Kelly Generator & Equipment Inc.

SIEMENS

Ingenuity for life

KELLY GENERATOR & EQUIPMENT, INC.

Headquarters

1955 Dale Lane

Owings, MD 20736

KELLY GENERATOR & EQUIPMENT OF PA & WV, INC.

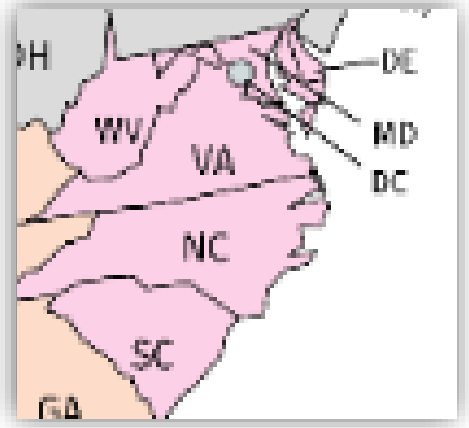
PA & WV

50 Technology Drive

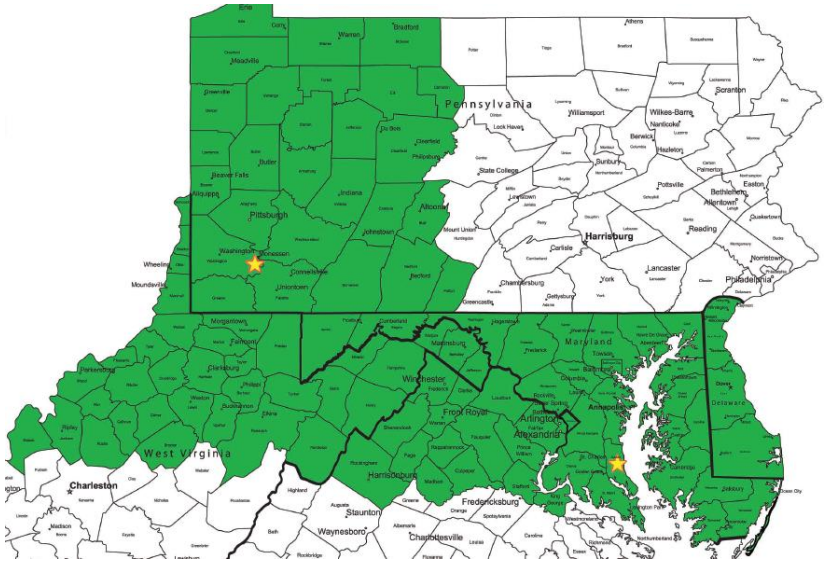
Coal Center, PA 15423

Mid Atlantic Distributor: FOOTPRINT

- Delaware
- Maryland
- DC
- West Virginia
- Virginia
- North Carolina
- South Carolina



Original Kelly Generator-Generac Footprint



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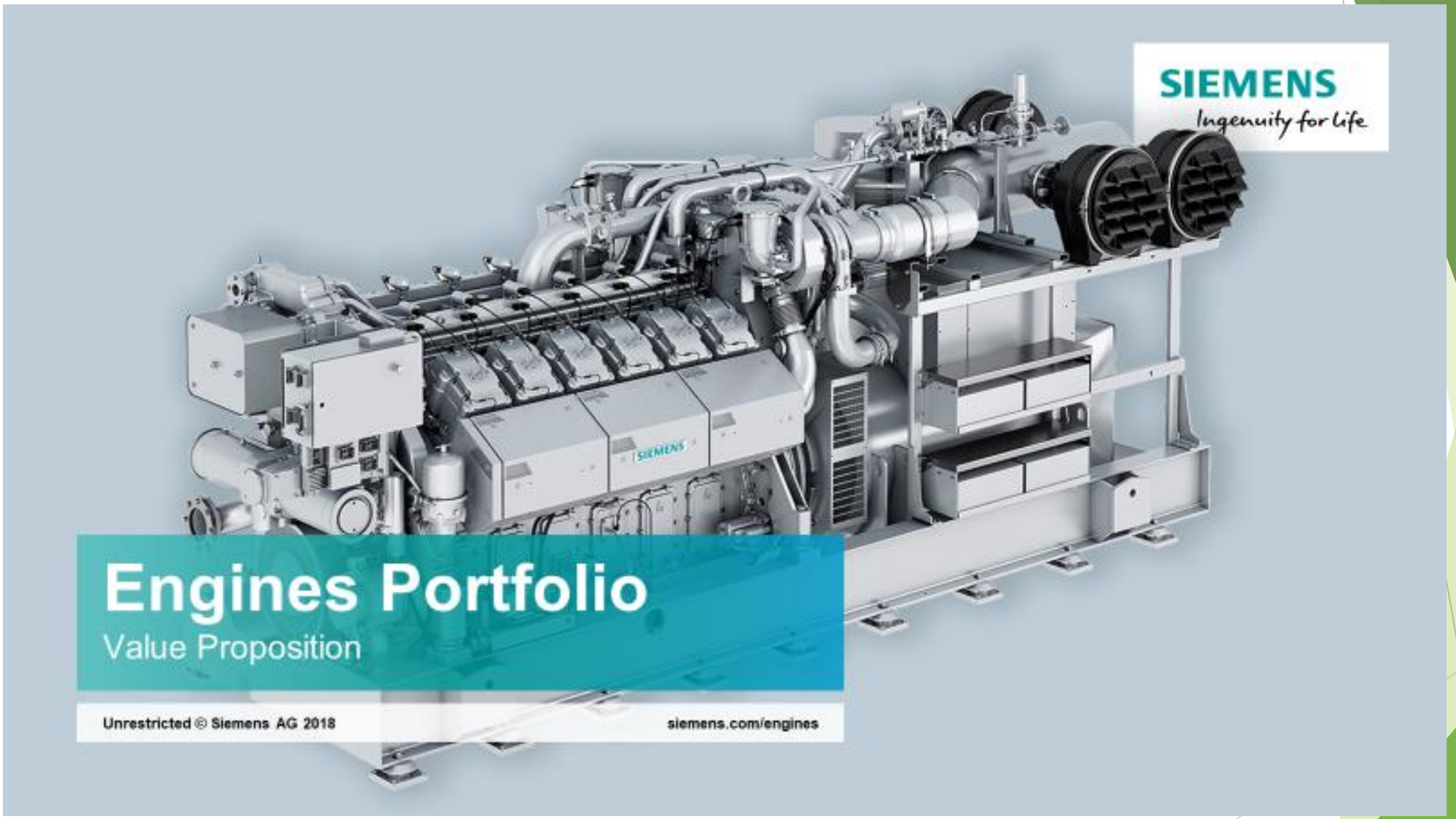
Kelly Generator & Equipment Inc. Over 27 years in business…

