ESG and Produced Water Management
How to Do More with Less

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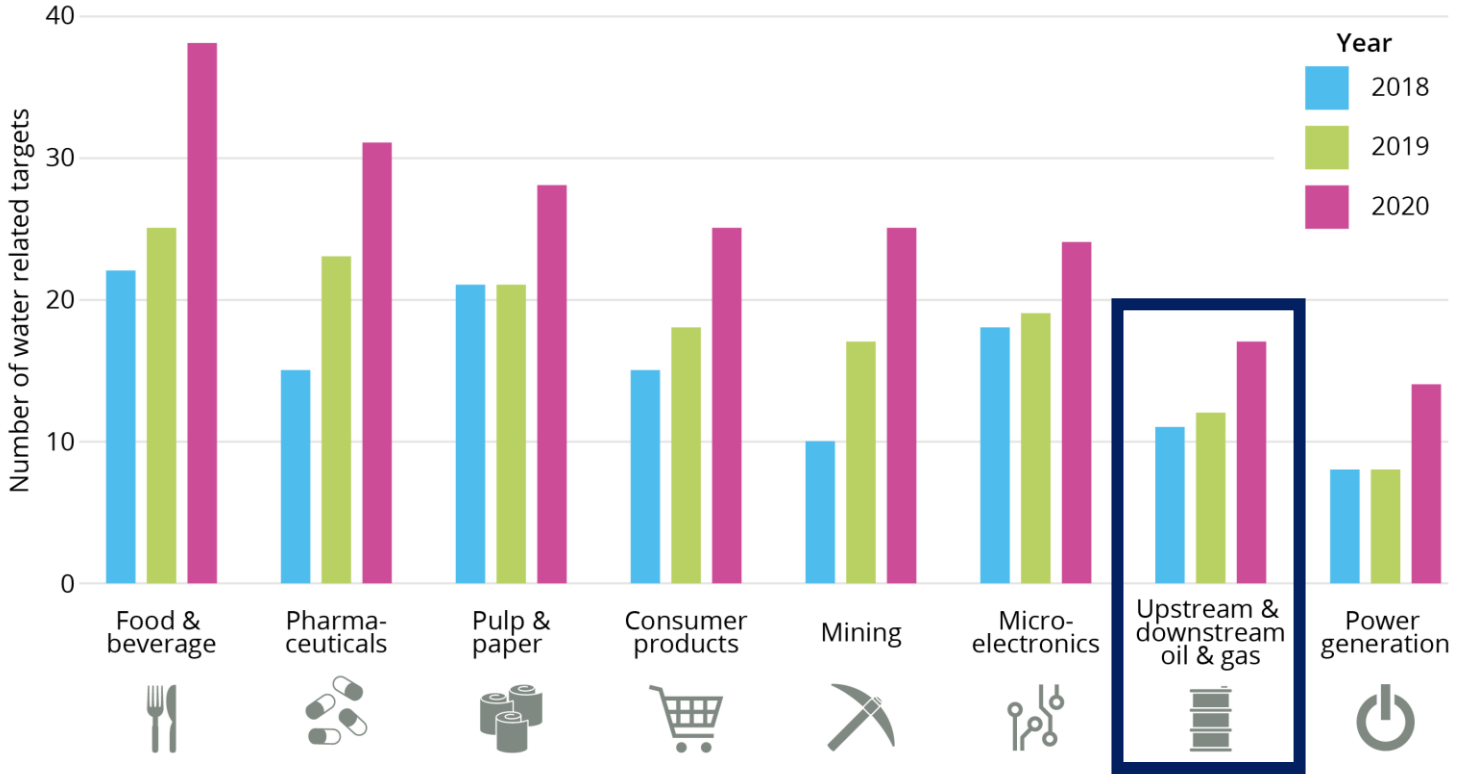
ENERFLEX

WATER SOLUTIONS

Global Water Sustainability Goals

- Continued movement toward sustainable development in all industries.
- Oil and gas industry slow to set water related sustainability goals compared to other industries.
- Huge opportunity for produced water to drive improvement in this area.



