

# Baker Hughes IET Gas Technology

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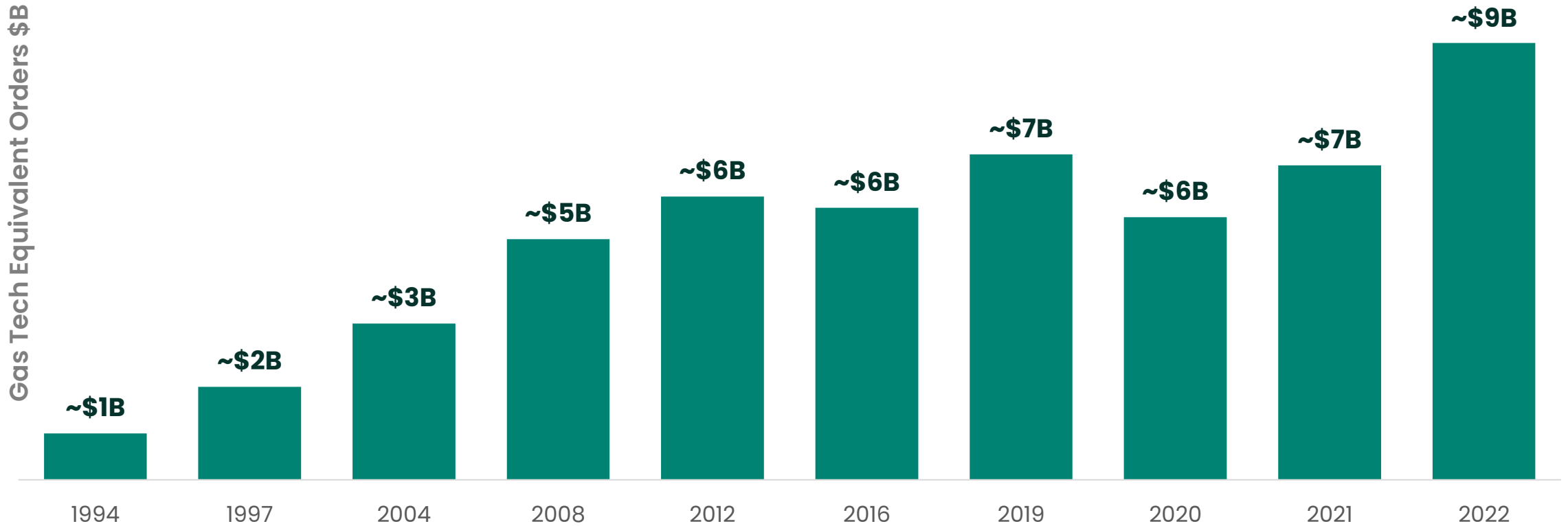
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# LNG overview

Industrial & Energy Technology

# Gas Tech – Structural growth through the cycles

Technology differentiation has allowed Gas Tech to continually capitalize on market trends

