Gaianova Srl/GmbH
Via Artigianale 54
39040 Varna (BZ)
IVA: IT 03200470213

info@gaianova.it
+39 3775954541

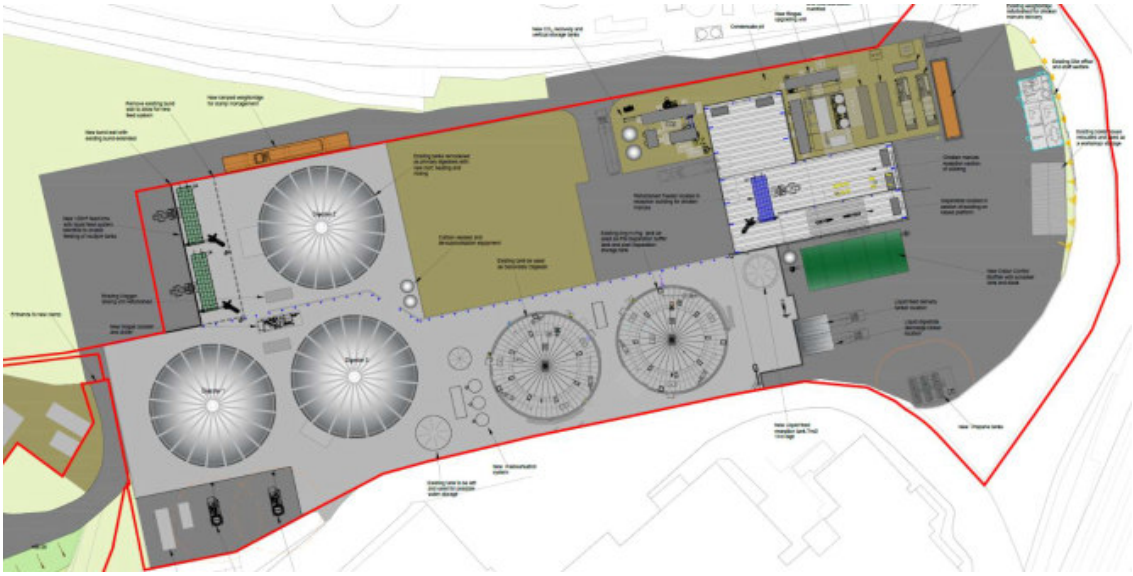
MASS BALANCE
AND ENERGY BALANCE
OF THE PROJECT

ACORN BIOENERGY - Devon Green Power LTD

Type of plant: gas injection

Biomethane injection 1150 Nm³ CH4/h

VERSION 03 13/01/2026



Gaianova Srl/GmbH
info@gaianova.it

Project and biomass data

Project name:	**ACORN BIOENERGY - Devon GI**	Note: The results presented in this study may vary considerably due
Type of plant:	**gas injection**	to various factors, such as biomass quality, plant operating
Biomethane injection	**1.150**	**Nm³ CH_4/h** parameters or the plant design chosen.

General data and mass balance data			Data for the energy balance		
Biogas plant					
Input biomass liquid	30.000	t/a	El. Consumption per Nm³ of BG	0,20	kWh/Nm³
S.S.	-	%	El. Consumption	4.092	MWh/a
Input biomass solid	80.780	t/a	Th. Consumption	6.869	MWh/a
S.S.	-	%			
Input biomass sum	110.780	t/a	Notes thermal calculation:		
S.S.	-	%	Medium yearly thermal consumption.		
Input water	10.000	t/a	Temperatures incomming biomasses:		
Input liquid separated	25.550	t/a	slurry and water 15 °C - solids biomasses 20 °C - liquid		
S.S.	3,5%	%	separated 42 °C - Digester temperature = 42 °C.		
Output biogas plant	119.573	t/a	Post pasteurization with heat recovery from 70 °C to 55 °C		
S.S.	11,42	%			
Prod. biogas in 8.760 h	20.459.389	Nm³/a			
Biogas prod. per year	20.319.256	Nm³/a			
Percentage of methane	52,4	%			
Biogas production	8.700	h/a			

