

# Innovative LFG Energy Project Case Studies

## The Benefits of Modular Power Generation Systems



Ulrich Nielen  
Sales Director

**2G CENERGY Power Systems Technologies Inc.**  
a 2G Energy AG Group Company

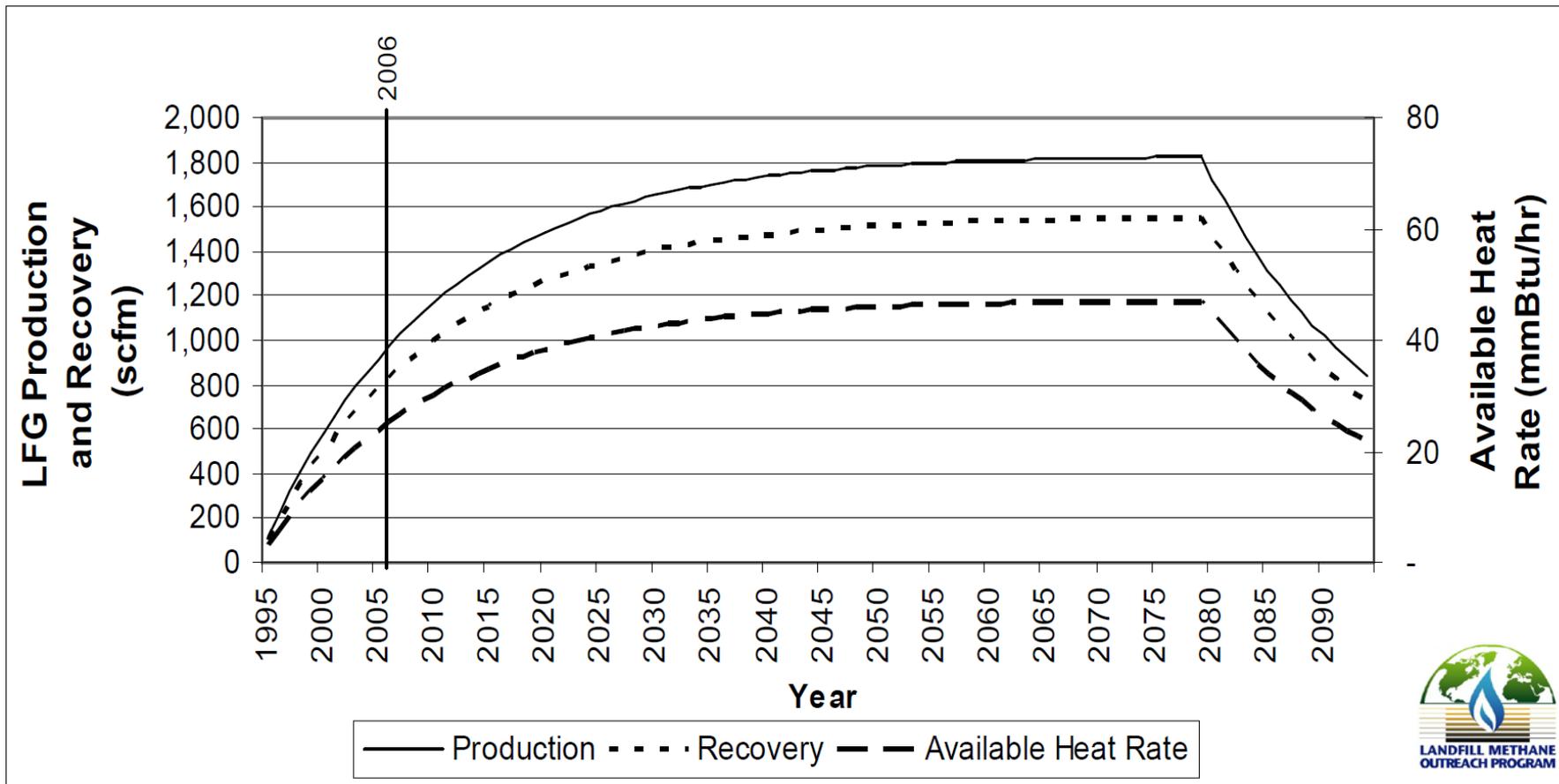
# THREE RIVERS

Solid Waste Management Authority



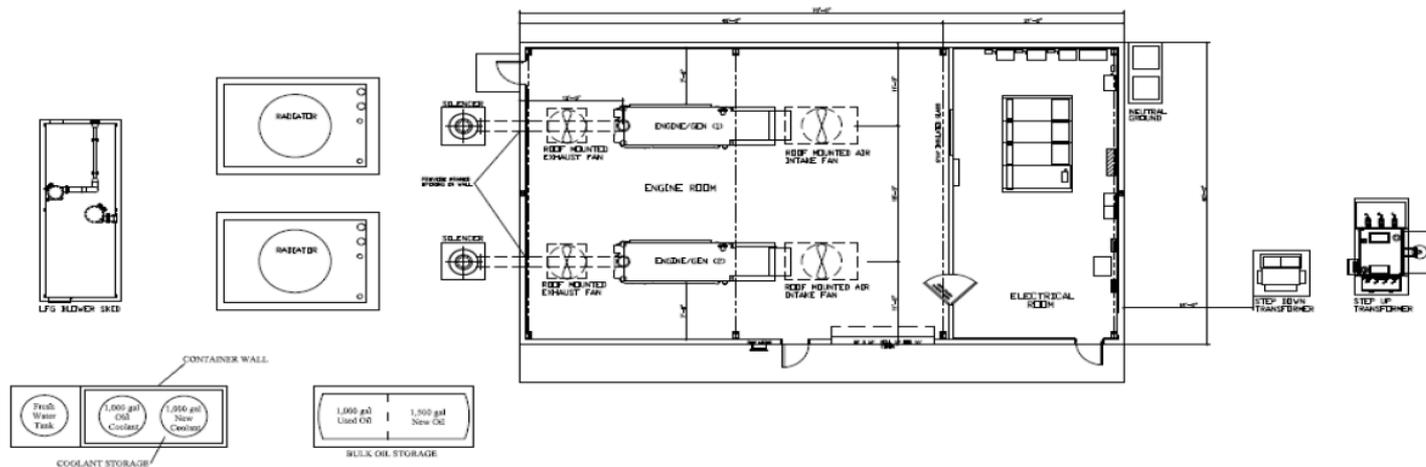


The Landfill in Three Rivers County generates a significant Amount of LFG for many Years to come.





Initially the Tree Rivers Waste Management Authority planned to construct a Power Generation Building to house Generator Sets, very similar to what's shown on these Photos and Drawing.





