CCUS and Low Carbon Fuels

11 – 12 March 2025 | Tokyo, Japan

Decarbonizing Indonesia's Upstream: Zero Routine Flaring Initiative

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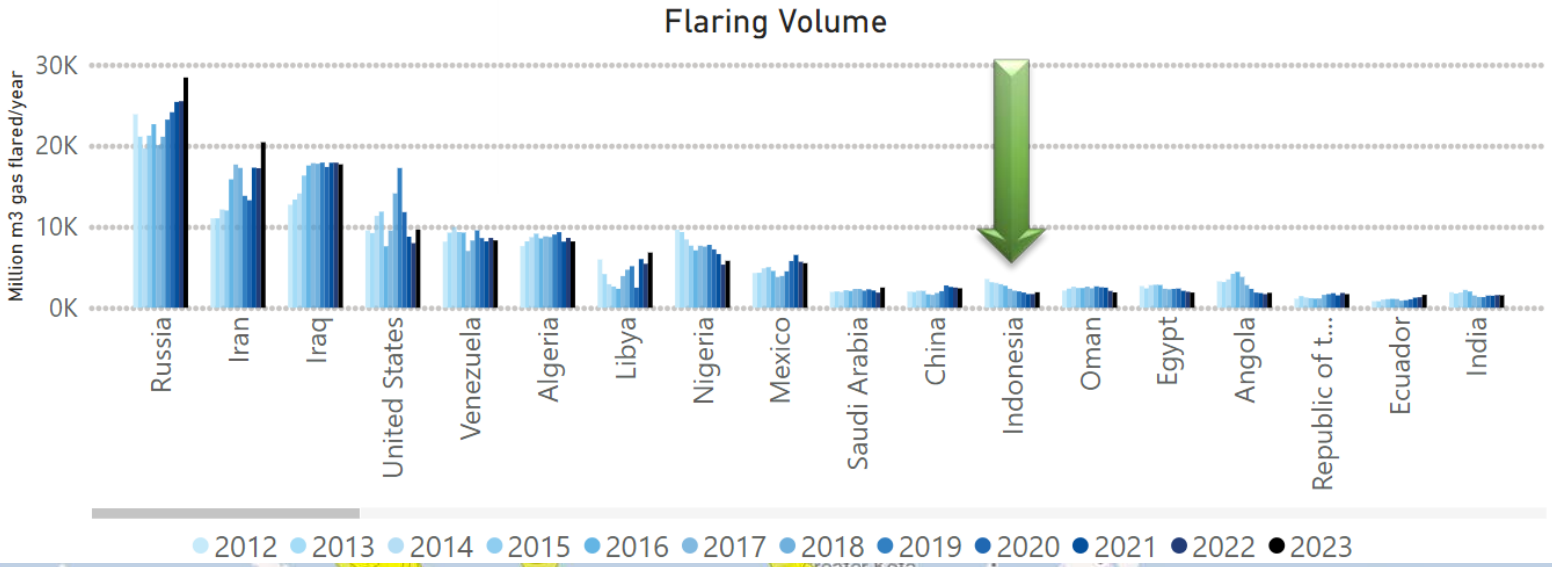
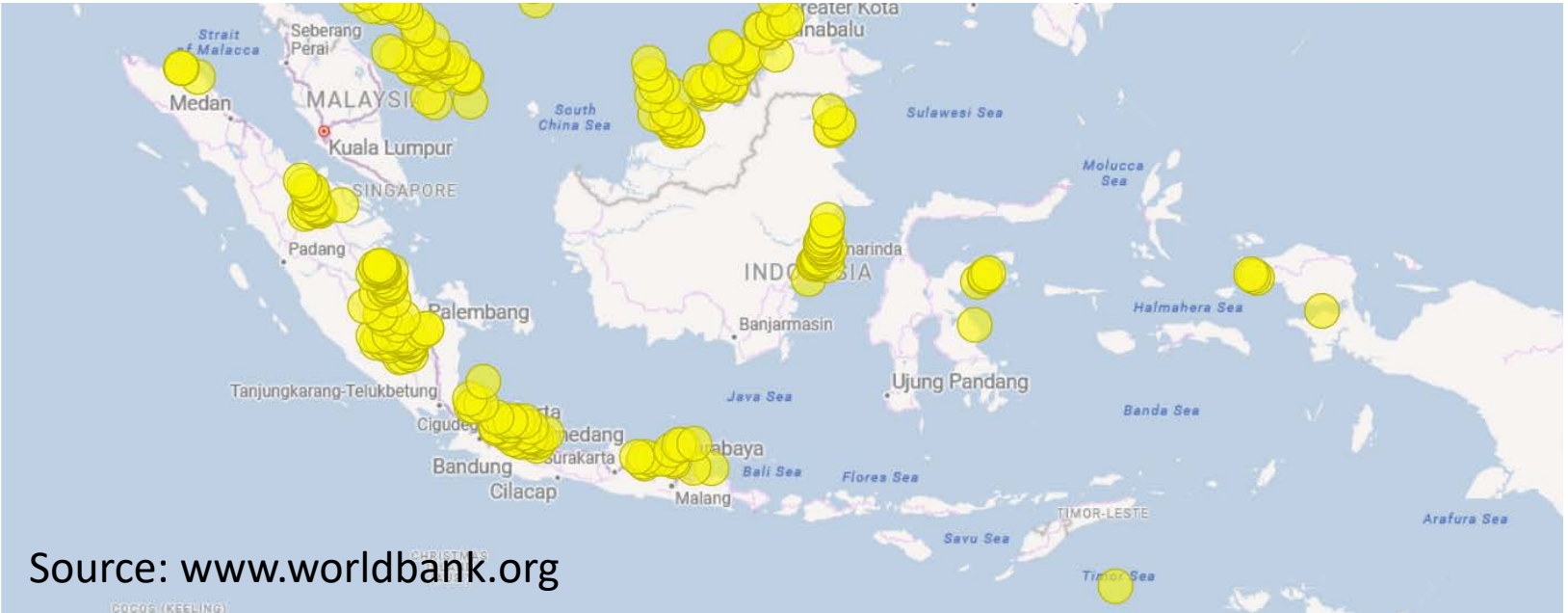
PT. Pertamina Hulu Energi

