

INNIO





THE FUTURE OF ENERGY IN BRAZIL CONFERENCE



São Paulo, February 14, 2019

* Indicates a trademark



Flavia Granato

Regional Sales Manager



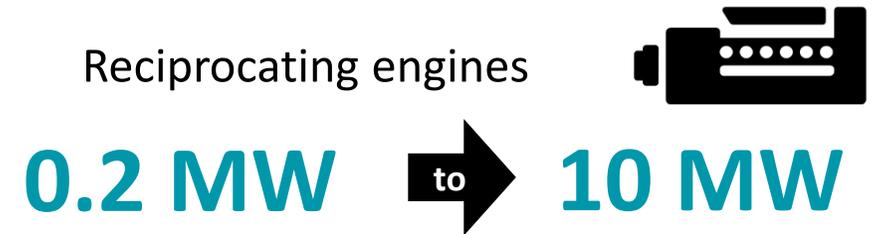
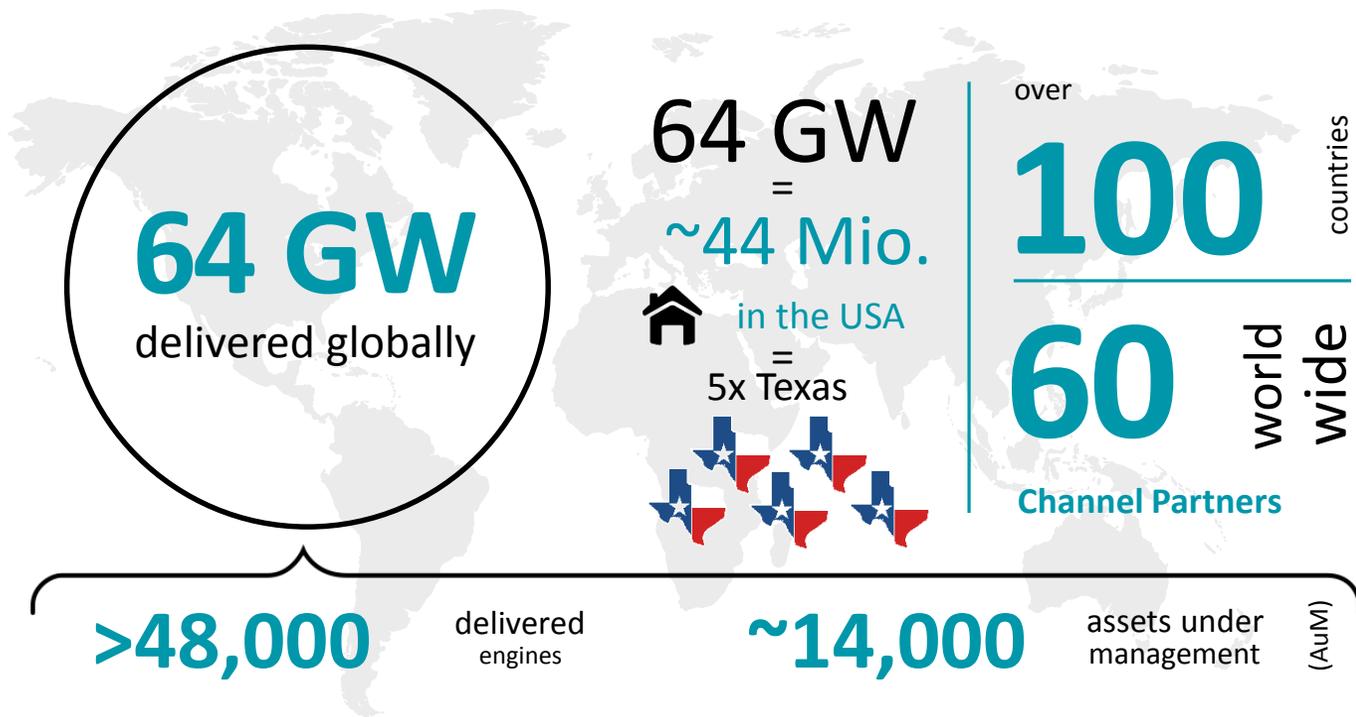
Rickard Schäfer

Regional Sales Manager

ABOUT INNIO

- ✓ INNIO is a leading technology provider of gas engines, power equipment, a digital platform and related services for power generation and gas compression at or near the point of use. With our renowned Jenbacher* and Waukesha* product brands.
- ✓ INNIO pushes beyond the impossible and looks boldly toward tomorrow. Our diverse portfolio of reliable, economical and sustainable industrial gas engines generates 200 kW to 10 MW of power for numerous industries globally. We provide life-cycle support for more than 48,000 gas engines worldwide. And, backed by our service network in more than 100 countries, INNIO connects with you locally for rapid response to your service needs.
- ✓ Headquartered in Jenbach, Austria, the business also has primary operations in Welland, Ontario, Canada, and Waukesha, Wisconsin, US.

INNIO AT A GLANCE



High efficiency & fuel flexibility

- ➔ Natural gas
- ➔ Oilfield power
- ➔ CHP
- ➔ Special gas applications

Jenbacher & Waukesha

focused on power generation, gas compression and services

Advantages

Overall efficiency of 95% or more

Durability

90+ years experience

Fast start capability

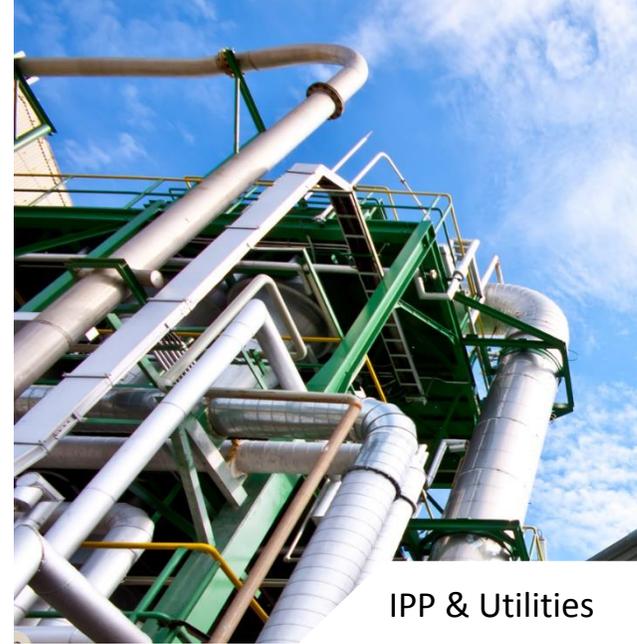
Fuel flexibility

Life cycle services

INNIO provides customers of all types the ability to generate reliable, sustainable power whenever and wherever it is needed.



Greenhouse



IPP & Utilities



Oil & Gas



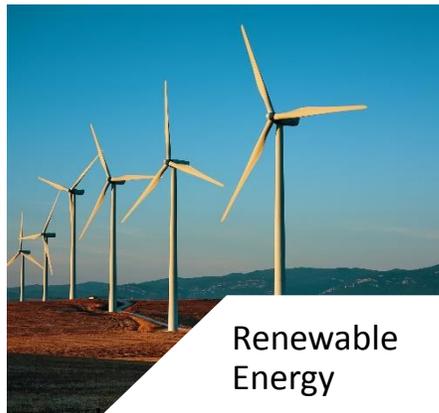
Grid Firming



Steel



Agriculture & Food Processing



Renewable Energy

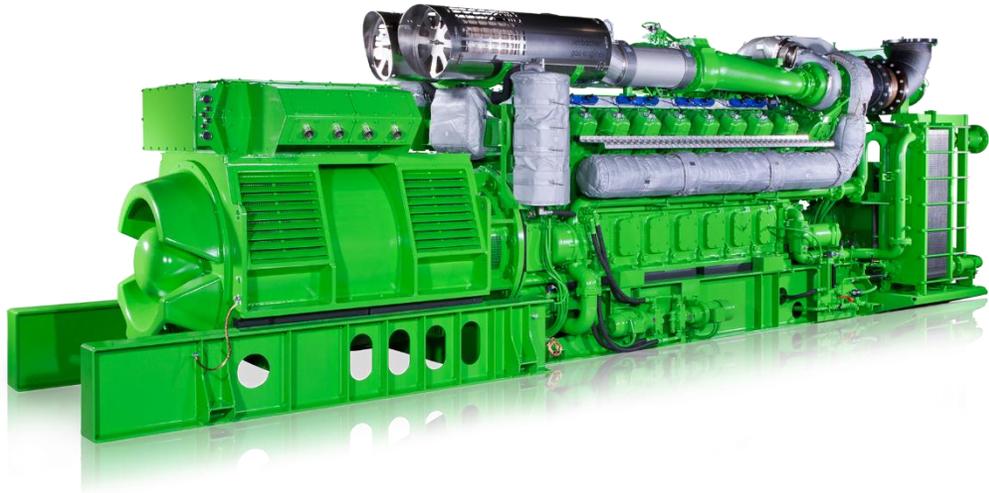


Waste-to-Power



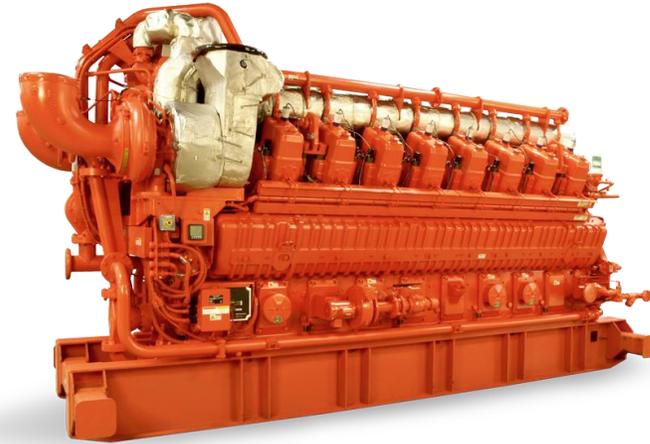
Commercial & Industrial Buildings

INNIO'S JENBACHER AND WAUKESHA GAS ENGINES



Power generation

- / Electrical output: 220 – 9,350 kWe, el. efficiency up to 49.9%, overall efficiency of >90%
- / 20,000+ engines delivered, 25,000 MW power globally
- / Natural gas, CHP, excellence in special gas applications (biogas, LFG, CMG, BFG), oilfield power



Gas compression

- / Output: 335 bhp – 5,000 bhp (220 kWe – 3,605 kWe)
- / 28,000+ compression engines delivered, over 16 million bhp power globally (12,000 MW)
- / Wellhead, gathering, storage/transmission

Headquarters in Jenbach, Austria

INNIO Jenbacher product portfolio



Jenbacher type 2

- Electrical Power: 249-330 kWe (50 Hz), 335 kWe (60 Hz)
- L8 Cylinder; 1.500/min (50 Hz)/1.800/min (60 Hz)
- Delivered engines: ~650
- 1976 introduced



Jenbacher type 3

- Electrical power: 526-1.067 kWe (50 Hz), 633 - 1.062 kWe (60 Hz)
- V12, V16 und V20 Cylinder; 1.500/min (50 Hz)/1.800/min (60 Hz)
- Delivered engines: ~7.700
- First installed: 1988

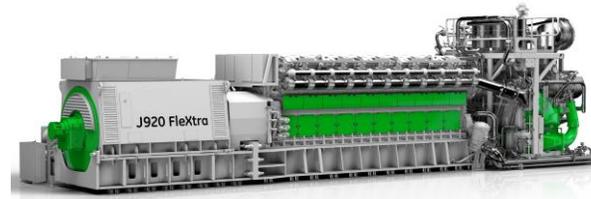


Jenbacher type 4

- Electrical power: 845 - 1.500 kWe (50 Hz), 850 - 1.426 kWe (60 Hz)
- V12, V16 & V20 Cylinder; 1.500/min (50 Hz)/1.800/min (60 Hz)
- Delivered engines: ~3.200
- 2002 introduced

Jenbacher type 6

- Electrical power: 1.795-4.498 kWe (50 Hz), 1.795-4.498 kWe (60 Hz)
- V12, V16, V20 & V24 Cylinder; 1.500/min (50 Hz, 60 Hz with gearbox)
- Delivered engines: ~4.000
- First installed: 1989



Jenbacher type 9

- Electric power: 10.380 kWe (50 Hz), 9,350 kWe (60 Hz)
- V20 Cylinder; 1.000/900/min (50/60Hz)
- Electrical efficiency / Total Efficiency:
 - (50 Hz): 49,1/ >90 %
 - (60 Hz): 49,9/ >90 %
- Product introduction 2013

COVERING A BROAD OUTPUT RANGE (60 Hz)

0.2 – 1.5 MW

1.5 – 5 MW

5 – 10 MW

Power Generation



Type 2 | 249 kW – 335 kW



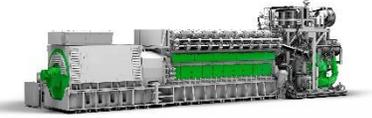
Type 3 | 633 kW – 1,059 kW



Type 4 | 850 kW – 1,426 kW



Type 6 | 1,795 kW – 4,498 kW



Type 9 | 9,350 kW



VGF* | 265 kW – 830 kW



VHP* | 600 kW – 1,600 kW



275GL+* | 2,415 kW – 3,215 kW

Mechanical/O&G/Mining/Marine



VGF | 265 kW – 830 kW



VHP | 600 kW – 1,600 kW



275GL+ | 2,415 kW – 3,215 kW

Mobile/Emergency Power

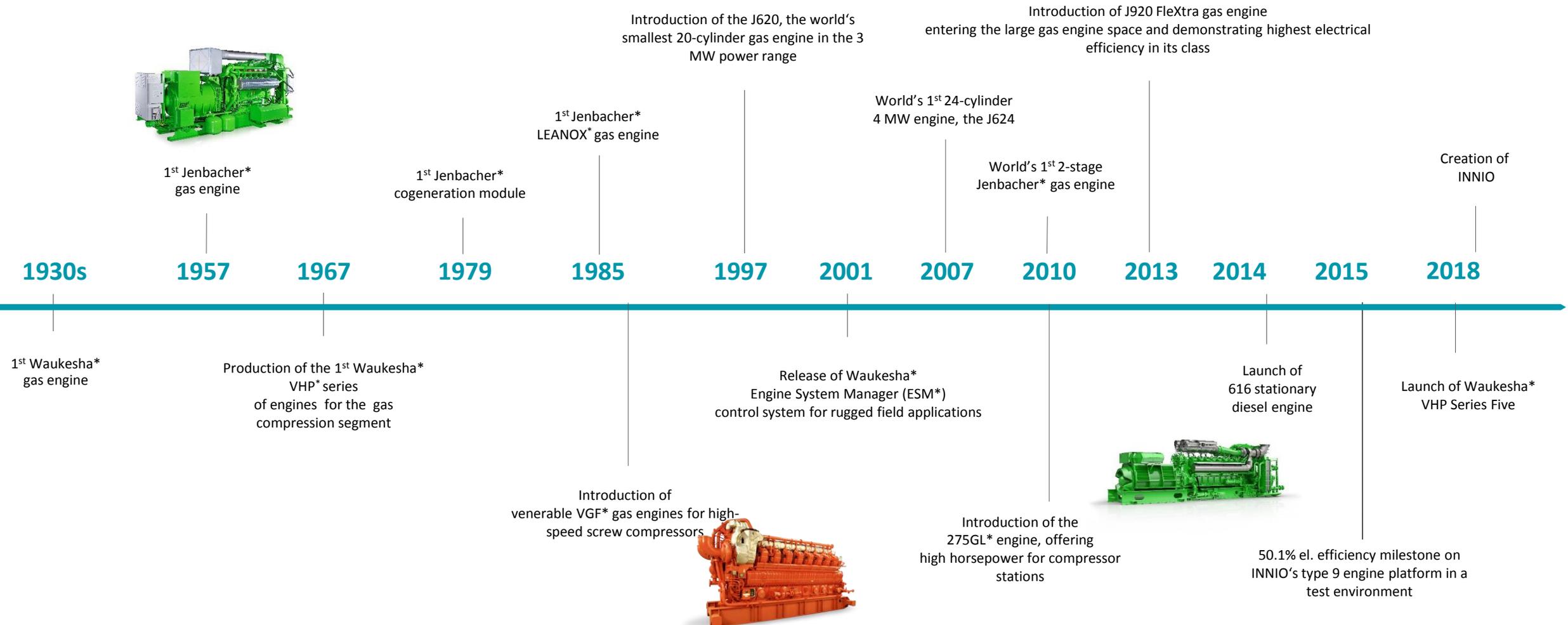


J320 generator set | 1 MW



mobileFlex J320 / VGF / VHP gas engines | 265 kW – 1MW

A HISTORY OF INNOVATIVE GAS ENGINE TECHNOLOGY



* Indicates a trademark

A GLOBAL INSTALLED BASE

~ 48,000 Units

~ 64 GW of Capacity

> 100 countries



CONFIGURATIONS CUSTOMIZED TO INDIVIDUAL NEEDS



- / Bare engines for gas compression
- / Generator sets for reliable onsite power generation

- / Cogeneration systems for efficient power and heat needs
- / Container solutions for flexibility

THREE MAIN AREAS OF USE IN POWER GEN

Renewables and waste-to-energy utilization



- / Reducing CO₂ emissions
- / Alternatives to fossil fuels
- / Biogas, landfill gas, coal mine gas, special gases (steel gas, wood gas, process gases)
- / Jenbacher* Types 2, 3, 4, 6

Decentralized power generation and cogeneration



- / Reliable energy supply for remote areas
- / Supporting local power needs
- / Avoiding transport and distribution losses
- / Enhanced total efficiency
- / Jenbacher Types 2, 3, 4, 6, 9

Oilfield power (associated petroleum gas)



- / Reliability for rugged, remote applications
- / Increased exploration, development in remote regions
- / Emission regulations driving increased use of natural gas versus diesel-powered generator sets
- / Jenbacher Types 2, 3, 4, 6
- / Waukesha* Types VGF*, VHP*, 275GL*+

FUEL FLEXIBILITY AND TAILOR MADE SOLUTIONS

Oil & Gas power generation,
mechanical drive, gas
compression

Fast and
backup power

Waste to
energy
alternative
fuels



Industrial power
generation/indepen
dent power
producers

Cogeneration -
combined cooling,
heat and power

MULTIPLE VALUES FOR OUR CUSTOMERS



Fuel flexibility

- / Natural gas
- / Renewable gases
- / Waste gases and special gases
- / Associated petroleum gas



Top efficiency and service

- / Electrical efficiency up to 49.9%
- / Overall efficiency: >90%
- / High power density
- / Extended service intervals
- / Low life cycle costs



Environmental benefits

- / Low emissions (NOx, CO, SOx, etc.)
- / Ability to reduce CO2 footprint:
 - Use of renewable gases
 - High overall efficiency