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Project Example 1



**A smart and Cost effective Solution.**  
**1200kW/h – 2G<sup>®</sup> avus<sup>®</sup> 1200 with MWM Prime Mover Engine**  
**Complete Package including Siloxane Gas Treatment & Dehumidification System**



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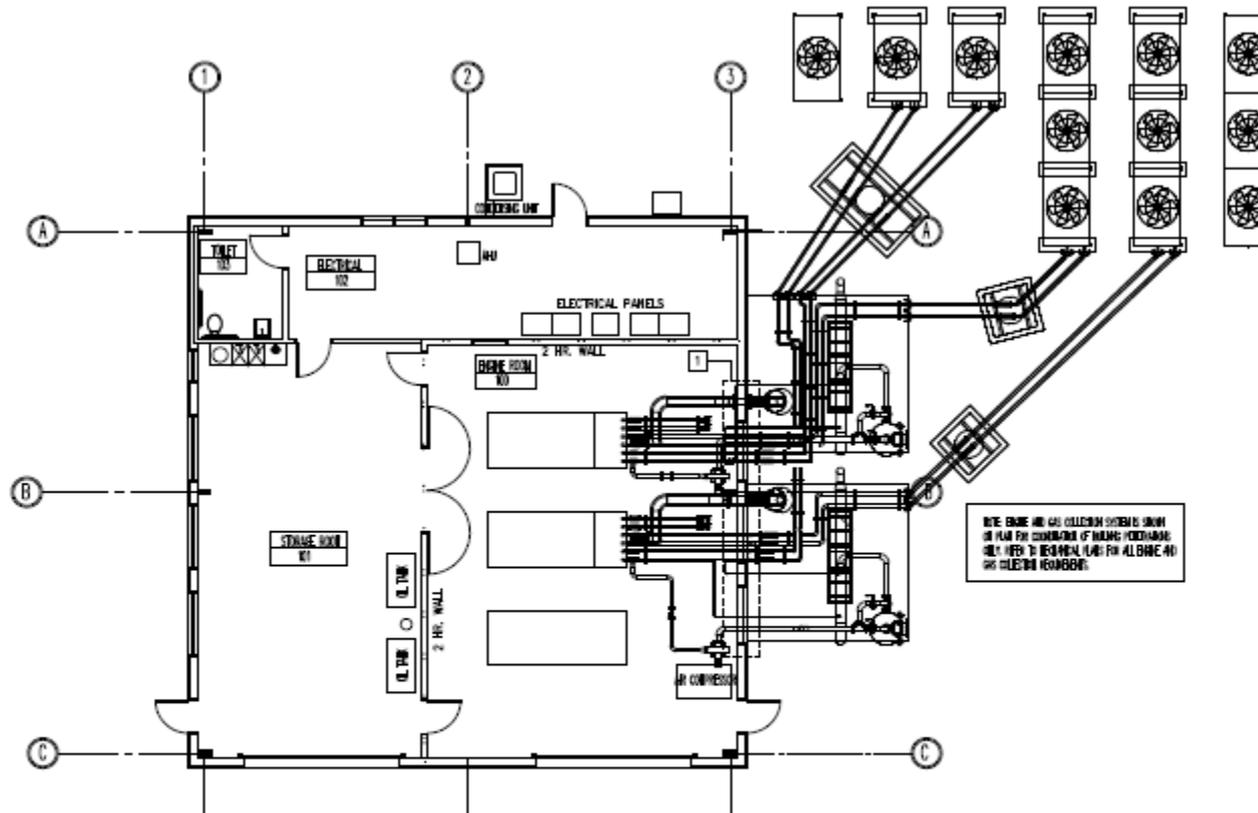
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Project Example 2



Year	LFG Flowrate (SCFM) (100% recovery)	LFG Flowrate (SCFM) (75% recovery)
		Total
1	312	234.00
2	301	225.75
3	291	218.25
4	281	210.75
5	271	203.25
6	262	196.50
7	253	189.75
8	245	183.75
9	237	177.75
10	229	171.75
11	222	166.50
12	215	161.25
13	208	156.00
14	202	151.50
15	196	147.00
16	190	142.50
17	184	138.00
18	179	134.25
19	174	130.50
20	169	126.75

Edgecombe County analyzed their LFG Availability for the next 20 Years. Based on those Numbers the Landfill Owner decided to apply two (2) Generators sized between 370 and 400kW/h each.



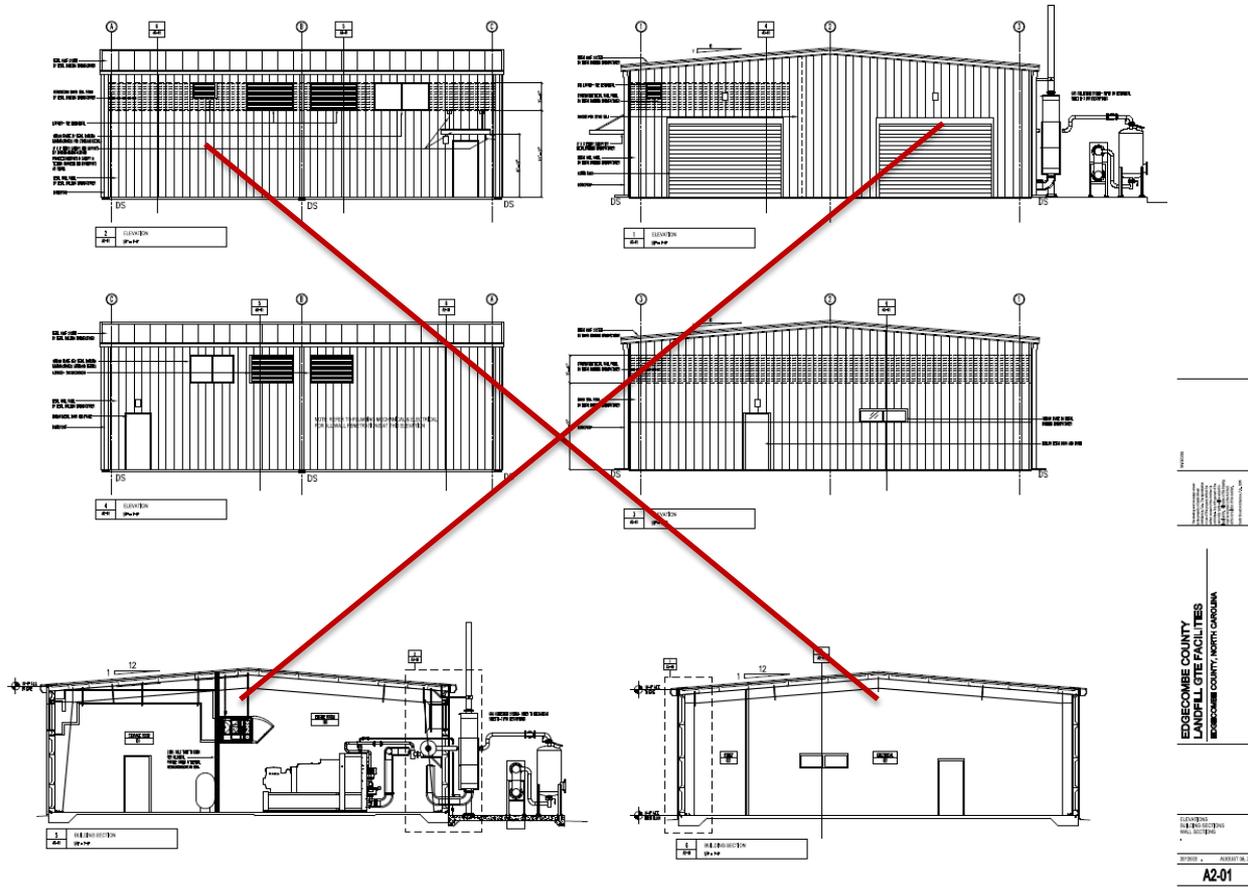
EDGECOMBE COUNTY  
 LANDFILL GTE FACILITIES  
 EDGECOMBE COUNTY, NORTH CAROLINA

Initially the County planned to construct a Power Generation Building with Engine Room. During the Public Bid Process it was determined that it would save the County more than \$ 850,000 by selecting modular pre-manufactured LFG Power Generation Systems.

