2G Energy AG

Gas Engines & CHP Plants
Introductory Presentation

Global Water Expo 2025
September 2nd – 4th, Riyadh, Saudi Arabia

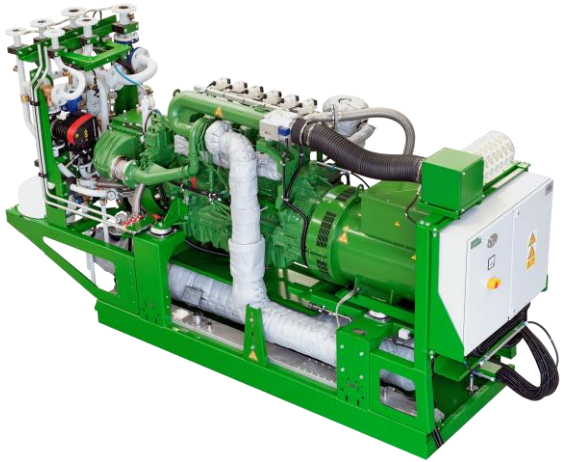
2G at a glance

- Founded in 1995 in Heek, north-western Germany.
- Gas gensets (75 kW – 1 MW) and Combined Heat & Power (CHP) systems (20 kW – 4.5 MW).
- Over 9,000 systems delivered to over 60 countries worldwide.
- Industrial, commercial, municipal, residential and agricultural applications.
- Flexible solutions provider: development, solucion engineering, integration & manufacturing, service, financing.
- Strong focus on R&D and OEM product development – OEM of 2G Gas Gensets.
- 11 subsidiaries in Europe and North America.
- Listed in the Frankfurt Stock Exchange since 2007 (2GB:FRA).
- EUR 365 million annual revenue in projects and services (2023)
- > 900 employees.

Principle of distributed Cogeneration (CHP)

Fuel gas

- Natural gas
- Propane / LPG
- Biogas
- Hydrogen
- ...



Electrical energy

Thermal energy

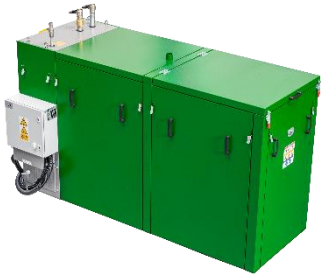
- Hot water
- Steam
- Thermal oil
- Chilled water
- ...

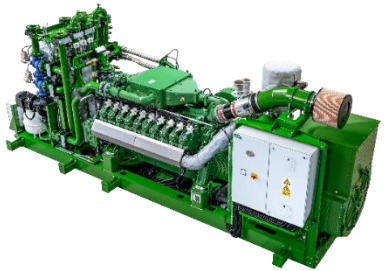
Up to 95% energy efficiency!

2G Product Portfolio (20 kW to 4.5 MW)

Product line	Power range	Typical fuels
g-box	20 a 50 kW	NG / LPG / BG
agenitor	75 a 450 kW	NG / LPG / BG / **H2**
aura	100 a 420 kW	NG
avus plus	500 kW a 1 MW	NG / LPG / BG / **H2**
avus	400 kW a 4.5 MW	NG / LPG / BG

READY FOR 100 % H_2





Design principle: gas engine ≠ gas engine

For each application, for each gas: the right engine!

Project-specific optimization:

- Altitude and ambient conditions (temp. & humidity).
- Fuel composition.
- Fuel blending, e.g. 100% natural gas / hydrogen.
- Electrical / thermal output.
- Electrical / thermal efficiency.
- Atmospheric emissions.

