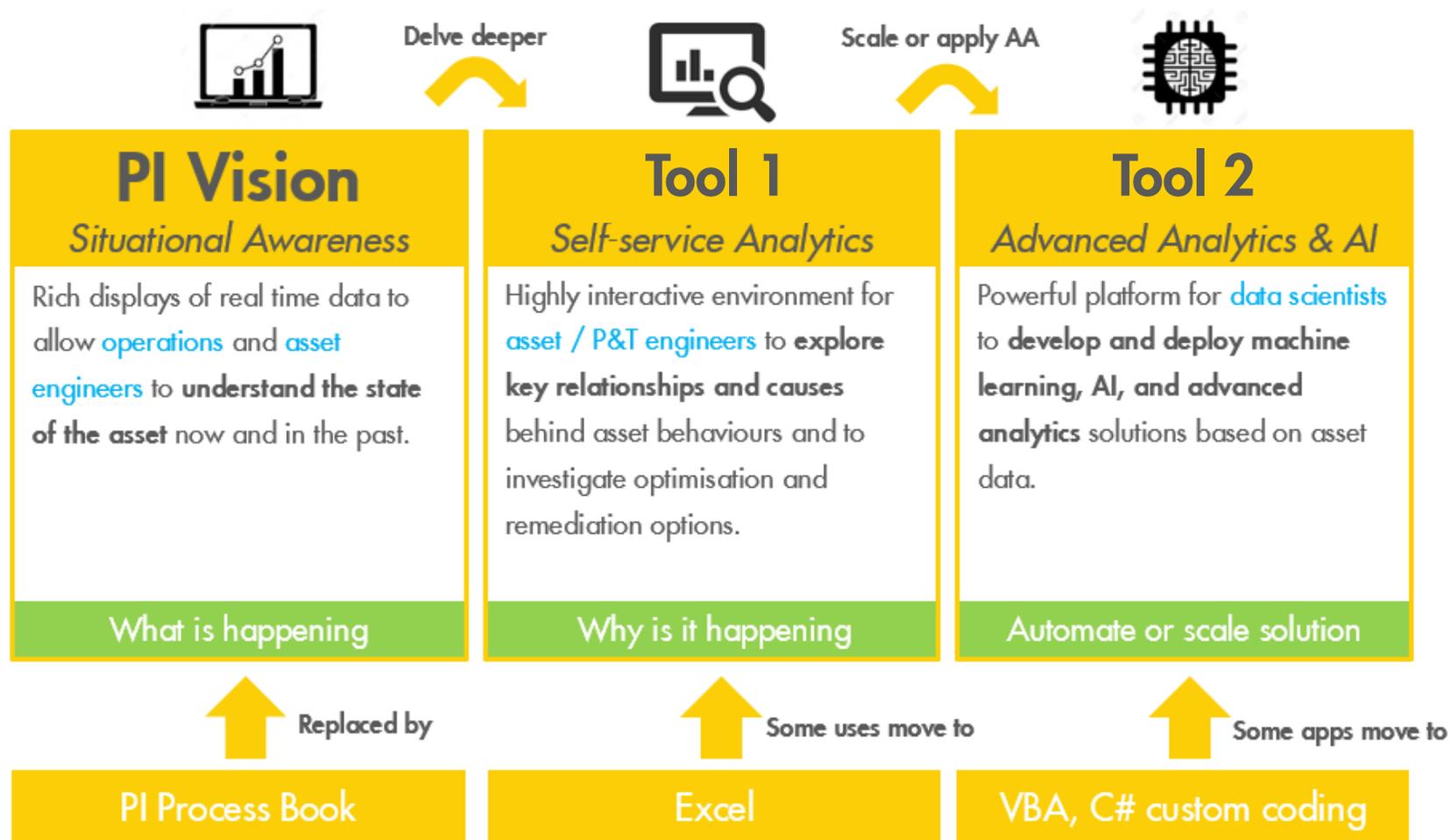
Input Parameters on Facility Element Level