FLOOR PLANS  
 REFLECTED CEILING PLAN  
 ROOF PLAN

2012003 . AUGUST 08, 2012

A1-01



The originally designed Building Plans were discarded.

The County not only saved a significant Amount of Money, but the Landfill Owner was also able to reduce the technical Risk and Project lead Times quite significantly.

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Project Example 2

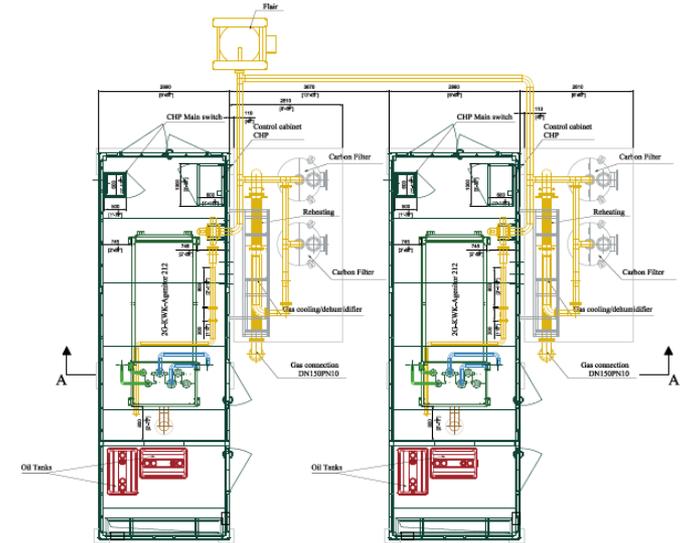
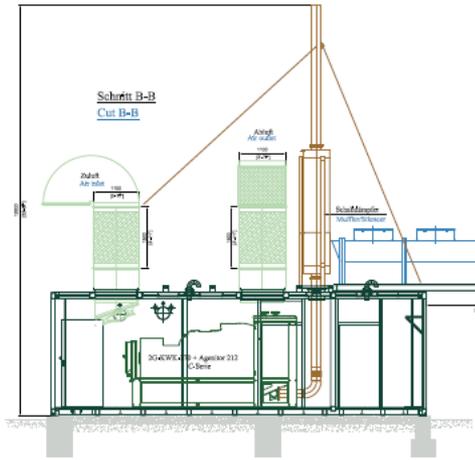
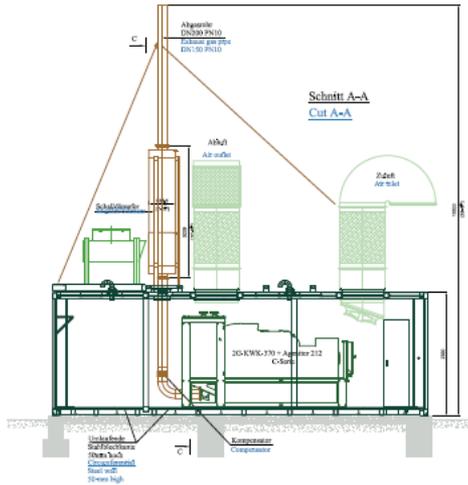


**2G CENERGY manufactured and supplied two identical LFG Power Generation Modules 2G® *patruus*® 370kW/h (total 740kW/h) with MAM Prime Mover Engines. Complete Package including Siloxane Gas Treatment & Dehumidification System all positioned next to an existing Landfill Storage Building.**

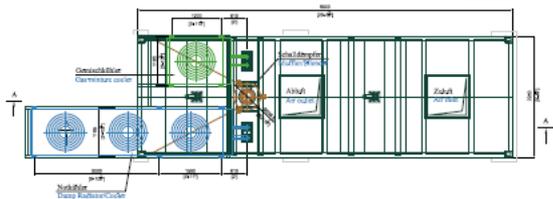
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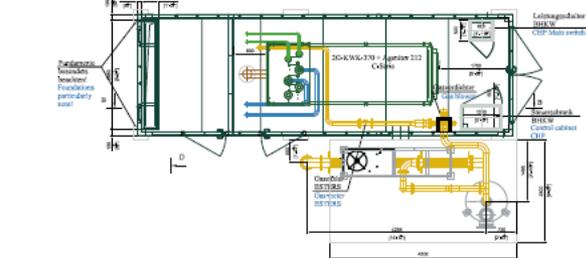
Project Example 2



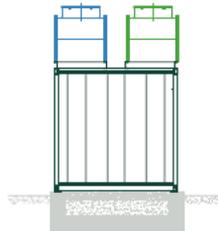
**Draufsicht Dach**  
Top view



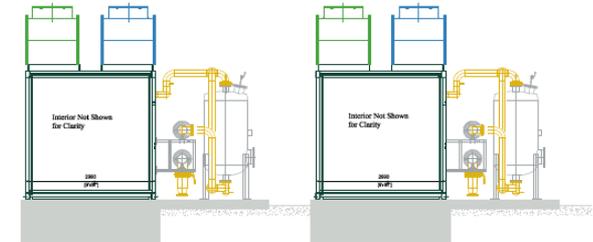
**Draufsicht ohne Dach**  
Top view without roof



**Schnitt D-D**  
Cut D-D



Section A



100% pre-manufactured, "all-in-one" and "plug & play" LFG Power Generation Plant. Installation Time approx. 3 Days.