Configuration intercooler	
a	without intercooler
b	single-stage intercooler (no low temperature circuit)
c	two-stage intercooler
Turbocharging	
t	turbocharged engine
s	natural aspirated engine
Methane number*	
22	Minimum methane number at nominal full load and standard reference conditions (=>TSP)
70	Minimum methane number at nominal full load and standard reference conditions (=>TSP)
80	Minimum methane number at nominal full load and standard reference conditions (=>TSP)
130	Minimum methane number at nominal full load and standard reference conditions (=>TSP)
135	Minimum methane number at nominal full load and standard reference conditions (=>TSP)
Configuration heat extraction	
-0	70/90 °C, exhaust gas heat exchanger in engine circuit
-1	70/90 °C, exhaust gas heat exchanger in heating circuit
-2	75/95 °C, exhaust gas heat exchanger in heating circuit
-3	75/100 °C, exhaust gas heat exchanger in heating circuit
-4	caloric value heat exchanger "onboard"
-5	70/80 °C, without exhaust gas exchanger

Overview is not valid for avus a,b,c-series.

*Methane number not applicable for fuels with higher hydrogen content

Integration by 2G: packaged CHPs (20 kW – 4.5 MW)

Cold **Heat** **Steam** **Power**

Integration by 2G

Mechanical

- Main equipment: EGHEs, HRSGs, absorption chillers, containers, enclosures, ...
- Auxiliary equipment: pumps, valves, sensors, actuators,...
- Interconection: exhaust gas piping, hot water, expansion joints, supports,...

Electrical

- Generator circuit braker (GCB / SC3), auxiliary power (SC2).
- Power / aux. power cabling.