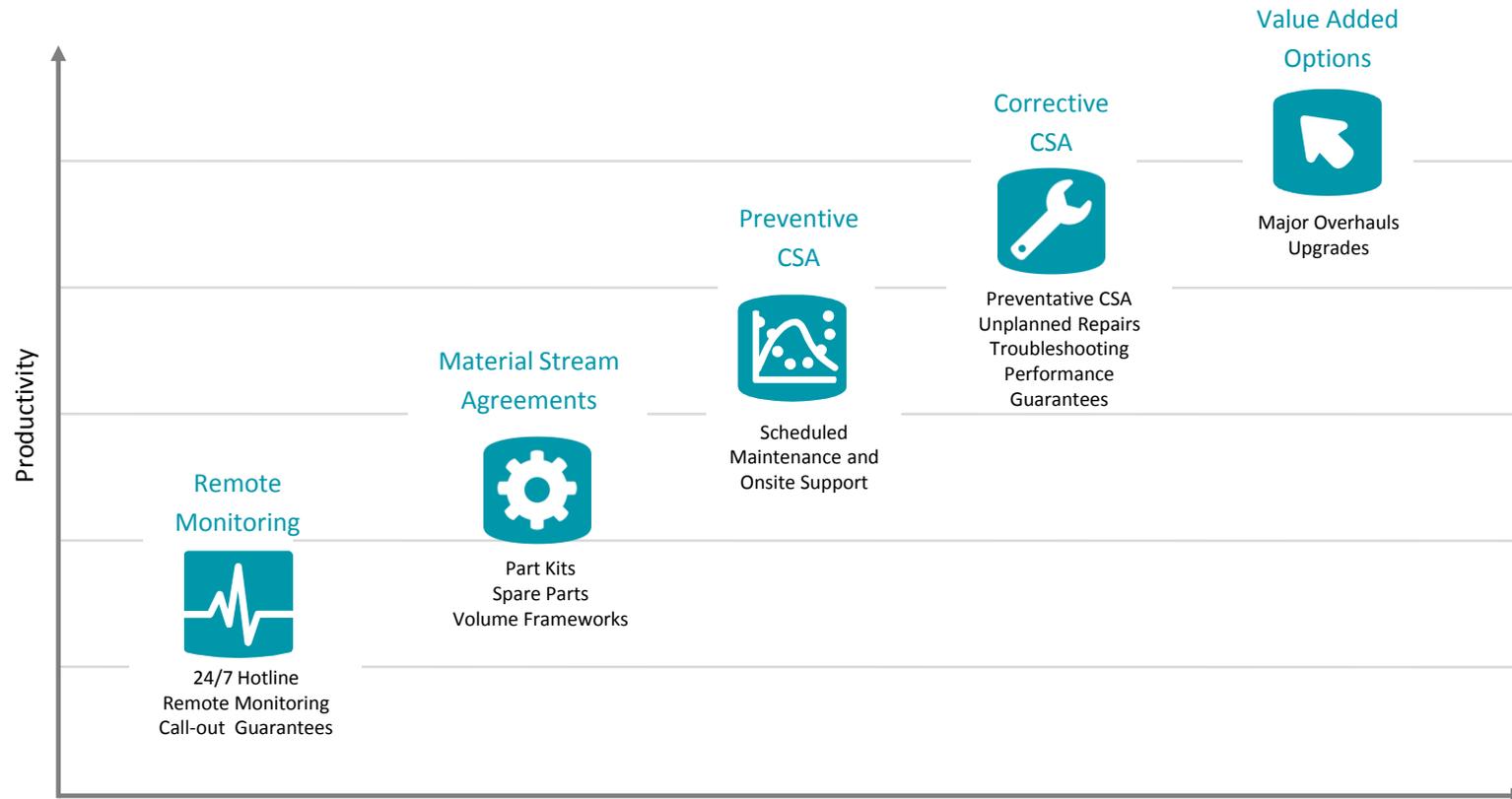
Durability and reliability

- / Established, field-tested designs
- / Optimized, robust engine components
- / Stationary engine concept
- / Increased operational safety and availability
- / Proven control and monitoring concept
- / Continuous focus on product development

Multi-Year Agreements (MYA)



Improve your performance at predictable maintenance spend

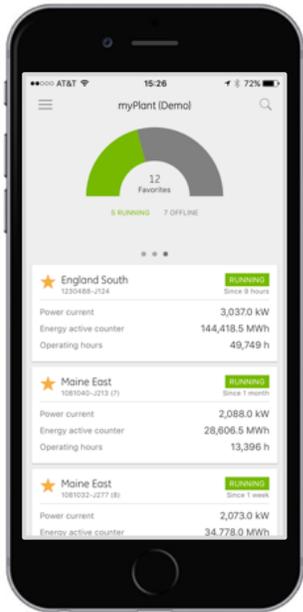


Monitor the health of all your equipment in one place

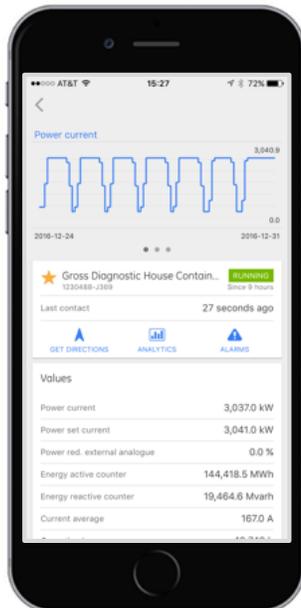
Mobile Application

Engine intelligence is always within reach with the myPlant* Mobile App for Apple iOS and Google Android Phones

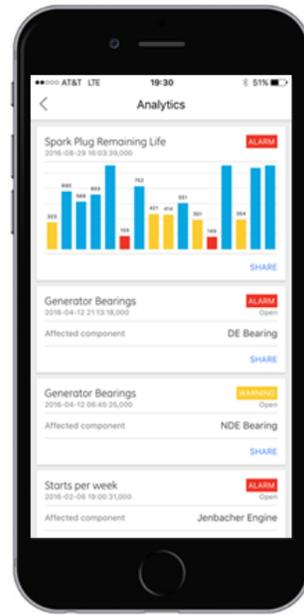
Fleet Level View



Asset Analytics & Alarms



Analytics & Alarms

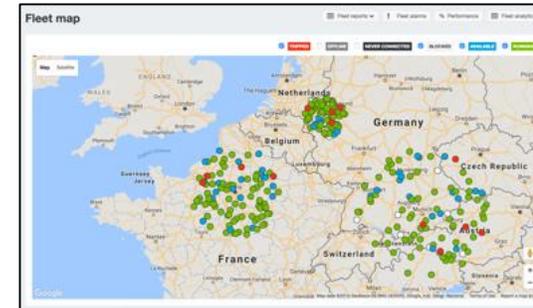


... and many more features!

Web Application

Manage the performance of your assets with the secure myPlant Web Interface

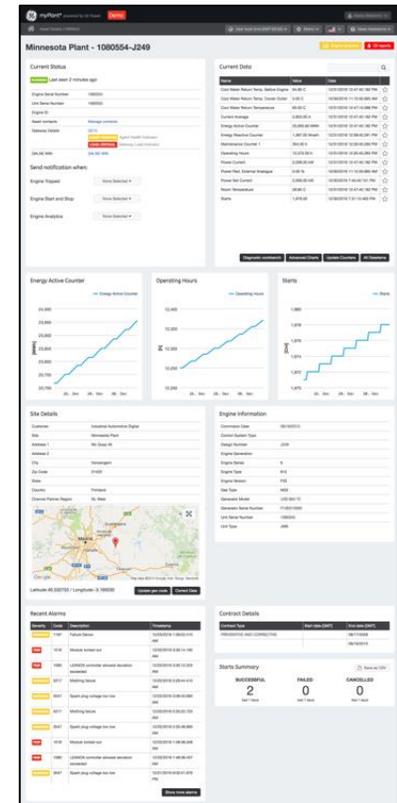
Operating status across fleet



Controller alarm summary

Severity	Code (e-Help)	Description	Timestamp
WARNING	ALM-415	Rich Limit - Primary Left	11/09/2017 04:31:18.910
WARNING	ALM-425	Rich Limit - Primary Right	11/09/2017 04:30:48.878
TRIP	ESD-222	Customer Emergency Shutdown	11/09/2017 03:08:28.300
WARNING	ALM-425	Rich Limit - Primary Right	02/09/2017 08:35:43.758
TRIP	ESD-222	Customer Emergency Shutdown	02/09/2017 05:14:29.858
WARNING	ALM-425	Rich Limit - Primary Right	01/09/2017 02:17:32.747
WARNING	ALM-415	Rich Limit - Primary Left	01/09/2017 02:16:59.715

Detailed Asset View



* Indicates a trademark

Predict service events and get the most out of your engine by proactively using analytics

Instant Notifications

Quickly initiate corrective measures by knowing immediately when engine trips, analytic triggers, via Email & SMS.

Send notification when:

- Engine Tripped
- Engine Start and Stop
- Engine Analytics
- Gateway Offline

Email, SMS (2) ▼

EMAIL

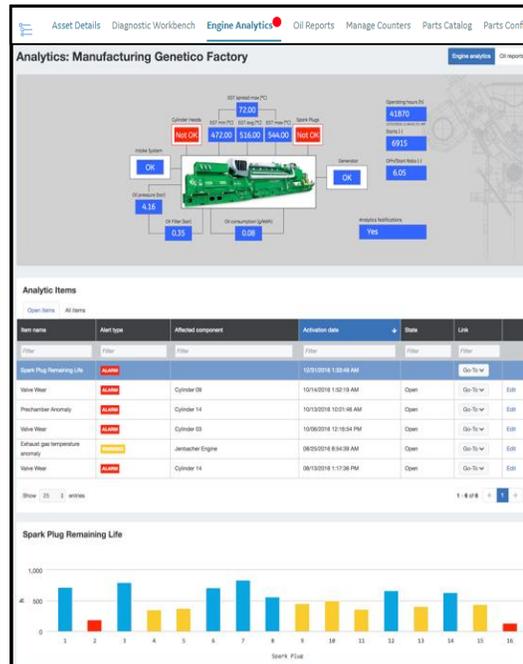
SMS

None Selected ▼

None Selected ▼

Predictive Analytics

Optimize maintenance and avoid downtime and with built-in, engineered predictive analytics



Build your own Analytic

Define your own calculations and analytics so myPlant* can look for specific business needs and send you customized notification.

Analytics configuration interface showing rule creation options:

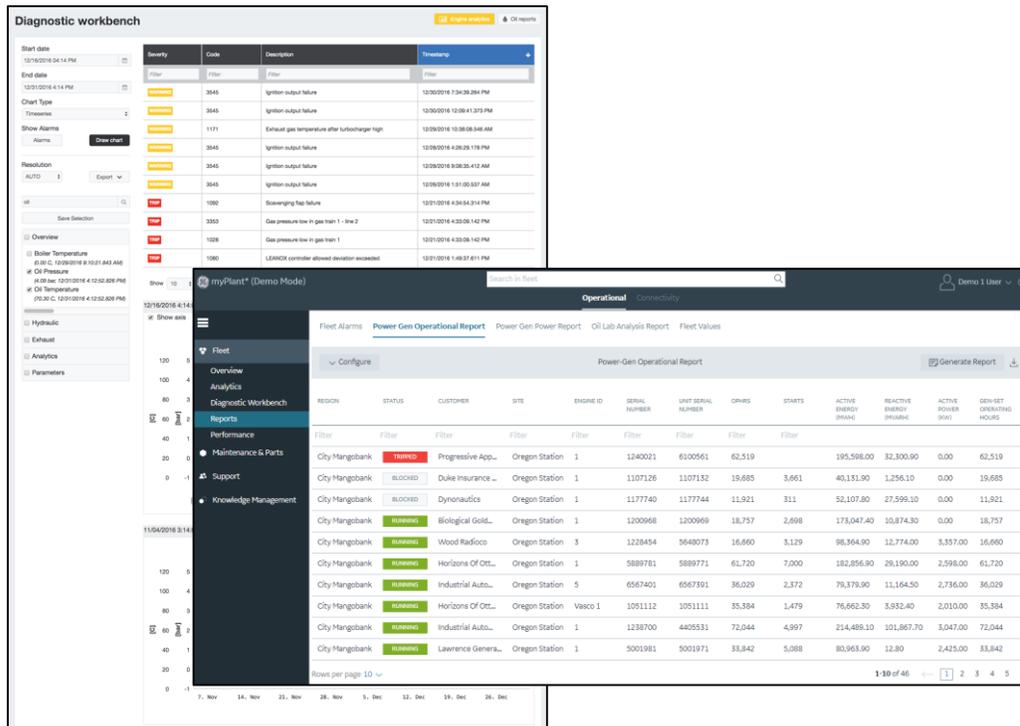
- Alarm condition: AND OR
- Data item condition: AND OR
- Formula variables: $(A - B) * C$
- Formula variables list: Stage 1 Discharge Pressure, Super Pressure, etc.

* Indicates a trademark

Access service tools, manuals and analyze data trends of your assets

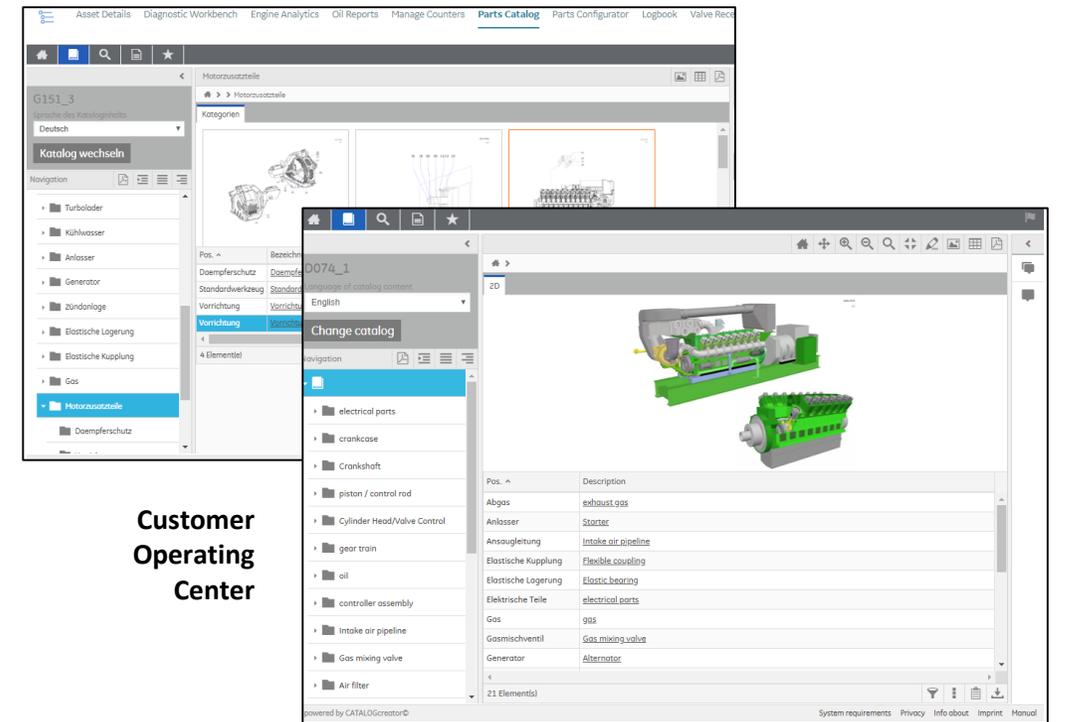
Analyze data trends

Get a deeper understanding of your engine and plant using stored historical data, data trends and reporting



Access key documents, parts information and more

Access engine manuals, operation and maintenance manuals, parts lists, and more



Customer Operating Center

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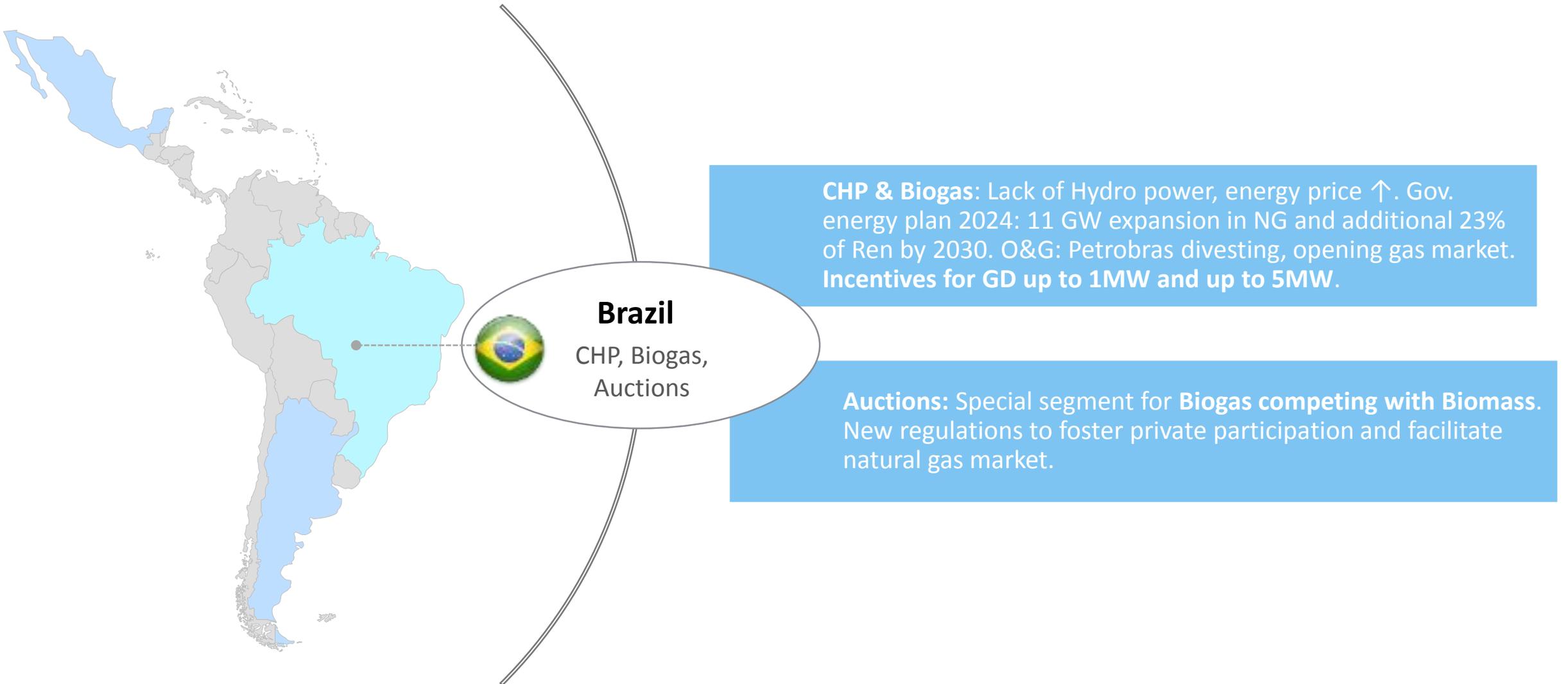
São Paulo, February 14, 2019



