Energy transition guide

Solutions for natural gas consumers

2024

Introduction

Lindsey Eby

Director,
C&I, Low Carbon,
and Cross Commodity Origination
bp

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Natural gas

can help support the transition to a low carbon energy system

Energy Outlook 2023 is focused on **three main scenarios:**

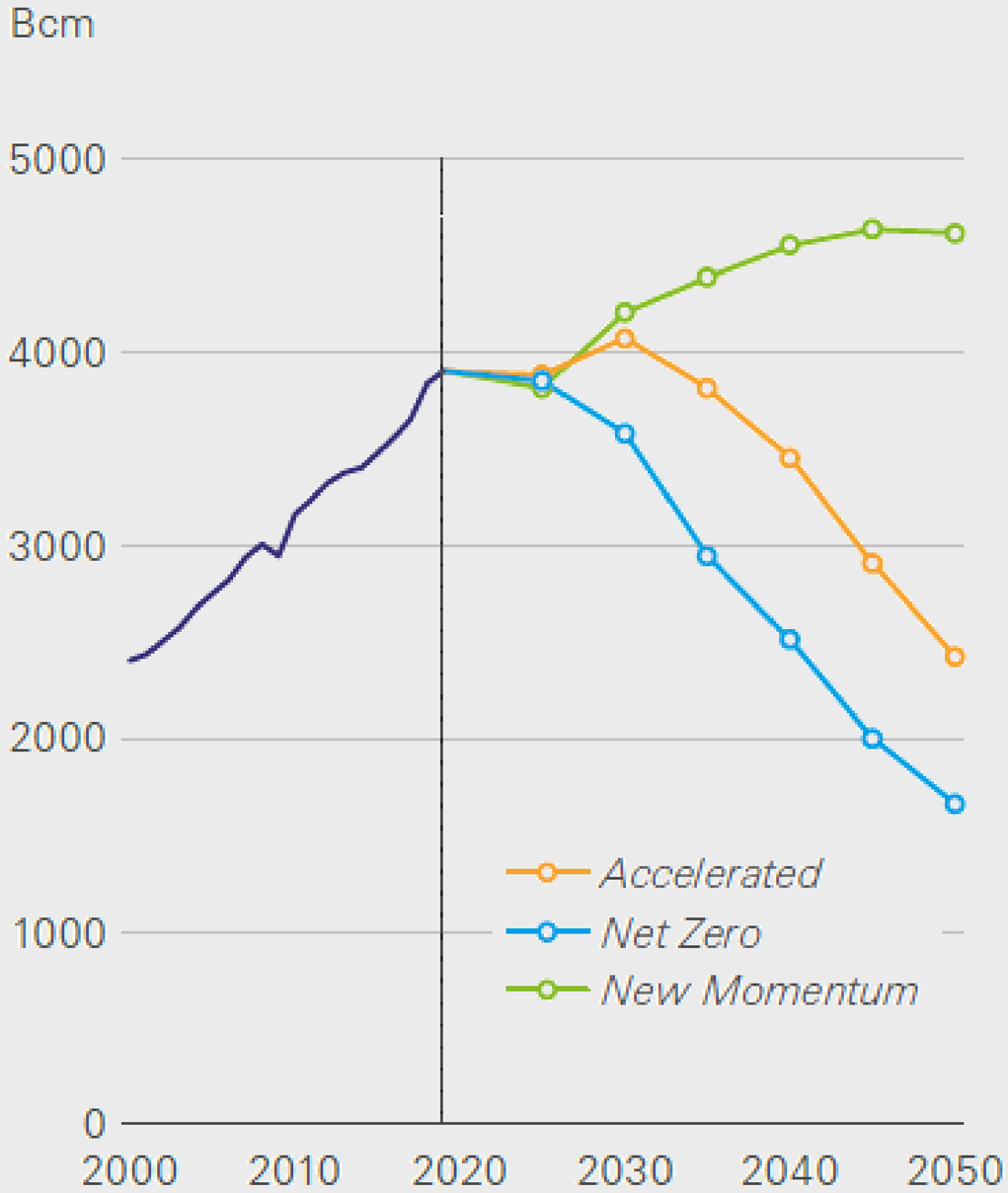
1 Accelerated

2 Net Zero

3 New Momentum

Global gas demand grows initially in all three scenarios.

Natural gas demand varies based on the speed of the energy transition



Source: bp Energy Outlook

Natural gas

can potentially play two important roles as the world transitions to a low carbon energy system

1. Increasing the speed at which fast-growing emerging economies reduce their dependency on coal.

2. Providing a source of low carbon energy when combined with carbon capture, use and storage.

Source: bp Energy Outlook

bp’s integrated energy company
strategy is deliberately designed to help on both counts:
contribute to the energy transition and **keep energy flowing today**

We have the risk management expertise and products to help you navigate the energy transition.