- Sales
  - Engineering Design Support
  - Turnkey Solutions
  - Training
  - Extensive experience in gaseous generator applications
- Service
  - 24/7 support
  - Over 40 technicians strategically located throughout territory with fully stocked service trucks
  - $300k/ year invested in technicians training
- Rentals
  - 20kVA up to 2MEG
    - Paralleling capability up to 9.5MEG
  - Over 85 in generator set fleet
  - All associated accessories
    - Cables, spider boxes, transfer switches, etc
  - Mobile Fueling Capabilities
- Parts
  - Stocking distributor for several generator manufacturers for all makes and sizes
  - Many obsolete parts available
    - Strong parts networking
  - Trained and certified personnel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Engines Portfolio
Value Proposition
Unrestricted © Siemens AG 2018
siemens.com/engines

Milestones of a 50-year history

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1966
Guascor is founded:
Diesel Engines for marine

1992
Launch of **Biogas** engines

2000
Launch of the **S Series** electronically controlled and turbocharged

DRESSER-RAND

2011
Dresser-Rand acquired Guascor

2015
Siemens acquired Dresser-Rand

Siemens innovations over the past 50 years

1988
First Gas **F Series**

1996
World Class **R&D** Center established in Miñano

2008
Launch of **H Series** of High performance

2013
Rich burn engines released

2017
E-Series (2 MW) best-in-class launch

We are dedicated to grow your business
Solutions based on your individual business needs

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- Best-in-class applications for power generation, cogeneration and waste to energy
- From small industrial to power plants

Power Generation

Utilities/ IPP

Industries

Cogeneration

District Heating

Commercial buildings

Industry

Waste to Energy

Landfill, sewage, farms, biomass

Application fields for Gas Engines

Power Generation

Utilities/ IPPs | **Industry** | **Oil&Gas**

Gas Engine Power Plants
e.g. Peaking, Capacity market, Fast Start, Peak shaving. Power generation available at need.

Complete package for the industry
e.g. Food processes, textile, ceramic, chemical, biopharma, etc. Reliable power supply.

Flare Gas Gensets
e.g. Engine systems on a well gas. Fuel flexibility in island mode. Power generation in remote areas.


Cogeneration

Comm.Buildings | **DH** | **Industry**

Cogeneration systems
e.g. hospitals, universities, hotels, data centers. Efficient and reliable energy.

District Heating full Cogeneration
e.g. combined heat and power (CHP), maximum efficiency through thermal recovery.

Complete package for the industry
e.g. laundries, food processes, others. Reliable power supply.


Waste to Energy

Landfill/ Sewage | **Farms** | **Biomass**

Biogas Gensets
e.g. wastewater treatment plants, landfills, farms. Efficient use of waste to power production.

Biomass Plants
e.g. Syngas from gasification processes of wood, forest waste other waste materials.