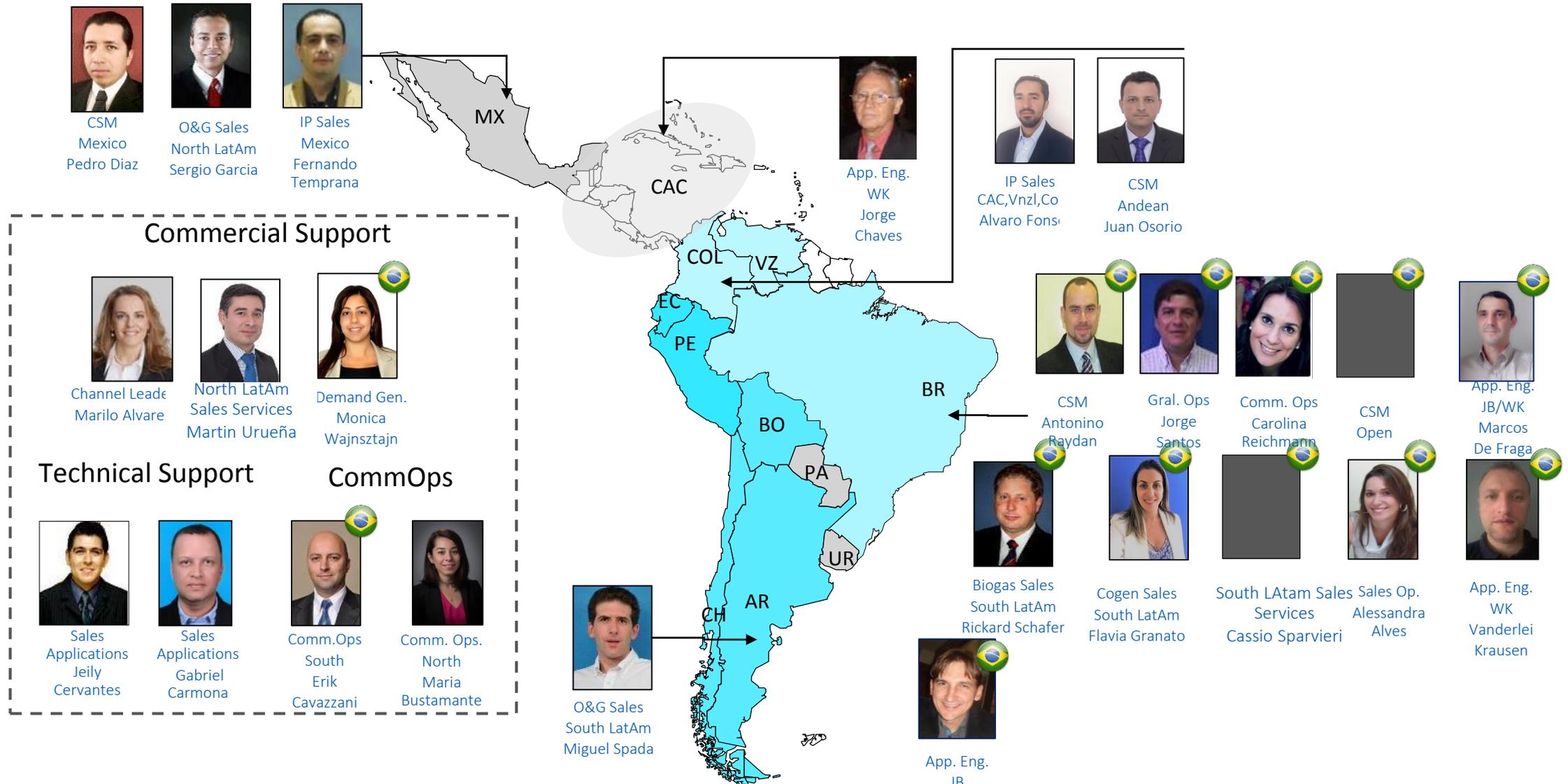
Flavia Granato

Regional Sales Manager

FOCUS ON BRAZIL



LATAM NEW UNITS AND SERVICE TEAM



* Indicates a trademark

App. Eng.
JB
Emerson
Hall

February 19

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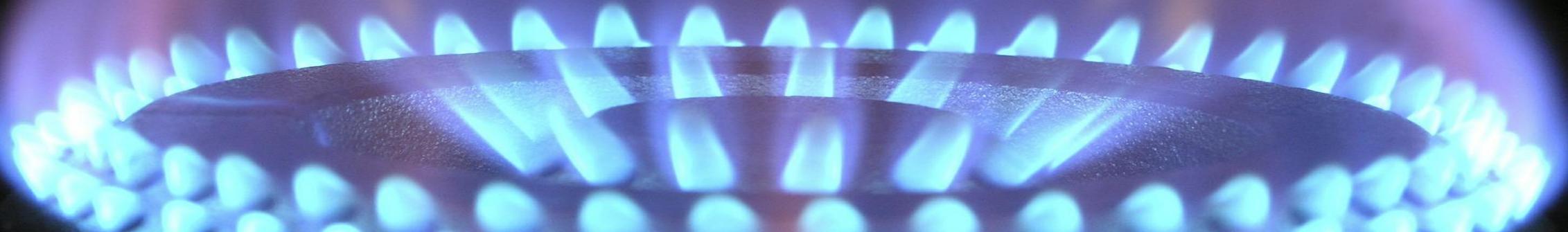


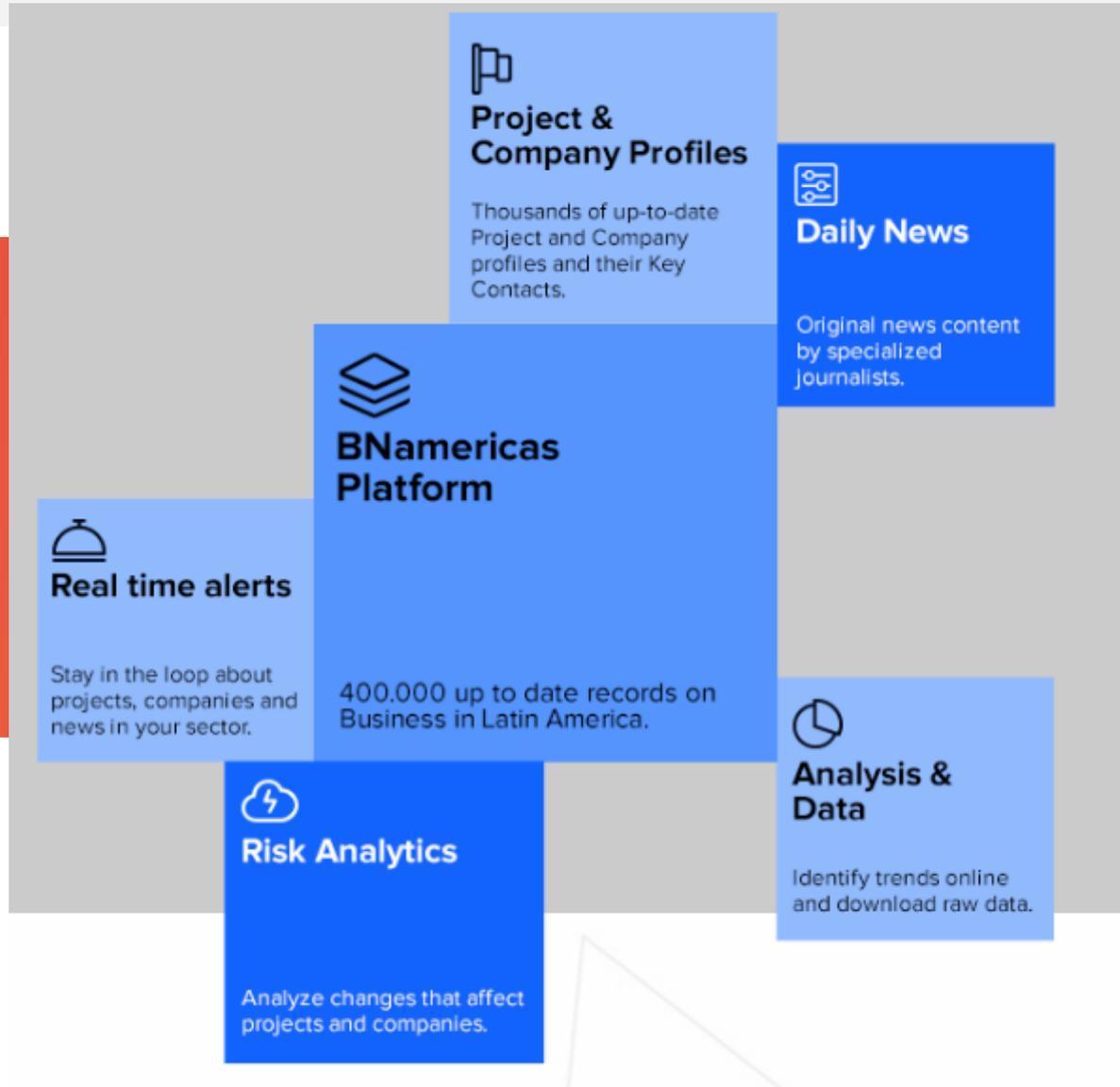
São Paulo, February 14, 2019

Perspectivas para o mercado de gás natural no Brasil

Gabriela Ruddy

Repórter
gabriela.ruddy@bnamericas.com





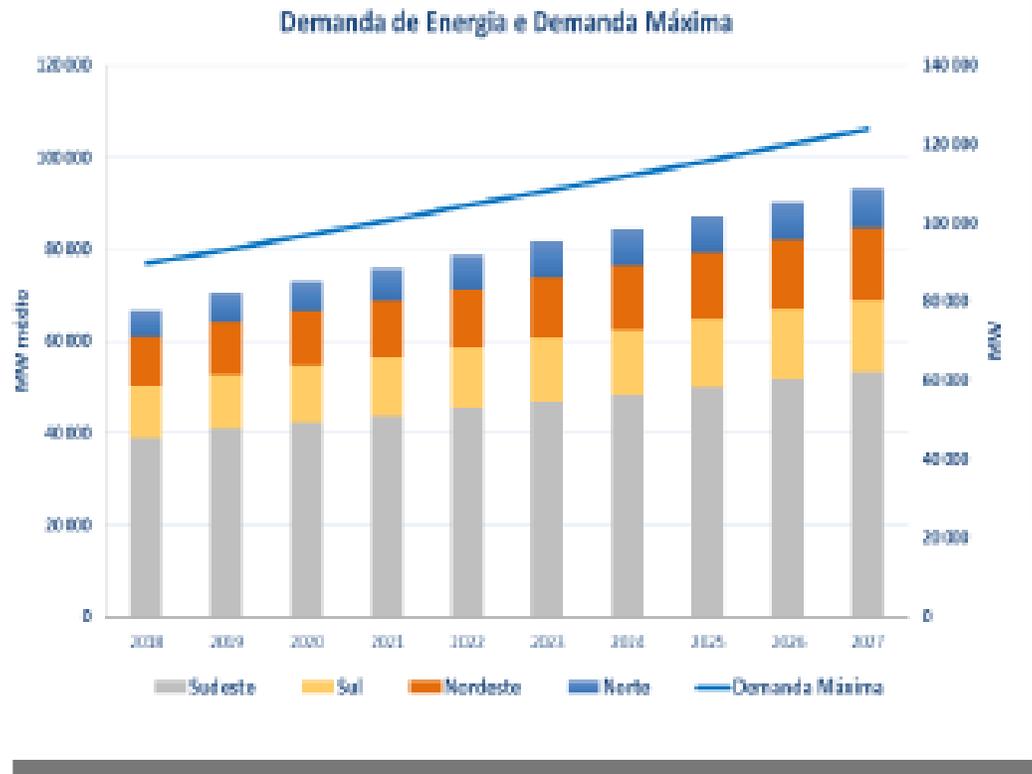
QUEM SOMOS NÓS

NOVO GOVERNO



**FOCO NA ABERTURA
DO MERCADO PARA
DESTRAVAR A
ECONOMIA**

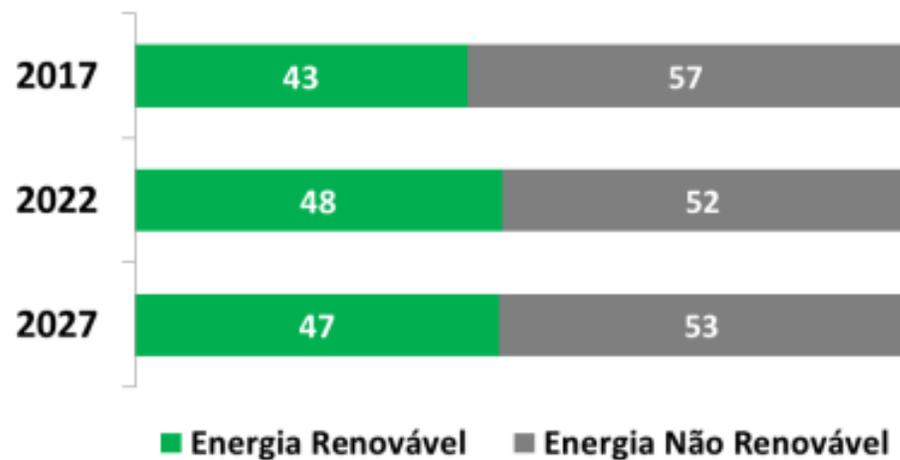
CRESCIMENTO ECONÔMICO AUMENTARÁ A DEMANDA POR ELETRICIDADE



Tendência de crescente eletrificação do país

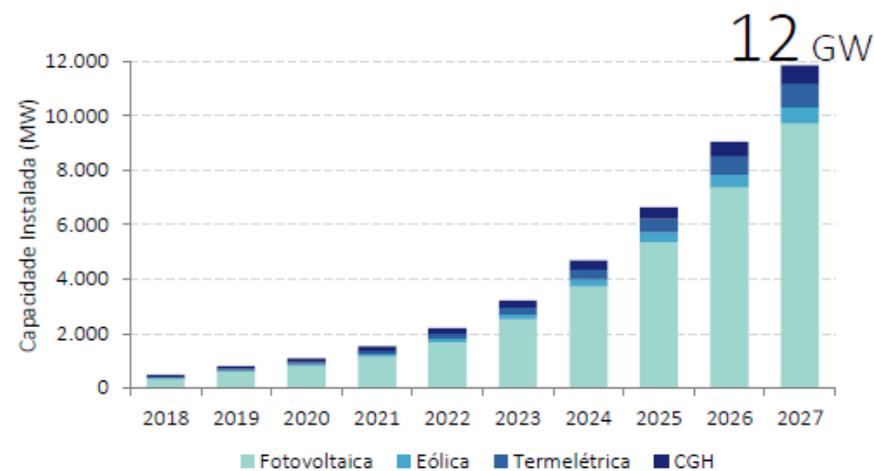
AUMENTO NA DEMANDA POR GERAÇÃO TÉRMICA A GÁS

Gráfico 11-1 - Matriz energética brasileira: energia renovável e não-renovável



Crescimento da participação de renováveis na matriz

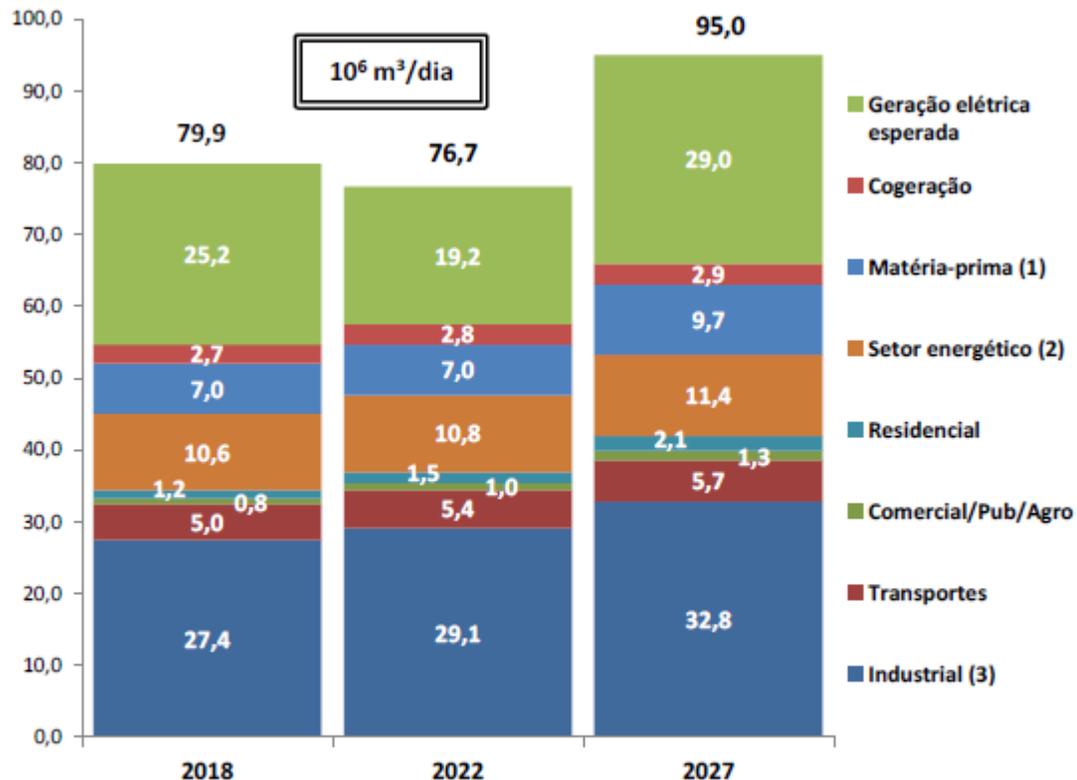
Gráfico 9-16 - Micro e Minigeração Distribuída