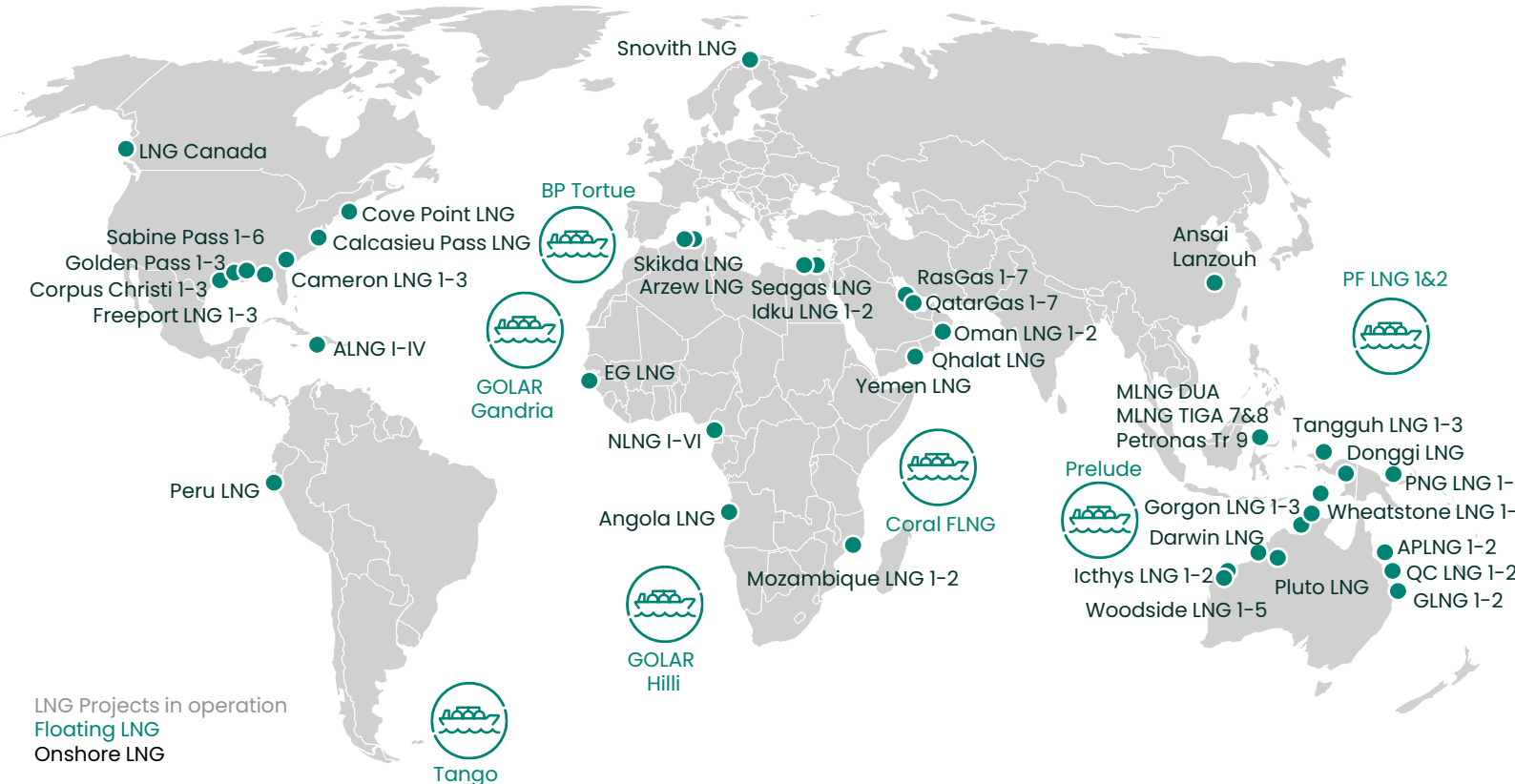


Resiliency through energy market downturns & COVID-19 pandemic  
 ~8% compounded growth over almost three decades

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 Note: Public company filings.  
 1994 –2008: GE O&G Turbomachinery & Services orders  
 2016: BHGE Turbomachinery & Process Solutions orders  
 2019 onwards: Total IET Gas Technology orders

# 30+ years serving LNG customers

with innovative turbo-compression technologies and solutions



## Baker Hughes' history & innovations in LNG

**WOODSIDE**  
1989

**Heavy Duty (HD) Gas Turbine (GT)**  
as mech. drive in LNG (MS5002)

**DARWIN**  
2006

**Aero GT**  
as mech. drive in LNG (PGT25+)

**QATAR**  
2009

**HD Large Power**  
as mech drive in LNG (MS9001)

**SATU FLNG**  
2017

**FLNG**  
Aero GT mech. drive (PGT25+G4)

**FREEPORT LNG**  
2019

**Large Motor 75 MW VSDS<sup>1</sup>**  
for e-LNG facility

**VG Calcasieu Pass**  
2022

**Mid size liquefaction system modularized**

**NFE**  
Under construction

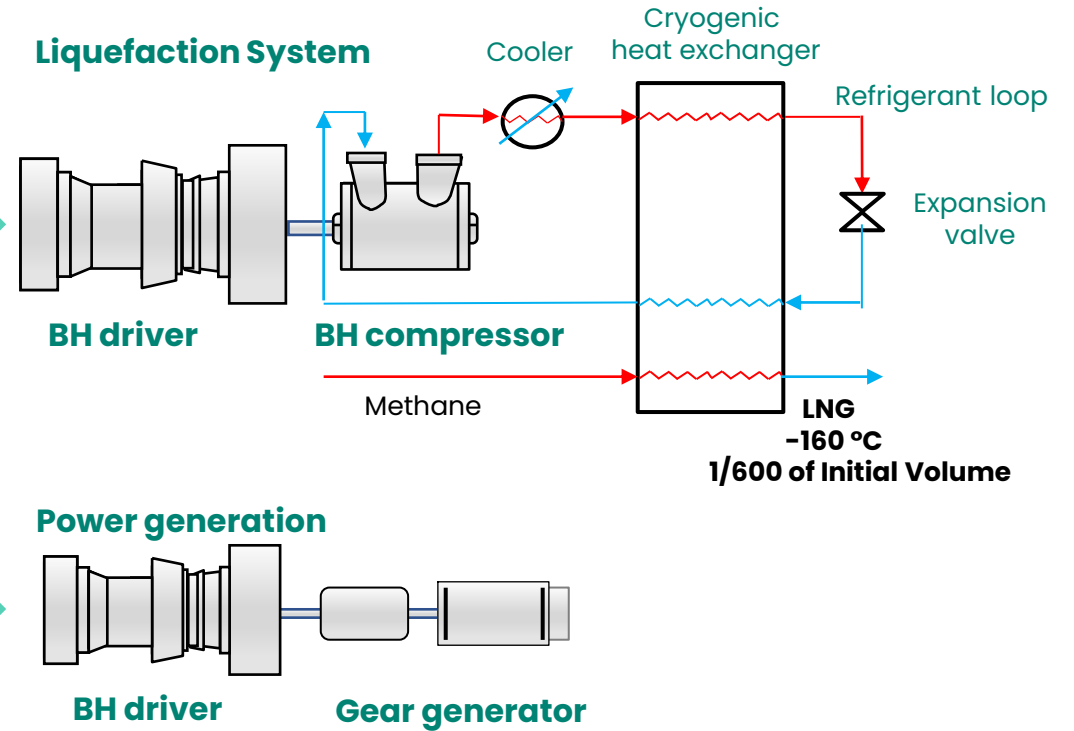
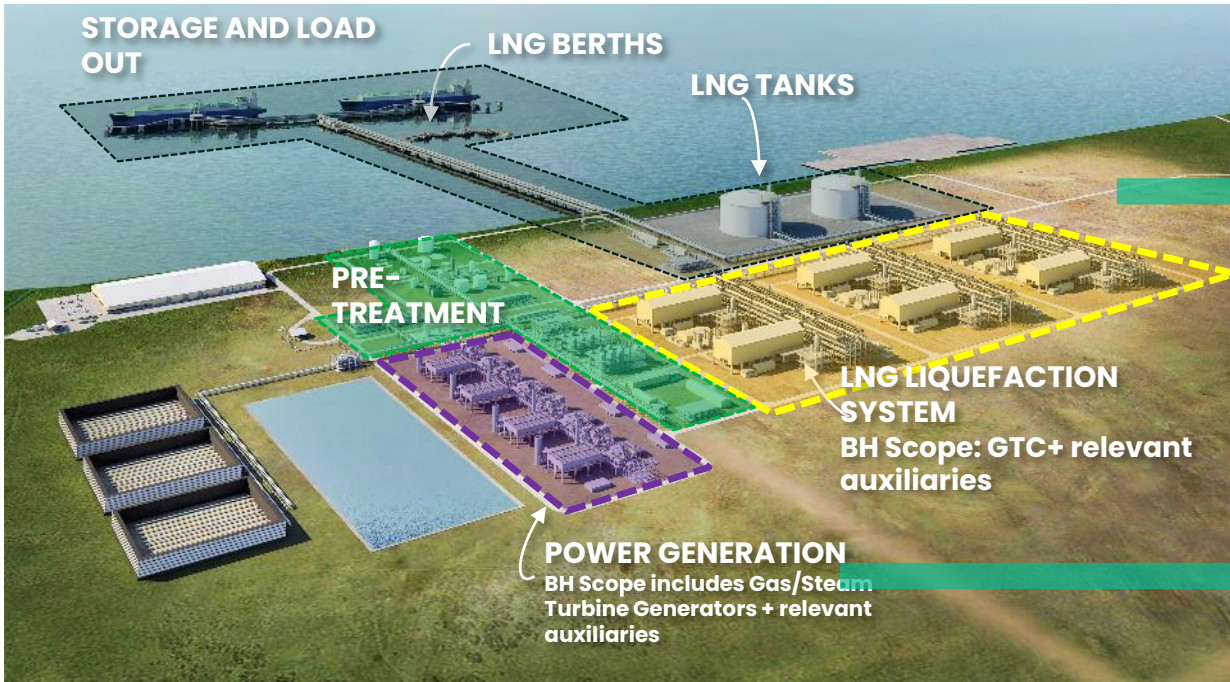
**Offshore modularized LNG train**  
(LM6000PF+)

