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Journey to water neutrality within energy operations at Ecopetrol

Ernesto Gutierrez

Innovation, Science, and Technology Vice President
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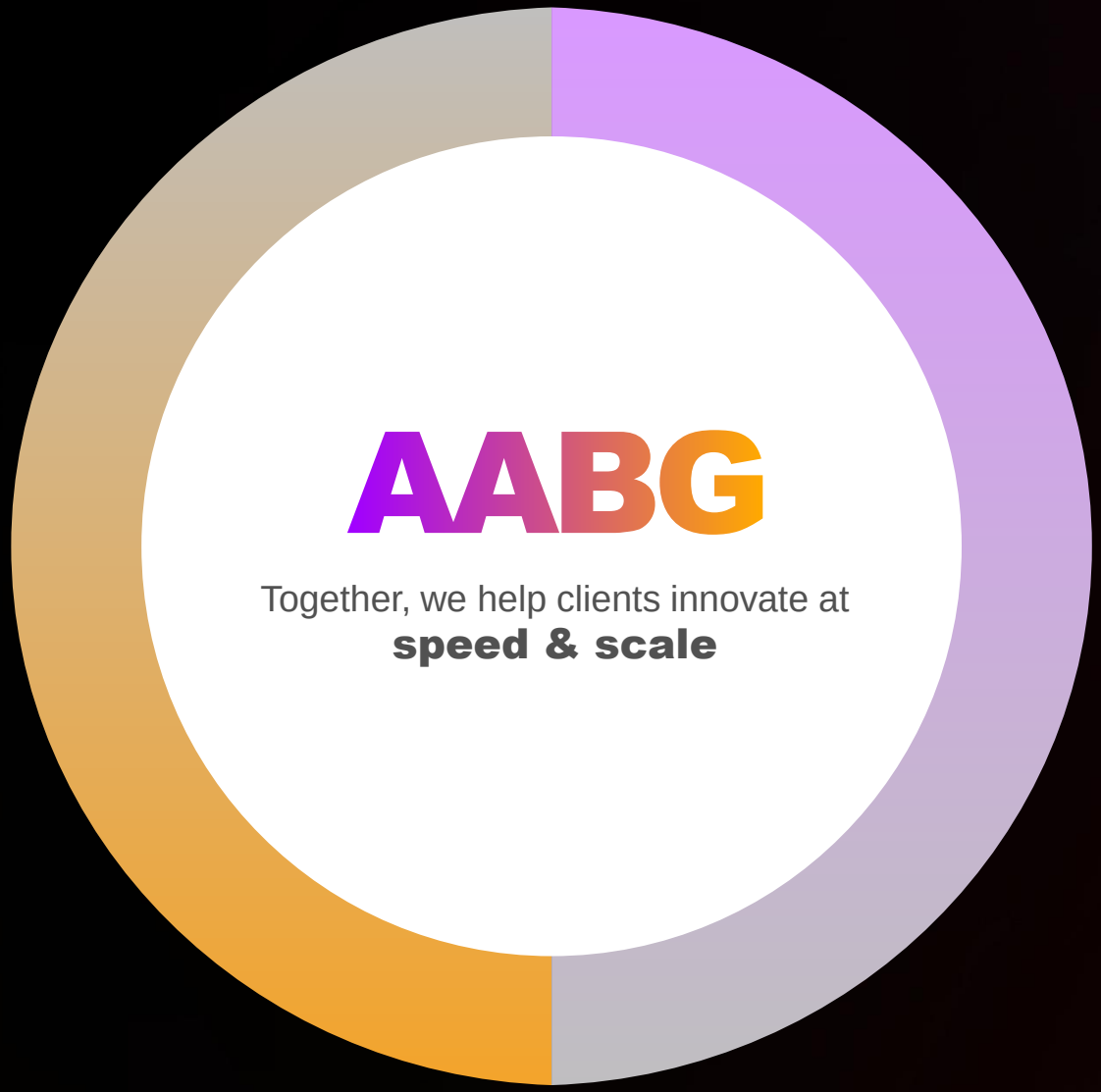
AABG Americas Market Lead
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The **Accenture AWS Business Group** (AABG) combines the resources, expertise, and industry knowledge of Accenture and AWS to **accelerate cloud transformation and innovation** for enterprises through full adoption of AWS services

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Ecopetrol is a leading and diversified energy group in Latam