Gas Engines portfolio

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S Series

Robust, Reliable, Fuel Flexible

SL-Lean burn
from 209 to 1150 kW

SM- Lean burn
NG/BG: from 1055-1100 kW
LPG: from 275 to 906 kW

SR- Rich burn
fr

H Series

High Performance

HM- Lean burn, Miller cycle
from 520 to 1350 kW

E Series

Best-in-class

EM- Lean burn, Miller cycle
Power output:
2065 kW

Innovative products matching customer needs – Scope of supply

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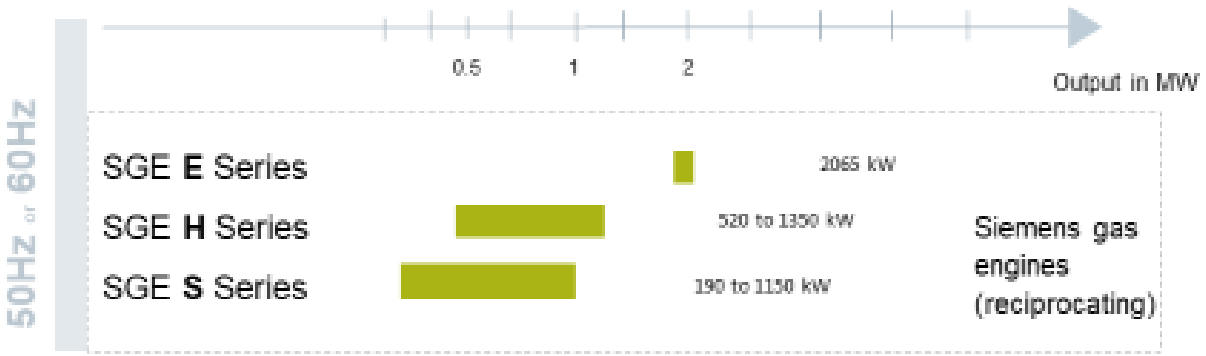
Bare engine	Genset	Genset+ Ancillaries+ heat recovery	Full containerized CHP package	Power Plant
				
Gas engine • Clients: OEMs, Packagers (NG, Biogas, other gases)	**Genset + Controls** • Clients: Packagers, direct end clients for power generation, integrators, EPC contractors.	**Complete Genset+ ancillaries+ heat recovery** • Clients: direct end clients for CHP, integrators, EPC contractors, developers, ESCOs	**Full CHP package** • Clients: direct end clients for CHP applications, integrators, EPC contractors, developers, ESCOs.	**Turnkey Power Plant** • Clients: Utilities, IPPs, Capacity market, peaking, remote areas

Tailored scopes and solutions to fit all project needs

The right engine for every requirement
The Siemens gas engines portfolio:



State-of-the-art technology

- Excellent Global & Thermal **efficiency**
- **Standard,** interchangeable engine **parts**
- Integrated proprietary GCS-E engine and GCS-G Genset control systems
- Industry-leading **fuel flexibility**
- **Fuel blending**
- **High operational availability**
- **Low life cycle costs**
- Cost-efficient short implementation
- Compact footprint
- High flexibility through **modularity**
- Emissions compliant
- Own and distribution network for spare parts and engine service

Technology that matters – proven, reliable, innovative
Evolution of the efficiency