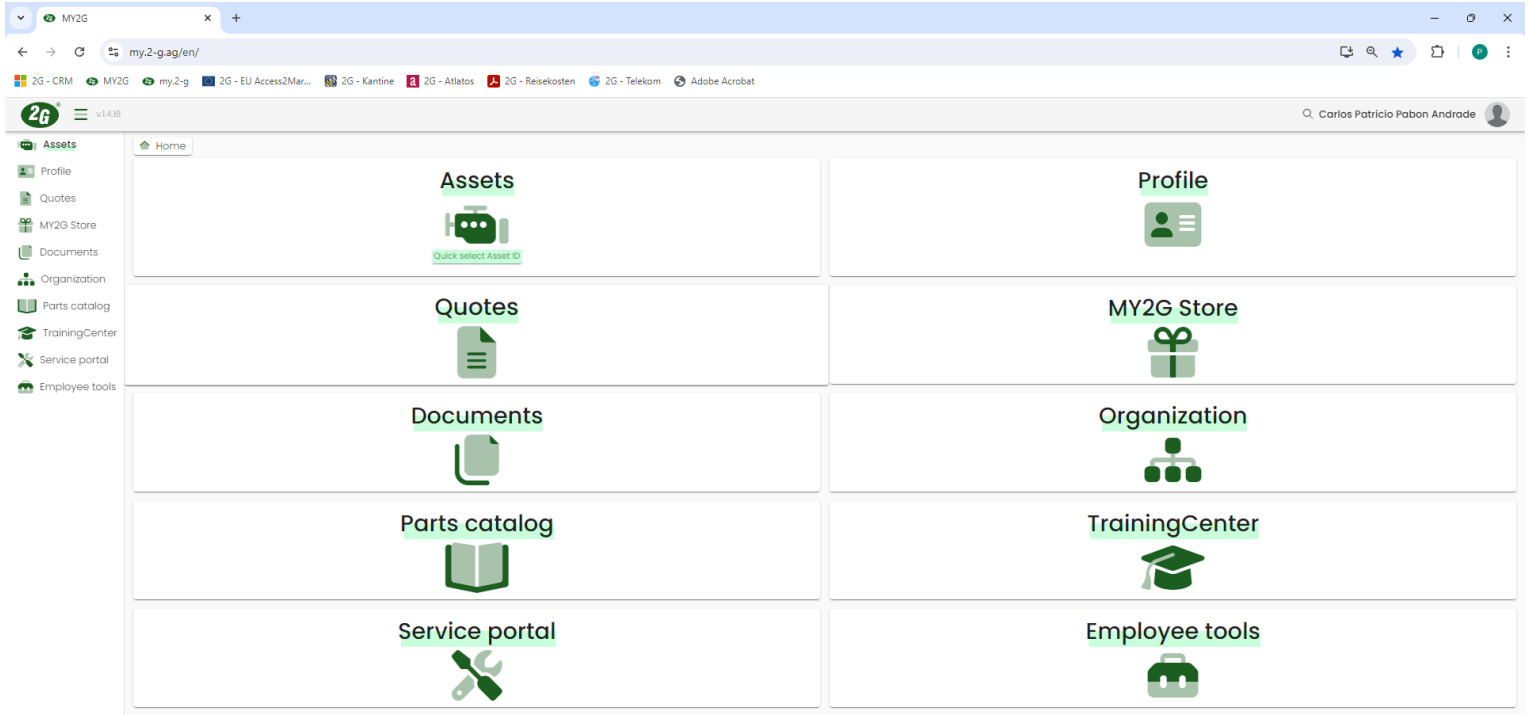
Controls

- Engine Control (ECC), thermal control (SC1) and plant control (SC2) cabinets.
- MasterControl.
- Control cabling.