From the desert to the rainforest, from the arctic to protected natural areas, Baker Hughes have successfully executed LNG projects in the most extreme environments and challenging conditions – **Pioneering technology and solutions for the LNG industry**

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 1. VSDS stands for Variable Speed Drive System



# Illustrative LNG liquefaction plant



# LNG – BH uniquely positioned to serve the industry

## LNG Application

- High power refrigeration cycles ... economy of scale
- High efficiency ... maximize LNG production for the same asset base
- Substantiated performance guarantees and referenced solutions
- Non-redundant mission critical liquefaction processes

High investment / High rewards plants

## Baker Hughes Positioning

- Single point responsibility marrying superior driver with driven equipment optimal efficiency
- Continuous equipment performance optimization around LNG Processes
- A history of industry Innovations
- 35+ years of references
- Extended maintenance intervals, world class turnaround services teams
- In-house Full Load String Test
- Feedback from fleet remotely monitored

Unmatched experience and infrastructure dedicated to LNG

430+

MTPA of global installed LNG capacity relies on Baker Hughes turbomachinery

~65

LNG plants with BH technology in operation or under construction

98%

Average availability

MOST

Referenced OEM for large centrifugal compressors and gas turbines on main refrigerants

ALL

Processes

We have consolidated operational experience in every LNG process and configuration with all types of prime-mover technologies