+9 countries

+18K employees

3 BUSINESS SEGMENTS

Hydrocarbons

Contribution to EBITDA: 82% 2022 » 60% 2040

- #1 in Colombia
- **2,002 mmboe** 1P reserves 2021
- **+9,000 km** Pipelines
- **+700 mboed** production
- **430 mbd Throughput Capacity** (additional capacity in Cartagena +60 mbd sep-2022)

Low-emission Solutions

Contribution to EBITDA: 14% 2040

- #1 self-generator with renewables in Colombia
- **119 MW** Renewables supply capacity
- **+15K ha** 15 Ecoreserves network in Colombia
- **1 pilot** green H_2 In Colombia

Transmission, toll roads and telecom

Contribution to EBITDA: 17% 2022 » 26% 2040

- #1 Energy transmission company in Latam
- **+48,000 km** Transmission lines
- **860 km Toll roads** in operation
- **1st energy storage** Project at industrial scale in Brazil

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2040 corporate strategy

ENERGY THAT TRANSFORMS

ecopetrol GROUP

COMPETITIVE RETURNS

8%-10% Return on capital (ROACE)

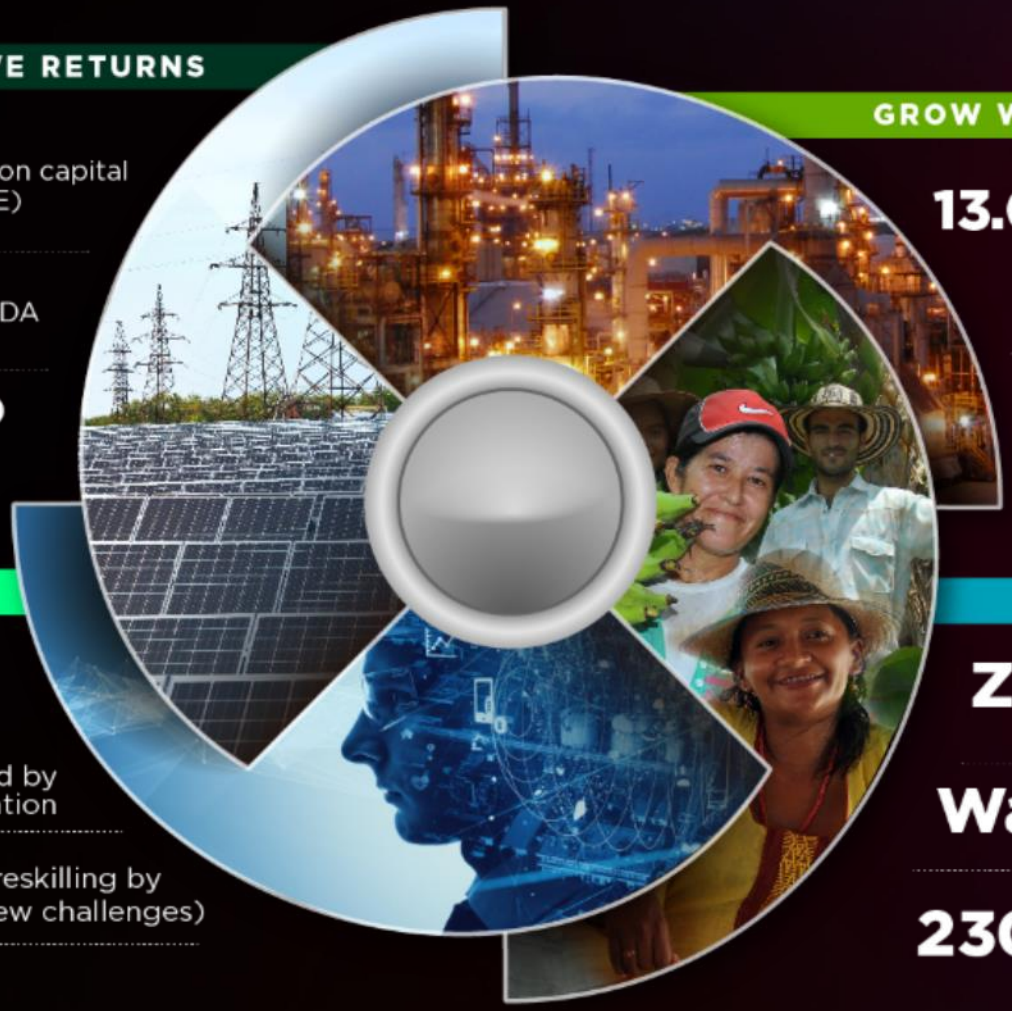
< 2,5x Gross debt / EBITDA

13 - 20 TCOP
Annual transfer payments to the Nation*

CUTTING-EDGE KNOWLEDGE

20 – 30 BUSD
(~76 - 114 TCOP)
Cumulative EBITDA by 2040 enabled by technology and innovation