Business benefits and USER uptake



Wierd Van der Kooi, Data Steward (Asset System), NAM Land, NL

Visualization and analytics positioning

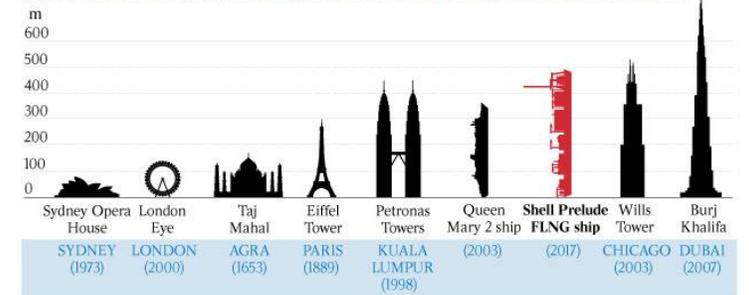


Prelude FLNG



Length: 488 m (1601 ft)
Wide: 74 m (243 ft)
Height: 105 m (344 ft)
Displacement: 600,000 t

HOW SHELL'S FLNG SHIP MATCHES GLOBAL MEGASTRUCTURES

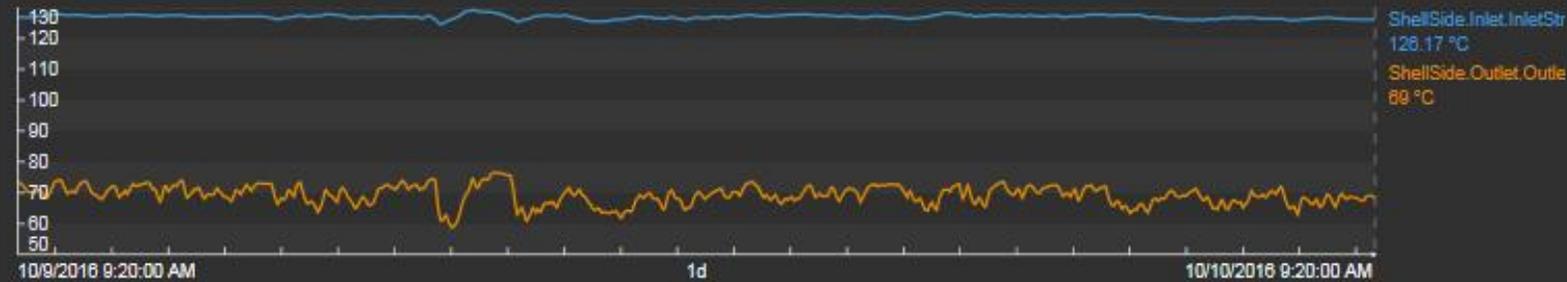
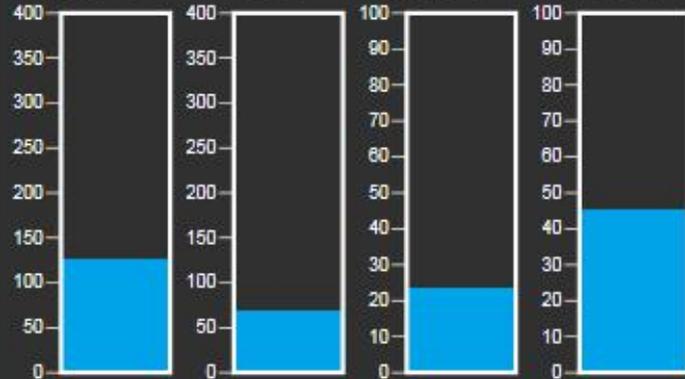


PI Vision at Prelude

Display: [Example with Prelude](#)

E201A|LifecycleState E201A|TubeSide.Inlet.InletStream.MassFlowRate
Operational **25743 t/d**

E201A|ShellSid E201A|ShellSid E201A|TubeSid E201A|TubeSid
126.17 °C 69 °C 23.711 °C 45.356 °C



Value of Real-Time data : Helping business to achieve operational excellence