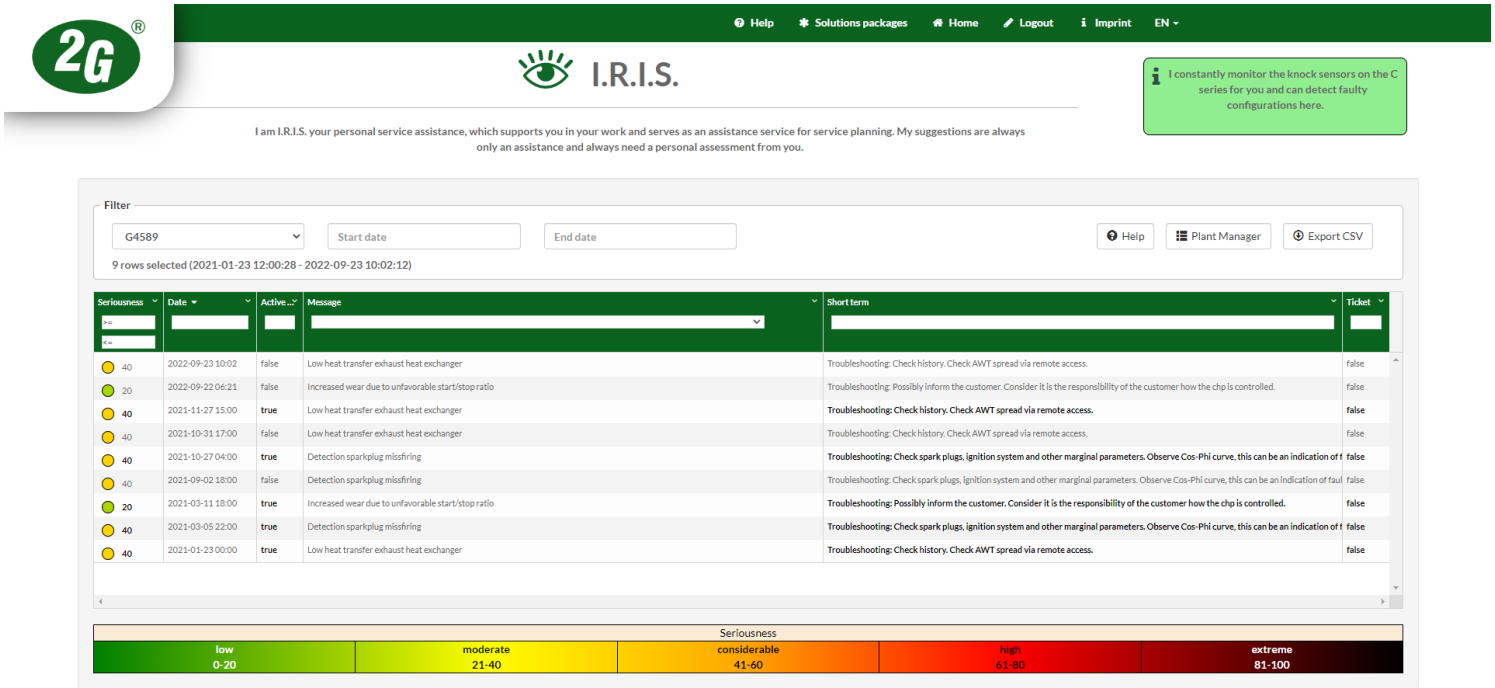
Example: MasterControl

Position	Basic scope of functions:	Extra option:	Number of CHPs	C Series/G-Box 50	avus a/b	avus c	avus d/e
1.1	**Island mode**		1	-	-	-	-
	Staggered start		2, 3, 4, 5	X	X	X	X
	Active power compensation		2, 3, 4, 5	-	-	X	X
	Reactive power compensation		2, 3, 4, 5	-	-	X	X
	Deselection of a CHP when island load is too low		2, 3, 4, 5	n/a	X	X	X
	Load transfer		1, 2, 3, 4, 5	-	-	-	-
	External voltage & frequency adjustment		2, 3, 4, 5	n/a	X	X	X
	Operating hour balancing		2, 3, 4, 5	X	X	X	X
1.2	**Zero supply regulation**		1	-	1* or X	-	-
			2	2*	X	X	X
			3, 4, 5	X	X	X	X
	CHP prioritization		2, 3, 4, 5	X	X	X	X
	Power limitation		2, 3, 4, 5	X	X	X	X
	Operating hour balancing		2, 3, 4, 5	X	X	X	X
1.5	Weekly data archive		1, 2, 3, 4, 5	X	X	X	X
1.8	Unbalanced load limitation		1, 2, 3, 4, 5	X	X	X	X
3	Data recording		0,1,2,3,4,5	X	X	X	X
7	Isolated operation signal extension		1, 2, 3, 4, 5	X	X	X	X
8	Power measurement with PAC 3200		0,1,2,3,4,5	X	X	X	X
10	M-Bus meter evaluation		0,1,2,3,4,5	X	X	-	-
11	Controlling external drives		0,1,2,3,4,5	X	X	X	X
13	Cos phi regulation on the grid connection point		1, 2, 3, 4, 5	X	X	X	X
14	Buffer storage control		1	-	1* or X	-	-
			2, 3, 4, 5	X	X	X	X
15	Heat recovery steam generator control		1	X	X	-	-
			2, 3, 4, 5	X	X	X	X
19	Absorber activation with 2G pumps & cooling tower control		0,1,2,3,4,5	X	X	X	X

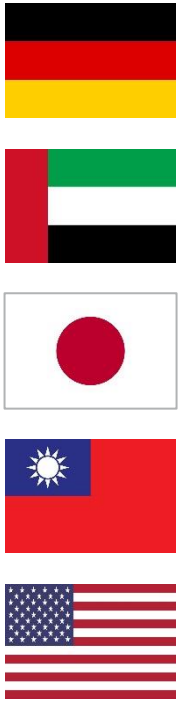
Digitalization – my.2-G.com



Digitalization – I.R.I.S.



2G H2 CHP: 1st delivery over 10 years ago, 30+ systems in operation

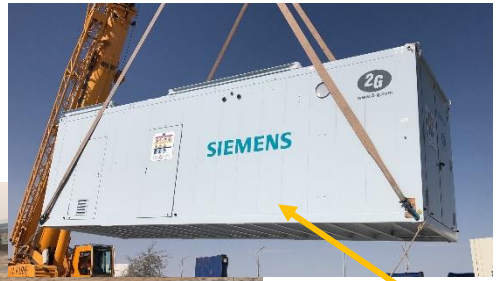


2G at one of the worlds' largest solar parks

Site: 1 GW Mohammed bin Rashid (MBR) Al Maktoum Solar Park, Dubai, UAE.

2G System: one (1) agenitor 412 H2.

Source: https://www.mbrsic.ae



2G at Saudi Arabia‘s 1st public-private STP Project

Site: Taif Independent Sewage Treatment Plant.

2G System: two (2) avus 500plus BG.

End User: Taif Independent Water Plant Company (Cobra and Tawzea Consortium).

Status: Commissioned in 2022.

- $85 million project located 1.5 hrs from Mecca for the construction of a new 100,000 m3/day Wastewater Treatment Plant.
- Strategically important as it is the first contract managed under the public-private partnership (PPP) model to come into operation in Saudi Arabia.
- More information available here.