70% of personnel in reskilling by 2030 (to face new challenges)



GROW WITH THE ENERGY TRANSITION

13.000 – 14.000 MUSD
(~49 - 53 TCOP)
Annual EBITDA by 2040**

30%–50%
Share of low-emission business in EBITDA

GENERATE VALUE THROUGH TESG

Zero CO_2 emissions by 2050 (Scopes 1 and 2)
-50% cutback of total emissions by 2050

Water neutrality by 2045

230K New Non-O&G jobs by 2040

Assumptions: Brent (2025- 2040) 45 -55 US$/Bl. Exchange rate: $3.800/cop
*Includes: Royalties, taxes and dividends **6.500 - 8.500 MUS$ Annual EBITDA by 2040

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Science, technology, and innovation strategy

Decarbonization

Net-zero emissions (100% scope 1 and 2, and 50% scope 3) vs. 2019 to 2050

Resilient assets

Contribute to the growth of 750 KBpe production by recovery, exploration, and international growth by 2040

TESG

Boost economies, education, and access to public services by 2040



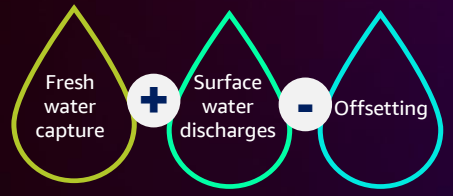
Energy transition

Use 6% of the business diversification goal with low-emission H2 by 2040

Industrial Revolution 5.0

Achieve 100% process automation by 2030

Circular economy



66% Reduction* ZERO 34%

2045

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Pushing knowledge frontiers of water management

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*Reduction vs. baseline 2019

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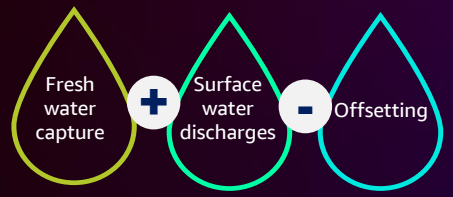
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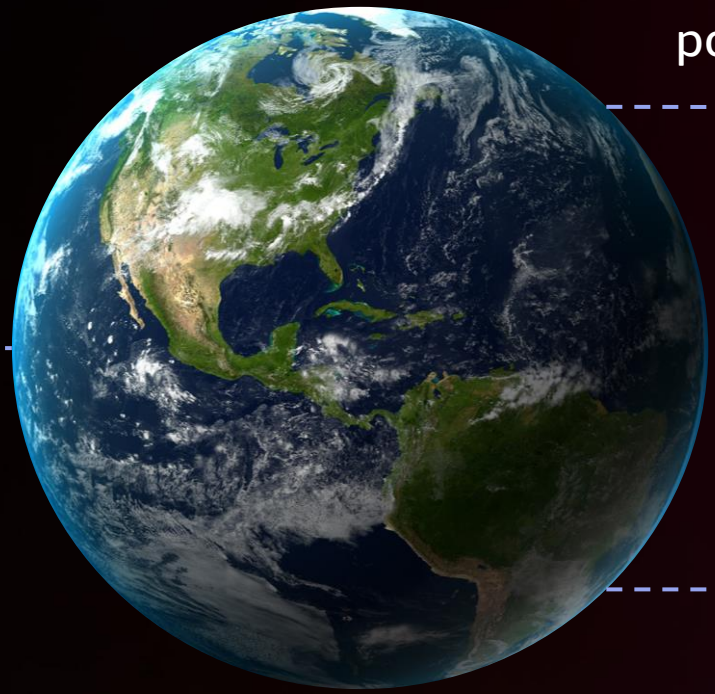
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*Reduction vs. baseline 2019

“Anyone who can solve the problems of water will be worthy of two Nobel Prizes – one for peace and one for science.” —John F. Kennedy

80% of wastewater resulting from human activities is **discharged** into rivers or the sea prior to any pollution removal

70% of all water abstracted from rivers, lakes, and aquifers is used for **irrigation**