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S Series 41%

Robust, reliable, fuel flexible

H Series 44 %

High performance

E Series 46%

Best-in-class

50 years of developments to offer the most reliable solution

Reference examples | All performance data based on ISO conditions

S- Series gas engines:
Designed for fuel flexible power generation

Technical data

- **Power Output kW** 190 /1150 (50-60 Hz)
- **Efficiency %** 38/ 41

Features

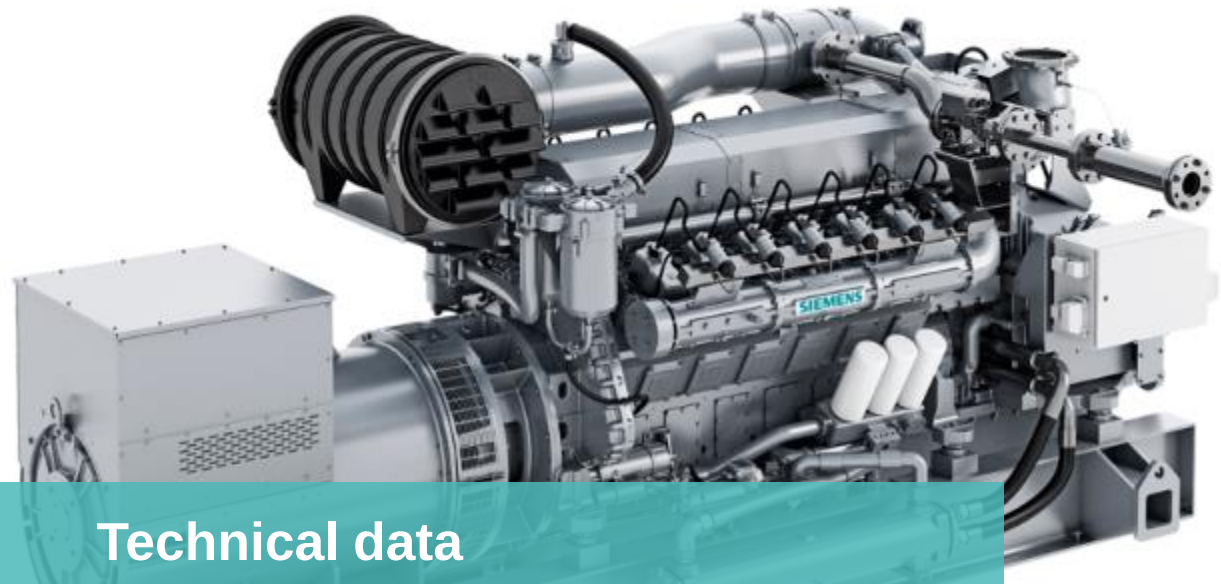
- **Lean and Rich burn** options (turbocharged and aftercooled)
- Otto and Miller **cycle**
- **Fuel type:** Natural gas, Biogas, Flare, APG, Syngas, LPG-Propane
- **Fuel blending** capabilities (NG/Biogas)
- Dry/ wet exhaust manifold

Benefits

- Mechanical efficiency of up to **41%**
- Load acceptance high operational flexibility
- Low life-cycle costs
- High reliability and availability
- Low emissions (also US standard)
- Fast start availability

Best-in-class global efficiencies Natural gas S Series: 500 - 1,030 kWe

H- Series gas engines:
Designed for high performance power generation



Technical data

- **Power Output kW** 520 /1350 (50-60 Hz)
- **Efficiency %** 42/ 44

Features

- **Lean burn** (turbocharged and aftercooled)
- Miller **cycle**
- **Fuel type:** Natural gas, Sewage, Landfill, Biogas
- **Fuel flexibility and fuel blending** capability
- Dry exhaust manifold

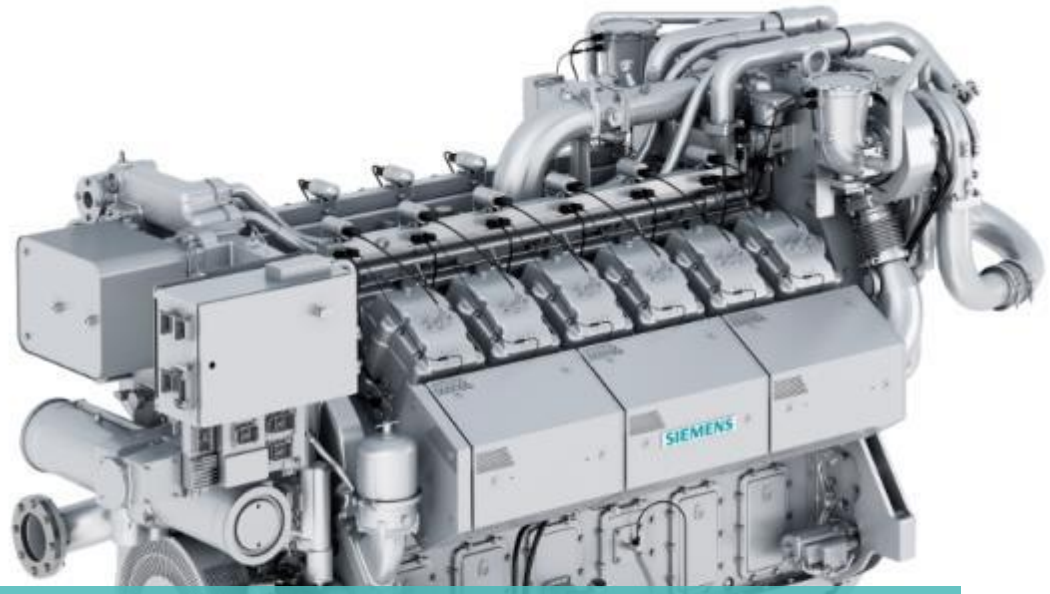
Benefits

- Mechanical efficiency of up to **44%**
- High performance
- Low life-cycle costs
- Cost efficient
- Low emissions (**250** mg/NOx)
- Compact Solution

Best-in-class electrical efficiencies in NG &Biogas*
H Series: 24HM: 500 kWe; 56HM: 1,300 kWe

* Including 42HM for biogas

E- Series gas engines:
Designed as best-in-class alternative



Technical data

- **Power Output kW** 2065 (50-60 Hz)
- **Efficiency %** 46.4

Features

- **Lean burn** (turbocharged and aftercooled)
- Miller **cycle**
- **Fuel type:** Natural gas
- **Best-in-class**: excellent efficiency within small footprint
- **90,000 hours** until **Overhaul** operation