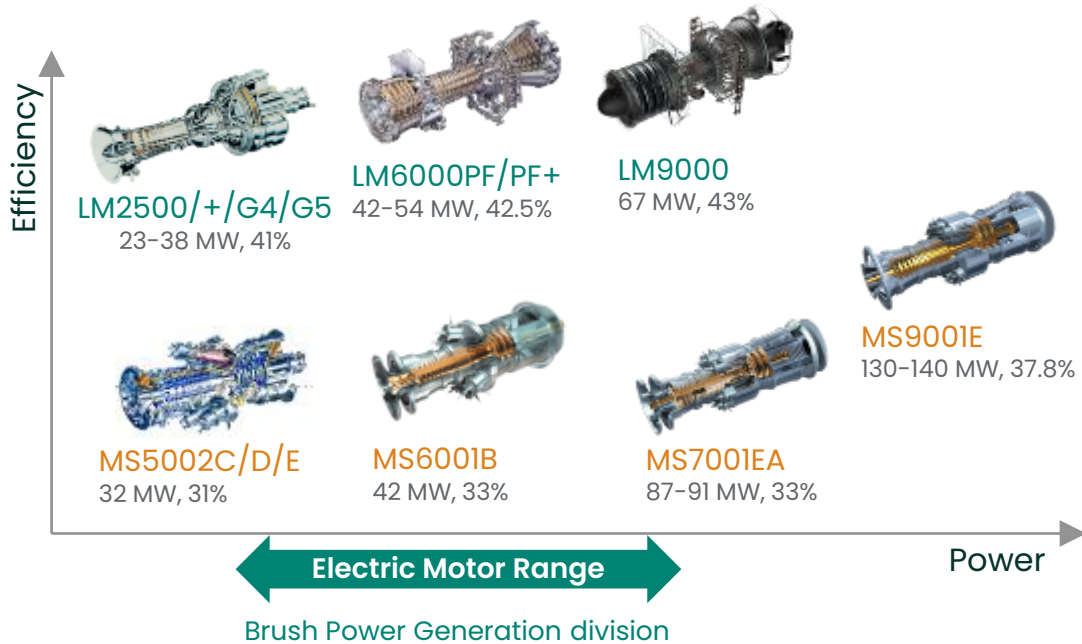
~1,000

Assets under Long Term Service Agreements and Remote Monitoring

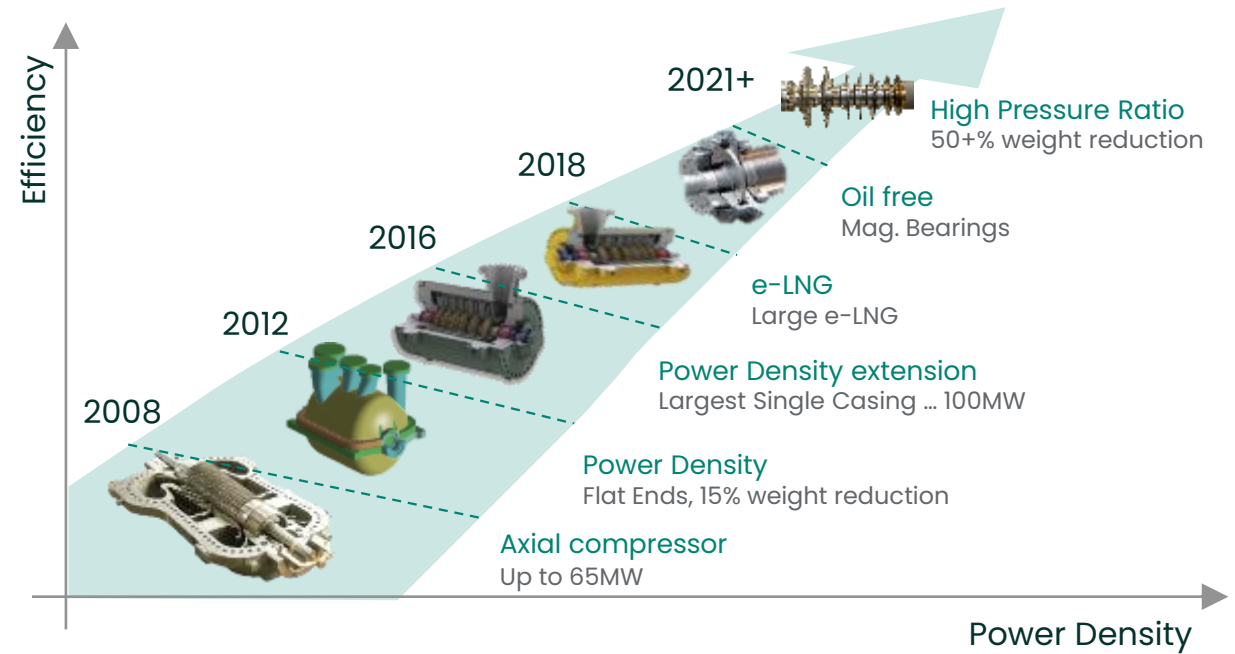
# LNG driver and compressor technology

Land-based and floating

## ~500 gas turbines in LNG operation



## ~670 compressors in LNG operation



**Baker Hughes keeps shaping the LNG industry through the continual introduction of market-driven efficient and reliable technology**



# Modularized solutions being deployed in LNG

Increasing site risks mitigation →



1  
Machinery Package/Skid



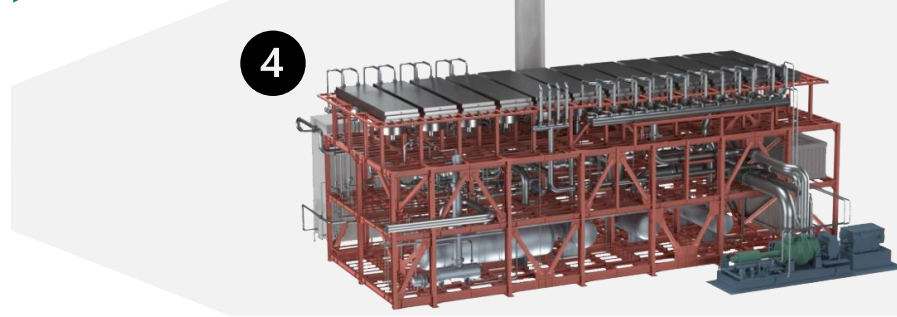
2  
Pre-Assembled Unit (PAU)