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Project Example 3



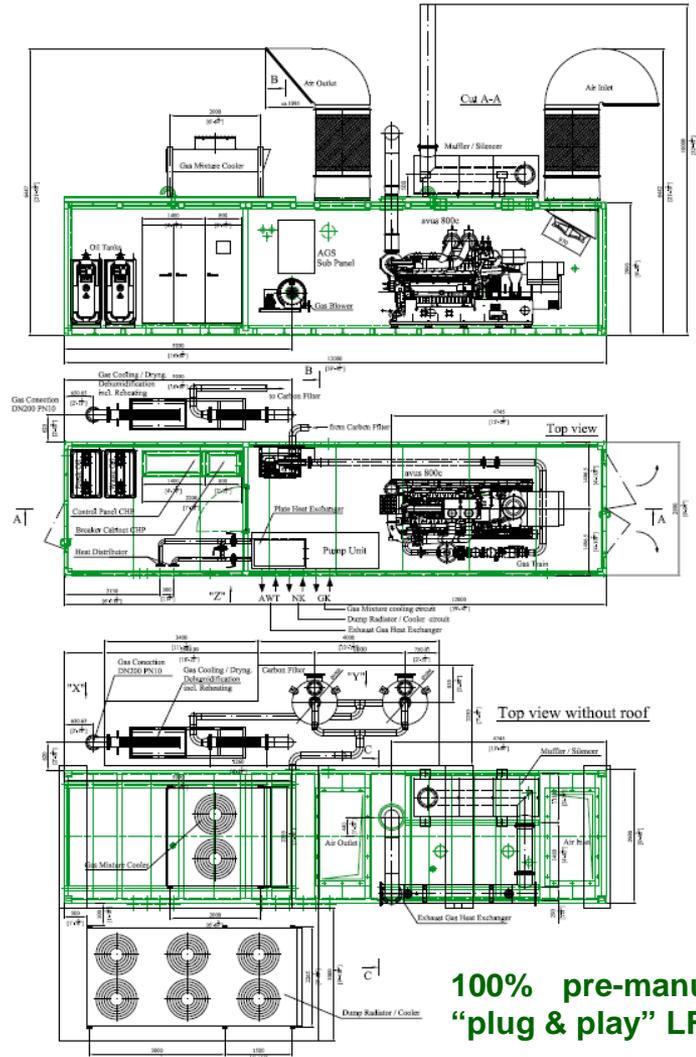


**The Business Technology Center of Rockingham County in North Carolina planned to construct a Power Generation Building with Engine Room for their local Landfill.**

**After carefully analyzing all available Options and based on Results from the Public Bid Process, Rockingham County changed their Plans. Instead of the traditional Approach to construct such Building the Decision was made to purchase a Modular LFG Power Generation & CHP System. Substantial Cost Savings have been achieved.**



**A smart and Cost effective Solution.  
800kW/h – 2G® avus® 800 with MWM Prime Mover Engine  
Complete Package including Siloxane Gas Treatment & Dehumidification System**



Designed to a sound pressure level of 65 dB (A) in a distance of 10m (mean value, open field conditions)

Foundations on site

Container color: RAL.6005

**100% pre-manufactured, "all-in-one" and "plug & play" LFG Power Generation Plant.**

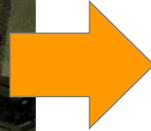
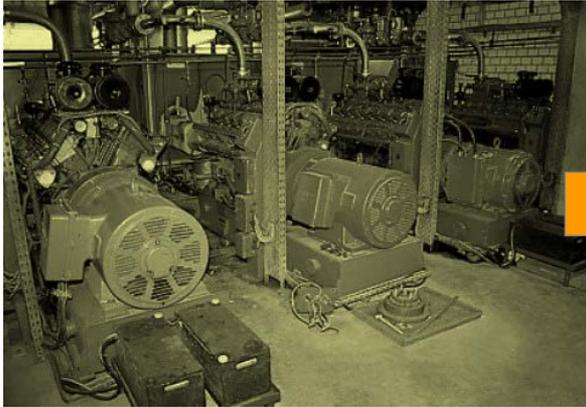
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Customer: 2G-Cenergy Power Systems Technology Inc. 200 Commercial Drive St. Augustine, FL 32082, USA		Customer/ Delivery address: Rockingham County USA
Reference: LFG Container 2000 800 800	Date: 2008-03-20	Drawn: [Blank]
Model: 2000 800 800	Scale: 1:100	Checked: [Blank]
Description: LFG Container 2000 800 800	Project: [Blank]	Approved: [Blank]
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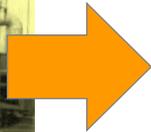
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The Advantage of Modular  
Power Generation & CHP



**In the 80's the European CHP Cogen and On-Site Power Generation Industry initiated a Transition from Custom-Built to Modular Pre-Manufactured "All-In-One" and "Plug & Play" Cogeneration Systems.**



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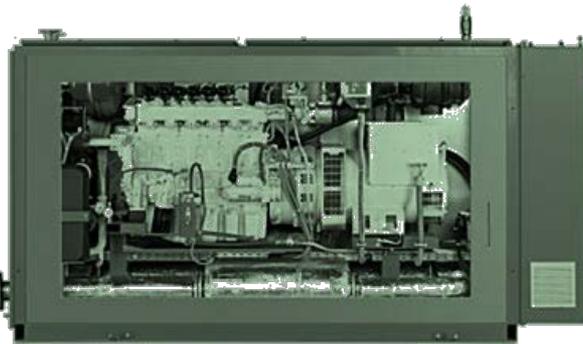
The Advantage of Modular  
Power Generation & CHP



Out



Out



Fuel In

Modular CHP and On-Site Power Generation Systems are completely engineered and designed for most efficient utilization, applying best practice, standardized, consistently production-line manufactured, and don't require any additional engineering at all.