Benefits

- Mechanical efficiency of up to **46.4%**
- High operational availability
- Low life-cycle costs
- High reliability and availability
- Lowest emissions (**200** mg/ NOx)
- Compact design

Best-in-class electrical efficiencies in NG E Series

10+ MW gas engine based Power plants: Adapting to fluctuating power demands

Example: Power Plants

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Technical data

- **Power Output kW** 10+ MW (50-60 Hz)
- **Efficiency %** 40/ 46

Features

- **Based on Standard packages** of several sizes within **1-2 MW**
- **Application focus: Power generation for** Capacity market, peaking, peak shaving, fast start, back up, remote areas.
- **Fuel:** Natural Gas
- **High efficiency, availability, reliability.**

Benefits

- Efficiency of up to **45.5%**
- Operating flexibility and high productivity
- Compensates for changes in renewable generation, demand or use
- Lowest emissions
- Easy commissioning and maintenance schedules
- Compact design (modularity)

Siemens gas engines: Fuel flexibility

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Large range of fuels of Siemens Gas Engines

LHV	120 – 375 Btu/ft3	375 – 620	590 – 805	805 – 1155	1155 – 2495	2495 – 2690
	4.5 - 14 MJ/NM3	14 - 23	22 - 30	30 - 43	40 - 93	93-100

Siemens gas engines:
Fuel blending dynamic system

Example: Fuel Blending system

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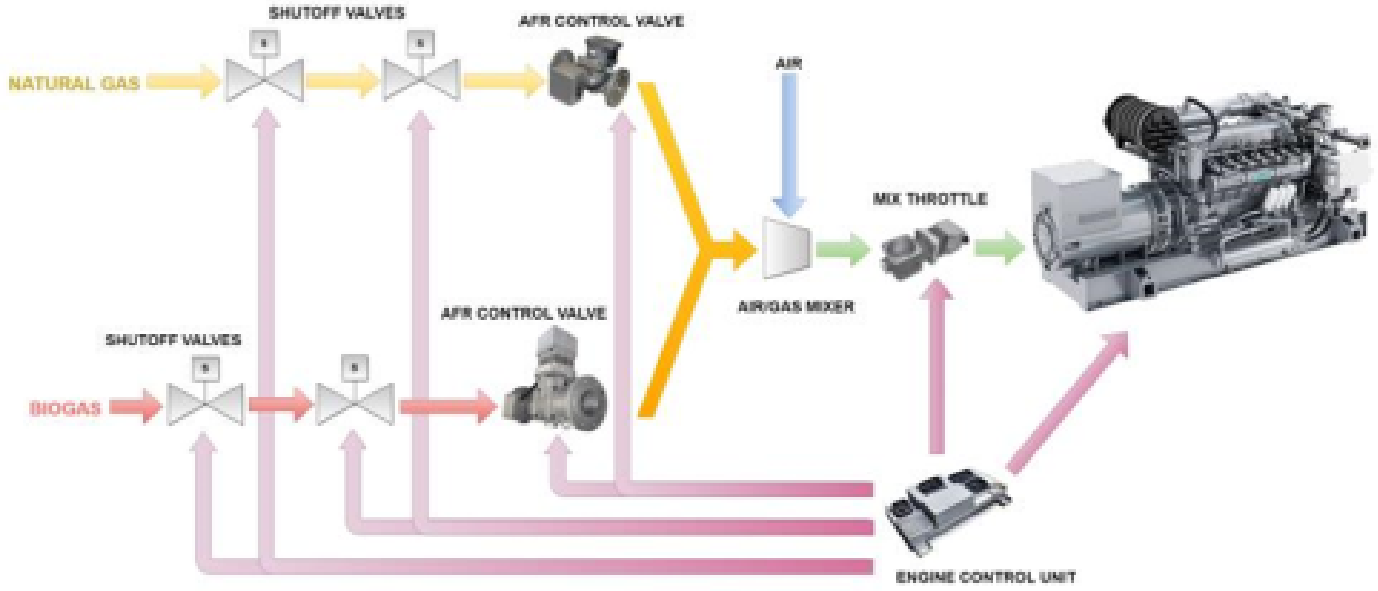
- **What is fuel blending?**

This is the ability of an engine to run on two fuels , A and B, or a mixture, being biogas the primary one and natural gas the secondary. Being the blending done on the engine and not outside.

- **Change on the fly:** Allows the change between the modes at full power from a real100% biogas (0% NG) to any fuel ratio >10%, including the possibility to run 100% NG (0% Biogas)

- **Easy start capability**: The customer can select biogas but start with Natural Gas. The control automatically changes to 100% biogas once the engine reaches the rated speed.