Outline

- Background and Significance
- Zero Routine Flaring Initiative: Goals and Scope
- Challenges and Opportunities
- Decarbonization Strategies
- Conclusion and Path Forward

Background and Significance





Source: www.worldbank.org

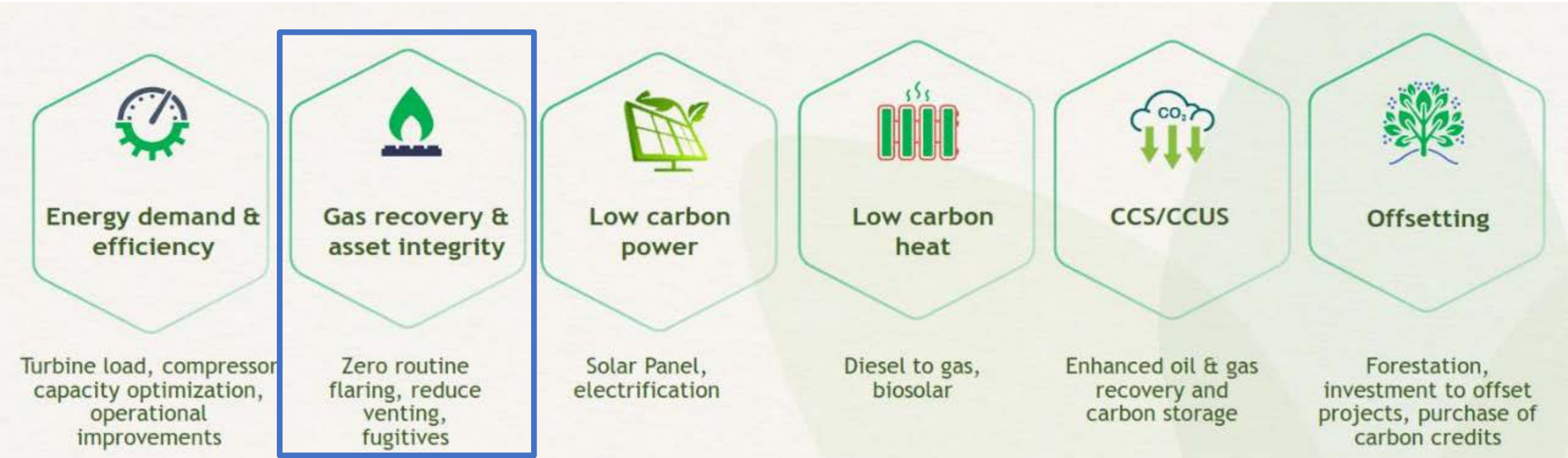
- Indonesia is one of the largest contributors to greenhouse gas emissions from routine flaring.
- Routine flaring wastes energy resources and exacerbates climate change.
- The government has committed to eliminating routine flaring in the upstream sector by 2030.
- As the state-owned oil and gas company, PHE plays a central role in this initiative.