3  
Full Machinery Module



4  
Full Process Module and Machinery



Next development  
**1 to 2 MTPA LNG**

Increasing factory Pre-assembly / Test →

**0.8 to 1 MTPA LNG Modular Solution**

**30+ years modularization experience across LNG & power generation ... ~90 modules built**

North Sea  
Buchan Field



1980

Brazil  
Campos Basin



1990-2008

Kazakhstan  
Kashagan



2008

Australia  
Gorgon LNG



2012-2014

UAE  
UZ 750



2016

Kazakhstan  
TENGIN



2018

USA  
Elba Island LNG



2020

USA  
Calcasieu Pass LNG



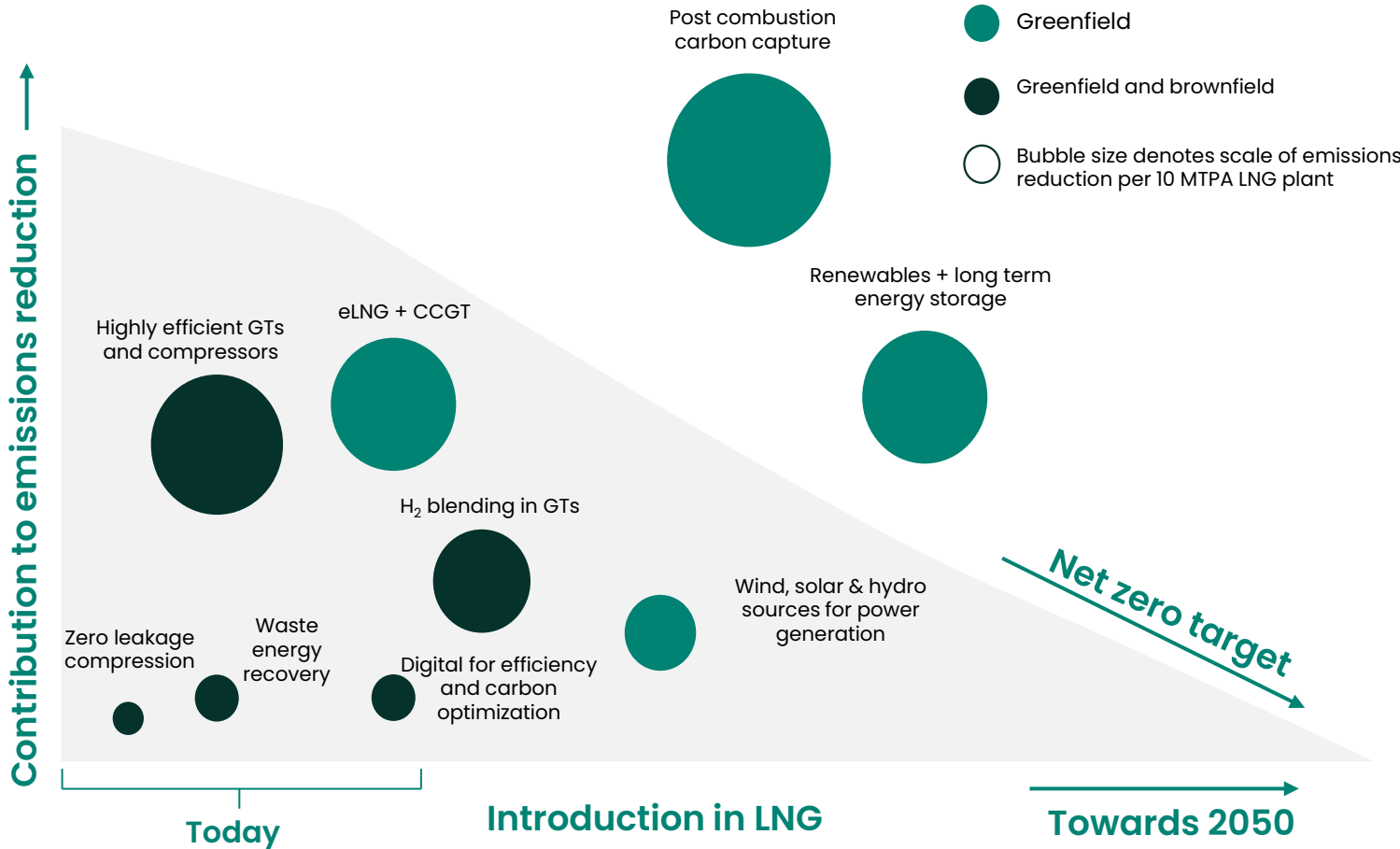
2022

The future of LNG plant design – faster, more flexible, lower cost and lower emissions