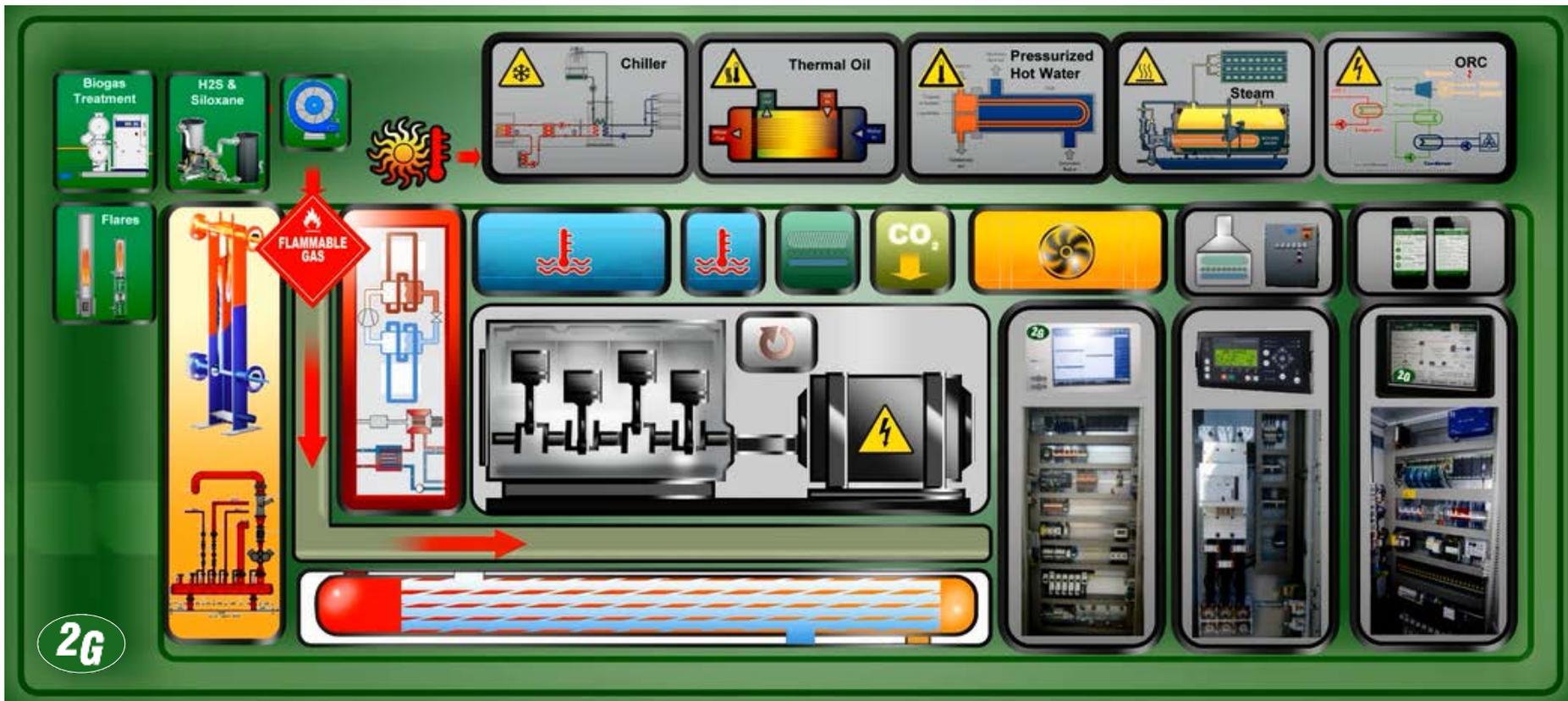
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**A genuine Modular System**

A professional CHP Cogeneration & Landfill (LFG) Energy Conversion System contains the entire Technology required to function most efficiently, and effectively. An advanced Gas Engine is just one Component.

Designed as complete “All-In-One” and “Plug & Play” Package. This includes a closed Loop Heat Extraction Technology if needed, “Best Available Control Technology” for Exhaust Emissions, sophisticated Electronics, and many other vital High Tech Components.



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## Modular CHP Cogeneration & On-Site Power Generation Technology

Modular CHP and On-Site Power  
Generation Equipment is supplied:

- ➔ All Inclusive – One Package
- ➔ Fully Factory Tested
- ➔ Connection Ready

- One Stop – One Source
- No Need to invent the Wheel again
- Proven Design
- Functionality is guaranteed
- Thousands of Modular Units  
in Operation



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**Modular CHP Cogeneration & On-Site  
Power Generation Technology**

**No Need to build Engine Rooms or a Power House. Also large Modules can be placed inside an existing Building / Structure, significantly reducing Investment Costs.**



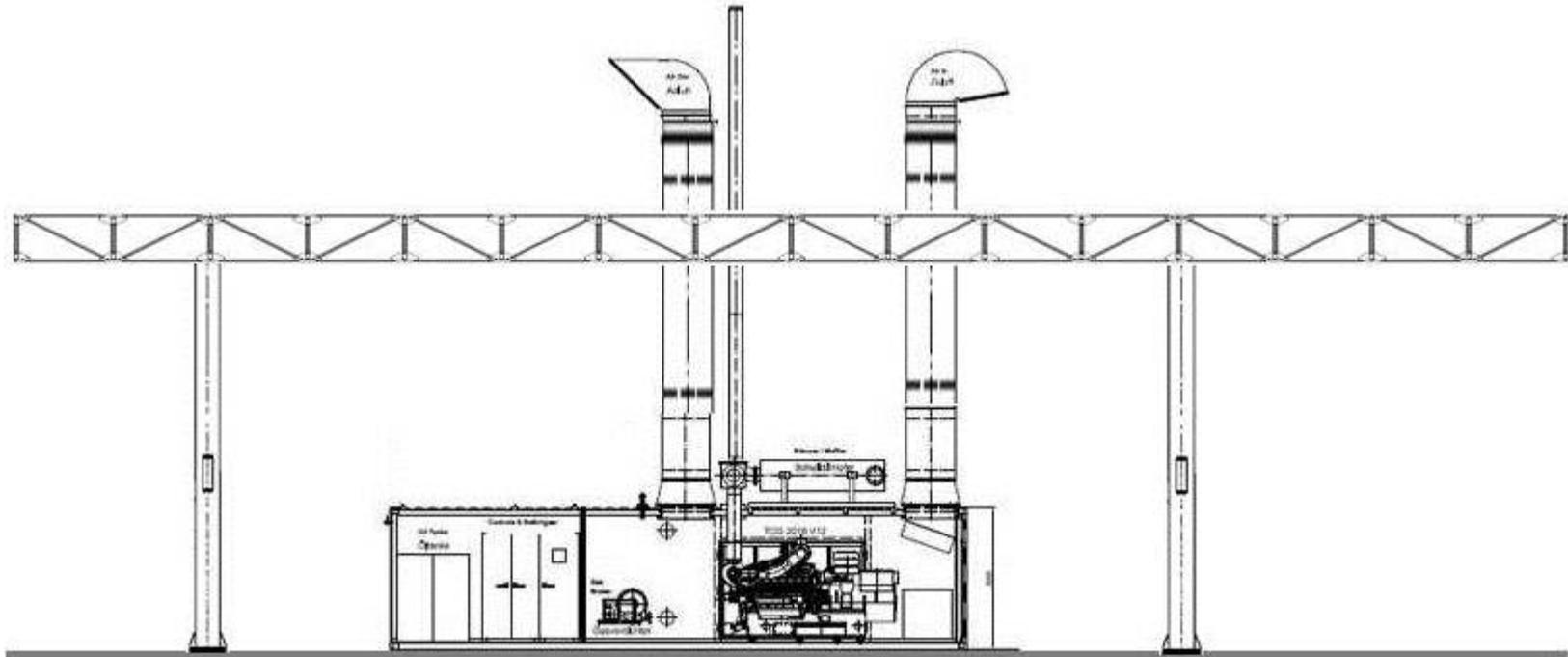
**Larger Systems up to 2000kW single, or multiple e.g. 3MW, 4MW, etc.**

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Modular CHP Cogeneration & On-Site  
Power Generation Technology

Integration into existing Buildings.





### Outside Building Installation Example

**A containerized Solution is always the most Cost-effective Solution.**



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## Modular CHP Cogeneration & On-Site Power Generation Technology



Very easy to transport,... and easy to install.