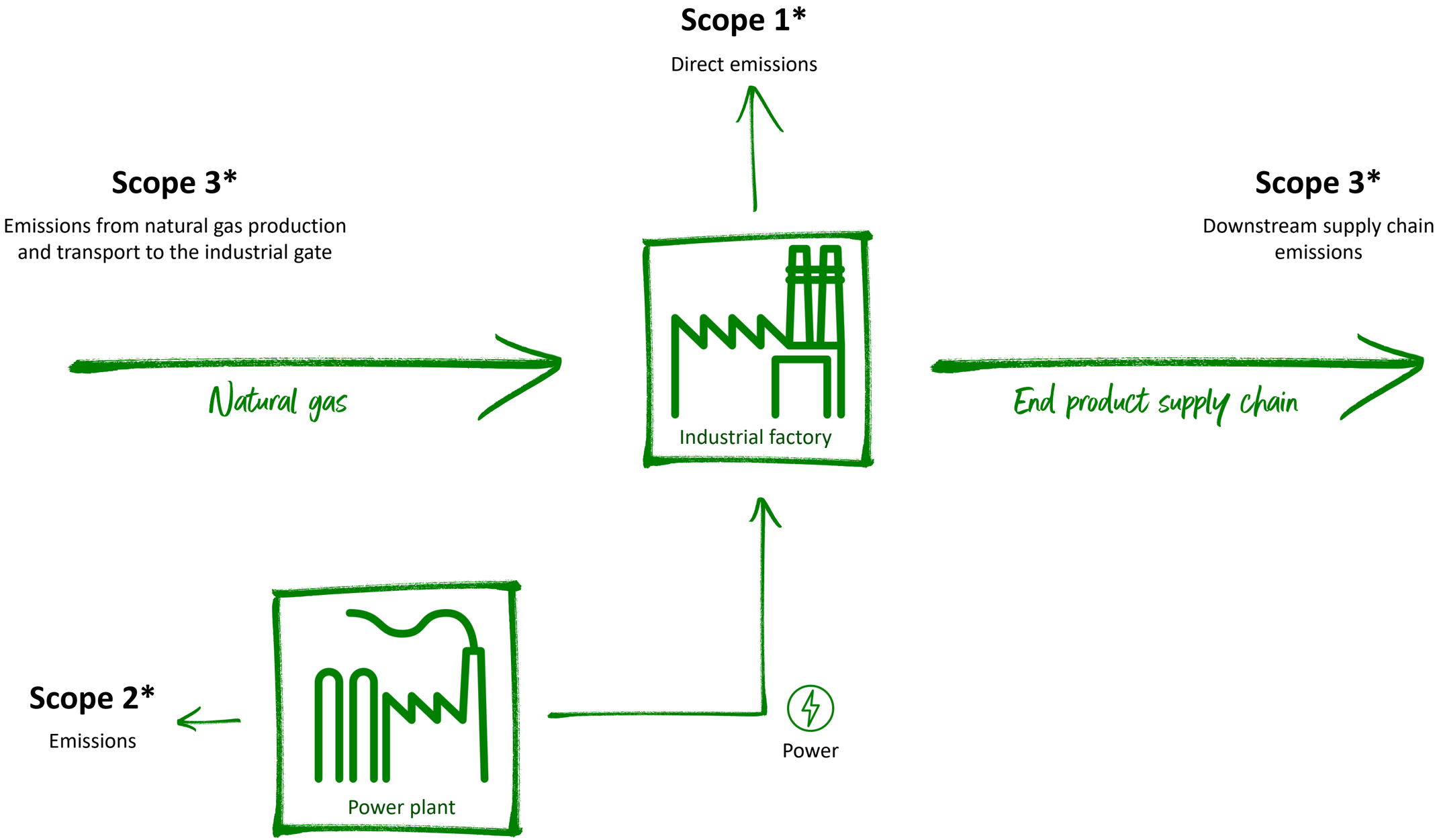
A leading supplier of **carbon offsets**, with a portfolio of **100+ projects around the world**

A leading supplier of **renewable natural gas (RNG)**

Largest **natural gas** marketer in the US

A leading marketer of **renewable energy credits (RECs)**

Award-winning Structured Solutions team—providing **energy price risk management** to third parties



*Scopes 1, 2, & 3 are represented from the perspective of the industrial factory

Mitigation hierarchy a company might use to reach net zero

The path to net zero for natural gas consumers is complex

Power consumers

Energy sources

Wind | Solar | Hydro

Path to net zero

Solutions Renewable PPAs, RECs

Supply **Readily available at scale**

Natural gas consumers

Energy sources

CONG | CtNG | RNG | CCUS | Low CI H_2

Path to net zero

Solutions RNG, CONG, Certified natural gas

Supply **Scalable bridge products** and **emerging solutions**

● Available at scale ● Expensive, scarce at scale ● Emerging solution

Natural gas consumers can start bridging the gap to net zero now.
Show stakeholders you are engaged and planning for the energy transition that is already underway.