Zero Routine Flaring Initiative

Goal: Achieve zero routine flaring in Indonesia's upstream oil and gas sector by 2030

Scope: Focuses on flaring reduction, energy efficiency, and decarbonization

Significance: Aligns with Indonesia's low-carbon economy goals and global climate commitments



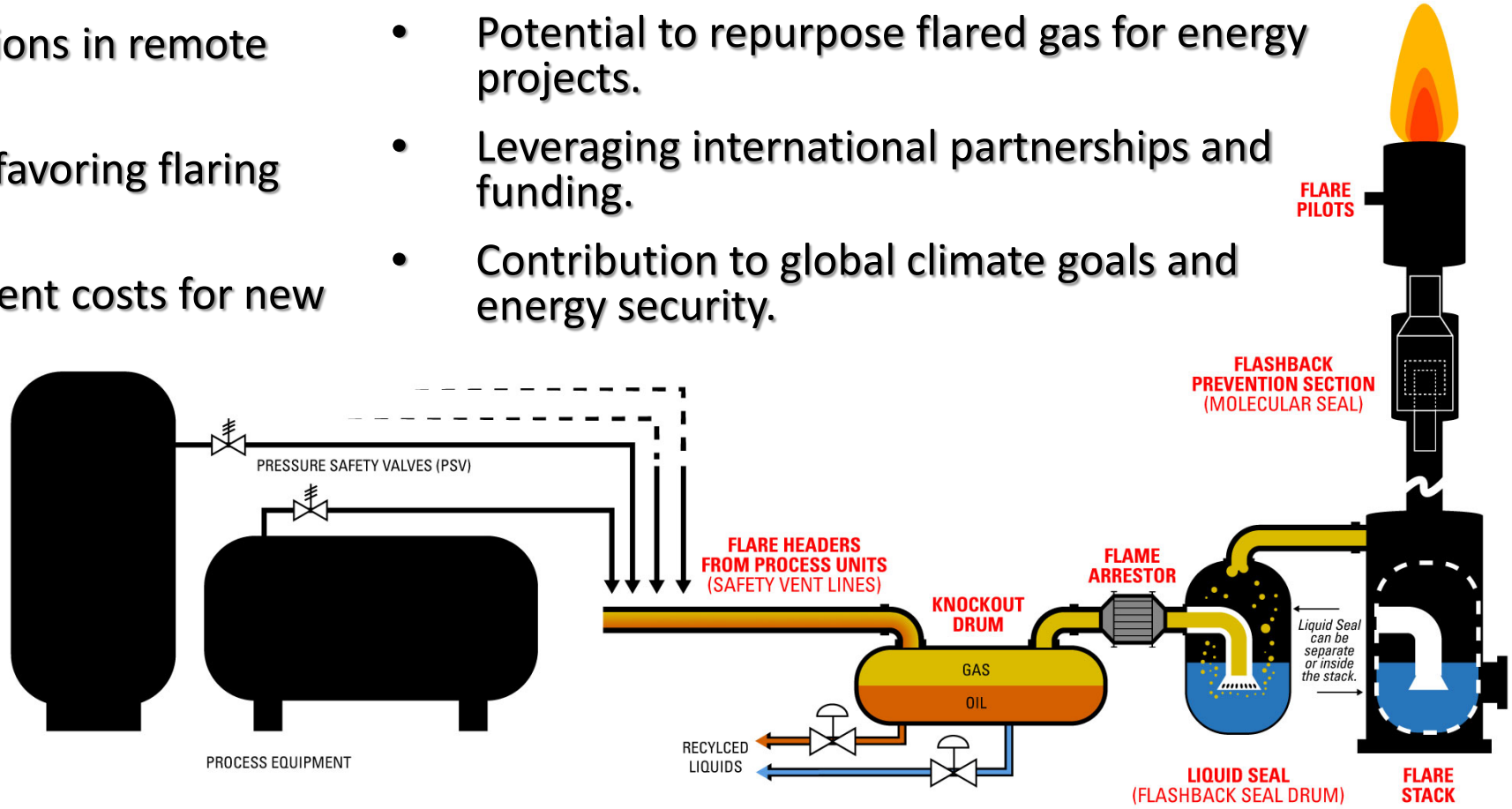
Challenges and Opportunities

Challenges:

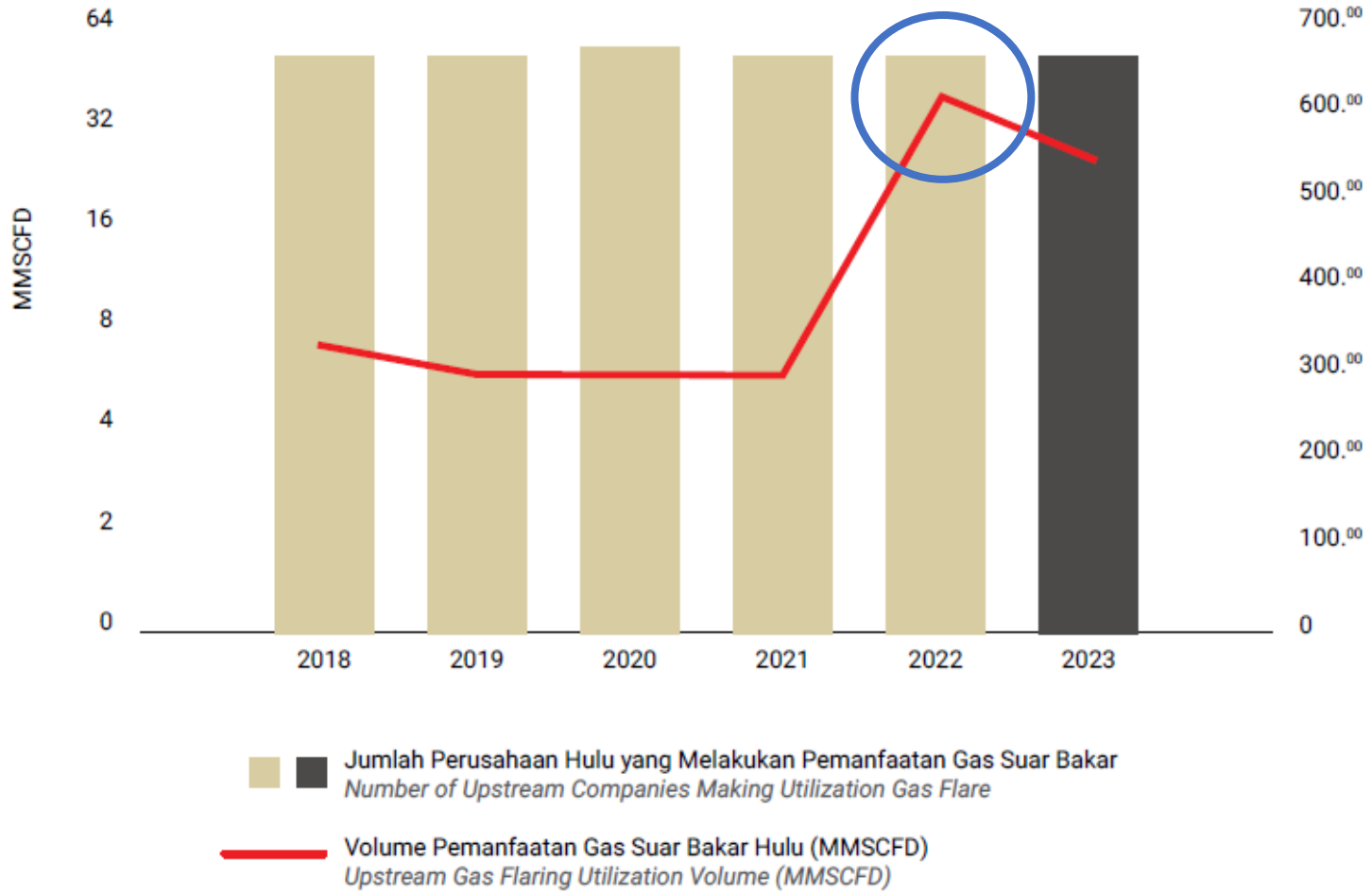
- Infrastructure limitations in remote areas.
- Economic incentives favoring flaring over gas utilization.
- High upfront investment costs for new technologies.