Desenvolvimento da geração distribuída

MUDANÇAS NO CONSUMO

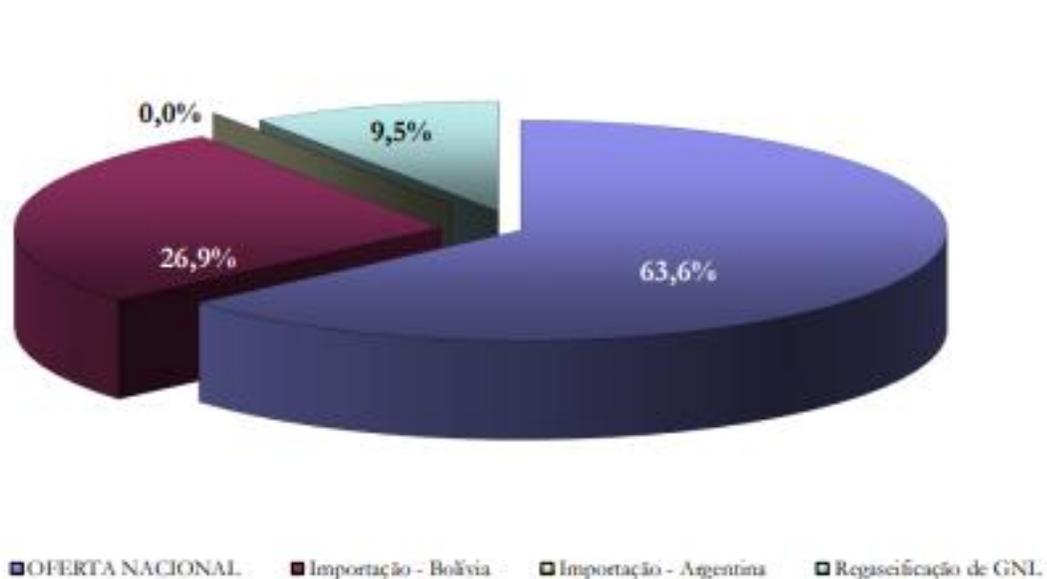
Gráfico 2-12 - Gás Natural: Consumo total de energia por setor



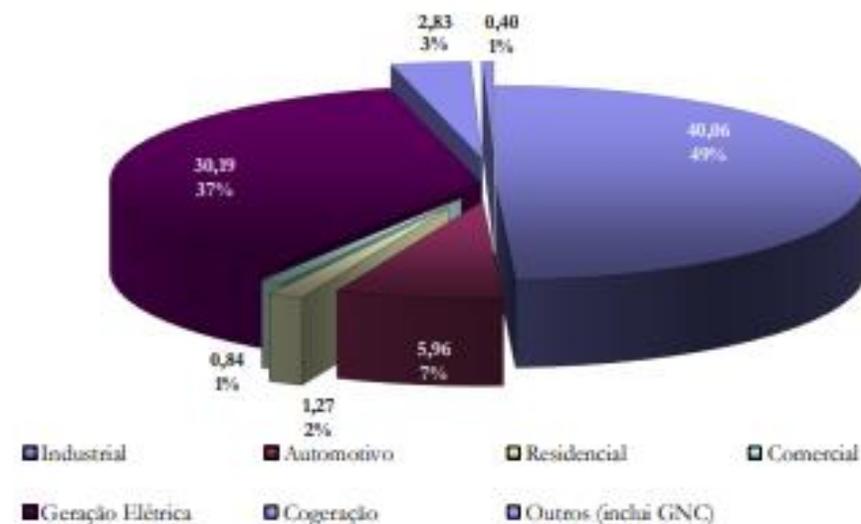
Demanda projetada

- Notas:
- (1) Consumo Final Não Energético (matéria-prima): Gás natural utilizado como insumo em refinarias (produção de hidrogênio), unidades de fertilizantes e indústria gás-química.
 - (2) Setor Energético: Consumo em refinarias, não incluindo produção de hidrogênio. Não considera consumo em E&P e gás natural absorvido em UPGN.
 - (3) Setor Industrial: Inclui parcela energética de fertilizantes.
 - (4) Dados de 2018 são estimativas.

O MERCADO HOJE

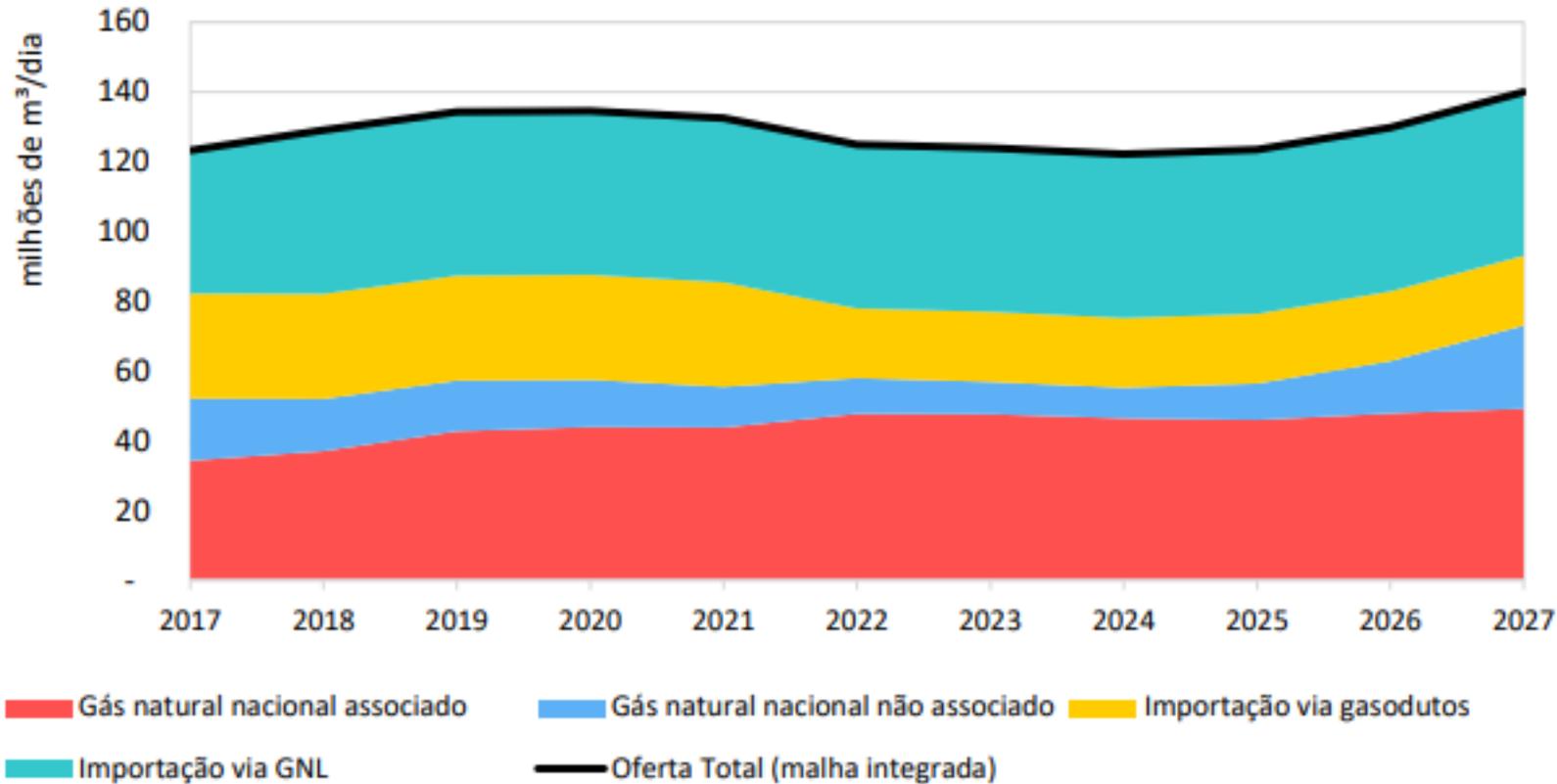


Oferta de gás natural



Segmentos industrial, termelétrico e GNV respondem por 93% da demanda

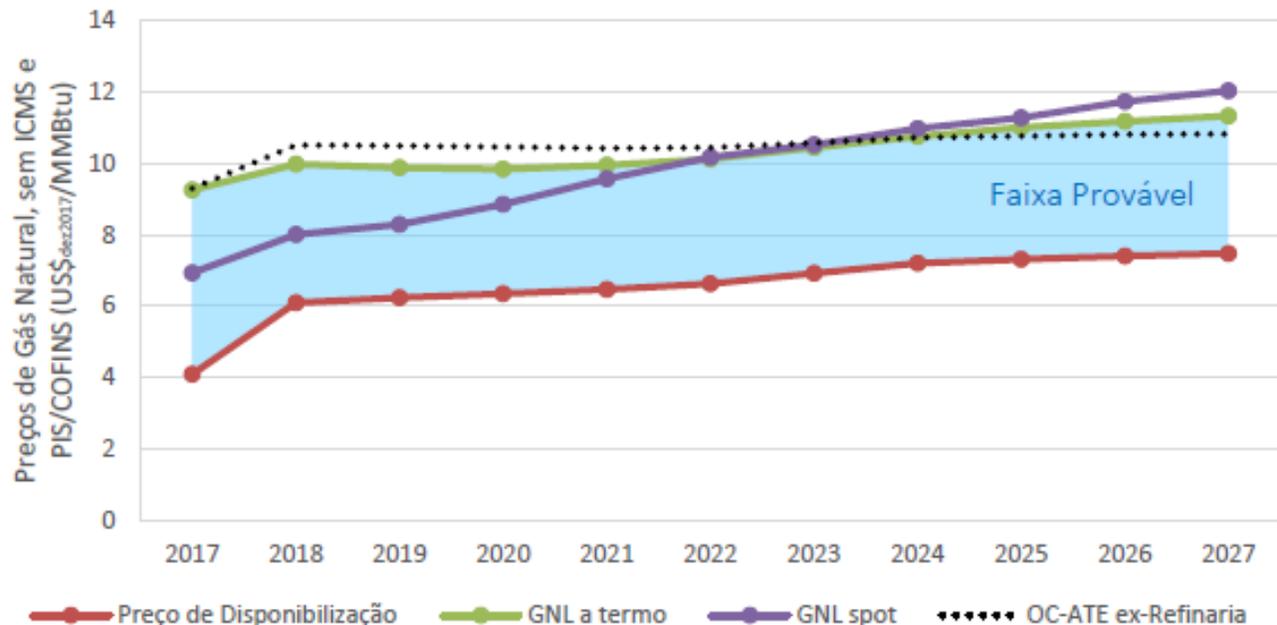
MUDANÇAS NA OFERTA



Pré-sal: aumento na produção interna

Renegociação do contrato do Gasbol

Gráfico 7-1 - Projeções de preços não incluindo ICMS e PIS/COFINS, transporte e margem de distribuição



Tendências de preço

Nota: O Preço de disponibilização é o mínimo preço que motiva o produtor nacional a empreender investimentos para ofertar o gás natural no mercado, e considera risco exploratório, gestão de portfólio e teor energético do gás natural; o preço do óleo combustível ex-Refinaria refere-se ao Óleo Combustível com Alto Teor de Enxofre (OC-ATE) imediatamente na saída da Refinaria, excluindo ICMS e PIS/COFINS.

Fonte: Elaboração EPE.

GÁS PARA CRESCER

Novo Desenho do
Mercado de Gás
Natural

Aperfeiçoamento
das Regras
Tributárias

Integração
Setores Elétrico e
Gás Natural

Potencial para
destravar grandes
projetos

ABERTURA EM TODOS OS ELOS DO SETOR

Segmento	Hoje	Gás para Crescer
Transporte	Contratação de capacidade ponto a ponto em gasodutos de transporte	Formação de Sistemas de Transporte com contratação de capacidade na modalidade de entradas e saídas
	Desverticalização jurídica	Desverticalização com certificação de independência para os transportadores existentes e total para os novos
	Operação coordenada pela Petrobras	Operação coordenada por Gestor de Área de Mercado formado por transportadores independentes, sem a criação de novo ente
	Regime de concessão para gasodutos de transporte como regra geral	Regime de autorização, com possibilidade de contestação por outros transportadores interessados
	Planejamento pelo MME com base em estudos da EPE	1) Planejamento indicativo pela EPE 2) Plano de investimento dos transportadores aprovados pela ANP após consolidação e avaliação pela EPE
	Ausência de mecanismos para cessão compulsória de capacidade	Regulação de mecanismos de cessão compulsória de capacidade

Segmento	Hoje	Gás para Crescer
Comercialização	Comercialização de gás em pontos físicos	Comercialização em Pontos Virtuais de Negociação (<i>virtual hubs</i>)
	Sem previsão para comercialização em mercados organizados	Criação das bases para comercialização de gás em mercados organizados
	Ausência de mecanismos para reduzir concentração de mercado	Possibilidade de restrição da fatia de mercado de um único agente (programa de liberação de gás natural ou <i>gas release e/ou capacity release</i>)
Distribuição	Regulação pelos Estados da figura do Consumidor Livre	Regulação Federal da figura do Consumidor Livre com liberalização gradual do mercado, respeitando a realidade de cada Estado
Escoamento, Processamento e Terminais de GNL	Acesso facultativo – sem regras definidas	Acesso negociado e não discriminatório, garantida a prioridade de acesso do proprietário
Estocagem	Concessão com base na Lei 8.666/93	Regime de autorização

O GOVERNO ENTENDE A NECESSIDADE DE ABERTURA DO MERCADO DE GÁS

- Desverticalização e desestatização do setor de gás natural.
- Livre acesso e compartilhamento dos gasodutos de transporte.
- Independência de distribuidoras e transportadoras de gás natural, não devendo estar atreladas aos interesses de uma única companhia.
- Criação de um mercado atacadista de gás natural.
- Incentivo à exploração não convencional, podendo ser praticada por pequenos produtores.

FONTE: PROGRAMA DE GOVERNO DE JAIR BOLSONARO

INVESTIMENTOS PRIVADOS EM ANDAMENTO

Tabela 7-1 - Investimentos previstos no horizonte de 2018-2027

Classificação	Previstos		Indicativos	
	Projetos	R\$ bi	Projetos	R\$ bi
Gasodutos de transporte ¹	1	0,13	-	-
Terminais de Regaseificação de GNL ²	2	0,80	6*	2,40*
UPGNs ³	2	2,39	1	2,30
TOTAL	5	3,32	7*	4,70*

VENDA DE ATIVOS DA PETROBRAS MUDARÁ RADICALMENTE A ESTRUTURA DO SETOR NO BRASIL

- | | | | |
|---|--|--|--|
| <ul style="list-style-type: none"> - TAG - PARCERIAS EM REFINO - UFN-III - ARAUCÁRIA NITROGENADOS | <ul style="list-style-type: none"> - CAMPOS TERRESTRES (POLO LAGOA PARDA) - BSBIOS - CAMPOS DE ÁGUAS RASAS (RN) | <ul style="list-style-type: none"> - CAMPO BAÚNA - CAMPO TARTARUGA VERDE E MÓDULO 3 DE ESPADARTE (50%) - SERGIPE ALAGOAS - ÁGUAS PROFUNDAS - REFINARIA DE PASADENA | <ul style="list-style-type: none"> - CAMPOS DE ÁGUAS RASAS (RJ, SP, CE E SE) - CAMPOS TERRESTRES - CAMPOS PIRANEMA E PIRANEMA SUL (SE) - CAMPO DE MAROMBA (RJ) |
|---|--|--|--|

Desinvestimento de US\$27bi até 2023



Perguntas

Gabriela Ruddy

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São Paulo, February 14, 2019

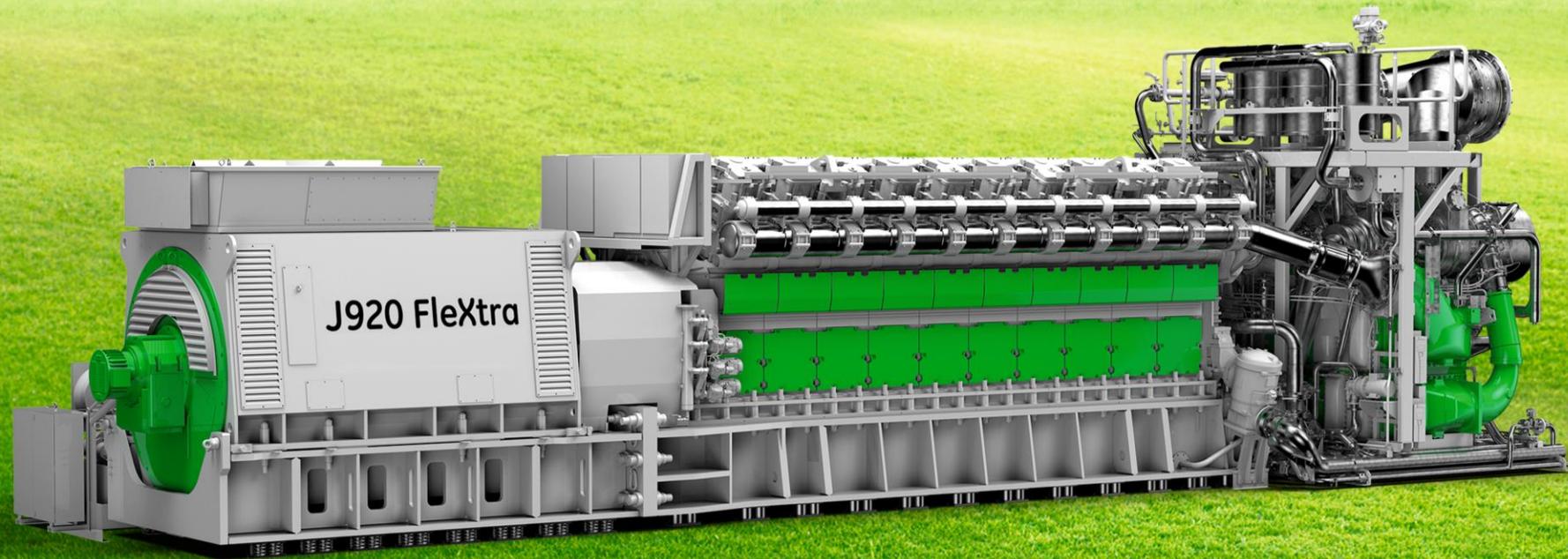


Brian Moloney

Senior Product Manager, J920



J920 FleXtra GAS ENGINE



FUTURE CHALLENGES FOR THE ENERGY INDUSTRY

8.5 B

Expected global population by 2030, today **7.6 B.**

1.2 B

People without **power**

50 %

Expected **increase** in energy demand by 2030

60 %

Number of people expected to be living in urban areas



MEGA TRENDS DRIVING GROWTH

1 Emerging economies



2 Coal → Gas



3 Renewables



4 Distributed power



5 Digital



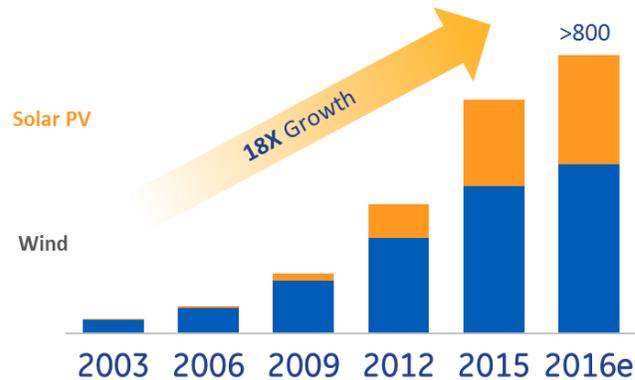
6 Hybrid models



Digital technologies will be at the nexus of highly efficient hardware & intelligent software

RENEWABLES DRIVING INTERMITTANCY AND VOLATILITY

Global installations Cumulative (GW)