Source: GWI Water Data Industrial Sustainability Company Reports, 2021

KSA National Sustainability Goals

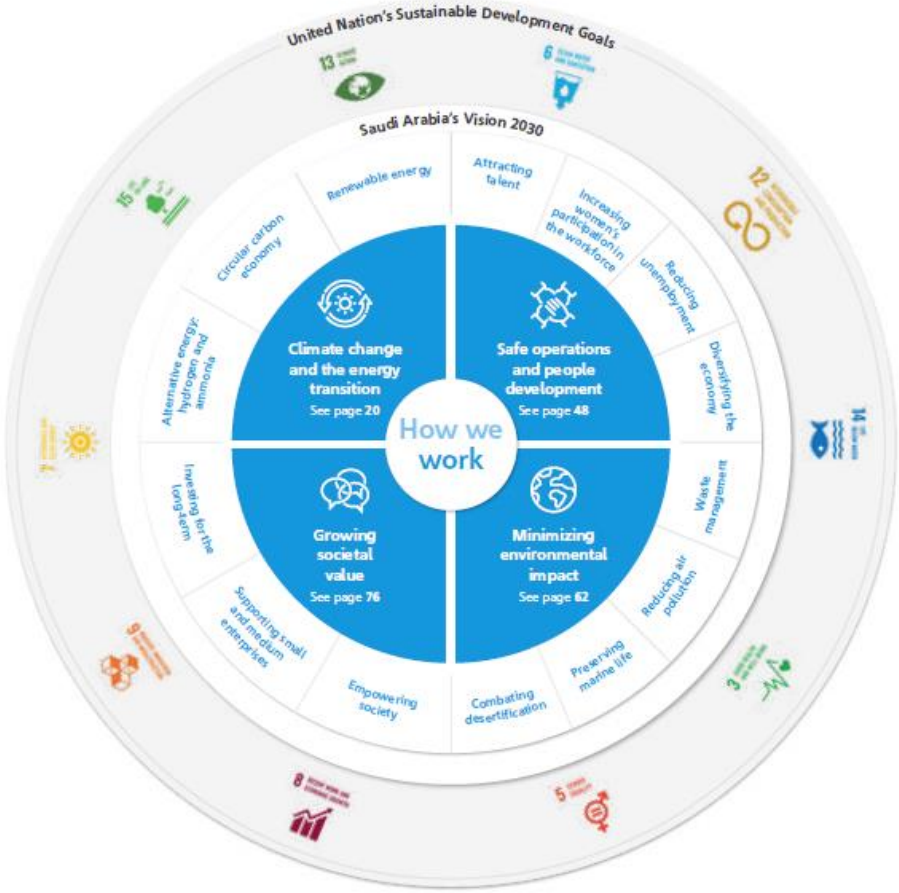
رؤيـــة VISION 2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

Kingdom of Saudi Arabia Vision 2030

Responsible economic growth
- Focus on natural gas production
- Development of a renewable energy sector

Optimize use of water resources
- Reduce consumption
- Increase use of treated and renewable sources

Move toward more public-private partnerships
- Increased opportunities for local and international businesses



Saudi Aramco Sustainability Framework

Integration of ESG Strategies

HOW?

Metrics – find your baseline

- Start with core – water, energy, waste
- Use existing frameworks
- Materiality analysis
- Pick industry recognized standards – GRI, SASB

Understand your value chain and define boundaries

Execute

- Procurement/SC, design, operations
- AI, digital twin – monitoring and reporting

WHY?