Opportunities:

- Potential to repurpose flared gas for energy projects.
- Leveraging international partnerships and funding.
- Contribution to global climate goals and energy security.



Utilization of Upstream Oil & Gas Flare in Indonesia



- Government policies that support the monetization of flared gas:
  - Allocation, Utilization, and Price of Flare Gas in Upstream Oil & Gas
  - Implementation of Flare Gas Management in Oil & Gas
- High demand from the industrial sector

Source: Directorate General Oil & Gas of Indonesia

Indonesia's Regulation for Flare Gas Management

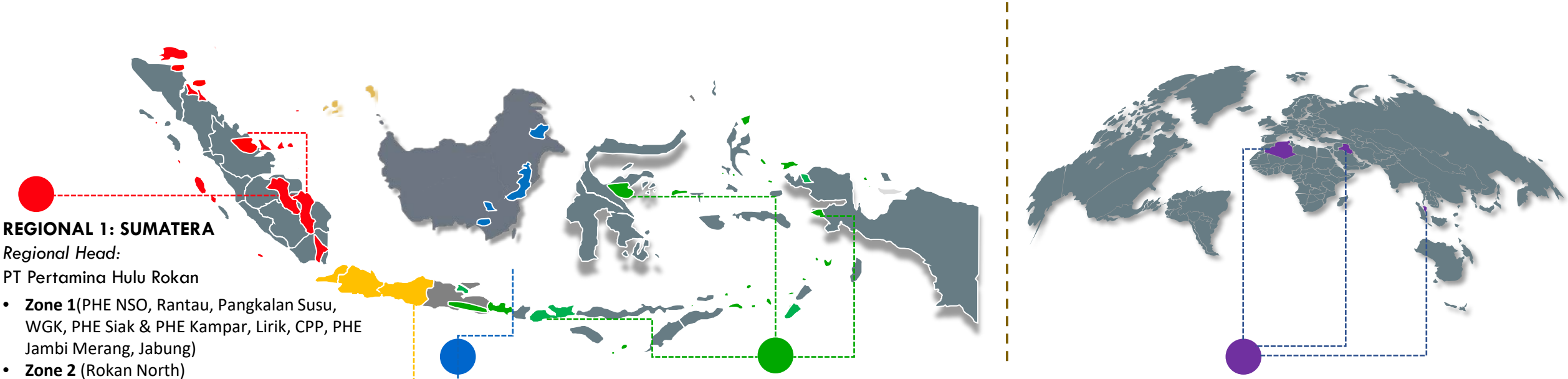
Routine | Safety | Non-Routine | Emergency | Pollutant | Fuel for Polluted gas | Commercial Issue

Minister Decree ESDM No.17 Tahun 2021

Lapangan ...	Lokasi	Jenis Lapangan	Fasilitas Produksi	Koordinat *Flare Stack*		Produksi		Reinjeksi	Pemanfaatan		Pembakaran Gas Suar							Kompo-sisi Gas Suar	Keterangan
				LS	BT	Minyak	Gas				Rutin	Kesela-matan	Non Rutin	Darurat	Pengotor	Tambahan Fuel Pembakaran Gas Pengotor	Terken dala Komers ialisasi		
						(BOPD)	(MMSCFD)	(MMSCFD)	(MMSCFD)	Perunt ukan	(MMSCFD)	(MMSCFD)	(MMSCFD)	(MMSCFD)	(MMSCFD)	(MMSCFD)	(MMSCFD)		
Lap A	*Onshore/ Offshore*	Minyak/ Gas	*GS A*	*LS1*	*BT1*														
				LS2	*BT2*														
				LS3	*BT3*														
			GS B																

Subholding Upstream Pertamina

(PT. Pertamina Hulu Energi – PHE)



REGIONAL 1: SUMATERA

Regional Head:

PT Pertamina Hulu Rokan

- **Zone 1**(PHE NSO, Rantau, Pangkalan Susu, WGK, PHE Siak & PHE Kampar, Lirik, CPP, PHE Jambi Merang, Jabung)
- **Zone 2** (Rokan North)
- **Zone 3** (Rokan South)
- **Zone 4** (PHE OK & PHE RT, Ramba,Corridor, Prabumulih, Limau, Pendopo, Adera)

REGIONAL 2: JAWA

Regional Head:

PT Pertamina EP

- **Zone 5** (PHE ONWJ*, PHE Abar/Anggursi)
- **Zone 6** (PHE OSES*)
- **Zone 7** (Tambun, Subang, Jatibarang, East Natuna, Block A - Natuna Sea)