# Low carbon LNG

## The new imperative

### LNG Emissions Reduction Technologies



## Baker Hughes Solutions

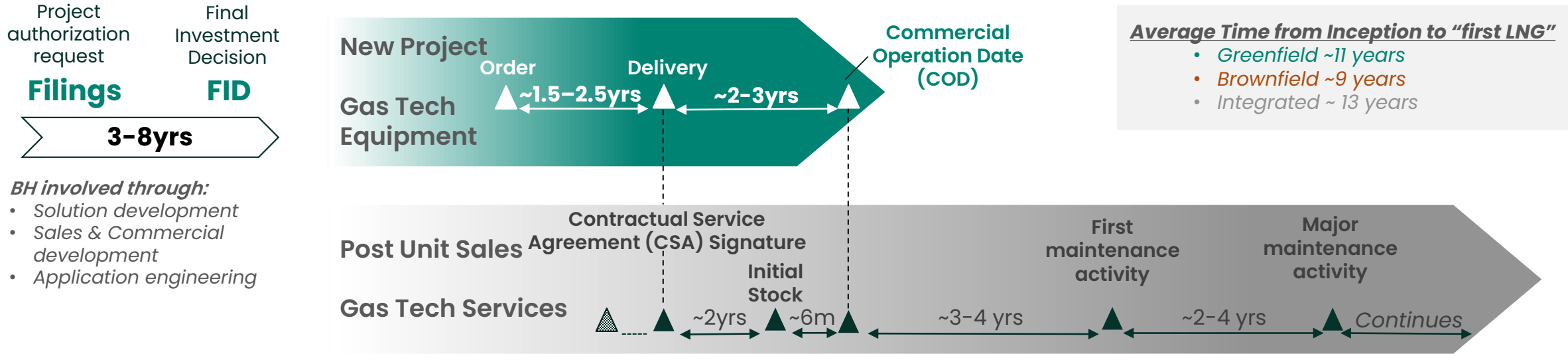
- Highly efficient gas turbines and compressors
- H<sub>2</sub> blending for brownfield & greenfield
- eLNG with combined cycles
- Reduced venting / flaring
- Zero methane leakage
- e-drive solutions referenced up to 75 MW
- Hybrid power solutions
- CCUS solutions for LNG

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Note: Emission reduction estimated for a 10 MTPA plant with 1.5% CO<sub>2</sub> in the feed gas, using a baseline configuration with heavy duty gas turbines in simple for both compressor drive and power generation

# Illustrative LNG project lifecycle

Illustrative LNG project lifecycle ... Baker Hughes involved from pre-filing all the way through later stage operation



- BH involved through:**
- Solution development
  - Sales & Commercial development
  - Application engineering

## Prior to order, LNG operators go through ~3-8yrs of pre-FID requirements, including:

- Engineering/design
- Filings, permitting & approvals
- Commercial offtake negotiations
- EPC selection
- Financing (where required)

## Baker Hughes order

- Gas Tech Equipment order typically received at or around FID of LNG project
- Modularization/FLNG can potentially shorten cycle between project selection and COD

# Gas Tech – Equipment

Industrial & Energy Technology

# Gas Tech – Equipment overview

**\$9.5B**

Gas Technology – Equipment RPO<sup>1</sup> as of 4Q'22

## Gas Tech Equipment 2022 Orders

**\$6.4B**

**Other ~1.0**

**OOP  
~1.9**

**LNG  
~3.5**

**2022 Orders**



### LNG

- Full range of technology solutions from gas liquefaction to regasification
- Equipment and/or modules for refrigeration, power generation, flash gas/boil-off gas compression



### Onshore & Offshore Production (OOP)

- Compression and powergen solutions for hydrocarbon production: extract, gather, treat, and process
- Onshore, offshore, and unconventional applications



### Other Segments

- Compression Solutions for hydrocarbons transport from production to consumption
- Refinery, Petrochemical and Fertilizing chemical processes, industrial applications
- Industrial power generation



# Organization geared for LNG >>

- Solution Development
- Sales & Commercial Development
- Application Engineering
- Engineering
- Sourcing
- Manufacturing
- Project Management
- Testing
- Modularizing
- Installing
- Serving