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Larger & More Convenient to Service



**Enlarged Container Design**

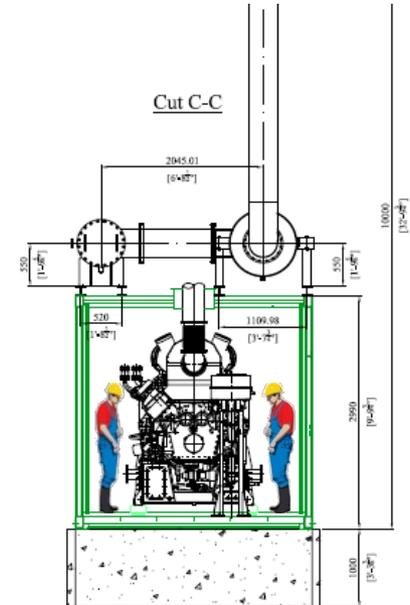
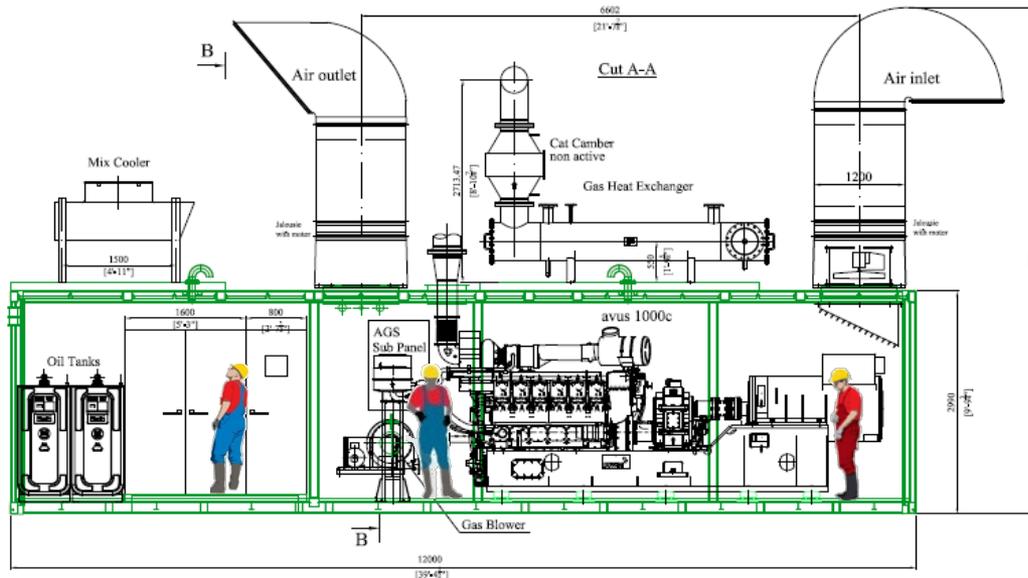
10' (118'') 3 m wide, 10' (118'') 3 m high  
available in various Length (depending on  
Engine Size and System Configuration)

Large Floor-Space for easy Access, Movement,  
and comfortable Service & Maintenance.

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A genuine “Walk-In”  
“All-In-One” CHP & Energy Conversion Module



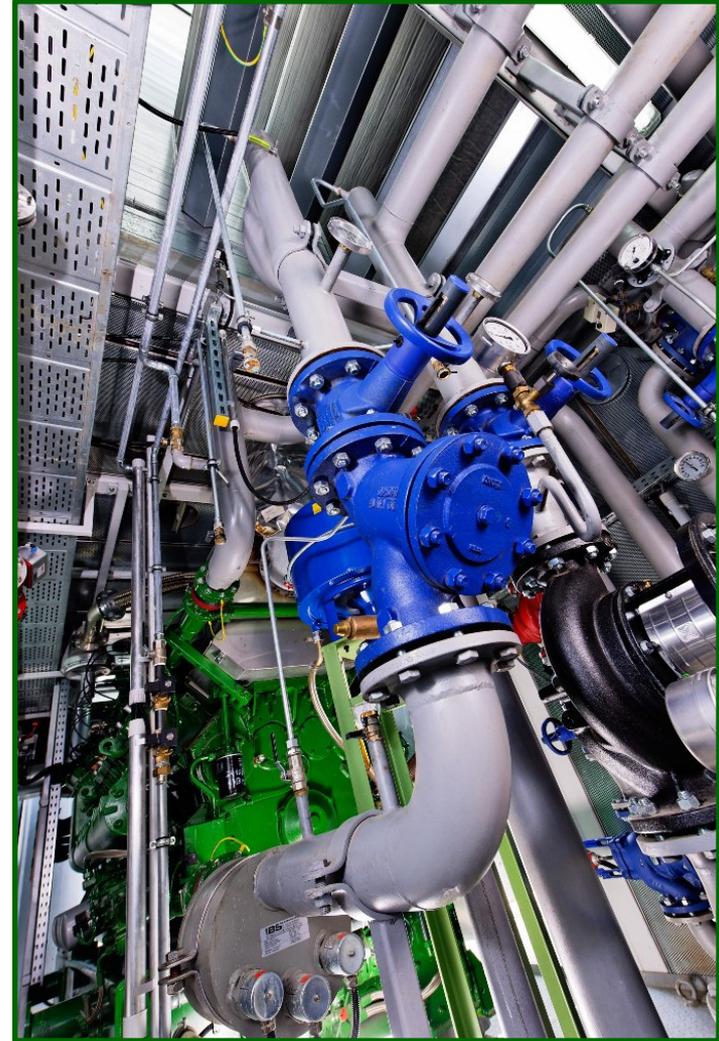
Professionally designed and purpose manufactured Power Generation Modules are especially made for this Application and are genuine Walk-In, very easy and convenient to Service.



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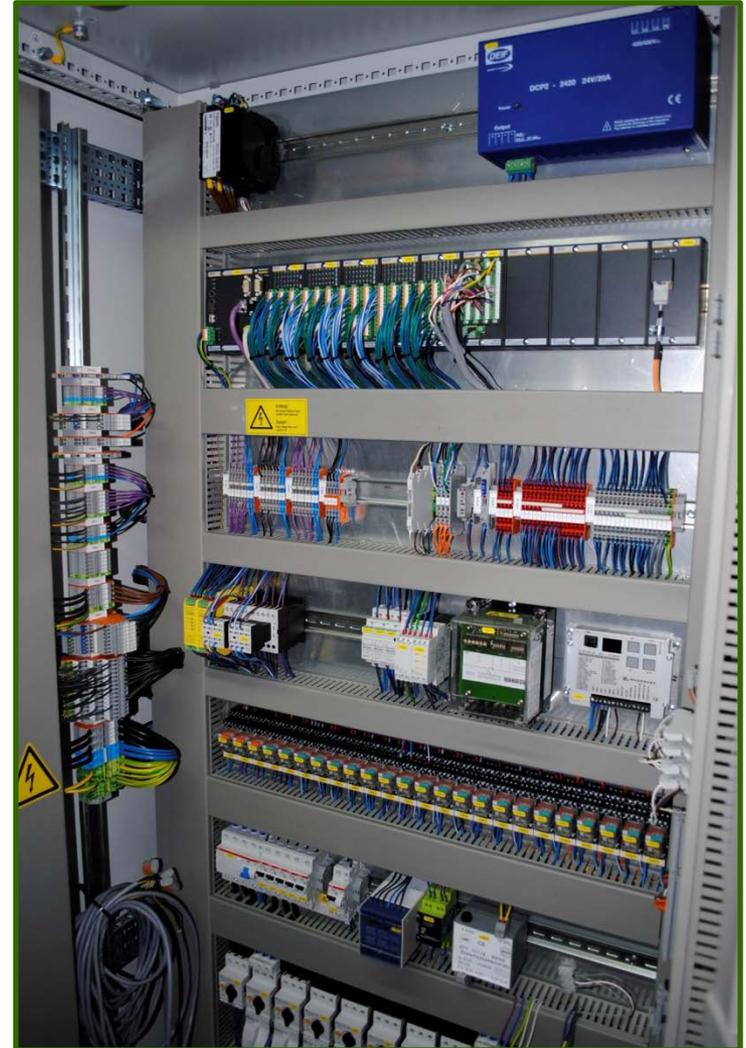
Power Generation Plant Equipment  
“All Included”