REGIONAL 3: KALIMANTAN

Regional Head:

PT Pertamina Hulu Indonesia

- **Zone 8** (PHM*, PHWG, East Sepinggan)
- **Zone 9** (PHSS, Sangatta, Sanga sanga, Maratua, Tanjung)
- **Zone 10** (PHKT*, Bunyu, Tarakan, PHE Nunukan, East Ambalat, Simenggaris, Bukat)

REGIONAL 4: EAST JAVA & EAST INDONESIA

Regional Head:

PT Pertamina EP Cepu

- **Zone 11** (ADK, Cepu, PHE WMO*, PHE TEJ & PHE Randugunting, Sukowati, Poleng)
- **Zone 12** (JTB, Banyu Urip)
- **Zone 13** (Donggi Matindok, Senoro Tolili, Makassar Strait)
- **Zone 14** (Papua, Salawati, Babar Selaru, Semai II)

AP Services:

- PT Elnusa
- PT Patra Drilling Service Indonesia
- PT Badak LNG

REGIONAL 5: OVERSEAS

Regional Head:

PT Pertamina International EP

- **Zone 15** (Algeria: MLN)
- **Zone 16** (Iraq: West Qurma)
- **Zone 17** (Malaysia: SK309, SK311, SK314A, Blok K, Block H)

Pertamina Upstream Decarbonization Strategies

Gas Utilization Projects (Business Development or Non-BD):

- Capture and utilize associated gas through:
  - Enhanced oil recovery (EOR) via gas reinjection.
  - Pipeline infrastructure development.
  - Small-scale LNG plants for remote areas.

Technology Adoption:

- Advanced flare gas recovery systems.
- Real-time flare monitoring and optimization.

Renewable Energy Integration:

- Expand green power sources across operations.
- Support national renewable energy targets.

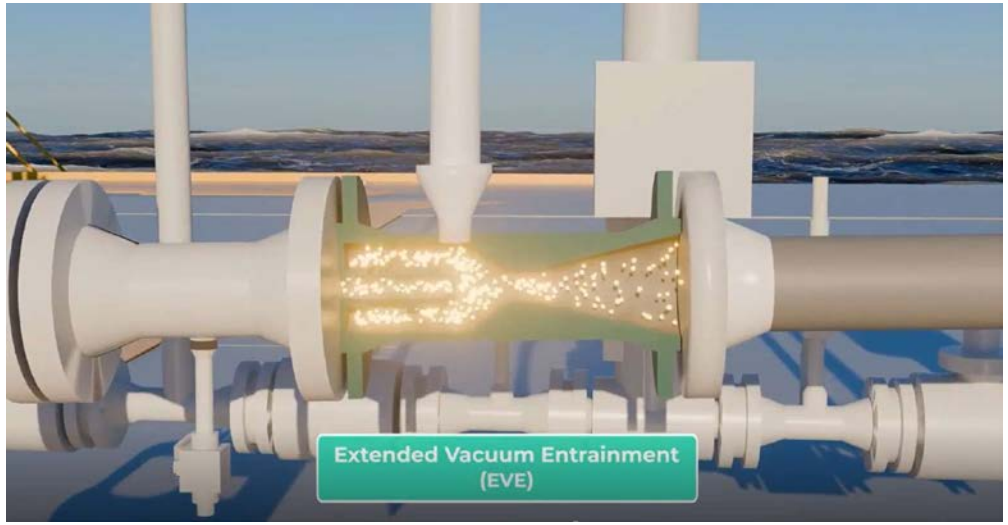
Technology	Utilization	Status
Mini gas compressor	Zulu Field (Region 2) Sindang Field (Region 2) Karangan Field (Region 1)	Onstream (2017) Onstream (2023) Onstream (2024)
VRU	Rokan Field (Region 1)	Onstream (2023)
Ejector	Bravo Field (Region 2) Echo Field (Region 2) Cinta Field (Region 2)	Onstream (2023) Onstream (2023) Onstream (2023)
Gas to wire	Rokan Field (Region 1)	Trial (2025)
CNG	Simpang Field (Region 1)	Preparation
Micro LNG	Jambi Field (Region 1)	Pre Conceptual Study