Liquid solid separation					
Output separated solid	29.389	t/a	El. Consumption	96	MWh/a
S.S.	25,00	%			
Output separated liquid	90.184	t/a			
S.S.	7,00	%			
Separated s.	29.389	t/a			
Separated l. for dilution	32.429	t/a			
Separated l.	57.756	t/a			

Second stage separation					
With secondary separation	YES	[-]	El. Consumption	104	MWh/a
Flocculants	0	t/a			
Water for fl.	0	t/a			
Separate output s.	6.879	t/a			
S.S.	20,00	%			
Separate output l.	25.550	t/a			
S.S.	3,50	%			
Separated solids	6.879	t/a			
Separated solids composting	0	t/a			
Separated liquids for dilution	25.550	t/a			
Separated liquids	0	t/a			
Separated liquids composting	0	t/a			

Biochemical desulfurization					
With desulfurization plant	YES	[-]	El. Consumption	216	MWh/a
Input biogas	20.319.256	Nm³/a	Th. Consumption	0	MWh/a
Input chem.	53	t/a			
NaOH (30%) e AD13					
Water consumption	688	t/a			

Gaianova Srl/GmbH
info@gaianova.it

Project and biomass data

Project name:	**ACORN BIOENERGY - Devon GI**	Note: The results presented in this study may vary considerably due to various factors, such as biomass quality, plant operating parameters or the plant design chosen.
Type of plant:	**gas injection**	
Biomethane injection	**1.150**	**Nm³ CH_4/h**

Methane boiler					
Thermal power	599	kW	El. Consumption	0	MWh/a
Natural gas consumption	0	Nm³/a	Th. Production	0	MWh/a
Efficiency	98,00	%			
Hours of operation	0	h/a			

Biogas boiler					
Thermal power	599	kW	El. Consumption	0	MWh/a
Biogas consumption	0	Nm³/a	Th. Production	0	MWh/a
Average thermal production	0	kW			
Efficiency	96,00	%			
Hours of operation	0	h/a			

CHP natural gas					
Electrical power	1.200	kW	El. Consumption	255	MWh/a
Average electricity production	1.200	kW	El. Production	10.200	MWh/a
Electrical efficiency	39,50	%	Th. Production	11.016	MWh/a
Power th.	1.296	kW			
Natural gas consumption	2.718.188	Nm³/a			
CHP availability	8.500	h/a			
Engine shutdown	260	h/a			

CHP biogas					
Electrical power	530	kW	El. Consumption	135	MWh/a
Average electricity production	530	kW	El. Production	4.505	MWh/a
Electrical efficiency	39,00	%	Th. Production	4.852	MWh/a
Power th.	571	kW			
Biogas consumption	2.212.499	Nm³/a			
CHP availability	8.500	h/a			
Engine shutdown	260	h/a			

Flare					
Operating per year	1,5	%	El. Consumption	1,3	MWh/a
Total biogas input	304.789	Nm³/a			
Hours of operation	131	h/a			

Gaianova Srl/GmbH
info@gaianova.it

Project and biomass data

Project name: **ACORN BIOENERGY - Devon GI**
Type of plant: **gas injection**
Biomethane injection **1.150** **Nm³ CH_4/h**

Note: The results presented in this study may vary considerably due to various factors, such as biomass quality, plant operating parameters or the plant design chosen.

Upgrading					
Input biogas	17.801.969	Nm³/a	El. Consumption per Nm³ of BG	0,30	kWh/Nm³
Input biogas	18.779.297	Sm³/a	El. Consumption	5.341	MWh/a
Percentage of methane	52,38	%	Th. Consumption	0	MWh/a
Energy (calc. on lower cal. value)	92.943	MWh	Th. Production	3.342	MWh/a
Methane production	9.305.458	Nm³/a			
Methane production	9.816.327	Sm³/a	El. Con. of compressor connected to 12 bar gas network		
LCV per year	92.757	MWh/a	El. Consumption per Sm³ of CH4	0,00	kWh/Sm³
Additional propane (refered to volume)	**5**	**%**	El. Consumption	0	MWh/a
Average methane output with propane	**1.150**	**Nm³/h**			
Quantity methane and propane fed into the GEU	**9.770.731**	**Nm³/a**			
Energy methane (calc. on lower cal. value)	92.525	MWh			
Energy propane (calc. on lower cal. value)	12.604	MWh			
Energy injected gas (calc. on lower cal. value)	**105.129**	**MWh**			
Efficiency	99,80	%			
Availability of equipment	97,03	%			
Activated carbon nec.	47	t/a			
Hours of operation	8.500	h/a			