## Florence, Italy

Business Leadership

Engineering & Sourcing

Gas Turbines, Compression Manufacturing



## Massa, Italy

Machining, Packaging and Testing

Rotating Equipment Skid Assembly

Full Speed, Full Load Turbocompressor Test



## Avenza, Italy

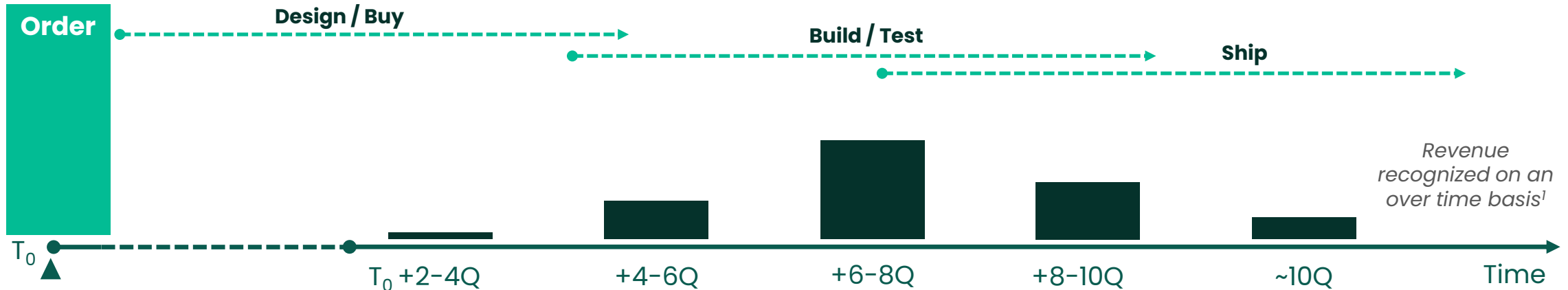
Large Module Construction

Full Speed, Full Load Modules Test

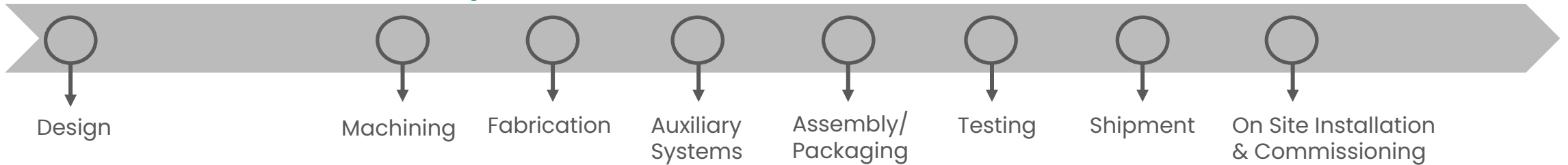
Modules Commissioning

# From order booking to delivery

A typical illustrative LNG project in execution



## Activities / milestones at the factory or site



### Milestones

- Multiple costs items included in one milestone (make/buy mix)
- Milestones are mix of internal and external events

### Dynamics of revenue recognition

*Revenue recognized on an over time basis<sup>1</sup>*

### Internal Factors

- Integrated planning
- Risk management & mitigation
- Supply chain
- Inbound logistics

### External Factors

- Outbound logistics
- Site readiness
- Geopolitical

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Note: each LNG project is different- the ranges provided are indicative for a typical LNG project

1. BH 10K filing 2021: Revenue from Sale of Equipment: We recognize revenue on agreements for sales of goods manufactured to unique customer specifications including long-term construction projects, on an over time basis utilizing cost inputs as the measurement criteria in assessing the progress toward completion.

# Gas Tech – Services

Industrial & Energy Technology

# Gas Tech – Services overview

Full lifecycle services to optimize availability and reliability in mechanical drive, compression, and power generation.

- Global network of Services repair centers
- Regional engineering support
- 24/7 Remote Monitoring and Diagnostic (RM&D) support
  - ~1,600 machines monitored
- ~1,000 global Field Service Engineers

## Portfolio:

- *Heavy Duty Gas Turbines, up to Fr9*
- *NOVA LT Gas Turbines*
- *Steam Turbines*
- *Centrifugal Compressors*
- *Reciprocating Compressors*
- *Electric Motors*