Extended Vacuum Entrainment (EVE) Ejector

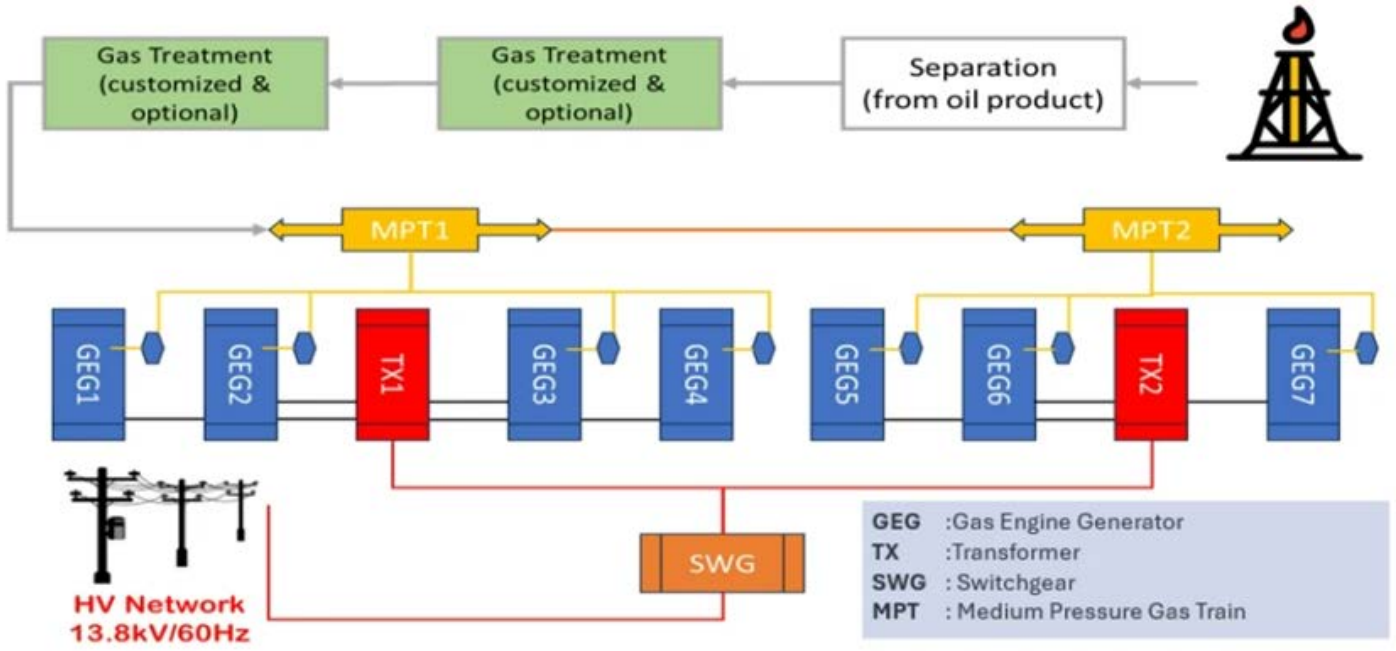
The **Extended Vacuum Entrainment (EVE) Ejector** implemented in **Pertamina Hulu Energi ONWJ** works based on the **Venturi effect** to optimize gas production and reduce emissions. First implementation in 2023 (Bravo Field).

Basic Working Principle

- ✓ The EVE Ejector is a type of **gas ejector** that uses **high-pressure gas (motive gas)** to entrain and compress **low-pressure gas (suction gas)**.
- ✓ It relies on the **pressure differential** between these two gas streams to generate a **vacuum effect**, allowing low-pressure gas to be recovered instead of being flared.