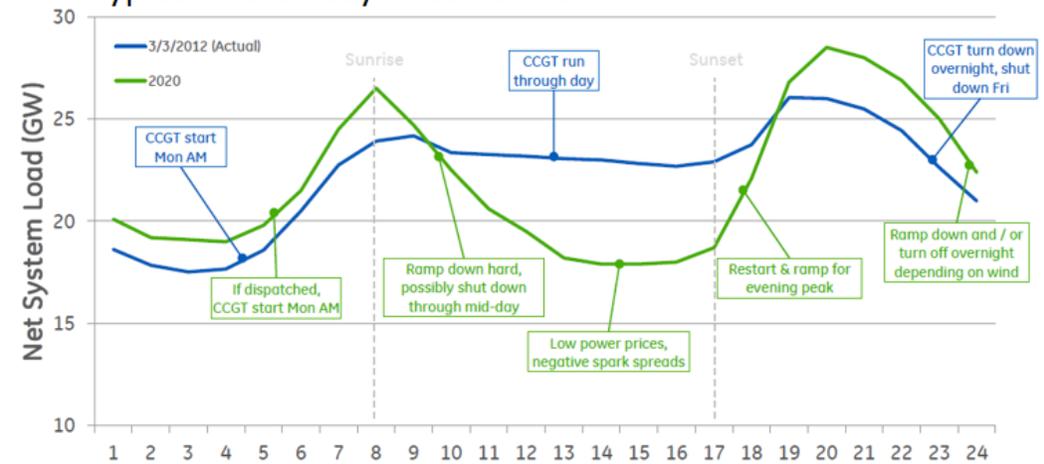


Source: GWEC, GTM Research, Navigant, REN21

Value creators:

- Part & full load efficiency
- Modularity → output reliability
- Multiple fast start & stop time

Typical March day in California



Source: California ISO, GE Power Marketing

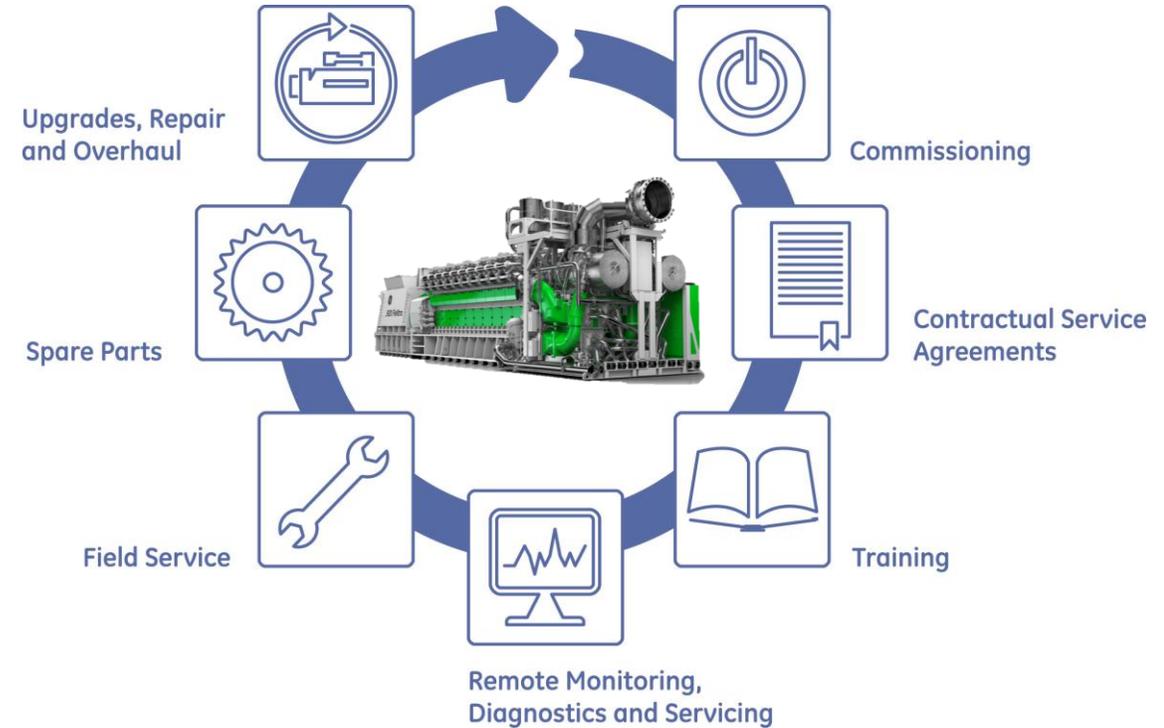
- Full output: temperature, altitude
- Grid stabilisation services (ancillary services)
- Low environmental impact

Future market volatility will drive flexibility & technologies to support renewables revolution

THE J920 FleXtra
RECIPROCATING GAS ENGINE



THE J920 FleXtra LIFE CYCLE MODEL



Power plant solutions

From Generating set to TK Power Plant
Brown field or green field sites

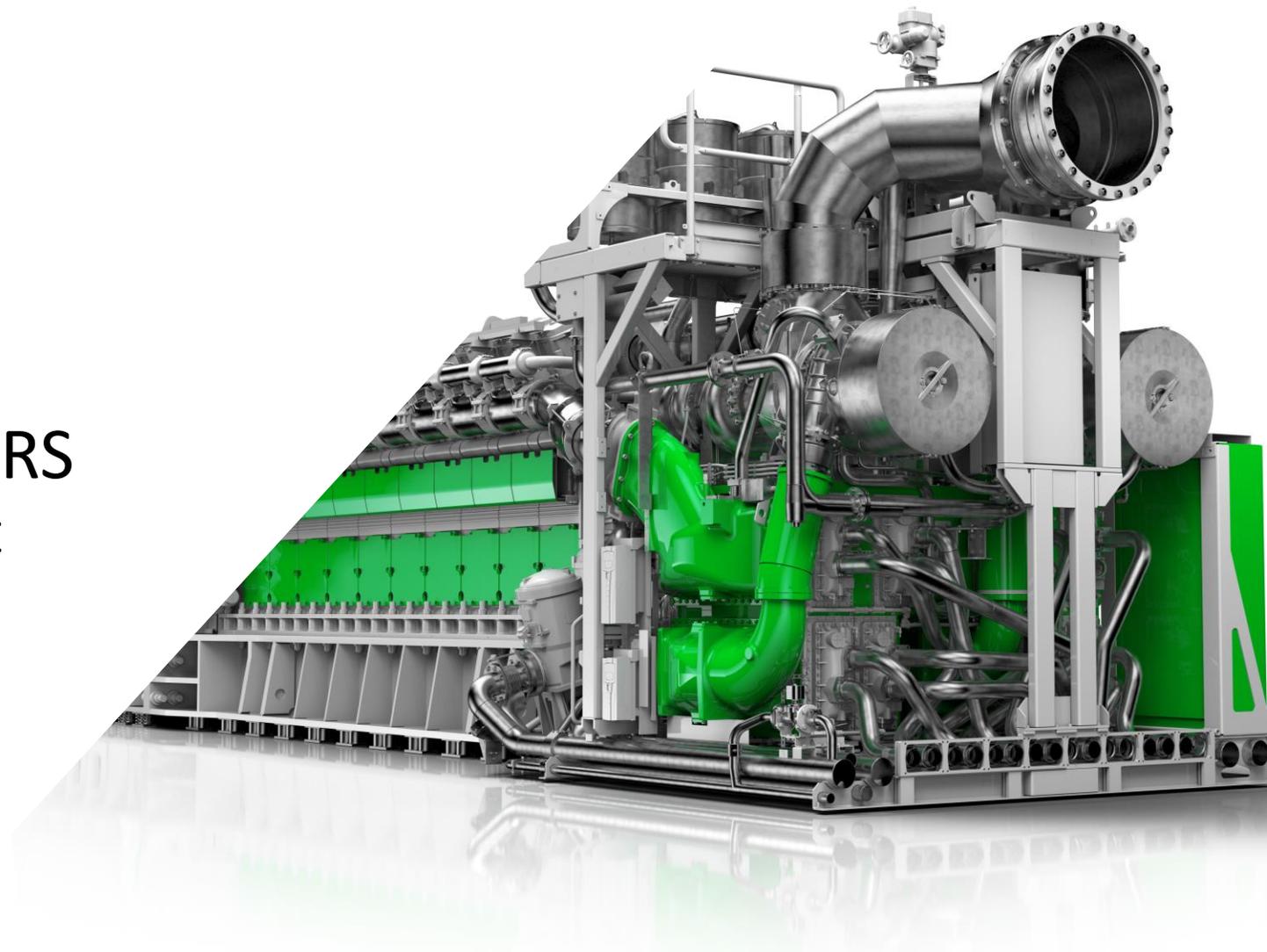


Life cycle solutions

From Commissioning to O&M
Tailored customer solutions

TECHNOLOGY DIFFERENTIATORS

J920 FleXtra GAS ENGINE

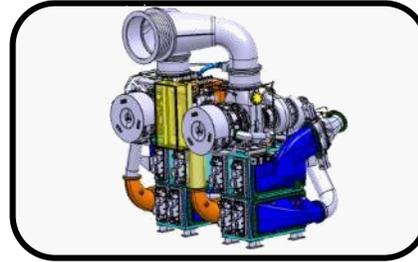


J920 FleXtra ADVANCED TECHNOLOGY BLOCKS

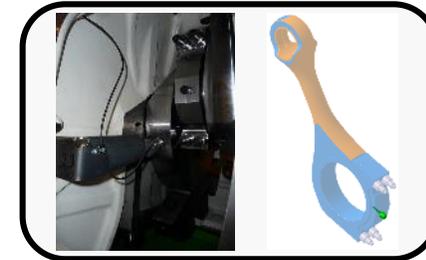
Grid compliance & Island mode behavior



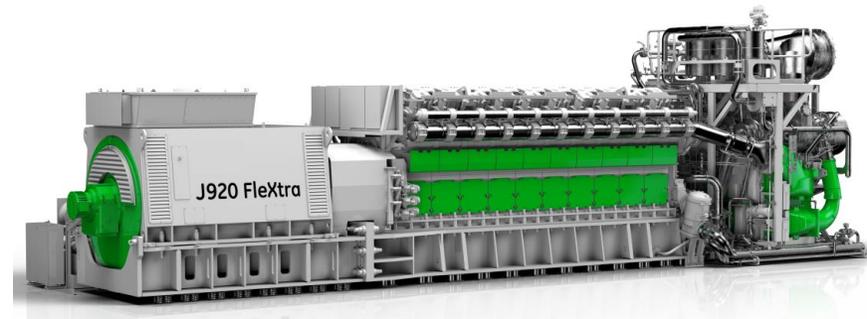
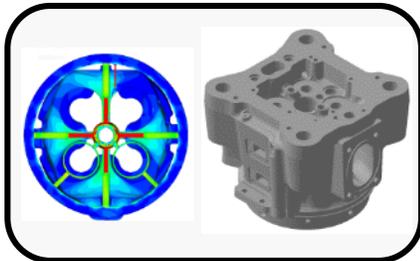
Two stage turbocharging



Sensors for asset performance & protection



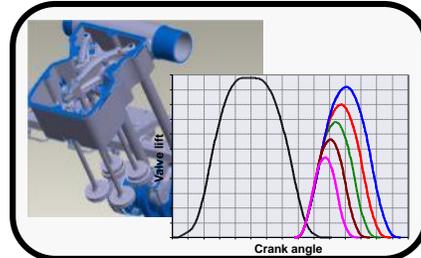
Advanced cooling system



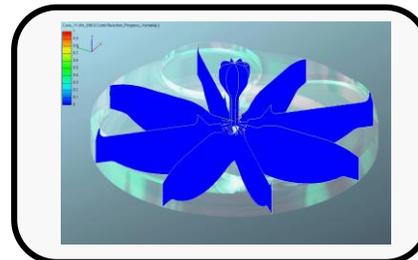
Cylinder individual control



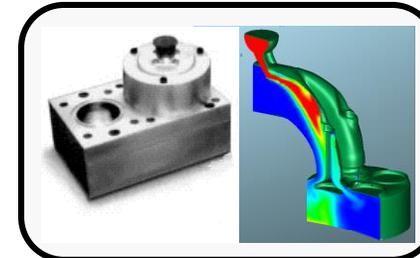
Advanced valve timing



Rapid burn combustion



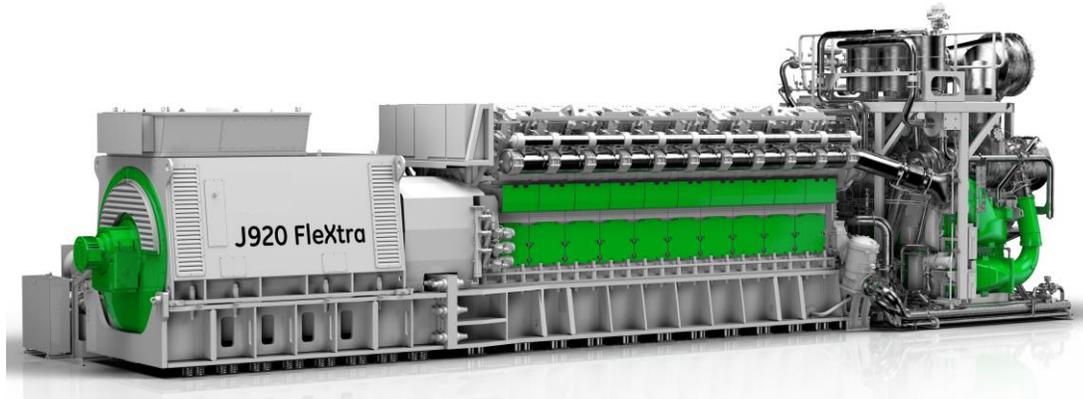
Port injection



**SOLVING SOLUTIONS TO
MODERN ENERGY PROBLEMS
WITH THE J920 FleXtra GAS
ENGINE**



J920 FleXtra ENVIRONMENTAL FOOTPRINT SUMMARY



NO_x mg/Nm³ @5% O₂:

- Engine out: 500mg or 250mg
- Less than 25mg or 7.5ppm with after-treatment

Water usage:

- Closed loop engine circuit uses no water
- Radiator cooling circuit ~3L per week

Noise:

- 75dB(A) @ 10m standard
- 55dB(A) @ 10m option

Aesthetics:

- Low silhouette with no visible emissions

The J920 FleXtra ... Creating a New Power Plant Environment

RECIPROCATING GAS ENGINES ADVANTAGES

Value creators:

- Part & full load efficiency
- Modularity → output reliability
- Fast Start & stop time
- Full output: temperature, altitude
- Grid stabilisation services (ancillary services)
- Low environmental impact

Creating customer value

Performs better on hot days & at high altitudes

J920 FleXtra Fast start capability

Plant flexibility & resiliency with high efficiency

Designed for flexible operation & ancillary services

Customers face dynamic environments

J920 FleXtra Environmental footprint summary




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The J920 FleXtra ... Creating a New Power Plant Environment

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SUMMARY OF EXPERIENCES
WITH THE J920 FleXtra GAS
ENGINE

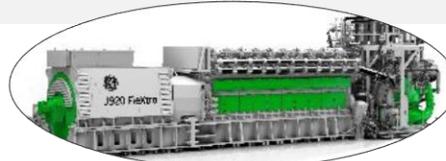


REFERENCE PROJECTS

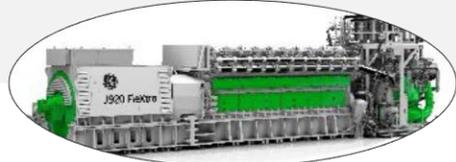
Sky, USA
Sky Global Partners
Peaking Power
6 units



Stapelfeld, GER
HanseWerk Natur
CHP & Peaking
1 unit



Merheim, GER
CHP & Peaking
3 unit

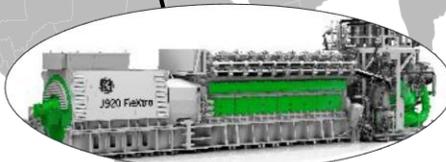


Pforzheim, GER
CHP & Peaking
5 unit

Kiel, GER
SW Kiel
CHP & Peaking
20 units



Rosenheim, GER
SW Rosenheim
CHP & Peaking
1 unit



Cassino, ITA
Metaenergia
Trigen
2 units



Roma, ITA
Acea
CHP district heating
2 units

	Units	COD
GER	1	2013
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USA	6	2016
ITA	2	2017
GER	20	2018
ITA	2	2018
GER	3	2019
GER	5	2020
Accumulated	40	

INNIO'S FIRST J920 FleXtra PROJECT WITH SKY GLOBAL PARTNERS

6 x J920 FleXtra IPP TX, USA (60 Hz)

- 51.4MW total generator output
47% el. efficiency measured
49.3% el. efficiency incl. 5% tol.
- Sky Global is an Independent Power Developer founded in '07
- Sky Global will sell high efficient peaking power to the San Bernard Electric Cooperative, Inc.
- INNIO's BOP equipment includes SCR, oxidation catalysts, silencers, and associated hardware
- Multi-year O&M agreement with INNIO



POWER PLANT K.I.E.L



Elektrode Boiler
35 MW

Chimney (a 5)

Heat Storage
42,000 m³
30,000 m³ used
~1,500 MWh
FWT 60 / RWT 115 °C
Ø 31,2 m
60 m height

Engine hall

Control room

Transformer

Workshop

Transformer

Storage

Pump hall

190 MW Electrical energy
192 MW Thermal energy
>91% Total efficiency



- EPC Partner (KAM)
- 20 engines commissioned
- Q1 2019 trial run

- 190 MW Electrical energy
- 192 MW Thermal energy
- >91% Total efficiency
- Availability guarantees
- Full engine maintenance agreement



INNIO's J920 FleXtra

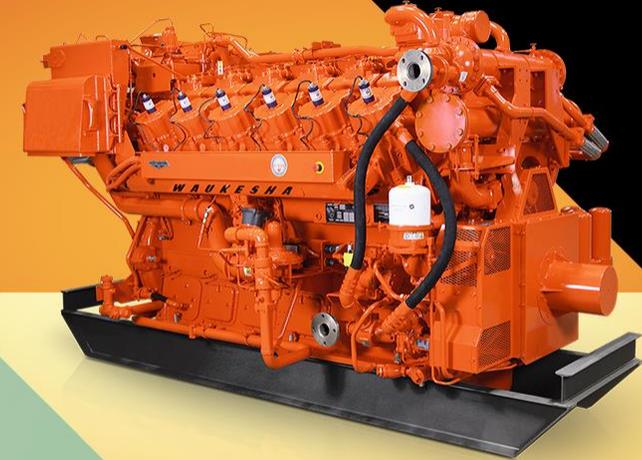
- 10.38MW / 9.35MW, >49% eff.
- Full power to 48°C
- High plant flexibility & availability
- No water usage
- Modular design for ease of transport, installation, & service
- Long-term service agreement