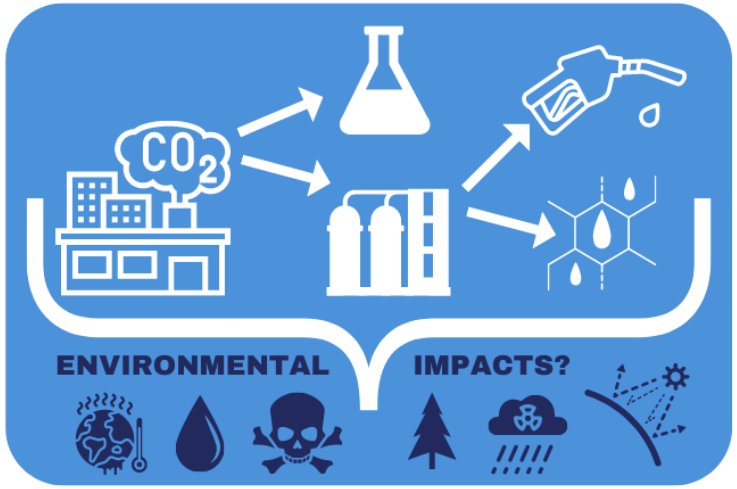
- Opens doors for strategic decision making
- Allows for optimization
- Identify risks and gaps
- Internal and external transparency for stakeholders

Material topics chosen using GRI & SASB guidelines mapped onto UN SDGs

Material Aspect	Metric	Reporting	SASB	GRI
Environmental Sustainability	GHG emissions & intensity: Scope 1 & 2	CO_2e & ratio	EM-EP-110a.1	GRI 305-1/2/4
Environmental Sustainability	Methane emissions / total GHG	ratio	EM-EP-110a.1	GRI 305-1/4
Environmental Sustainability	Flaring volume	CO_2e	EM-EP-110a.2	GRI 305-1/5
Environmental Sustainability	Flared volume/production (Mcf/BOE)	ratio	EM-EP-110a.2	GRI 302-3
Environmental Sustainability	Volume spilled / total produced liquid	ratio	EM-EP-160a.2	GRI 306-3
Environmental Sustainability	Gaseous emissions - other	kg	EM-EP-120a.1	GRI 305-7
Energy Management	Energy consumption: Scope 1 & 2	kJ	EM-SV-110a.1	GRI 302-1/2
Energy Management	Vehicles required on site	GJ	EM-SV-110a.1	GRI 305-1
Water Management	Reject/waste water volumes	MT	EM-EP-140a.2	GRI 303-4
Water Management	Recycle/reuse and treatment volumes	Bbl./day	EM-EP-140a.2	GRI 301-2
Water Management	Recovered oil volumes	bbl/day	EM-EP-140a.2	GRI 301-3
Water Management	Fresh water use	ML	EM-SV-140a.1	GRI 303-3
Technical Innovation	Chemical additive amounts	L or kg	N/A	GRI 301-1
Technical Innovation	Plant footprint, equipment, and instrumentation	CO_2e	IF-EN-160a.2 & IF-EN-410a.2	GRI 302-4

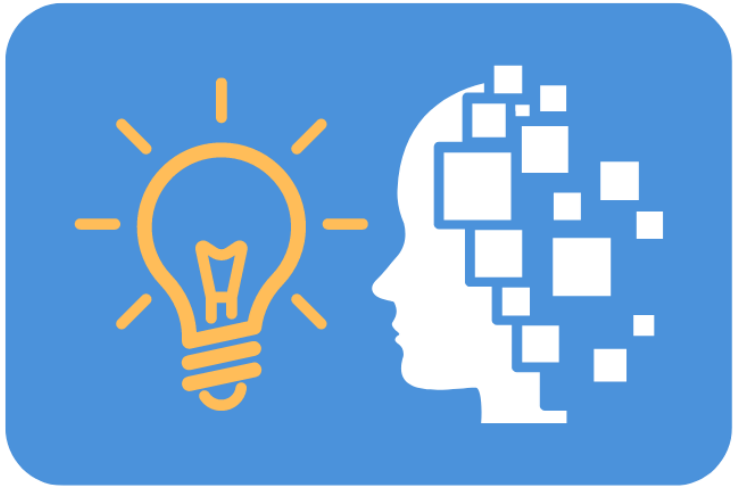
Challenges Faced with the Incorporation of ESG Strategies