Microturbine – Flare Gas To Power Schematic Diagram

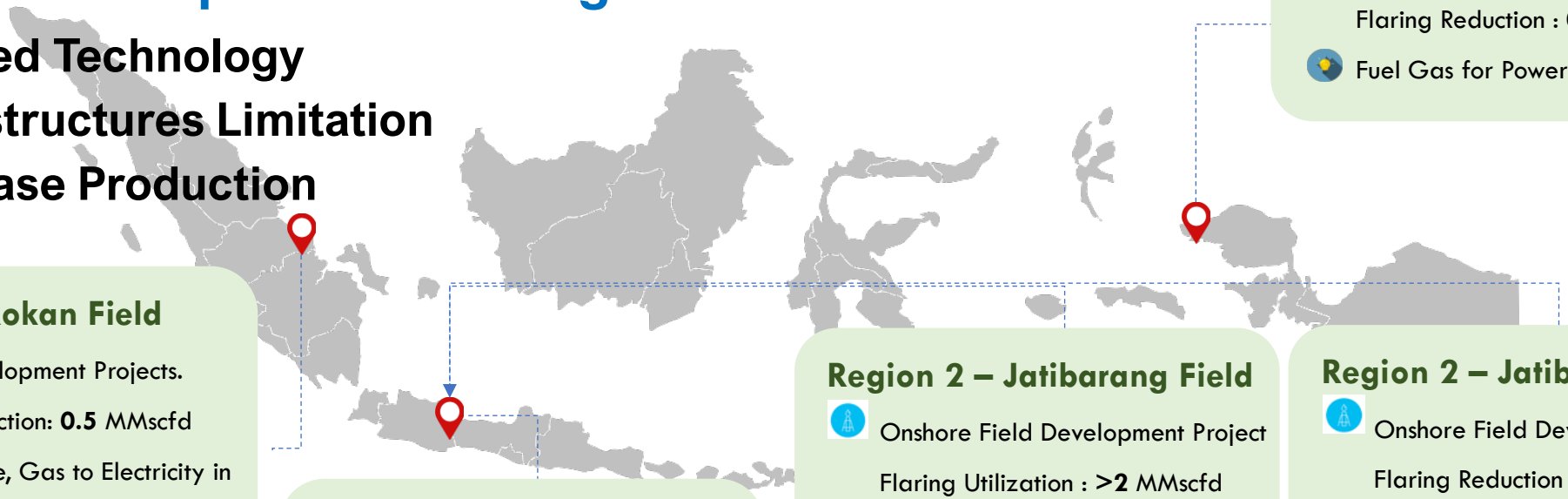


PARAMETERS	VALUE
Duration	60 Weeks
Running Hours of Operation/Day	24 Hrs/day
Power Installed Capacity	4 MW
System Voltage	13.8 kV
System frequency	60 Hz
Power Factor at the package take off point	0.9pf lag to unity
Rating	Continuous
Operating Configuration	Grid Mode at constant power and power factor (0.9 lag)
Package Application	Grid support on continues basis
Site Ambient Temperature	Max 35 °C Min 20 °C
Site Altitude	< 50 Meters
Type of Genset Considered	
Applicable site rating of the Generator Sets (kW)	700
Fuel Metering requirement	Yes
Fuel Type	APG (Associated Petroleum Gas)
Gas pressure at POC (barg)	5
No. of sets for normal operation	6
Redundancy %	16 %
Total No. of sets	7
Site Requirement	Number of Site(s) 1 Area 1800 Sq. M

ZRF in Pertamina Upstream Project Development

Project Development Challenges

- **Limited Technology**
- **Infrastructures Limitation**
- **Increase Production**



Region 1 – Rokan Field

- 8 Field Development Projects.
  Flaring Reduction: **0.5** MMscfd
- Micro Turbine, Gas to Electricity in 2027

Region 2 – Offshore NW Java Field

- Offshore Field Development Project
  Flaring Reduction : **0.6** MMscfd
- VRU cap. 2 x 0.3 MMscfd by 2026

Region 2 – Jatibarang Field

- Onshore Field Development Project
  Flaring Utilization : **>2** MMscfd
- CO2 Removal by 2025

Region 2 – Cemara Field

- Onshore Field Development Project
  Flaring Reduction: **1.1** MMscfd
- Gas Lift Compressor by 2025

Region 2 – Jatibarang Field

- Onshore Field Development Project
  Flaring Reduction : **1.3** MMscfd
- VRU by 2025

Region 4 – Salawati Field

- Onshore Field Development Project
  Flaring Reduction : **0.5** MMscfd
- Fuel Gas for Power supply by 2025

Conclusion/Summary

Key Takeaways:

- Routine flaring reduction is crucial for Indonesia's decarbonization and sustainable energy transition.
- Comprehensive strategies demonstrate commitment to achieving the Zero Routine Flaring target.
- Collaboration, investment in technology, and infrastructure development are essential for success.
- Pertamina's efforts has contributed significantly to Indonesia's low-carbon economy goals and global climate leadership.

Call to Action: Support and collaborate with industry stakeholders to accelerate the transition toward zero routine flaring.

Acknowledgment, Thank You, Questions

Acknowledgment:

Indonesian Government for policy leadership.

Pertamina's teams and partners for implementation efforts.

Thank You!

Questions are welcome.

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