Renewable natural gas

(RNG, Biogas)

Biogas is predominantly produced from **organic waste that would otherwise release GHG compounds into the atmosphere**—potentially creating a **negative carbon intensity fuel.**

Common sources of organic waste include **landfills**, **agricultural manure**, **food waste**, **municipal solid waste**, and **biomass**. Biogas can be upgraded to renewable natural gas (RNG) and injected directly into the gas grid.

Feedstocks → Collection/Upgrading → Distribution → Demand → Credits

Average CI ($g\ CO_2e/MJ$)[2]	
Fossil Natural Gas	80
Landfill	46
Manure	-271

Details

Under global renewable fuel programs**, biogas generates regulatory credits when consumed as a transport fuel**.

In the US and Canada, the main programs are:

- US Renewable Fuel Standard (**RFS**)
- California Low Carbon Fuel Standard (**LCFS**)
- Washington State's Clean Fuel Standard
- Oregon Clean Fuels Program
- B.C. Low Carbon Fuel Standard (**BCLCFS**)

Costs

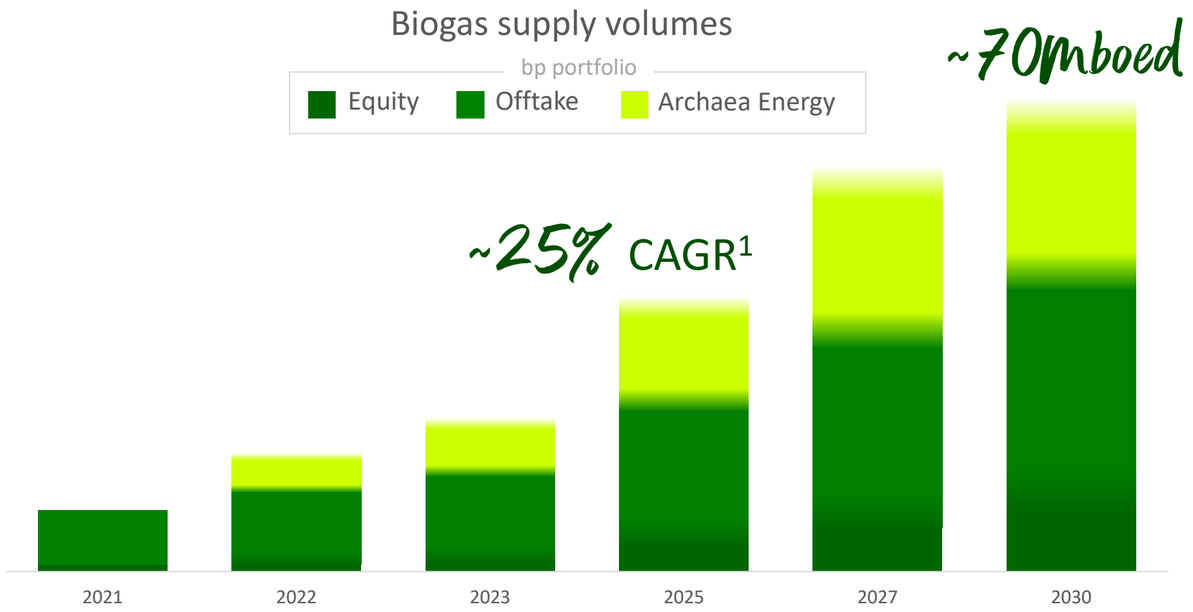
Indicative adder to natural gas commodity cost:

$18.00+ USD per mmbtu[2]

[1] Subject to relevant company sustainability framework, carbon accounting policies, among other factors. Individual projects may vary.
[2] Indicative spot adder as of September 2023. Price range reflects the range of carbon intensities associated with different sources of RNG.
[3] An Overview of Renewable Natural Gas From Biogas (EPA, July 2020) EPA 456-R-20-001; Citing CARB LCFS-Certified Pathways.