Tangible Measuring & Standardized Frameworks



Premium to pay for "ESG" Solutions

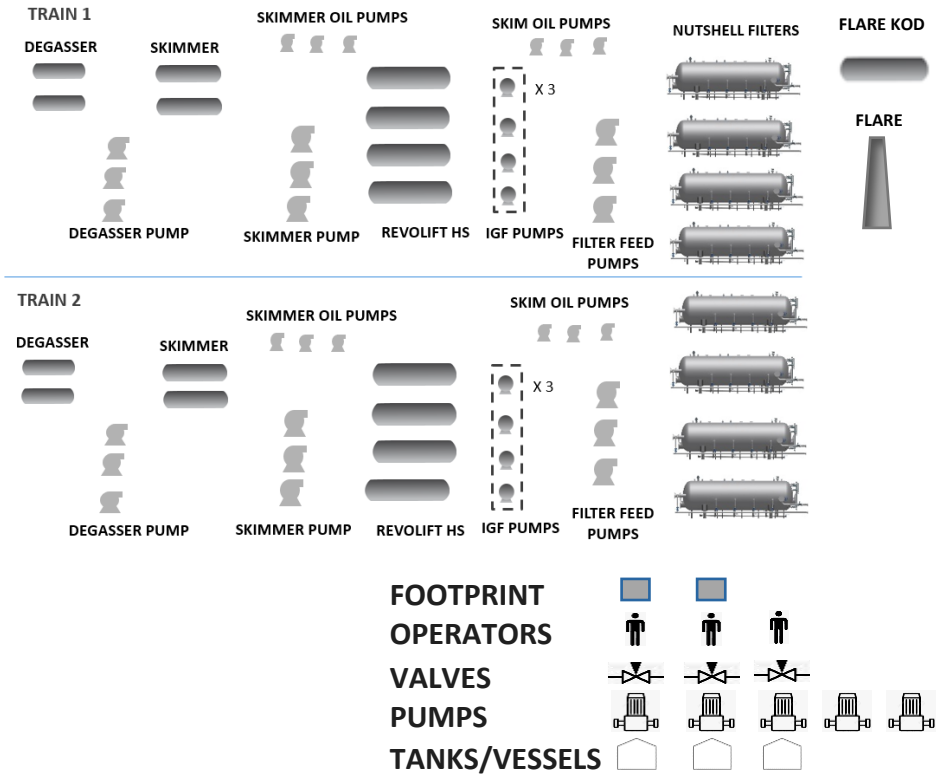
Greenwashing



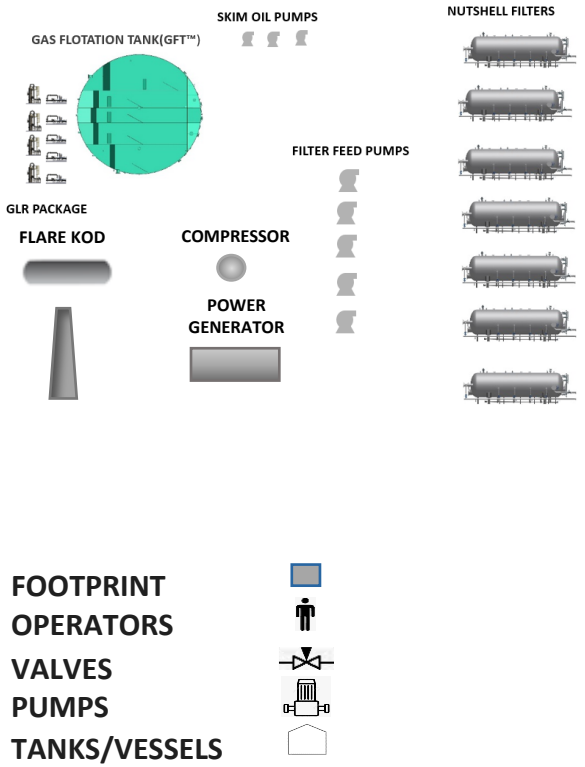
Shifting Mindsets

ESG Integrated to Design – Do More with Less

TRADITIONAL SOLUTION



INNOVATIVE SOLUTION



>40% Reduction In **Footprint**

~60% Reduction In **Power Used**

~35% Reduction In **Tonnes of CO_2e**

~30% Reduction In **Chemicals Used**

~60% Reduction In **Major Equipment**

~60% Reduction In **Steel Tonnage**

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Based on flow rate of 650,000 BPD competitive analysis and public domain industry benchmarks for carbon lifecycle metrics. For simplicity, vent & flare gas lines & auxiliaries are not shown.
Sources used: Science Daily, Bellona Org, Carbon Independent