Over **3B** people worldwide lack the ability to **safely wash** their hands at home

Goal #6 UN SDG:
Ensure availability and sustainable management of water and sanitation for all
Countries face growing challenges linked to water scarcity, water pollution, degraded water-related ecosystems, and cooperation over transboundary water basins

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The unique position of the energy industry

The dependency of water in operations is seen across industries, but the oil and gas sector is uniquely impacted due to the heavy reliance on water

At the same time, the expertise within the energy industry positions us to be pioneers in water management

Ecopetrol

In the US

10:1

Is the ratio of produced water per barrel of oil – globally, this number can reach up to 40:1

16:1

Daily

250

Million barrels of water are produced globally

11.4

72%

of water used in refineries comes from rivers or lakes and ground and municipal sources

64%

It takes a

2:1

ratio of water to process a barrel of oil

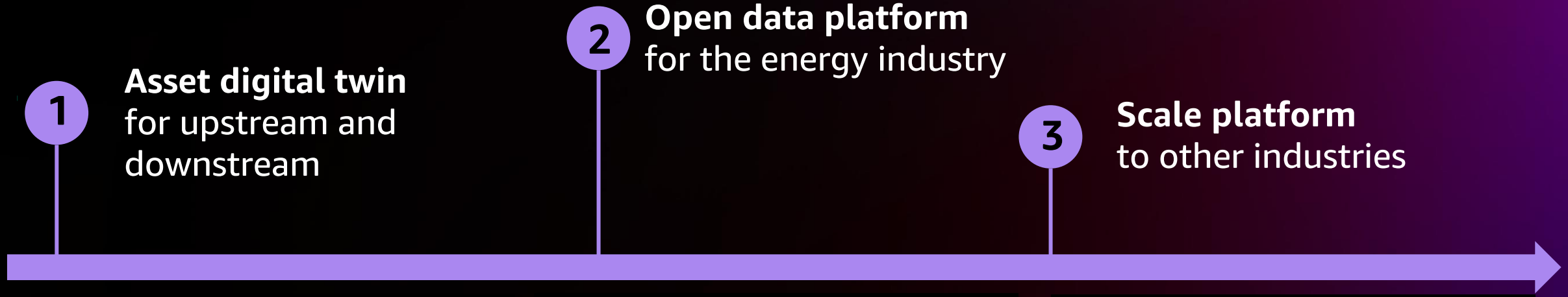
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Water management collaboration across the industry



Development of the **water optimization solution** to optimize the **capture, treatment, reuse/use,** and **disposal** of water in operations

Serves as the platform for **collaboration** in oil and gas, enabling partnership between companies to work toward the water **sustainability goals** in the industry

Opportunity to better **manage and optimize** the use of water across businesses, vendors, and suppliers with the goal of continued collaboration and innovation

AWS Cloud data platform

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First-of-its-kind Water Management Platform overview

Focused on . . .

Visualizing
Represent physical processes and business activities in a digital form; showcasing operational, quantity, quality, financial, and environmental parameters

Connecting
Internal and external data sources and benchmarks in one place

Optimizing
Water parameters to inform decisions and identify unique optimal scenarios; impacting operating decisions at business unit and enterprise levels

To enable. . .

competitive advantages across ecosystems by incorporating financial, environmental, and operational parameters to the decision-making process, accelerating the journey toward water neutrality