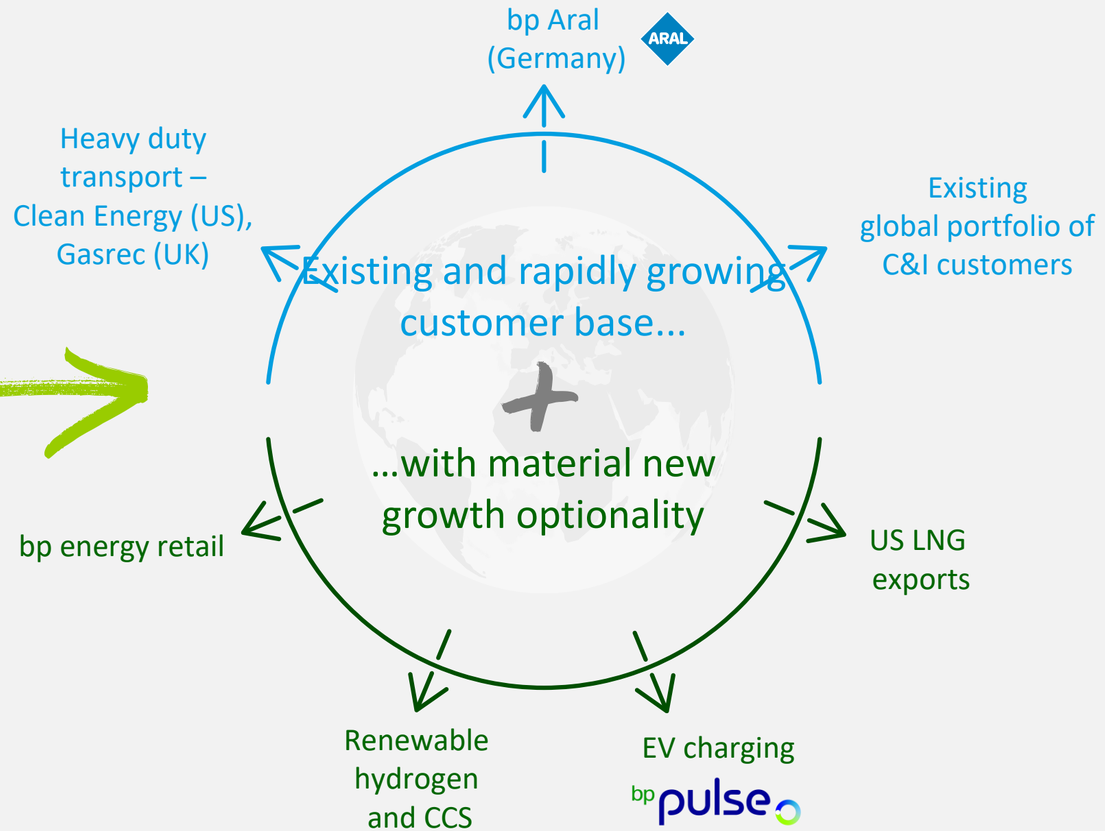
Combining to grow bp's biogas value chain

An established platform driving rateable global growth



Leading biogas supplier to US road transportation today + Archaea Energy adds significant feedstock + Multiple growth options

Rapidly growing & diversifying demand



Leveraging our World-class trading capabilities to optimise across the value chain

(1) 2021-2030

Carbon offset natural gas (CONG)

CONG is **pipeline natural gas combined with an obligation to retire voluntary carbon offsets** on behalf of a customer.

A carbon offset represents **one metric ton of CO_2 emission equivalent** that has been avoided, reduced or removed from the atmosphere

Each carbon offset project in bp's portfolio has been **verified by third-party firms** accredited under the applicable offset project standard.

Natural gas + Carbon offsets

Details

bp offsets **meet or exceed the standards** published by the listing registries to ensure they are:

- **Real** – represent GHG reductions in tons of CO2e that can reliably be estimated
- **Additional** – incremental to what would have happened without the offset
- **Verifiable** – by a qualified independent third party
- **Permanent** – any reversal should be accounted for and compensated

Costs

Indicative adder to natural gas commodity cost:

$0.25+ per mmbtu[2]

[1] Subject to relevant company sustainability framework, carbon accounting policies, among other factors
[2] Indicative spot adder as of September 2023, assuming 100% offset of the emissions associated with natural gas combustion (using EPA emission factors)