INNIO





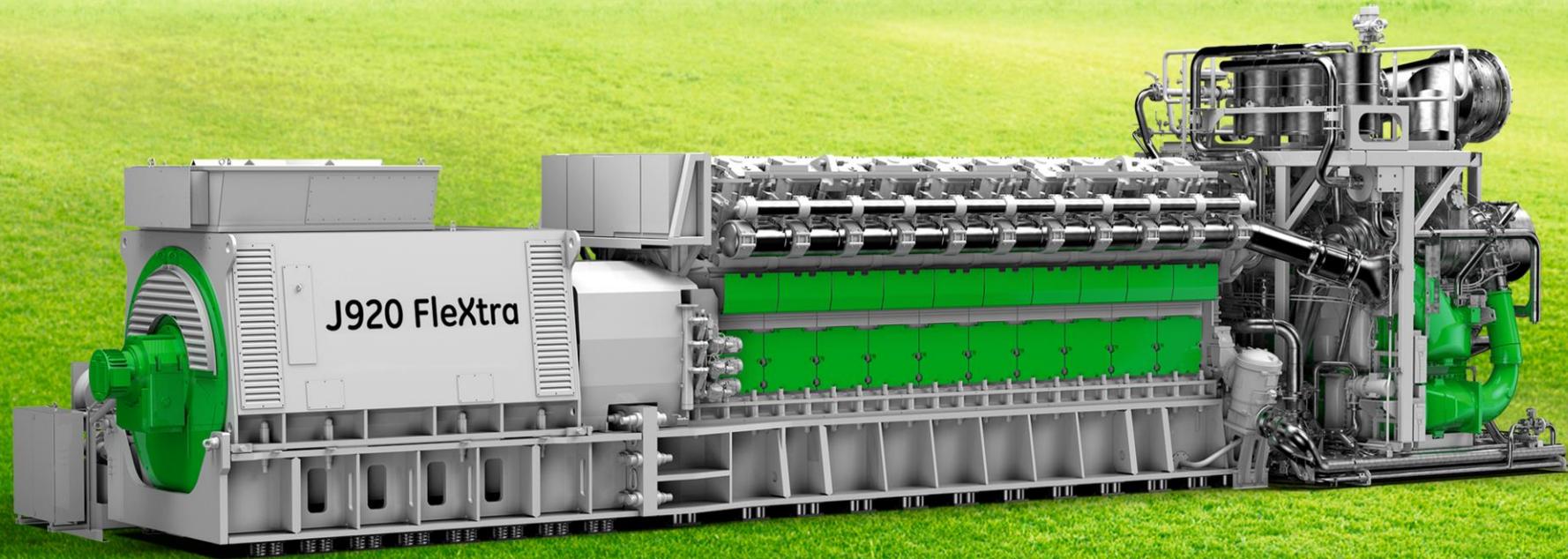
THE FUTURE OF ENERGY IN BRAZIL CONFERENCE



São Paulo, February 14, 2019



J920 FleXtra GAS ENGINE IN POWER PLANTS

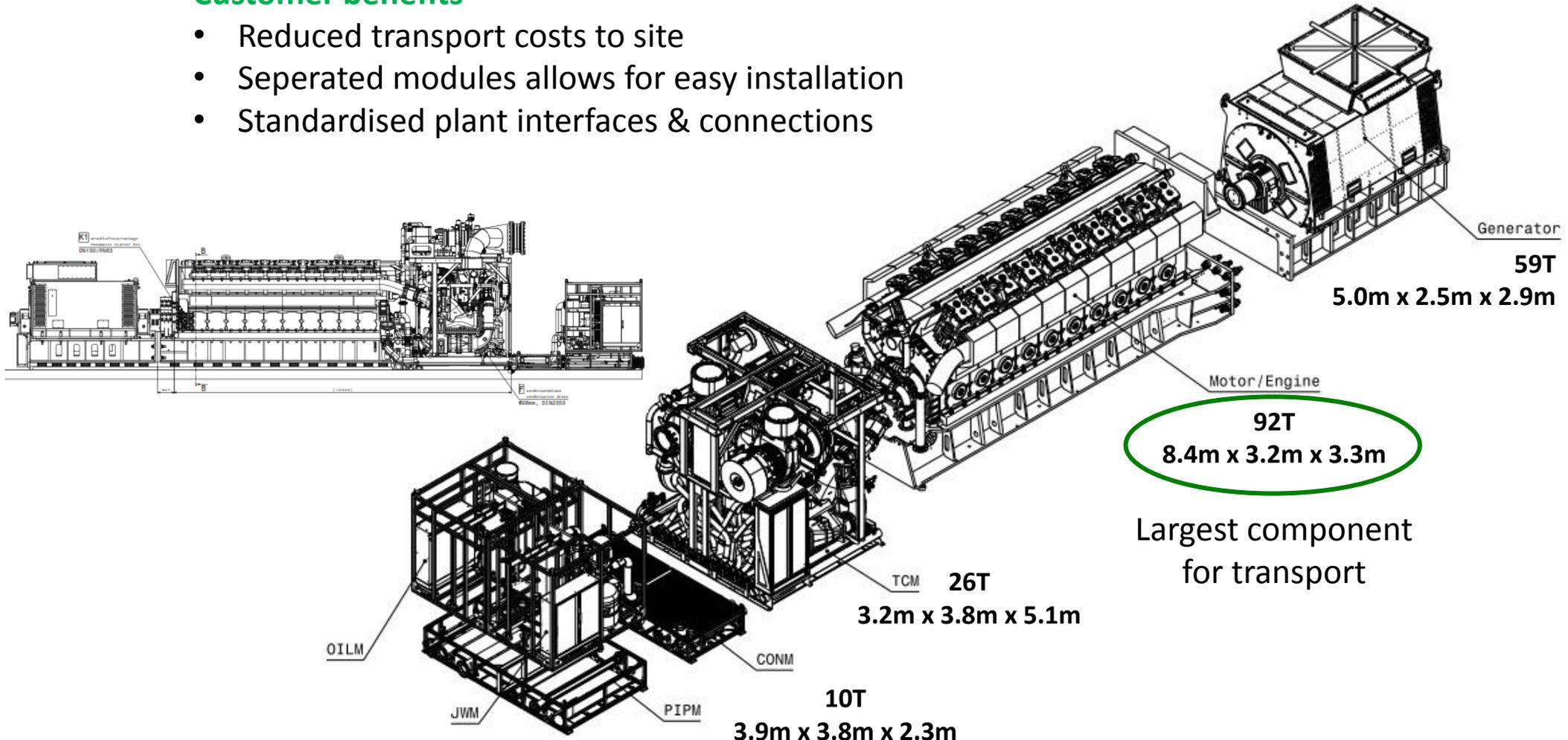


MODULAR DESIGN STARTS WITH THE CONCEPT

Reduced installation & transport costs

Customer benefits

- Reduced transport costs to site
- Separated modules allows for easy installation
- Standardised plant interfaces & connections

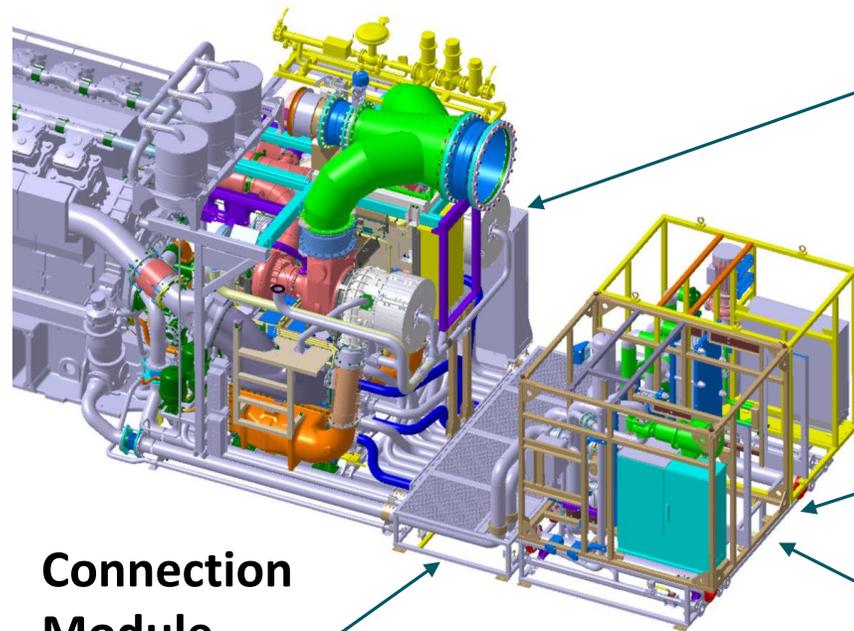


J920 FleXtra: MODELS FOR TC, WATER AND OIL FOR MAX PLANT INTEGRATION



Engine module separated in generator, engine, TCM and Aux Modules

2 separated modules for oil and cooling water => compact installation – low centreline distance between 2 engines



TCM

(Turbo Charger & Intercooler)

Cooling water module

(Heat Exchanger/Cooling water pump/ Cooling water pre heating)

Oil Module

(Oil cooler/oil preheating/preheating pump)

Piping module

Adaption to hydraulic integration/ interface to customer plant)

Connection Module

(Variable distance to water and oil module)

MODULAR CONCEPT PROVIDES FAST AND FLEXIBLE INSTALLATION



- Aux modules & TCM can be delivered and installed separately
- Installation of aux modules even before engine supply possible
- Pipework and installation can start early
- “Only” 92t as engine weight to be transported, lifted and installed in one piece



J920 SCOPE BALANCE OF PLANT

LV distribution = 480V bus bar

genset dedicated auxiliaries

commons and master control

oil supply, compressed air, ...

building installation

MV distribution = 12.47/13.8 kV bus bar

step-up trafo to HV

Engine module control

step-down trafo 12.47/13.8 kV/480V

expansion vessels

maintenance water tank w/ pump

HT fin-fan coolers

LT fin-fan coolers

SCR+OXI Catalyst

urea tank

exhaust gas heat exchanger

steam generators

silencer/w/ stack

Cooling

Exhaust

Air

Oil

Electrical

Induction & Ventilation

Fuel

air receiver tank

air compressors

inlet silencer

ventilators

filtration

gas booster /reduction station

daily oil tank

temporary oil tank

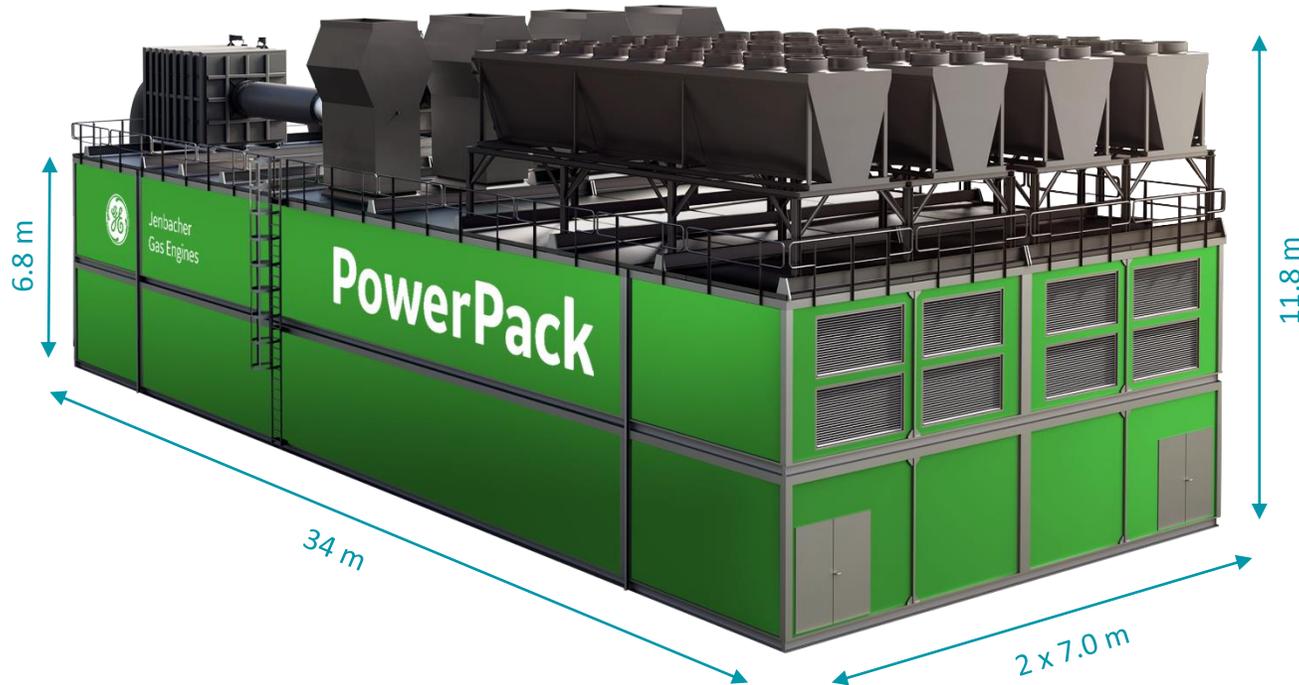
waste oil tank

fresh oil tank

MODULAR SOLUTIONS WITH
THE J920 POWER PACK



POWER PACK SOLUTION OVERVIEW



Ambient conditions

Standard ambient temperature	-20 to 40 °C	-4 to 104 °F
Option for cold ambients down to	-40 °C	-40 °F
Option for high ambients over	40 °C	104 °F

Sound pressure level

Standard design	85 db(A) in 10 m
Optional design	65 and 75 db(A) in 10 m
(surface and sound pressure level according ISO 3744)	

Main dimensions per unit

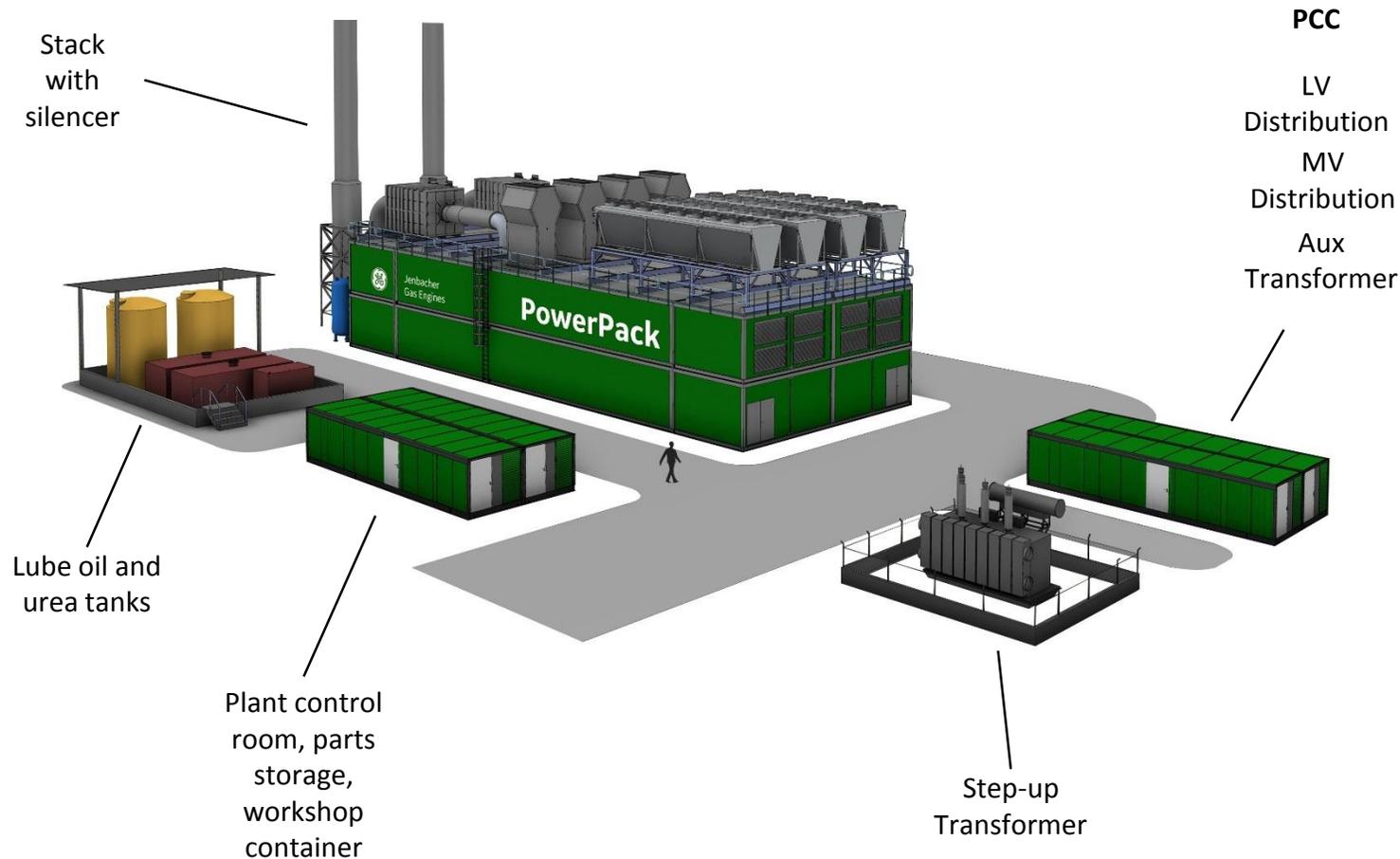
Length	34.0 m	112 ft
Width	7.0 m	23 ft
Height (excl. exhaust stack)	11.8 m	39 ft

Modularised, pre-engineered fast power solution

J920 PowerPack ... fast, flexible power at a competitive installed cost

J920 POWER PACK SOLUTION

2 units example side by side



Jenbacher optional BoP scope

- Starting air, lube oil & urea tanks
- Stack with silencer, heat exchanger
- Plant control room, parts, storage
- workshop container
- PCC (Power Control Container)
- Step-up transformer