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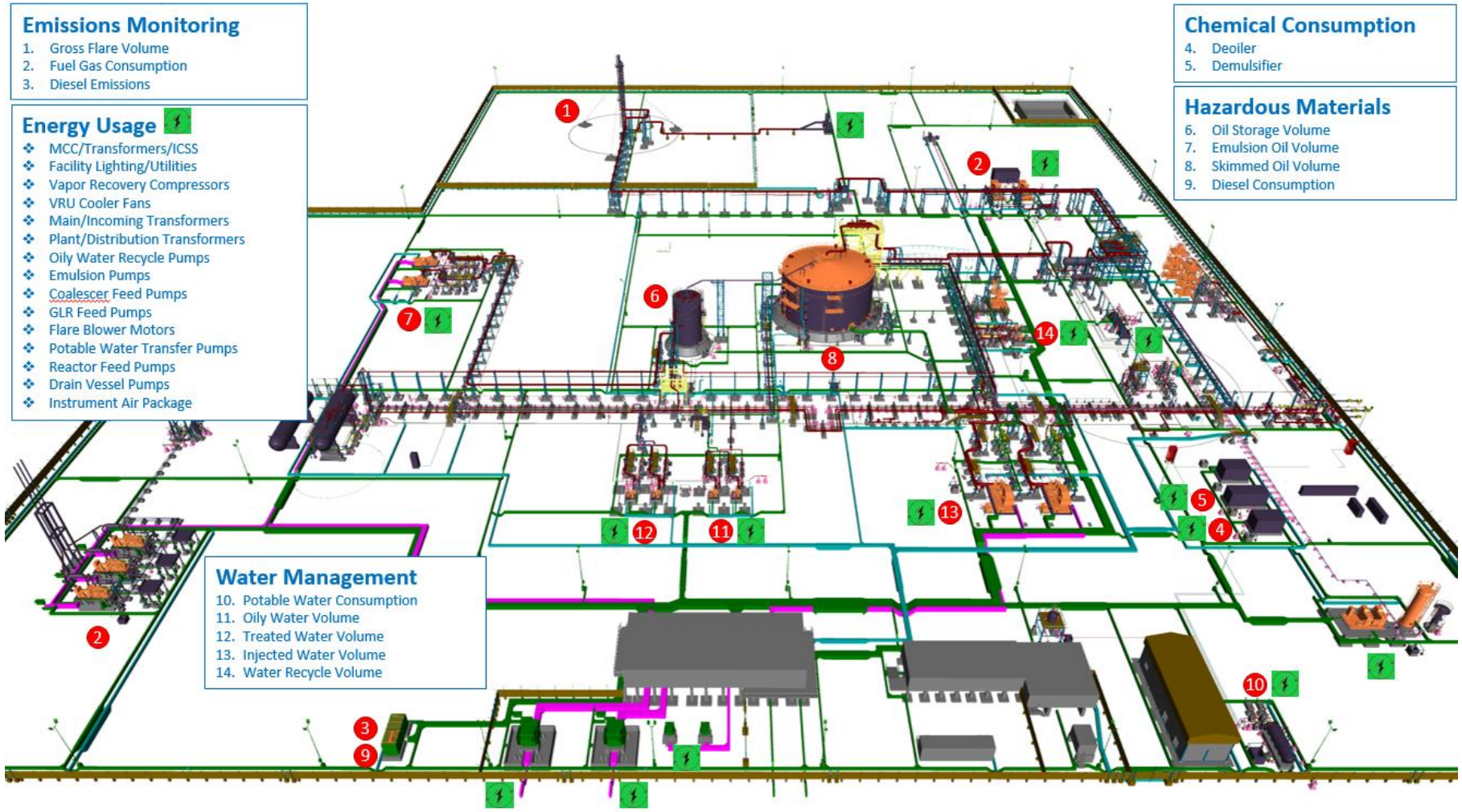
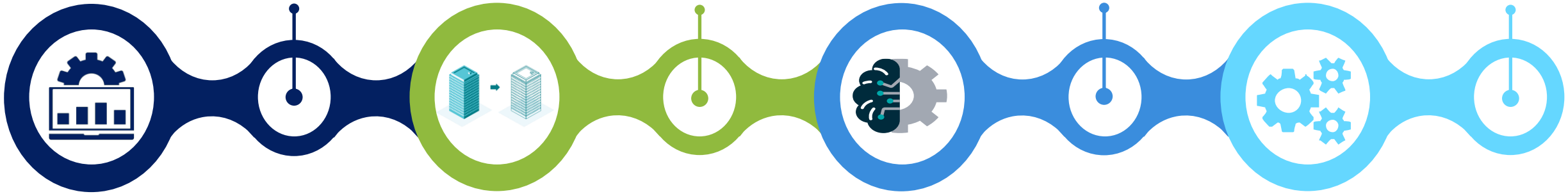
ESG Integrated to Operations: Data Collection and Monitoring