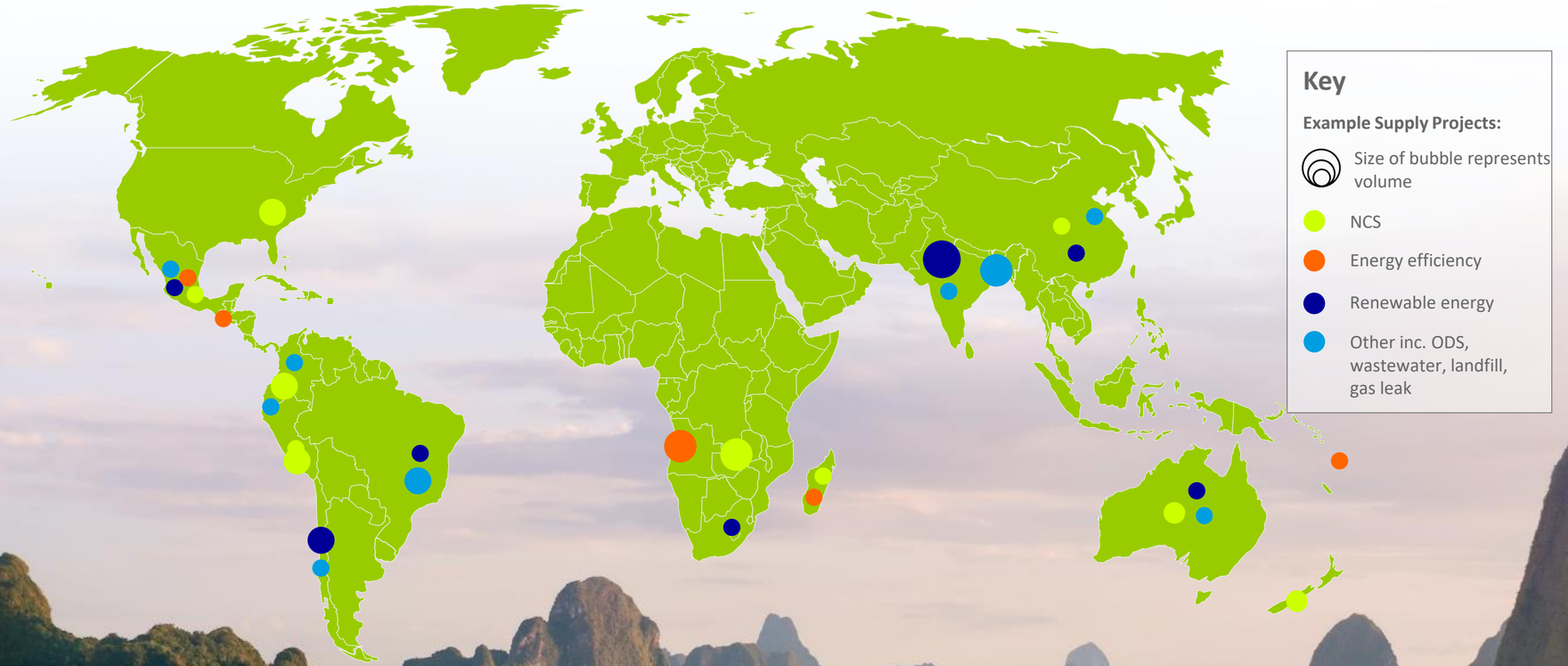
Low Carbon Solutions (LCS) – project portfolio

LCS has a diverse supply portfolio spread across multiple geographies and also serves compliance requirements for bp assets.

Built over a decade, our supply portfolio is made up of

100+ **projects across all continents**.

We can bring scale to the market and help our clients mitigate their emissions.



Certified natural gas (CtNG)

Certified Gas is **pipeline-quality natural gas accompanied by an MiQ certificate** (or similar third-party accreditation).

The **MiQ Certificate represents a producing facility's methane emissions performance**—that is, generally, the ratio of methane emissions relative to natural gas throughput—for a volume of gas that is graded to an independent MiQ Standard.

bp can retire MiQ certificates on behalf of the buyer, or transfer the certificates to the buyer's registry account

Certified Gas can be **transacted via a NAESB**—with the MiQ retirement or transfer terms documented in a special transaction confirmation

Details

The MiQ Standard assesses three criteria:

- Methane emission performance
- Monitoring technology deployment
- Operating practices that promote a culture of emissions management and continuous improvement

Other third-party accreditations in the Certified Gas market include **Project Canary**, **Equitable Origin 100**, and **Platts MPCs**.

Costs

Indicative adder to natural gas commodity cost:

$0.03+ per mmbtu[2]

[1] Subject to relevant company sustainability framework, carbon accounting policies, among other factors.
[2] Indicative spot adder as of September 2023. Price range reflects the range of carbon intensities associated with different sources of RNG