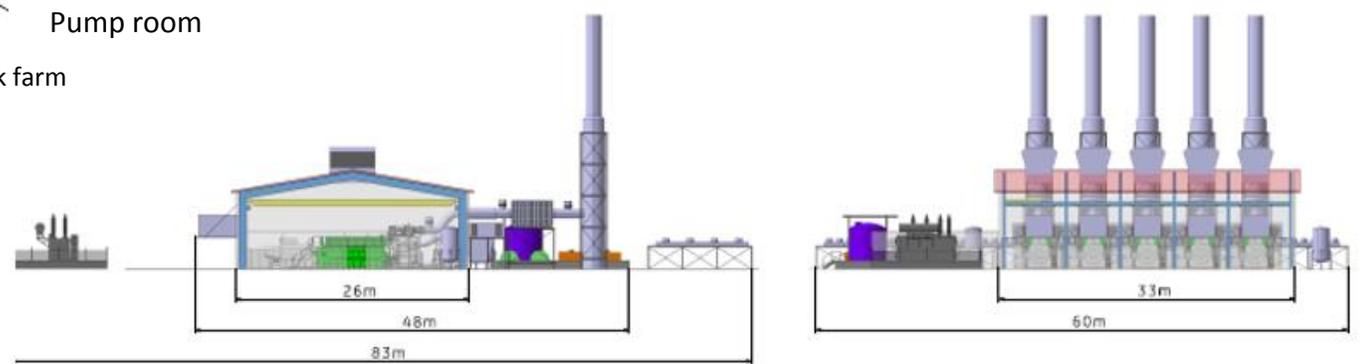
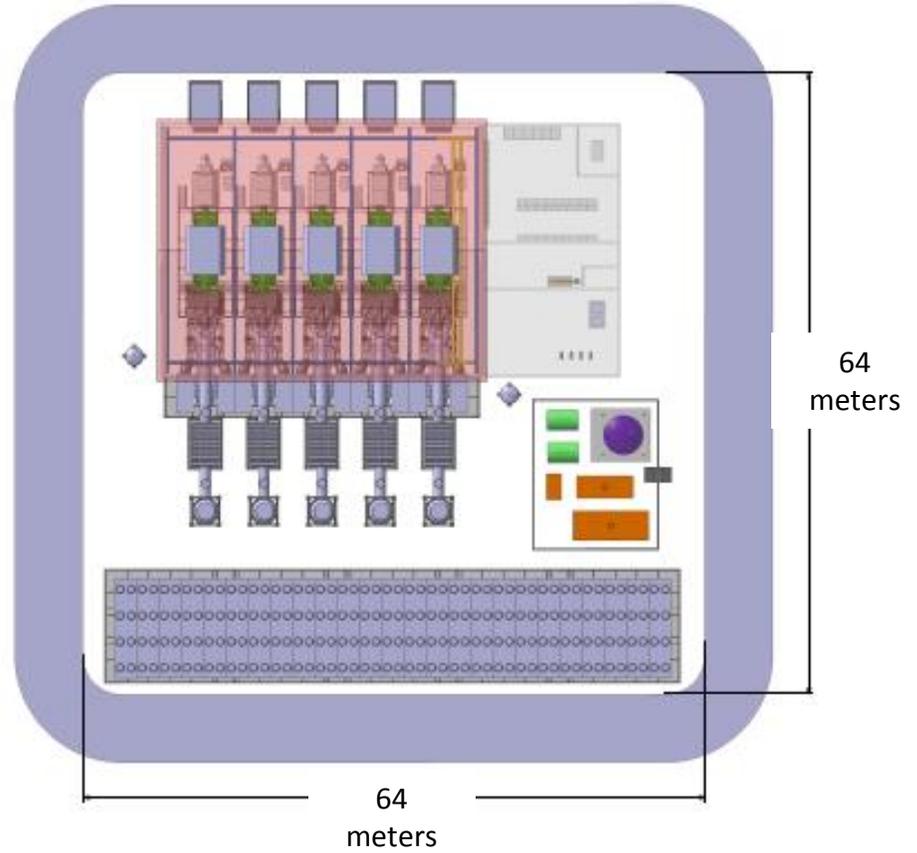
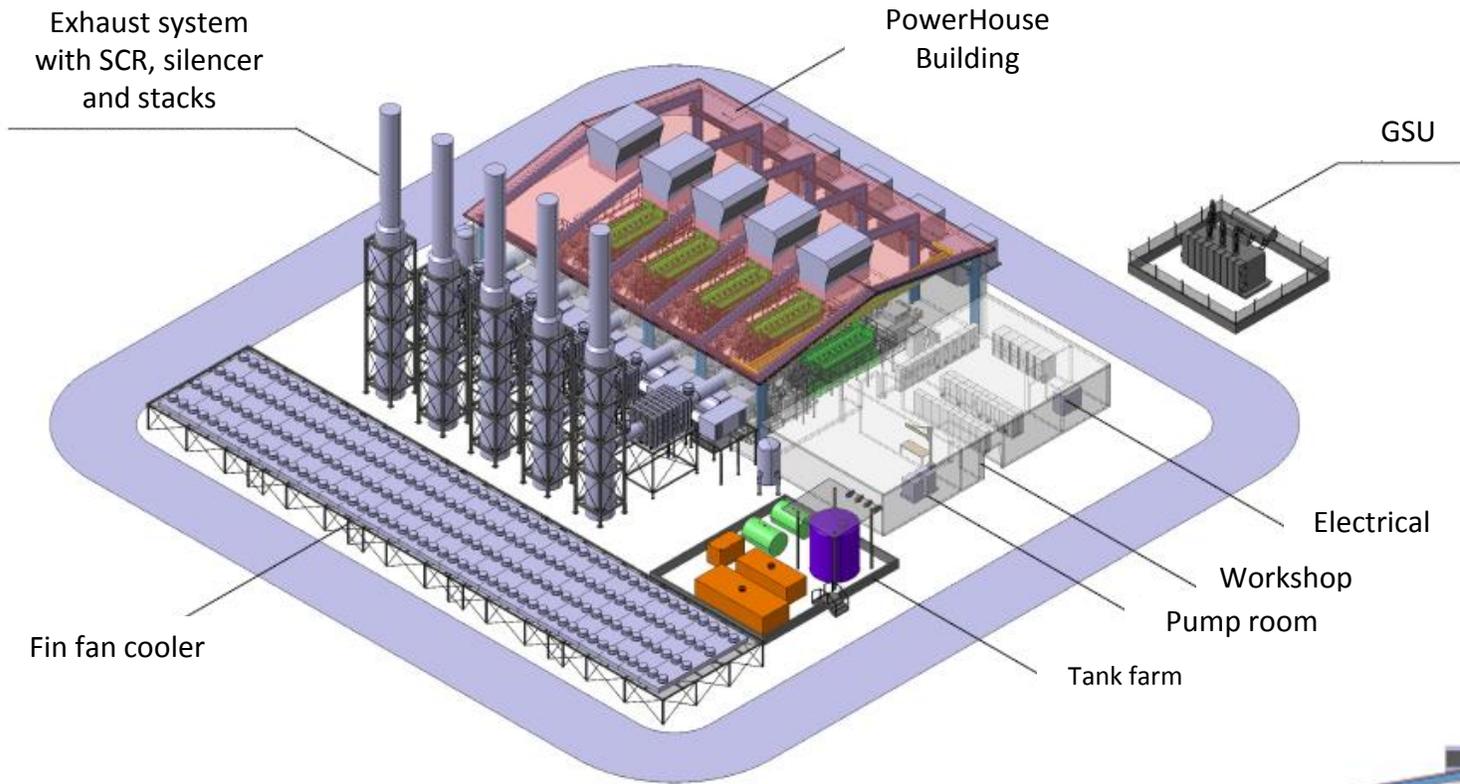
Solving solutions to modern
energy problems

Working with Partners

J920 FleXtra Gas engine



5x J920 FleXtra LAYOUT



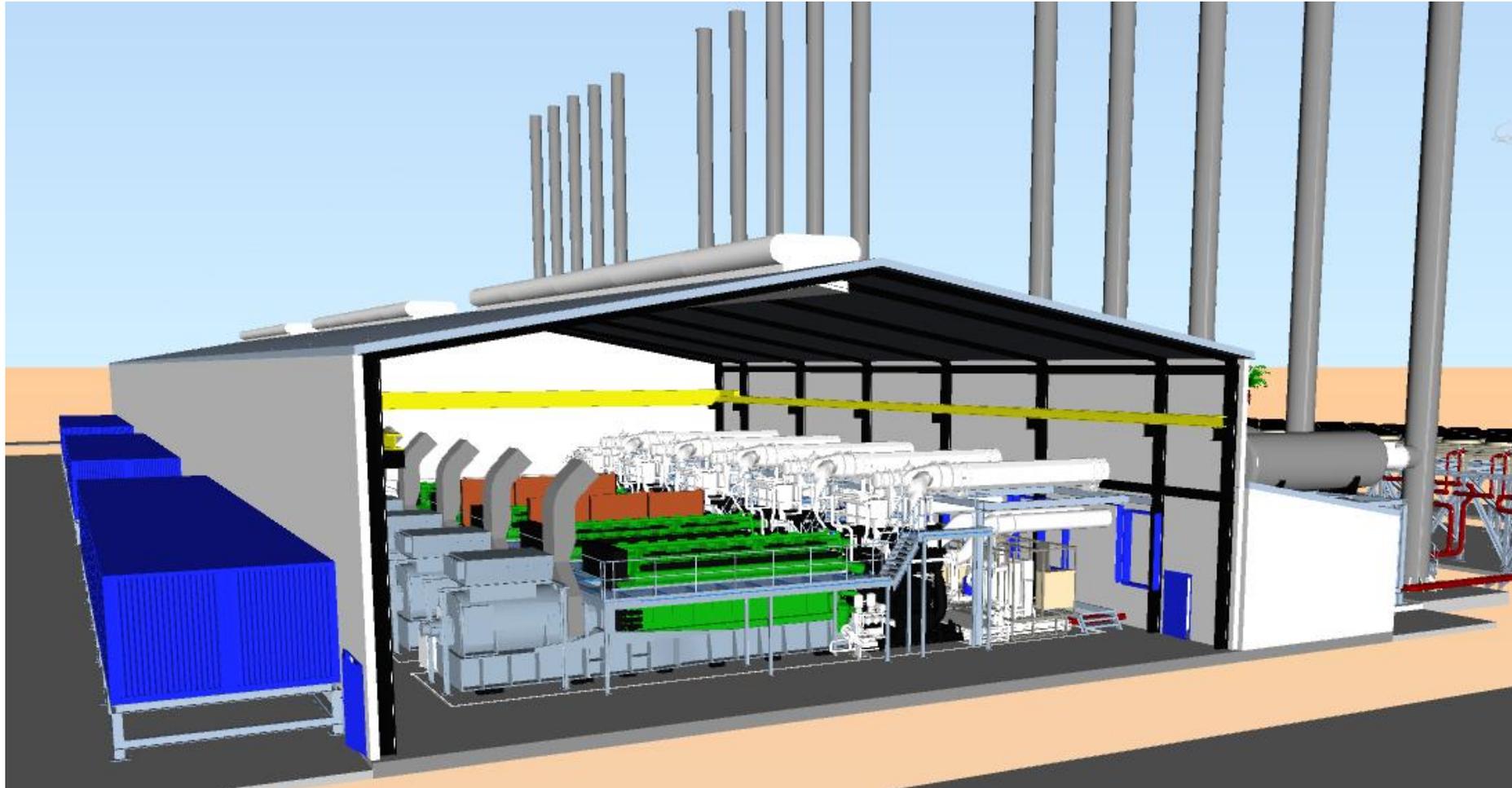
J920 FleXtra – 15 ENGINE POWER PLANT CONCEPT



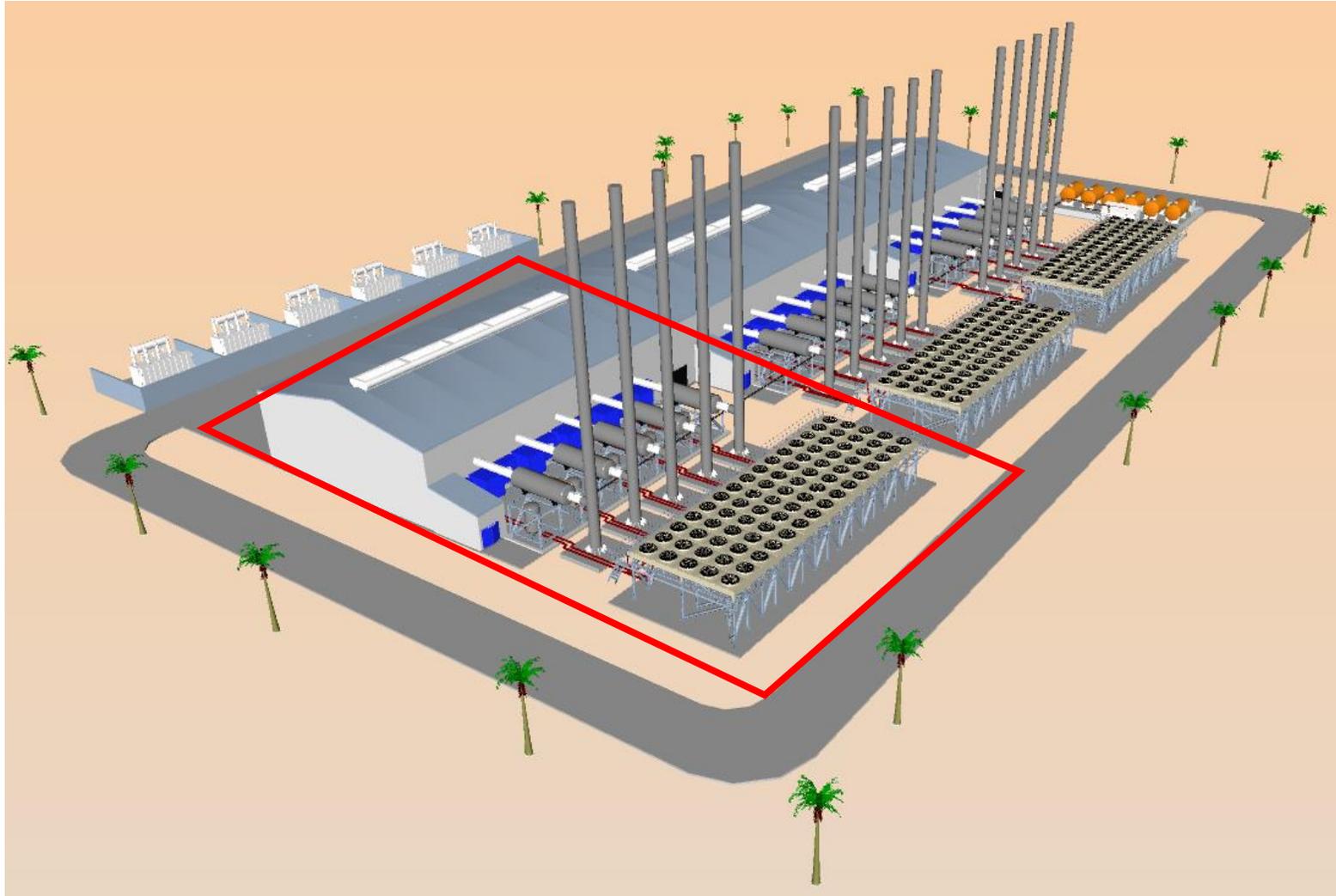
J920 FleXtra – GENERAL LAYOUT DEFINED DURING PLANNING



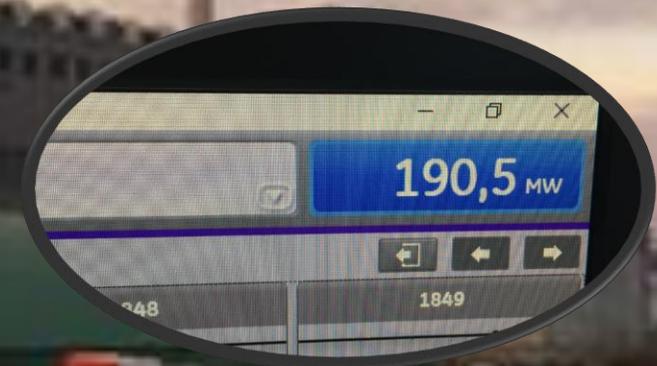
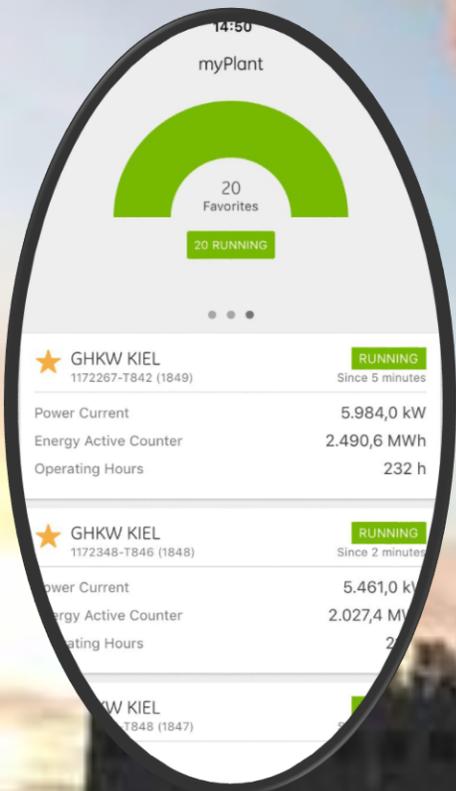
J920 FleXtra – SIMPLE AND COMPACT INTEGRATION



J920 FleXtra – MODULAR AND SIZEABLE FOR YOUR NEEDS



- Modular design easy for MW additions
- Can add more engines as more gas becomes available
- Planning for additional capacity possible



LATEST NEWS!!!