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Controls & Switchgear “All Included”

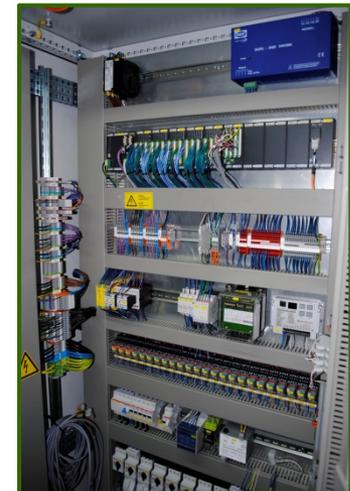


Complete and highly advanced Controls & Switchgear included. Also includes Controls of all Ancillaries as well as the Gas Detector & Fire Warning Systems, etc.

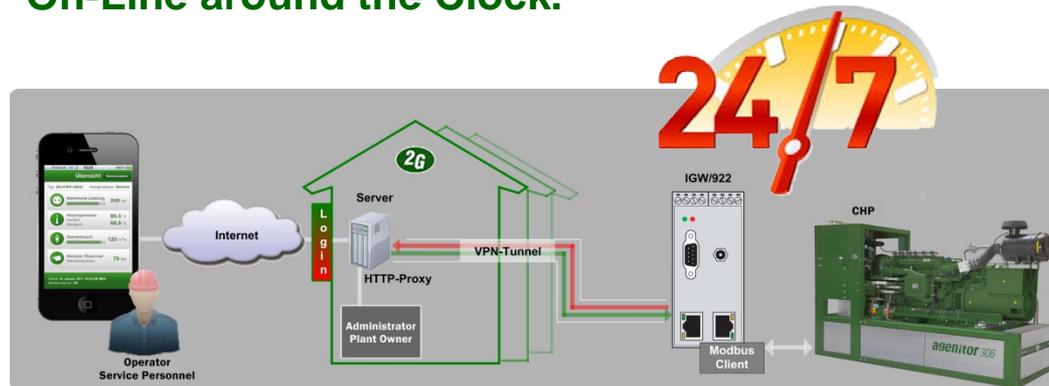
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## System Controls



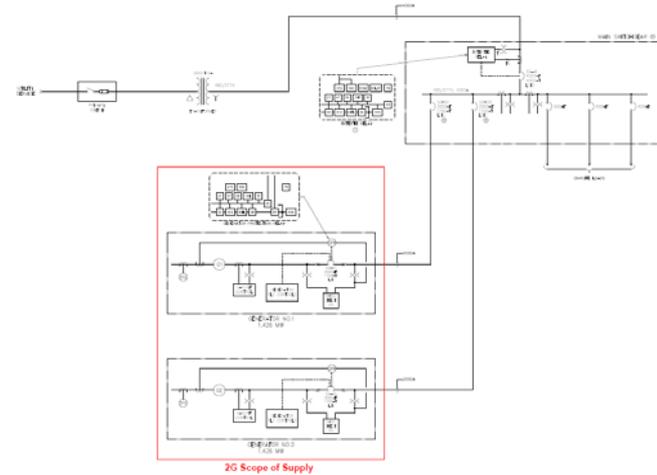
The Heart of a modular On-Site Power Generation System is a comprehensive and very advanced Digital Control Technology monitored On-Line around the Clock.



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## Combining Multiple Modules



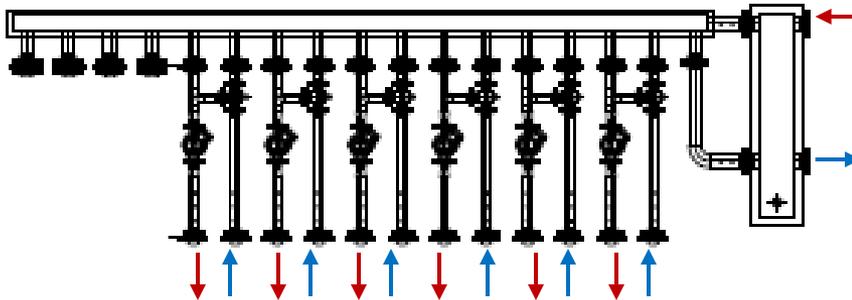
**The Electrical Grid Inter-connection is also pre-engineered and genuine “All-In-One” Modules are adequately prepared for Synchronization and Paralleling.**



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## Combining Multiple Modules



All Modules are combined into one Central Thermal Heat Distribution Assembly, if Thermal Energy is required.

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## Disadvantages of Conventional Building and Site-built System Design

During the traditional design-engineering and custom on-site built process, literally thousands of pages of paper, bid specs, drawings, etc. are produced.



It's an attempt to re-invent the wheel over and over again,...



...and the outcome is often less than suitable or technically adequate.

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## Disadvantages of Conventional Building and Site-built System Design



The traditional approach drives cost up, makes Power Generation in general unnecessarily expensive, and last but not least increases risks.

Because too many people and entities are involved, finger pointing happens frequently when things do not work out as planned.