MiQ B Grade

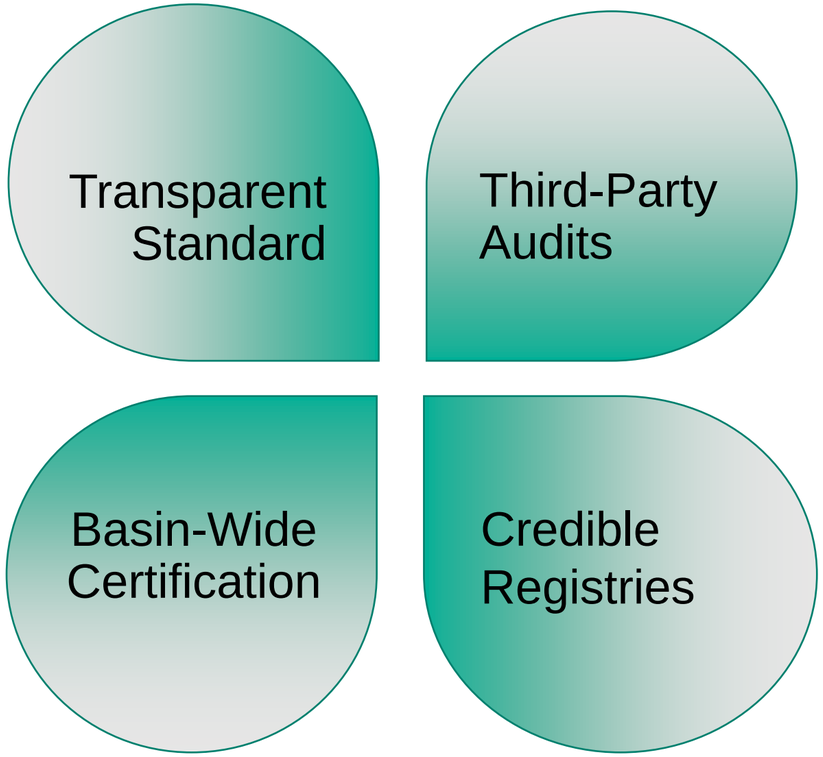
17.1 gCH4/mmbtu

Facility = Company X
Marcellus Assets

Vintage = June 2023

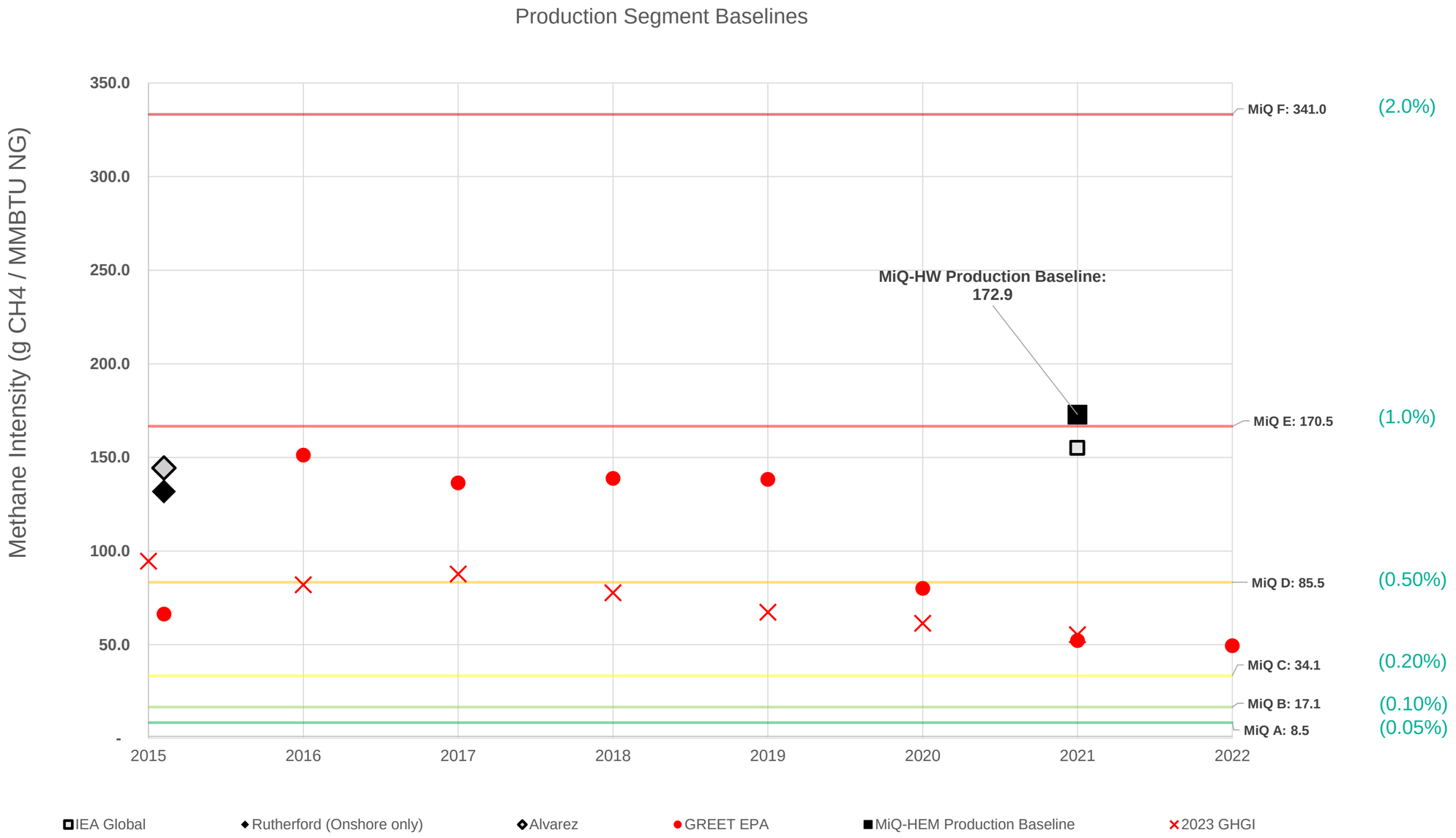
- Implies Independent Third party verification
- Corresponds to 0.1% MI
- Calculated using Quantitative Metrics, not Emission Factors
- Intensity allocated to natural gas product
- Assumes Basin-wide “Facility” level certification, min granularity allowed in Life Cycle Assessments