Source: Smart Water Magazine

2G's 1st Flag in Qatar

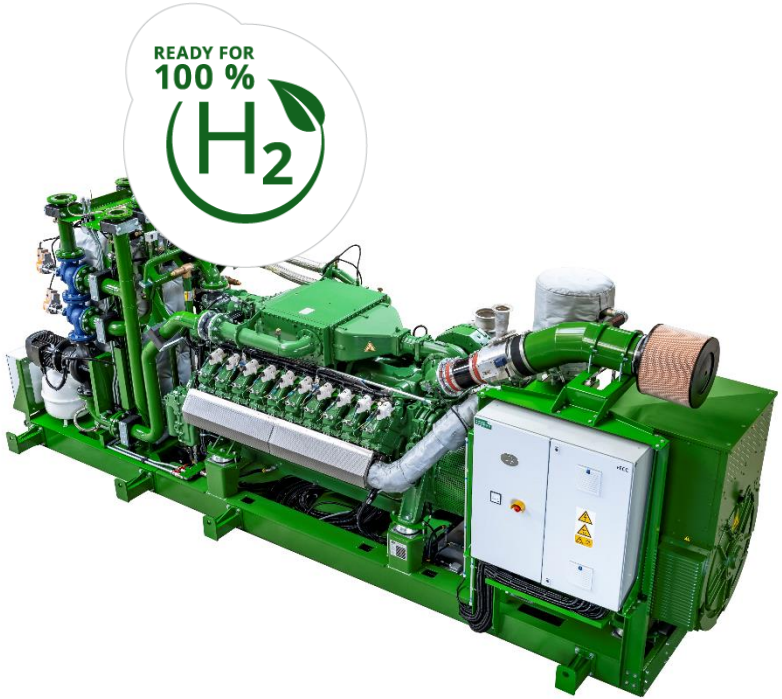
Site: Al Wakra & Al Sukair Sewage Treatment Plant.

2G System: three (3) avus 416plus BG.

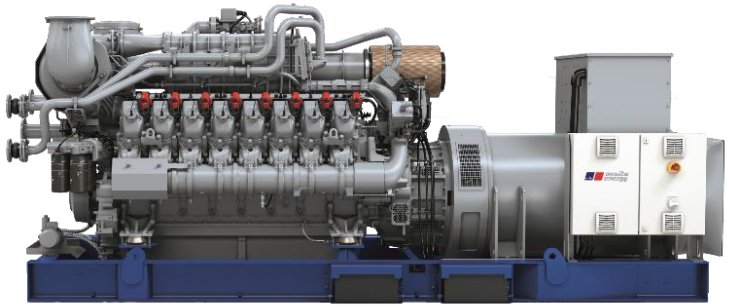
End User: Qatar's Public Works Authority (Ashghal).

Status: Delivery scheduled Q3 2025 (work-in-progress).

- $729 million project located 0.5 hrs from Doha for the construction of a new 150,000 m3/day Wastewater Treatment Plant.
- The Project Sponsors are Metito Utilities Limited, Gulf Investment Corporation, and Al Attiya Motors & Trading Company. The Offtaker is Ashgal through a 25 year public private partnership agreement.
- More information available here.



2G‘s 1st Flag in Jordan



Site: Al Ghabawi Septic Tank Facility.

2G System: three (3) avus 1200e.

End User: Water Authority Jordan (WAJ).

Status: Delivery scheduled Q3 2025 (work-in-progress).

- €70 million project located 1 hr from Amman for the construction of a new 22,500 m3/day Wastewater Treatment Plant.
- The European Union is providing a grant of €30 million that is co-financed by a €41.3 million loan from the EBRD.
- More information available here.

Source: EBRD

2G at one of Europe‘s largest WWT projects

Site: Emschermündung WWTP.

2G Systems: three (3) avus 1000plus BG.

- Europe’s largest WWTP with biogas generation at the time of construction.
- Over 1.1 million m3/day treatment capacity.

Source: WOLF Anlagen-Technik

2G: tailor-made, plug & play CHP solutions

Thank you for your attention!

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