Implementation of Digitalization Solutions

- Implementation of Data Monitoring System and Basic Data Analytics
- Creation and Implementation of Digital Twin
- Artificial Intelligence and Machine Learning
- Continuous System Improvement and Maintenance

PHASE I **PHASE II** **PHASE III** **PHASE IV**



Automation

- More data of higher quality

Real-time visualization

- Continual process optimization

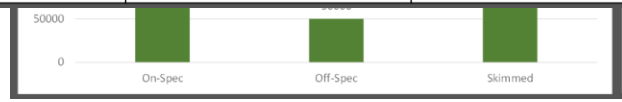
- Faster interpretation
- Easier reporting
- Fewer errors
- Less down-time

Real-Time Dashboard

OVERVIEW | SCOPE 1 EMISSIONS | SCOPE 2 EMISSIONS | REPORTING | SASB | GRI

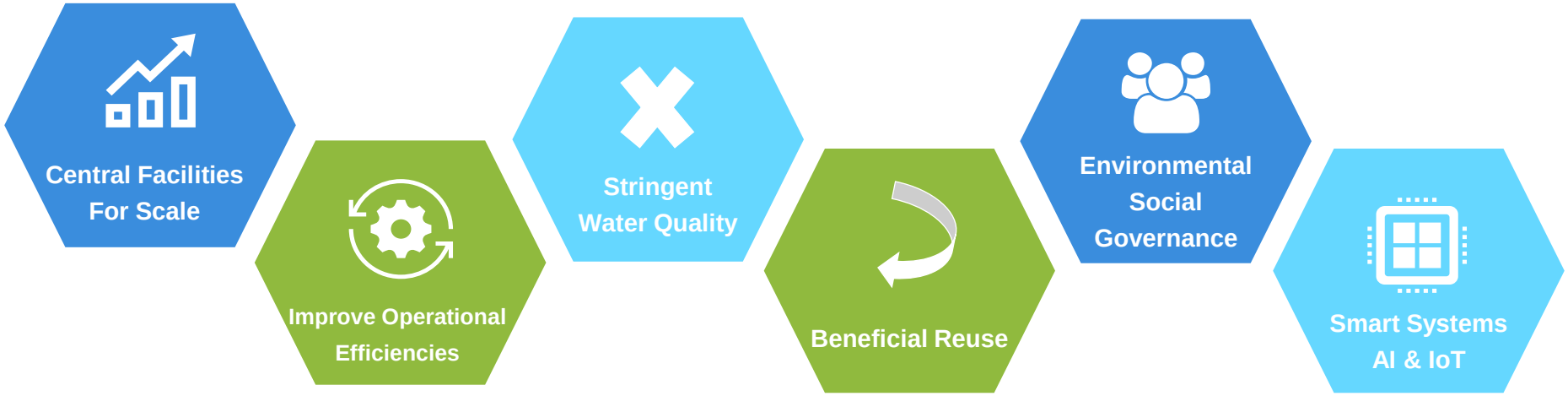
SASB REPORTING

CATEGORY	DIRECTIVE	DESCRIPTION	DATA	UNITS
OPERATIONS - GENERAL EMISSIONS	EM-EP-110a.1&2	GREENHOUSE GAS EMISSIONS – SCOPE 1	10000	mt CO2e
	EM-EP-110a.1	GREENHOUSE GAS INTENSITY – SCOPE 1	200	ratio
	EM-EP-110a.1	METHANE EMISSIONS – SCOPE 1	XXXX	ratio
	EM-EP-120a.1	GASEOUS EMISSIONS – OTHER	XXXX	mt
	EM-EP-110a.1&2	PUMPS – ENERGY CONSUMPTION	XXXX	mt CO2e
	EM-EP-110a.1	DIESEL FUEL CONSUMPTION	XXXX	mt CO2e
	EM-EP-120a.1	N2 GAS CONSUMPTION	XXXX	mt CO2e
	EM-EP-110a.1&2	FUEL GAS CONSUMPTION	XXXX	mt CO2e
	EM-SV-110a.1	ENERGY CONSUMPTION	XXXX	mt CO2e
	EM-EP-140a.2	PROCESS WASTE GENERATED	XXXX	mt CO2e
	EM-EP-140a.2	CONSUMABLES WASTE GENERATED	XXXX	mt CO2e
	EM-EP-140a.2	SANITARY WASTE GENERATED	XXX	mt CO2e