CO2 recovery plant					
CO2 recovery plant	YES	[-]	El. Consumption per Nm³ of CO_2	0,50	kWh/Nm³
Input offgas	8.496.511	Nm³/a	El. Consumption	4.247	MWh/a
Input offgas	8.962.970	Sm³/a	Th. Consumption	0	MWh/a
CO2 production	14.774	t/a	Th. Production	0	MWh/a
Efficiency	88	%			
Water consumption	0	t/a			
Hours of operation	8.500	h/a			

Biofilter					
Med. electrical consumption	100	kW	El. Consumption	850	MWh/a
Hours of operation	8.500	h/a	Th. Consumption	0	MWh/a

Accessories (offices, ill. …)					
			El. Consumption	88	MWh/a
			Th. Consumption	438	MWh/a

Gaianova Srl/GmbH
info@gaianova.it

Project and biomass data

Project name:	**ACORN BIOENERGY - Devon GI**	Note: The results presented in this study may vary considerably due to various factors, such as biomass quality, plant operating parameters or the plant design chosen.
Type of plant:	**gas injection**	
Biomethane injection	**1.150**	**Nm³ CH_4/h**

Constants for calculations:		
Conversion factor Nm³ in Sm³	1,0549	[-]
LCV methane from upg per Nm³	9,9680	kWh/Nm³ at (0°C; 1013,25 mbar)
LCV methane from upg per Sm³	9,4492	kWh/Sm³ at (15°C; 1013,25 mbar)
LCV propane per Nm³	25,8000	kWh/Nm³ at (0°C; 1013,25 mbar)
Methane Density	0,7180	kg/Nm³
LCV LNG per kg	13,9000	kWh/kg at a concentration of 100% methane
Density of CO_2	1,9760	kg/Nm³
LCV natural gas per Nm³	9,5000	kWh/Nm³ a (0°C; 1013,25 mbar)
	fields to fill in	

Gaianova Srl/GmbH
info@gaianova.it

Results of the mass balance and the thermal and electrical balance

Natural gas and LNG					
INPUT			**OUTPUT**		
Natural gas consumption	**2.718.188**	**Nm³/a**	**LNG production***	**0**	**kg/a**
LCV per year	*25.823*	*MWh/a*	*LCV per year*	*0*	*MWh/a*
			Quantity methane and propane fed into the GEU	**9.770.731**	**Nm³/a**
			Energy injected gas (calc. on lower cal. value)	*105.129*	*MWh/a*

Incoming and outgoing biomass					
INPUT			**OUTPUT**		
Input biomass liquid	**30.000**	**t/a**	**Separated l.**	**57.756**	**t/a**
Input biomass solid	**80.780**	**t/a**	**Separated s.**	**36.268**	**t/a**
Water consumption	**10.688**	**t/a**			

Summary of the electricity balance		
Average power consumption	1,761	MW
Total electricity consumption	**15.424**	**MWh/a**
Average electrical power of the CHP biogas	0,530	MW
Average electrical power of the CHP nat. gas	1,200	MW
Electricity production from the CHP's	14.705	MWh/a
Total electricity production	**14.705**	**MWh/a**
Electricity to be purchased	**719**	**MWh/a**

Summary of the heat balance		
Biogas plant consumption	6.869	MWh/a
Remaining consumption	438	MWh/a
Total thermal consumption	**7.307**	**MWh/a**
Thermal production of the CHP biogas	4.852	MWh/a
Thermal production of the CHP nat. gas	11.016	MWh/a
Thermal production of natural gas boiler	0	MWh/a
Thermal production of biogas boiler	0	MWh/a
Thermal production Upgrading	3.342	MWh/a
Thermal production of biogas boiler	0	MWh/a
Total thermal production	**19.210**	**MWh/a**