Certification Market Principles



Source: MiQ

SETTING THE STANDARD FOR METHANE EMISSIONS



Source: MiQ

MiQ-Highwood Index (Production)

MiQ Certificate: Methane Intensity B-grade Production

Emission Reductions

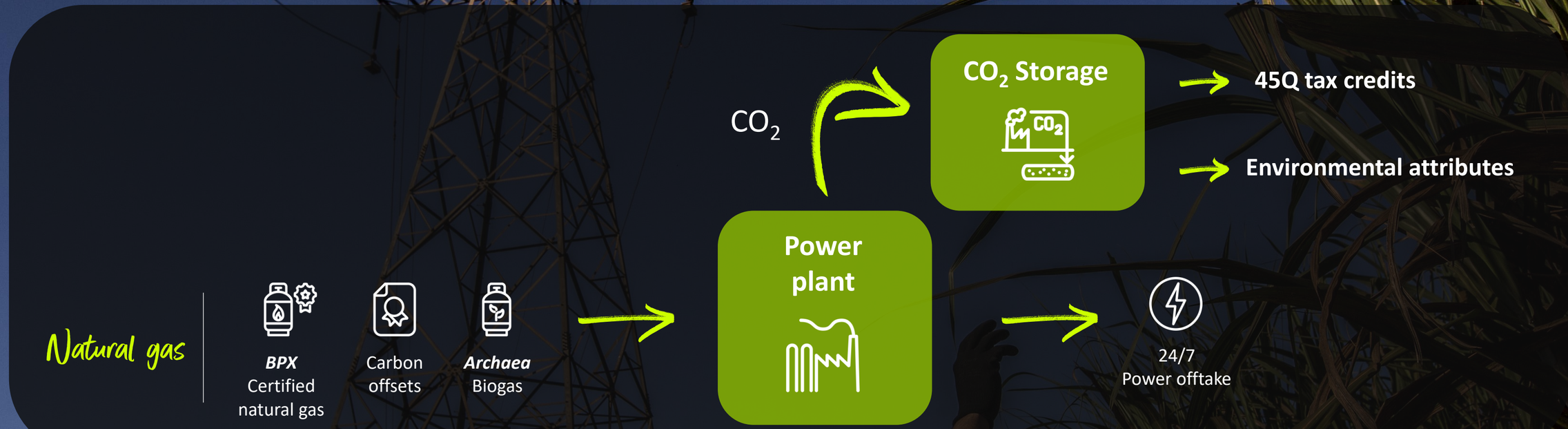
MI	1.0 %	-	0.1%	=	0.9%
g CH4/MMBtu	174	-	17	=	157
g CO2e/MMBtu – 20yr GWP	14,347	-	1,411	=	12,936
g CO2e/MMBtu – 100yr GWP	4,852	-	477	=	4,375

Assumptions: 20-yr GWP of 82.5 gCO_2e/gCH_4, 100-yr GWP of 27.9 gCO_2e/gCH_4,
HHV: 1.036 MMBtu/Mscf, CH4 Content: 92%, CH4 Density: 0.0192 t/Mscf

MI: Methane Intensity **CH_4**: Methane **CO_2e**: Carbon Dioxide Equivalent **MMBtu**: One Million British Thermal Units
GWP: Global Warming Potential **HHV**: Higher Heating Value **Mscf**: Thousand Standard Cubic Feet