Siemens gas engines:
Lean burn power rating (NG, MN-75)

Example: Lean burn portfolio

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Gas Engines				Engines			Gensets		
	Type	Cyl.	Displ.	1200 rpm	1500 rpm	1800 rpm	1200 rpm	1500 rpm	1800 rpm
Electronic Carburation	SGE-18SL	6L	18	252	315	350	242	300	336
	SGE-24SL	8L	24	335	419	453	322	405	436
	SGE-36SL	12V	36	503	630	700	486	609	676
	SGE-48SL	16V	48	670	838	906	649	812	874
	SGE-56SL	16V	56	788	985	1,067	760	957	1,028
Miller cycle, Elect. Carburation	SGE-56SM	16V	56	-	1,055	1,100	-	1,025	1,065
High performance Miller cycle engines	SGE-24HM	8L	24	-	520	520	-	502	502
	SGE-42HM	12V	42		1,040	1,040	-	1,007	1,007
	SGE-56HM	16V	56	1,040	1,350	1,350	1,011	1,315	1,307
New E-Engine Series Best-in-class	SGE-86EM	12V	86		2065			2012	
	SGE-100EM	12V	100	2065			2010		

Siemens Gas engines: Installed base

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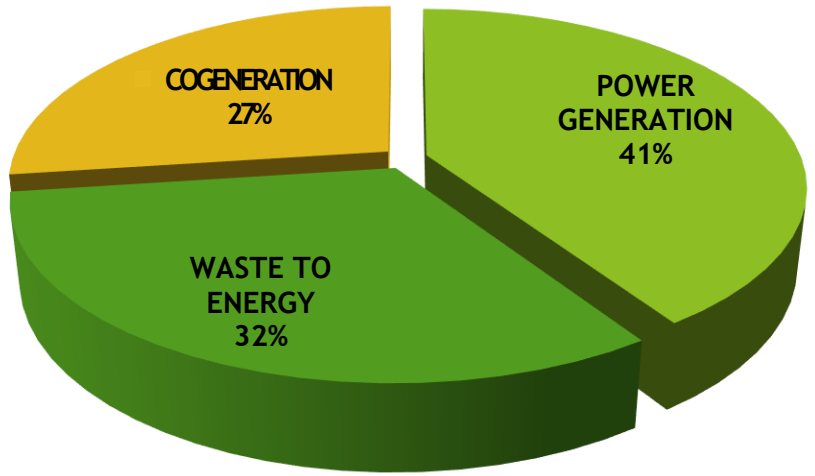
Installed base by application: 3200 units

Application	# of units
Power Generation	1300
Waste to Energy	1000
Cogeneration	900
TOTAL	**3200**

SGE installed base by application:



Exeter Capacity market, UK
STOR with PG gas engine

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Project Summary	
Project / Country	Exeter Capacity market, UK
Customer	STOR
Application	PG Peaking
Technology	Siemens SGE-56SL gas engine
Output	1059 kWe (total output: 20 MWe)
Complete	2016
Challenge	• Full load in less than a minute • Keep operating costs within reasonable budget while maintaining adequate energy levels
Solution	• SGE-56SL independently generates electricity at high reliability and availability for exigent start/ stop operation
Benefits	• Short delivery time • Easy commissioning and maintenance schedules

Pil Andina dairy, Bolivia
Dairy with PG gas engine

SIEMENS
Ingenuity for life

Project Summary	
Project / Country	Pil Andina dairy, Sta. Cruz de la Sierra-Bolivia
Customer	Pil Andina- Gloria Group
Application	PG
Technology	Siemens SGE-56SM gas engine
Output	906 kWe (total output:7 MWe)
Complete	2014
Challenge	• Whey regulations have been so burdensome for some producers that they've been forced to shutter their cheese-making operations. • Lack of financially feasible disposal options for the operation.
Solution	• SGE-56SM generates electricity for the dairy process • Using whey to generate power alleviates many of those issues and helps operations offset their energy needs
Benefits	• Creation of primary sludge from wastewater pretreatment, manure, spent, bleached earth from oil refineries or biosolids from industrial fermentation processes. • Generation of energy through the generated biogas being a net-energy generating business. • The surplus of energy can be exported to the grid.

Private Medisina Van Hospital, Turkey
Hospital with CHP gas engine

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Project Summary	
Project / Country	Private Medisina Van Hospital, Turkey
Customer	Medisina Van Hospital
Application	CHP
Technology	Siemens SGE-24SL gas engine
Output	405 kWe and 546 kWt
Complete	2014
Challenge	• High energy consumption of a hospital has to be met • Heat, cooling and steam needed • Keep operating costs within reasonable budget while maintaining adequate energy levels
Solution	• SGE-24SL independently generates electricity for hospital and provides resources they need for heating and cooling • Using an heat recover boiler, the gen-set jacket cooling water and exhaust gas are used for heating of water and the building
Benefits	• Reliable heat and power supply independent from external suppliers • Reduction of energy costs by 40% and peak electric energy costs • Steam used for hospital processes like sterilization