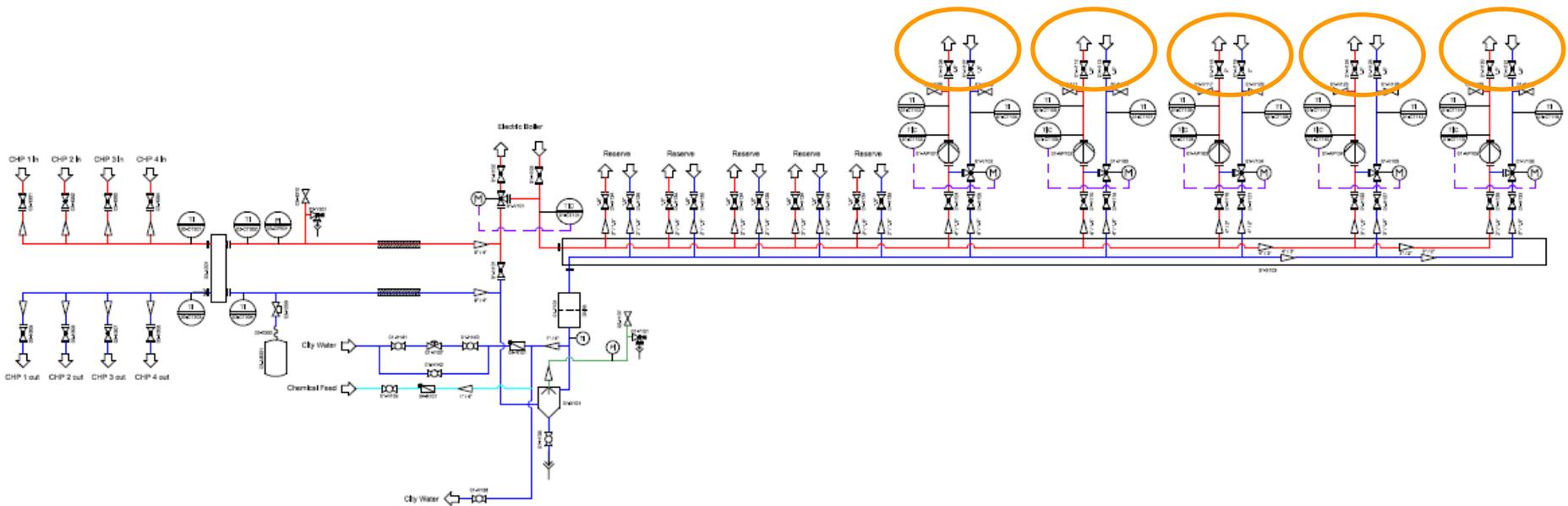


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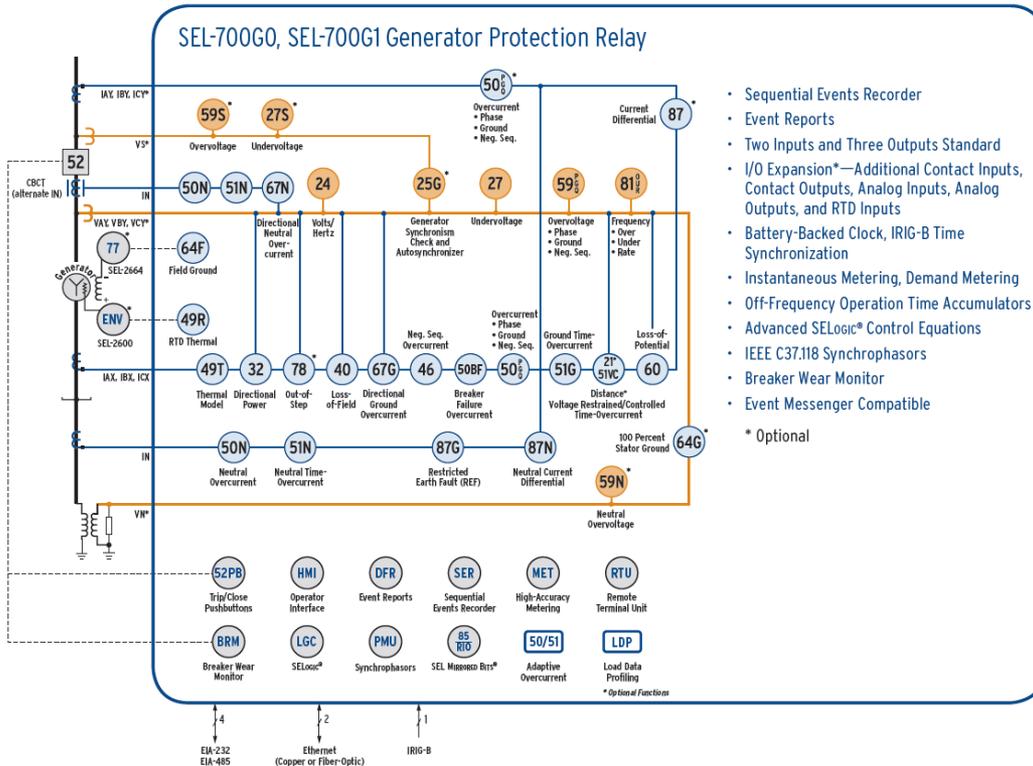
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Pre-Designed and  
clearly defined Mechanical Interfaces

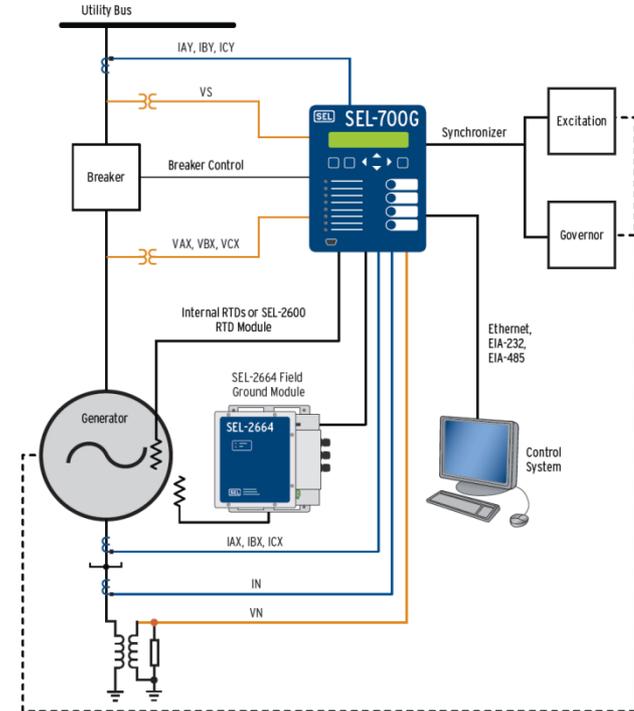
Mechanical Engineers can focus on the important Tasks of Interface Connection and Integration.







- Sequential Events Recorder
  - Event Reports
  - Two Inputs and Three Outputs Standard
  - I/O Expansion\*—Additional Contact Inputs, Contact Outputs, Analog Inputs, Analog Outputs, and RTD Inputs
  - Battery-Backed Clock, IIRIG-B Time Synchronization
  - Instantaneous Metering, Demand Metering
  - Off-Frequency Operation Time Accumulators
  - Advanced SELoc™ Control Equations
  - IEEE C37.118 Synchrophasors
  - Breaker Wear Monitor
  - Event Messenger Compatible
- \* Optional



**Advanced Grid Interconnection Protection Relay Technology is optionally 100% fully integrated into the CHP & Power Generation Module Controls. The Interconnection is also monitored 24/7 around the Clock.**

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Modular On-Site Power Generation  
The Future of Distributed Power

Transition



The Market is currently in a Transition Phase from  
“Customary Design Built” to “Modular Pre-Manufactured”.



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Thank You for Your Attention.