OPERATIONS - VEHICLE EMISSIONS	EM-EP-110a.1&2	HEAVY VEHICLE EMISSIONS	XXXX	mt CO2e
	EM-EP-110a.1&2	LOGISTICS VEHICLE EMISSIONS	XXXX	mt CO2e
	EM-EP-110a.1&2	COMMUTING VEHICLE EMISSIONS	XXXX	mt CO2e
OPERATIONS - FLARING	EM-EP-110a.2	GROSS FLARE VOLUME	200	mt CO2e
	EM-EP-110a.2	CAPTURED FLARE GAS	XXXX	mt CO2e
	EM-EP-110a.2	% GAS FLARED PER Mcf of GAS PRODUCED	XXXX	ratio
	EM-EP-110a.2	VOLUME GAS FLARED PER BOE PRODUCED	XXXX	ratio
OPERATIONS - WATER MANAGEMENT	EM-EP-140a.1	FRESH WATER USAGE	250000	m3
	EM-EP-140a.2	TREATED WATER VOLUME	675000	m3
	EM-EP-140a.2	REJECT/WASTE WATER VOLUME	20000	m3
	EM-EP-110a.2	OFF-SPEC VOLUME	2000	m3
	EM-EP-110a.2	WASTE RECYCLE VOLUME	50000	m3
	EM-EP-110a.2	CHEMICAL VOLUME	200	L
OPERATIONS - SAFETY	EM-EP-320a.1	SAFETY TRAINING	0	avg hrs
	EM-EP-320a.1	NEAR MISSES	0	#
	EM-EP-320a.1	WORK RELATED FATALITIES	0	#
	EM-EP-320a.1	TOTAL RECORDABLE INJURIES (RI)	0	#
	EM-EP-320a.1	LOST TIME INJURIES (LTI)	0	#
	EM-EP-320a.1	TOTAL RECORDABLE INJURY FREQUENCY RATE (TRIR)	0.2	RI/200K HRS
	EM-EP-320a.1	LOST TIME INJURY FREQUENCY RATE (LTIR)	0.1	RI/200K HRS
	EM-EP-320a.2	HSSE RECORDS AND SAFETY CULTURE	95	% emp trained



Closing Remarks

- ESG is here to stay – growing need towards tangible and auditable metrics.
- Parties need to work together to create a sustainable means of Produced Water Treatment for the future.

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