Wolverhampton University, UK
University with CHP gas engine

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Project Summary	
Project / Country	Wolverhampton University, UK
Customer	University of Wolverhampton
Application	CHP
Technology	Siemens SGE-36SL gas engine
Output	676 kWe, 798 kWt (+35 kWt from collected intercooler)
Complete	2011
Challenge	• Boost green credentials and reduce carbon impact of university • Provide heat and electricity to south campus buildings
Solution	• Fully packaged and noise insulated SGE-36SL gas engine • System additionally collects 35 kW of thermal energy from intercooler dump • Low emission engine (250 mg/Nm^3)
Benefits	• Savings of 352.000$ and 1000 tons of emissions per year • Improved energy efficiency achieved by capturing heat that is normally wasted • Reduced dependency on carbon-based fuels

Johannesburg Waste Water Treatment Plant, South Africa
Sewage with CHP biogas engine

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Project Summary	
Project / Country	Johannesburg sewage plant, South Africa
Customer	Johannesburg Water
Application	CHP
Technology	Siemens SGE-24SL gas engine (Biogas)
Output	1215 kWe, 1638 kWt (+60 kWt from collected intercooler)
Complete	2012
Challenge	• Swift from traditional boilers to more efficient generation equipment • Provide heat and electricity through anaerobic digestion and gas cleaning processes
Solution	• Fully packaged and noise insulated SGE-24SL gas engine • System additionally collects heat from exhaust recovery system, giving all together a 52% of thermal efficiency
Benefits	• 100% of the biogas generated is consumed • This biogas-to-energy project softens the impact of increasing power costs • Short payback term • This is the largest installation in its category and unique reference amongst worldwide

Itajaí landfill plant, Brazil
Landfill with PG biogas engine

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Project Summary	
Project / Country	Santa Catarina, Brazil
Customer	Itajaí Biogas
Application	CHP
Technology	Siemens SGE-56SM gas engine (Biogas- LFG)
Output	1066 kWe (3 MW in the near future)
Complete	2014
Challenge	• Generation of renewable energy through the capture of methane gas produced in a landfill that receives over 350 tons of garbage per day
Solution	• Fully packaged and noise insulated SGE-56SM gas engine • Instead of escaping into the air, LFG can be captured, converted, and used as a renewable energy resource. Using LFG helps to reduce odors and other hazards associated with LFG emissions, and prevents methane from migrating into the atmosphere and contributing to local smog and global climate change.
Benefits	• 100% of the biogas generated is consumed • This biogas-to-energy project softens the impact of increasing power costs • Reliable heat and power supply independent from external suppliers

Swine farm, Thailand
Farm with CHP biogas engine

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Project Summary	
Project / Country	VCF swine farm, Thailand
Customer	VCF Group
Application	CHP
Technology	Siemens SGE-56HM+2*SGE-56SL gas engine (biogas)
Output	3200 kWe and 3906 kWt
Complete	2014
Challenge	• Keep operating costs within reasonable budget while maintaining adequate energy levels • Use of Napier grass and manure for as a raw source
Solution	• SGE-56S+ 56HM independently generates heat and electricity for plant consumption • Use Napier grass and manure for biogas production
Benefits	• Reliable heat and power supply independent from external suppliers • Reduction of energy costs of the plant • Use of a renewable energy source

Anzoategui Venting plant, Venezuela
Flare gas plant with PG gas engine

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Project Summary	
Project / Country	Bare, Merey, Tejero/ Venezuela
Customer	
Application	PG
Technology	Siemens SGE-56SL gas engine
Output	752 kWe (total output:113 MWe- 150 containerized genset)
Complete	2012
Challenge	• Provide electricity with APG (flare gas) extracted from oil wells.
Solution	• SGE-56SL generates electricity in modular plants adapted to the demand • Improves the stability of the voltage of the electrical network • Increase in contingency reserves
Benefits	• Waste to energy power. • Lower energy losses in transmission and distribution. • Reliable and lasting power supply.

More Siemens Gas Engine References

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Project Summary	
Project / Country	Grand Hotel Vindgof, Chelybinsk, Russia
Technology	SGE-36SL with **CHP**
Power output	609 kWe

Project Summary	
Project / Country	Iguatemi business center, Brazil
Technology	3 x SGE-56SL with **CHP**
Power output	2700 kWe

Project Summary	
Project / Country	Dordtech woodchips plant, UK
Technology	9 x SGE-56SL with **CHP /syngas**
Power output	6.3 MWe, 5 MWt

Project Summary	
Project / Country	Qualtia food industry, Mexico
Technology	6 x SGE-56SM with **CHP**
Power output	5.5 MWe, 3.1 MWt

THANK YOU!