**\$13.6B**

Gas Technology – Services RPO<sup>1</sup> as of 4Q'22

**~1,000**

Assets under Long Term Service Agreements & Remote Monitoring

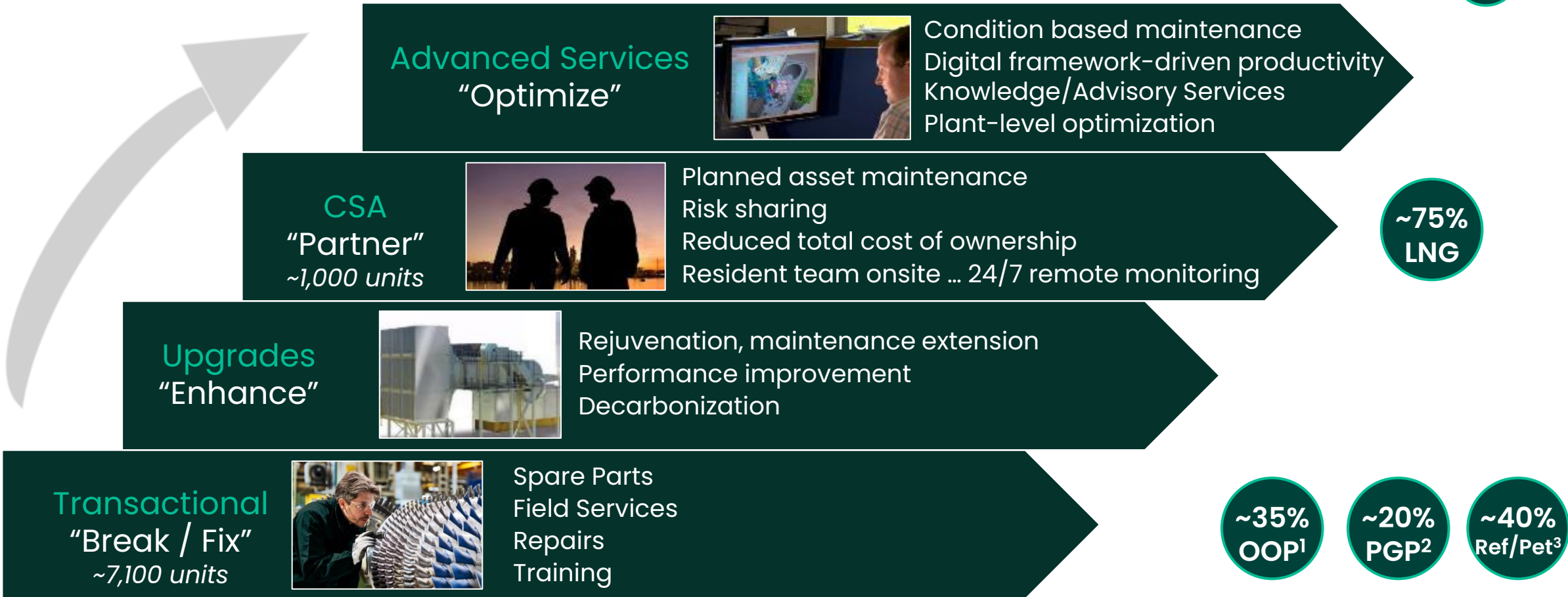
**~70**

Contracts under Long Term Service Agreements & Remote Monitoring



# Gas Tech Services portfolio

%  
fleet



The future of Services – comprehensive, data-driven solutions

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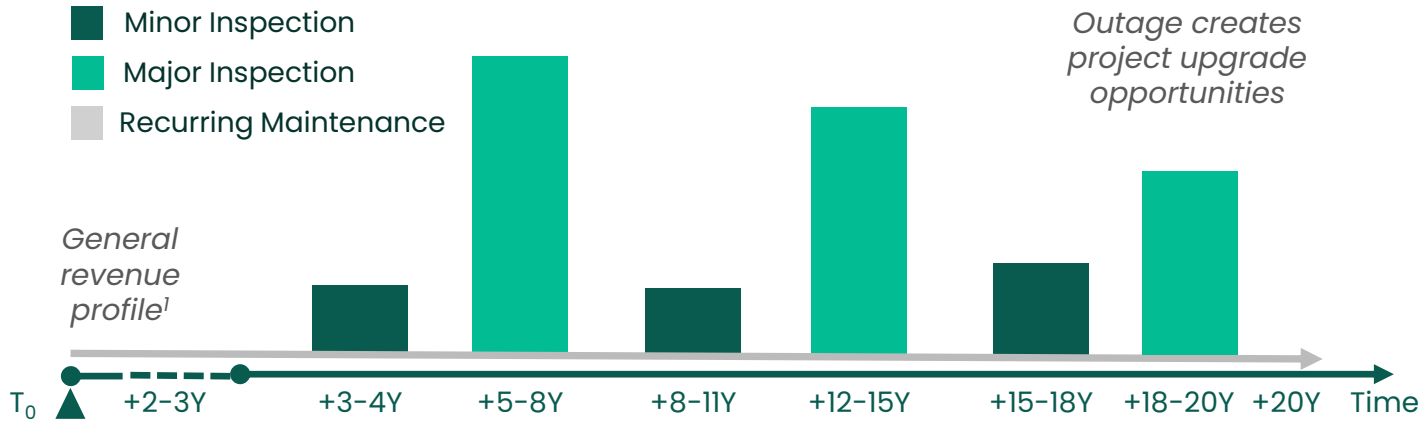
1. OOP = Onshore & Offshore Production  
 2. PGP = Pipeline & Gas Processing  
 3. Ref / Pet = Refining & Petrochemical



# From start-up to decommissioning

A typical LNG project under an illustrative long-term contract structure

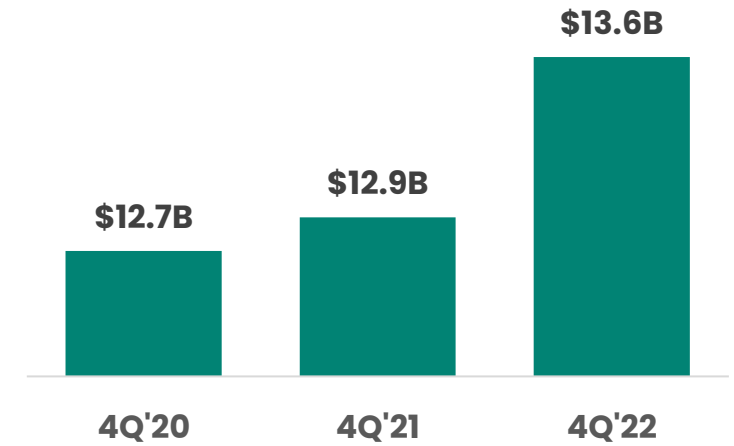
*Illustrative CSA outage schedule*



## CSA overview

- Designed to deliver availability and productivity guarantees over the full asset lifecycle
- Planned, unplanned, and extra work coverage—new parts, repairs, and field services
- Availability guarantees—granted production per year with bonus/malus program

## Gas Technology - Services RPO<sup>2</sup>



### Aeroderivative

### Frame / Heavy duty

**Minor inspection**  
(based on fired hours)

**Major inspection**  
(based on fired hours)

- ~3-4 years**
- Hot gas path inspection through gas generator swap
  - Auxiliary systems maintenance

- ~5-8 years**
- Minor inspection process + axial compressor module service

- ~3-4 years**
- Liner and transition piece inspection
  - Combustion & auxiliaries inspection

- ~5-8 years**
- Minor inspection process + axial compressor module service

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<sup>1</sup> Note: each CSA is different - the ranges provided are indicative for a typical CSA.  
 BH 10K filing 2021: We sell product services under long-term product maintenance or extended warranty agreements in our Turbomachinery & Process Solutions and Oilfield Equipment segments. These agreements require us to maintain the customers' assets over the service agreement contract terms, which generally range from 10 to 20 years. In general, these are contractual arrangements to provide services, repairs, and maintenance of a covered unit (gas turbines for mechanical drive or power generation, primarily on LNG applications, drilling rigs). These services are performed at various times during the life of the contract, thus the costs of performing services are incurred on other than a straight-line basis. We recognize related sales based on the extent of our progress toward completion measured by actual costs incurred in relation to total expected costs.

<sup>2</sup> Remaining Performance Obligations

**Baker Hughes** 