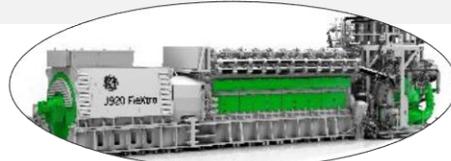
- All engines run on full flood
- Island mode test passed – full load rejection to idle

J920 FleXtra REFERENCE PROJECTS

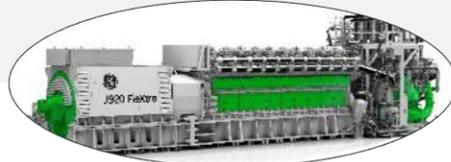
Sky, USA
Sky Global Partners
Peaking Power
6 units



Stapelfeld, GER
HanseWerk Natur
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1 unit



Merheim, GER
CHP & Peaking
3 unit



Pforzheim, GER
CHP & Peaking
5 unit

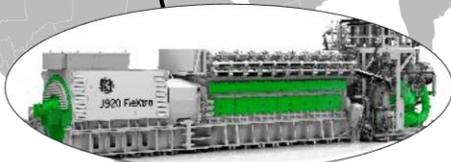
Kiel, GER
SW Kiel
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20 units



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1 unit



Roma, ITA
Acea
CHP district heating
2 units

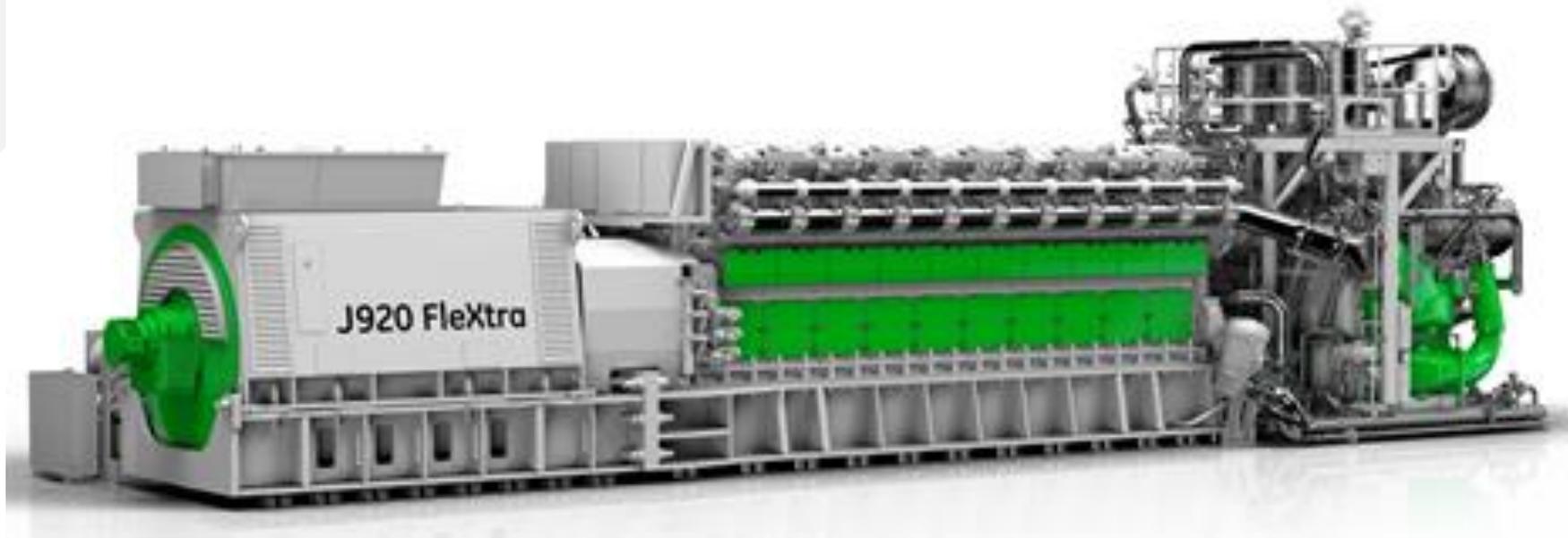


Cassino, ITA
Metaenergia
Trigen
2 units

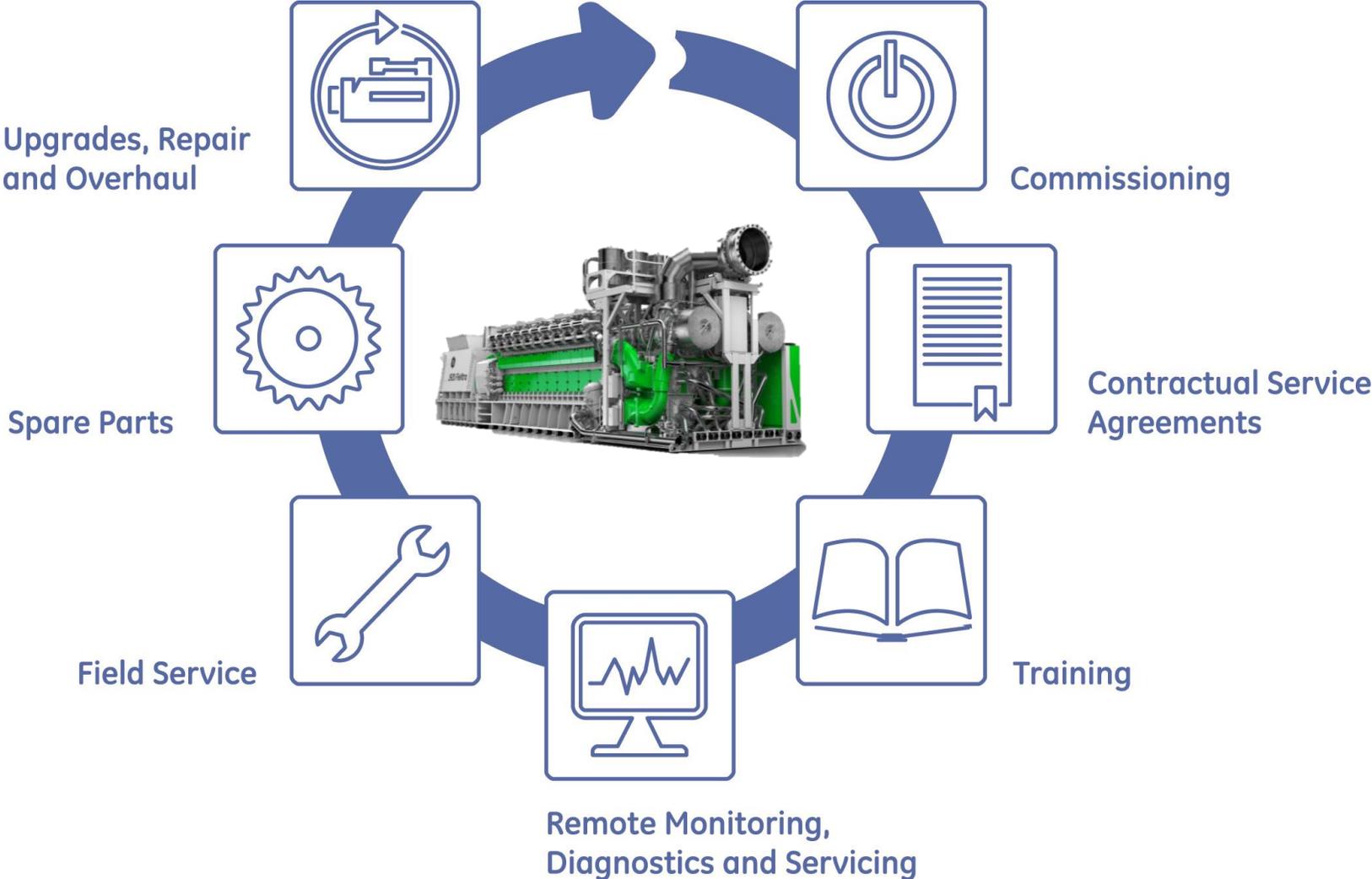
	Units	COD
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ITA	2	2017
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Accumulated	40	



J920 SERVICE AND DIGITAL



Lifetime Services -the right service at the right time



Fast Installation and Commissioning

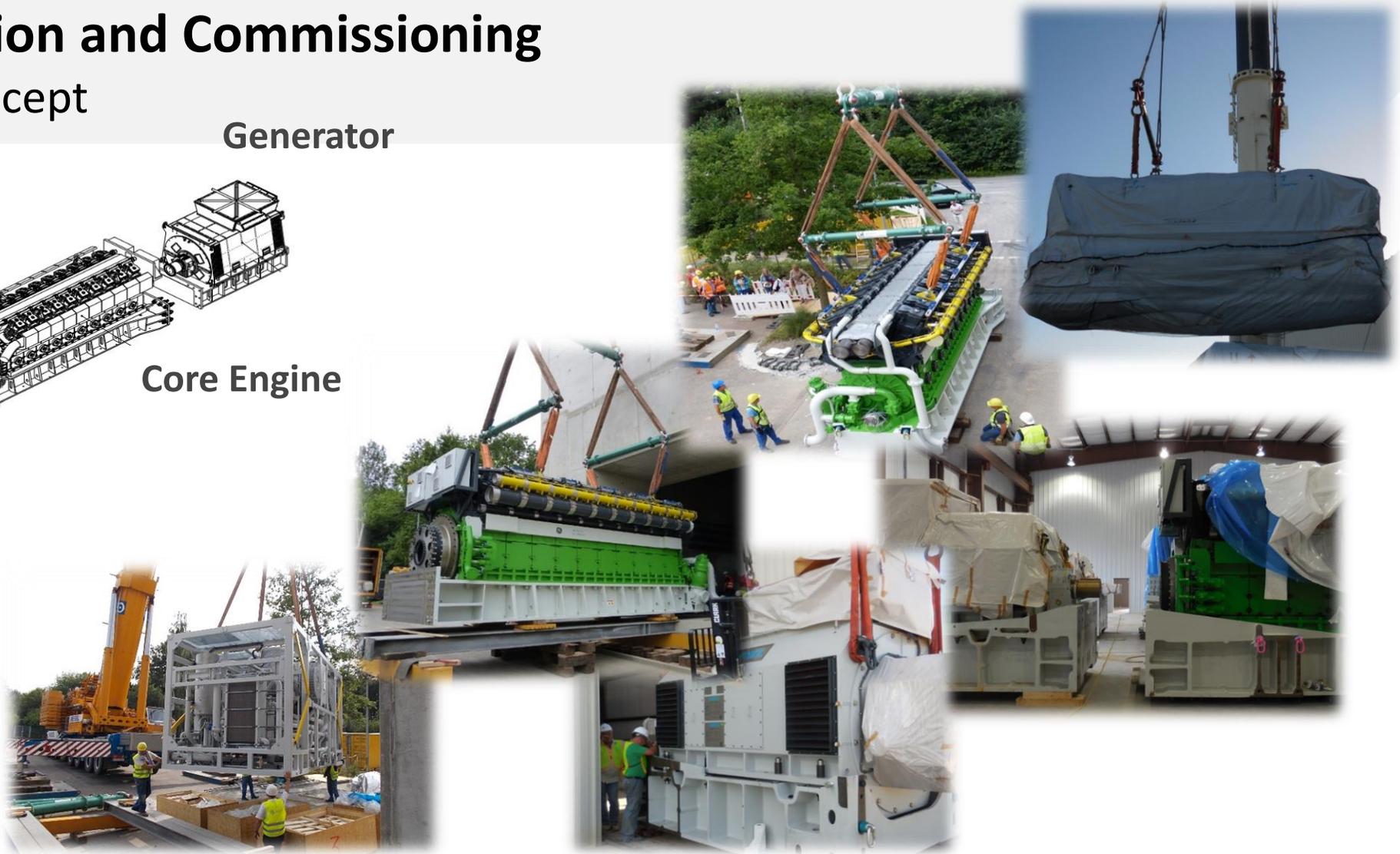
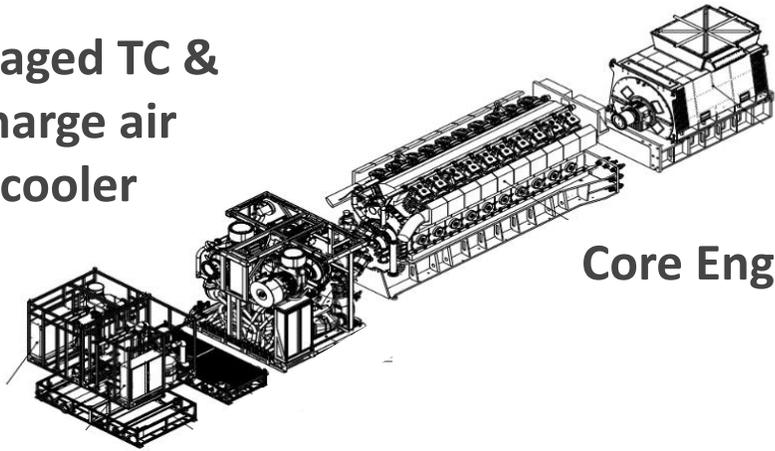
Modularity Concept

Generator

2-staged TC & charge air cooler

Core Engine

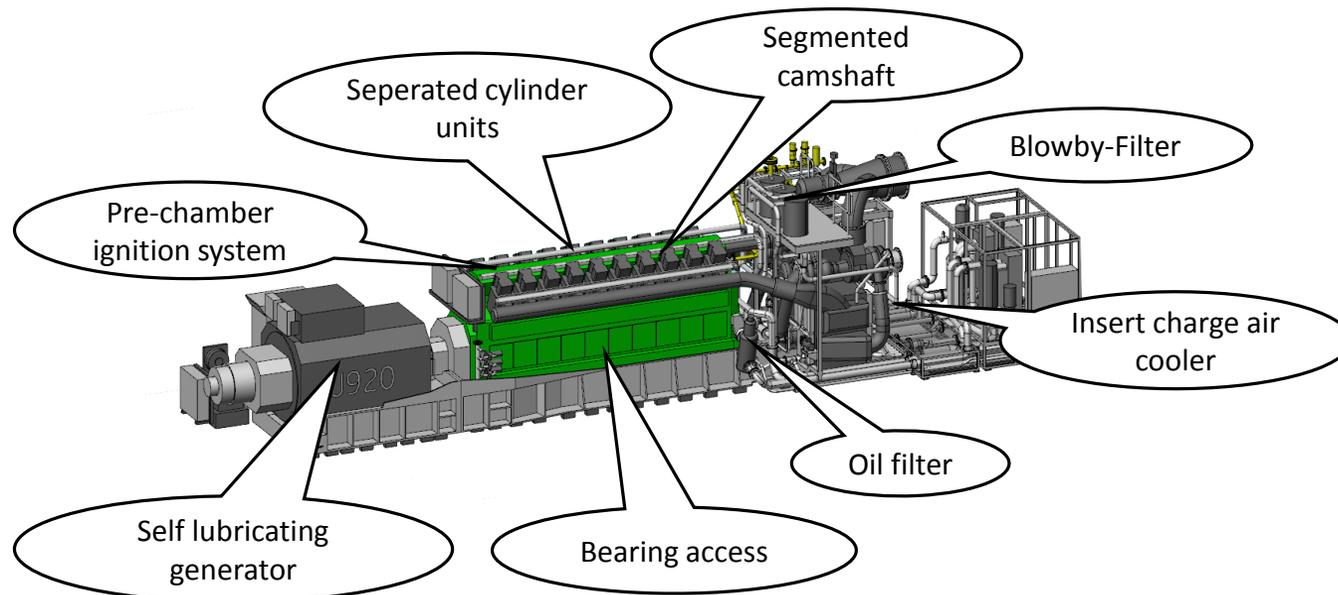
Oil and Water heat exchanger



Reduced transport and installation costs

Modularity for ease of operation and maintenance

1. Modular systems
2. Access of consumables
3. High plant availability
4. Enables upgrades



J920 Service Concept

Germany



Global Warehouse

Global logistic center for jenbacher gas engines

Delivery to site within 1-3 days
(depends on location)

In – Country / Region



Customer Service Manager

Personal customer care manager



In-Country/Regional Service Technician

Technician pool for J920 maintenance



Regional Warehouse

Deliveries to site <1 day

At Customer Site



Spares Inventory

Consumable spares and
emergency spare parts
package for fast reaction



Tooling

Special tooling stored at
site



Training

On the job training for
customer operation
team or technician



Resident Engineer

Technician for minor
maintenance during first 1-2
years to help customer to
familiarize with the
technology

Austria (Jenbach)



Remote Support Center

MyPlant Monitoring & Predict analysis
Hotline 24/7/365



Training Center

J920 trainings



Global Senior Technician Team

Senior experts to support regional
service technician team

50 MW - Sky Global US - Peak Power



- ❖ Full O&M first years
- ❖ Resident Engineers
- ❖ APM

190 MW – Municipality Kiel GER – CHP ~5000 oph/year

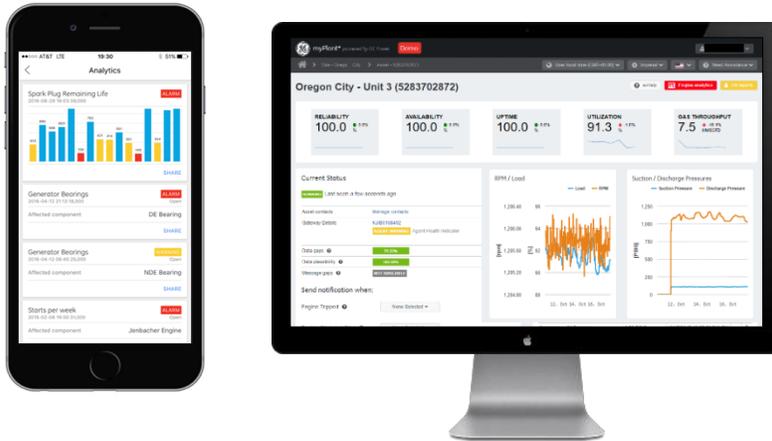


- ❖ Permanent Resident Team
- ❖ Supervision Maintenance
- ❖ WH & Overhaul Shop
- ❖ Customer Operations Training
- ❖ APM

myPlant* Asset Performance Management (APM)

The ideal match for your asset

What is APM?



APM solution suite, delivered through the myPlant* platform, is designed for reciprocating equipment fleet operators & service providers. With APM, you can:

- Monitor the health of driver, driven and balance of plant (BoP) equipment & diagnose faults
- Proactively manage asset performance through analytics

Examples from customer success stories

↑ **Reliability**... faster return to service and lower unplanned downtime

↓ **Maintenance Costs**... trip avoidance via remote visibility, early issue detection & resolution and condition-based maintenance

↓ **Operating Costs**... centralized fleet-level access to data, reduced manual data-logging, mobility and automated reporting

Take your business to the next level with real-time data

Continuous Monitoring	Issue Detection		Issue Resolution	
 <p>Manual Data Gathering</p>	<p>Proactive</p>	<p>Reactive</p>  <p>Call service provider</p>	<p>Field Technician</p>  <p>Field technician</p>	<p>Maintenance/Troubleshooting</p>  <p>Operating / spare part manual</p>
 <p>Automated Asset Health Monitoring</p>	 <p>Predictive Analytics</p>	 <p>Instant Access to Engine Data + Notifications</p>	 <p>Remote Resolution (Diagnostic Workbench)</p>	

1-3 days

<1 day

Digitalization

J920 Service Value

1. Fast Installation & Commissioning

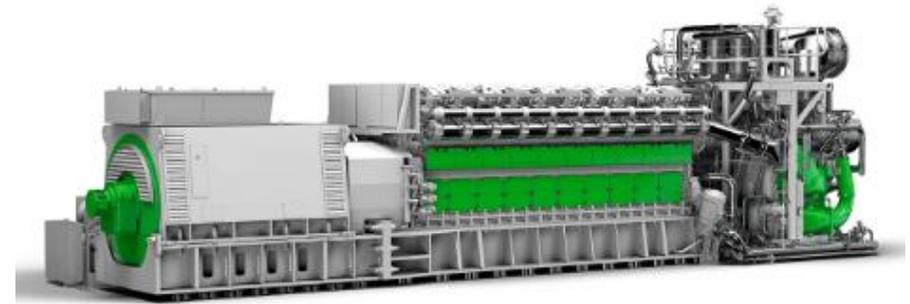
- ✓ Pre-commissioned @ test bench in Jenbach
- ✓ Optimized modules for logistic

2. High Availability

- ✓ Modularity concept (e.g. power unit)
- ✓ Easy consumables maintenance
- ✓ myPlant (Asset Performance Management)

3. Power for the future

- ✓ Upgrade possibilities to meet changing market/customer requirements
- ✓ Digital power plant



INNIO





THE FUTURE OF ENERGY IN BRAZIL CONFERENCE



São Paulo, February 14, 2019