Energy companies





Surrounding community

Regulatory agencies





Other industries

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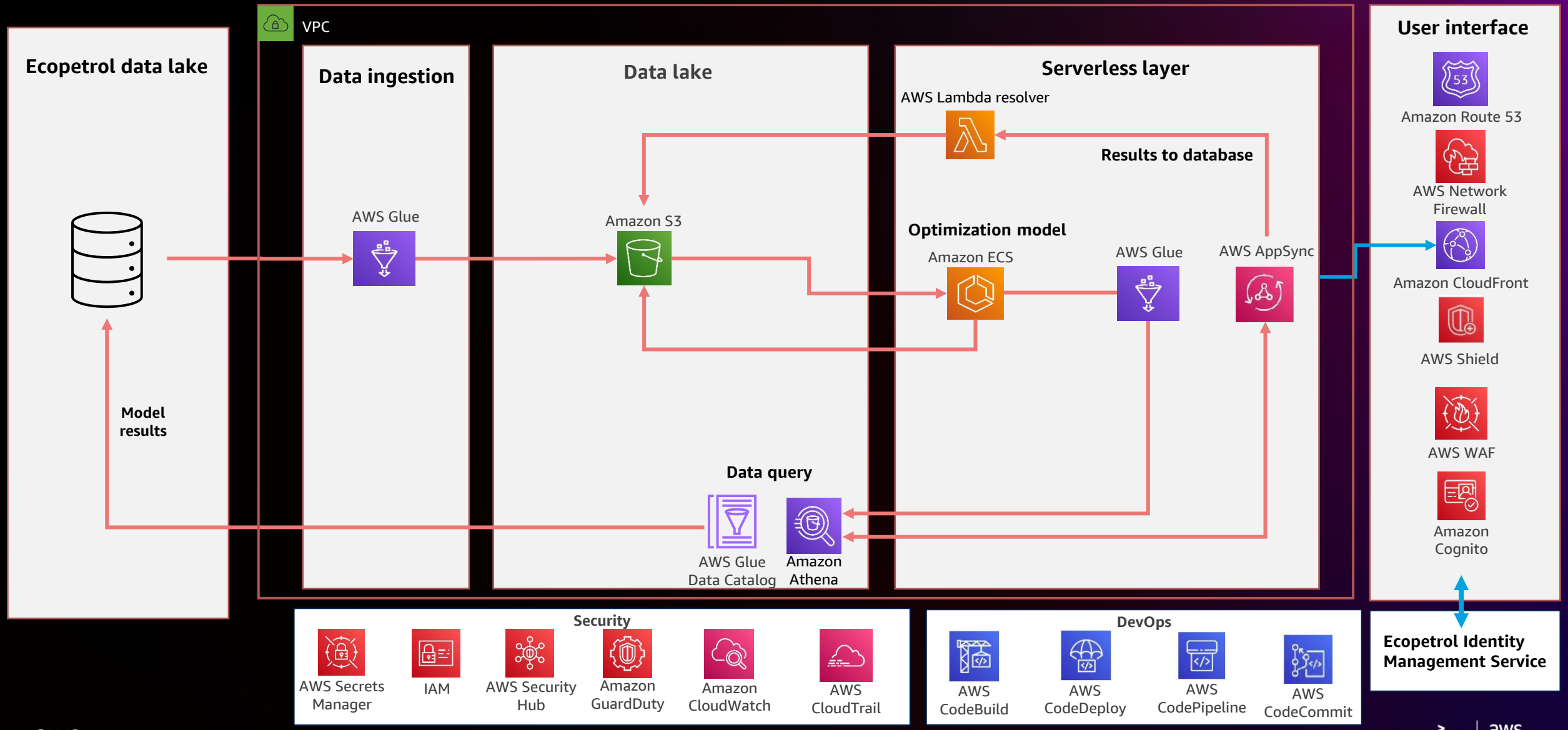
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Water Management Platform demo

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Solution architecture



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The journey to water neutrality is on!
Will you join us?