Source: MiQ

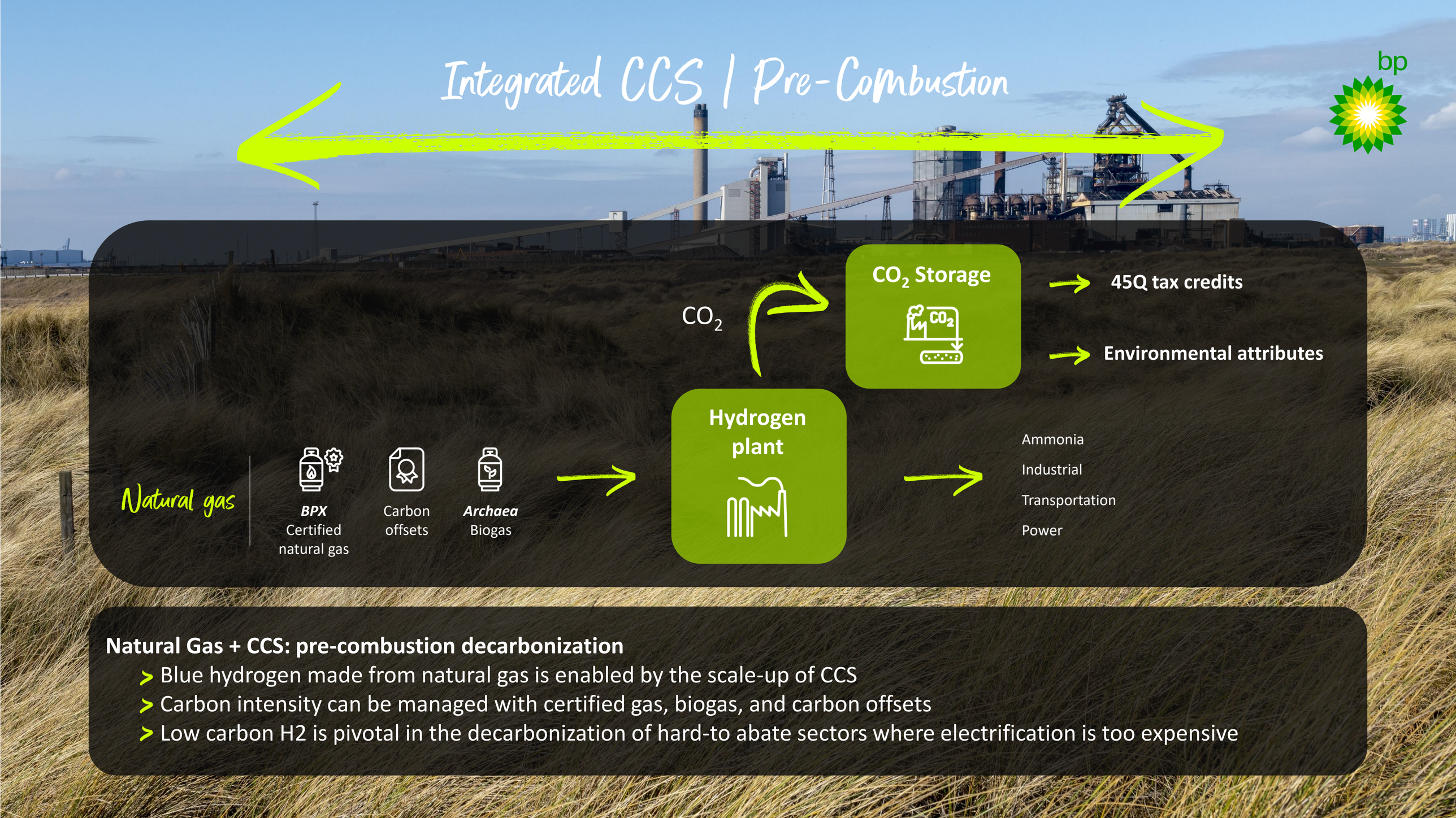
Integrated CCS | Post-Combustion



Natural Gas + CCS: post-combustion decarbonization

- When combined with CCS; natural gas can create a lower carbon source of non-intermittent power
- Carbon intensity can be managed with certified gas, biogas, and carbon offsets
- Non-intermittent power supports wider deployment of renewables

Integrated CCS | Pre-Combustion



Natural Gas + CCS: pre-combustion decarbonization

- Blue hydrogen made from natural gas is enabled by the scale-up of CCS
- Carbon intensity can be managed with certified gas, biogas, and carbon offsets
- Low carbon H2 is pivotal in the decarbonization of hard-to abate sectors where electrification is too expensive

Questions

Connect with me

Lindsey Eby

Director,
C&I, Low Carbon,
and Cross Commodity Origination
lindsey.eby@bp.com
bp