Mark Dougherty | **Distributed Generation Division Business Lead** | **Kelly Generator & Equipment, Inc.**
Owings, MD 20736 | Coal Center, PA 15423
Office: (410) 257-5225 x111 | Cell: (443)-721-0127 Fax: (410) 257-5227 | TF: (800) 677-3815 | www.KGE.com

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GENERATOR SALES, SERVICE, PARTS, RENTALS & TRAINING

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Back up

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Gas Engine Siemens Guascor 2/2

Lean Burn Portfolio (NG)

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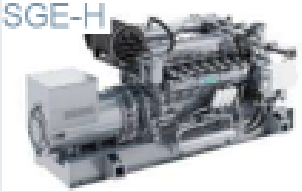
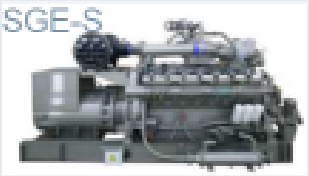
Miller cycle

		50Hz 1500rpm	60Hz 1200rpm	Eff. [%]
SGE-E 	SGE- 86EM 12V SGE-100EM 12V	2.012	2.013	45.4% 45.5%
SGE-H 	SGE-56HM 16V	1.315	1.011/1.307	43.4% 4253/41.3%
	SGE-42HM 12V	1.011	- /1.006	43.0% - /41.1%
50Hz 1500rpm 60Hz 12/1800rpm	SGE-24HM 8L	0.501	- /0.500	42.7% 40.5%
SGE-S 	SGE-56SM 16V	1.025	- /1.066	39.7% - /37.9%
	SGE-56SL 16V	0.957	0.763/1.028	39.0% 39.0/36.5%
	SGE-48SL 16V	0.813	0.647/0.873	38.8% 36.4/36.0%
	SGE-36SL 12V	0.610	0.485/0.677	38.9% 38.6/37.7%
	SGE-24SL 8L	0.405	0.321/0.435	38.5% 36.1/36.0%
50Hz 1500rpm 60Hz 12/1800rpm	SGE-18SL 6L	0.304	0.241/0.336	39.1% 38.6/37.4%

50Hz
60Hz

0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 // 2.0 2.1 Power el. [MW]

ISO; NG; NOx ≤ 500mg/Nm³

Back up

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Rich Burn Power Ratings								
			Engines			Gensets		
Type	Cyl.	Displ.	Continuous Duty	Prime Duty	Stand-by Duty	Continuous Duty	Prime Duty	Stand-by Duty
			kWb	kWb	kWb	kWe	kWe	kWe
			1800	1800	1800	60 Hz	60 Hz	60 Hz
SGE- 18SR	6L	18	281	300	330	273	291	320
SGE- 24SR	8L	24	375	380	420	364	369	407
SGE- 36SR	12V	36	562	600	660	545	582	565
SGE- 48SR	16V	48	750	760	840	728	737	715
SGE- 56SR	16V	56	870	--	--	844	--	--

Synthesis gas engines & gen-sets								
			Engines			Gensets		
	Cyl.	Displ.	kWb	kWb	kWb	kWe	kWe	kWe
			1200	1500	1800	1200	1500	1800
SGE- 18SL	6L	18	209	263	238	199	253	271
SGE- 24SL	8L	24	281	350	377	269	338	362
SGE- 36SL	12V	36	418	526	565	401	508	544
SGE- 48SL	16V	48	561	700	754	541	678	729
SGE- 56SL	16V	56	663	827	882	639	801	849

Back up

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Propane fueled engines & gen-sets										
			Engines				Gensets			
	Cyl.	Displ.	kWb 1500 C_3H_8>95%	kWb 1500 C_3H_8>80%	kWb 1800 C_3H_8>95%	kWb 1800 C_3H_8>80%	kWe 1500 C_3H_8>95%	kWe 1500 C_3H_8>95%	kWe 1800 C_3H_8>95%	kWe 1800 C_3H_8>95%
SGE- 18SM	6L	18	315	275	350	300	303	264	335	287
SGE- 24SM	8L	24	419	360	453	400	404	347	436	385
SGE- 36SM	12V	36	630	550	700	600	610	530	676	577
SGE- 48SM	16V	48	838	725	906	800	811	702	873	770

Oil&gas well gas, flare gas, APG, mining gas engines & gen-sets										
	Cyl.	Displ.	MN35 kWb/kWe		MN45 kWb/kWe			MN55 kWb/kWe		
			1500	1800	1200	1500	180	1200	1500	1800
SGE- 18SL	6L	18	290/279	240/325	220/210	275/264	300/287	252/242	315/303	350/335
SGE- 24SL	8L	24	390/376	450/433	290/278	360/347	400/385	335/322	419/404	453/436
SGE- 36SL	12V	36	580/562	675/652	440/422	550/530	600/577	503/485	630/610	700/676
SGE- 48SL	16V	48	775/750	900/867	580/559	725/702	800/770	670/645	838/811	906/873
SGE- 56SL	16V	56	900/872	1,050/1,012	671/646	900/872	905/872	788/760	1,055/1,025	1,067/1,028