Ernesto Gutierrez

Ecopetrol Innovation, Science, and Technology Vice President



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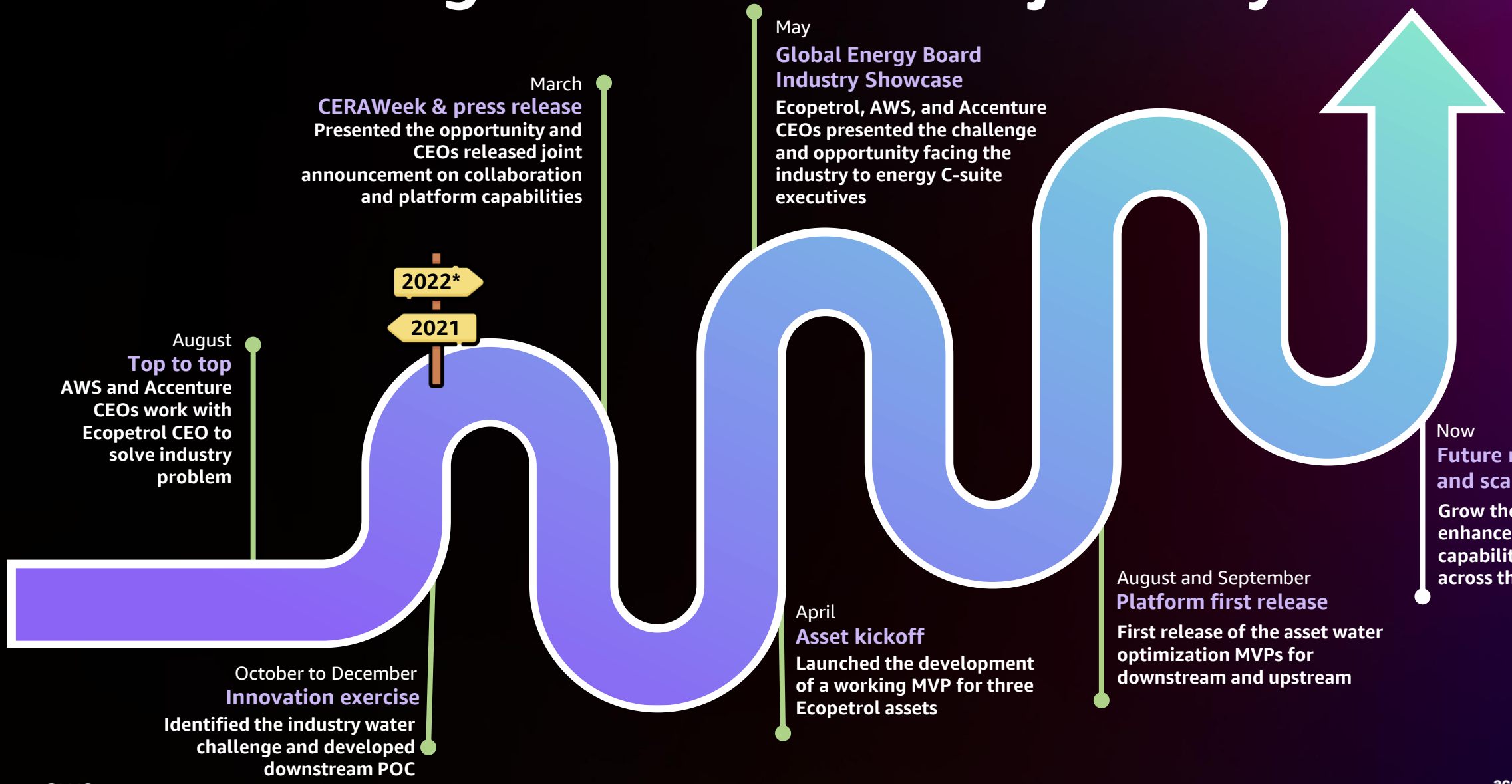
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Water Management Platform journey



August
Top to top
AWS and Accenture CEOs work with Ecopetrol CEO to solve industry problem

October to December
Innovation exercise
Identified the industry water challenge and developed downstream POC

March
CERAWeek & press release
Presented the opportunity and CEOs released joint announcement on collaboration and platform capabilities

April
Asset kickoff
Launched the development of a working MVP for three Ecopetrol assets

May
Global Energy Board Industry Showcase
Ecopetrol, AWS, and Accenture CEOs presented the challenge and opportunity facing the industry to energy C-suite executives

August and September
Platform first release
First release of the asset water optimization MVPs for downstream and upstream

Now
Future release and scale
Grow the solution to enhance current capabilities and scale across the industry

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Water Management Platform

Now | Opportunity | In consideration

Visualize*	Water value map	Water parameters	Historical trends	Key performance indicators	Insights and actions	What if scenarios	Optimization risks and alerts	Goals and targets	. . .
Connect	Financial data	Operational data	ESG data	Reporting data	External influencing factors	Industry best practices (KPIs and benchmarks)	Supply and demand	Community needs and risks	Regulatory agency targets and requirements	. . .

Optimize for . . .

Optimize	**Revenue efficiencies**	**Cost efficiencies**	**Asset-level efficiency**	**Internal water efficiency**	**External alternatives for water use**	**Future scenario planning**	**Future use cases**
	Maximize income with production and secondary water revenue	Reduce operational costs for energy, transportation, and treatment of water	Find and manage bottlenecks and process efficiencies	Identify channels to reutilize treated and used water internally	Explore options to reuse and release treated and used water externally	Enable longer-term planning and decisions with prediction scenarios	
Downstream			Refinery optimization	Water recirculation	Water reuse	Weather impact	. . .
Unconventional					Treated vs. disposed water	Supply and demand planning	. . .
Conventional	Production systems	Energy consumption	Facility optimization		Water reuse	Equipment failure prediction	. . .
Other							. . .

Together, the modules drive the goals of

sustainability and water neutrality

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Thank you!

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