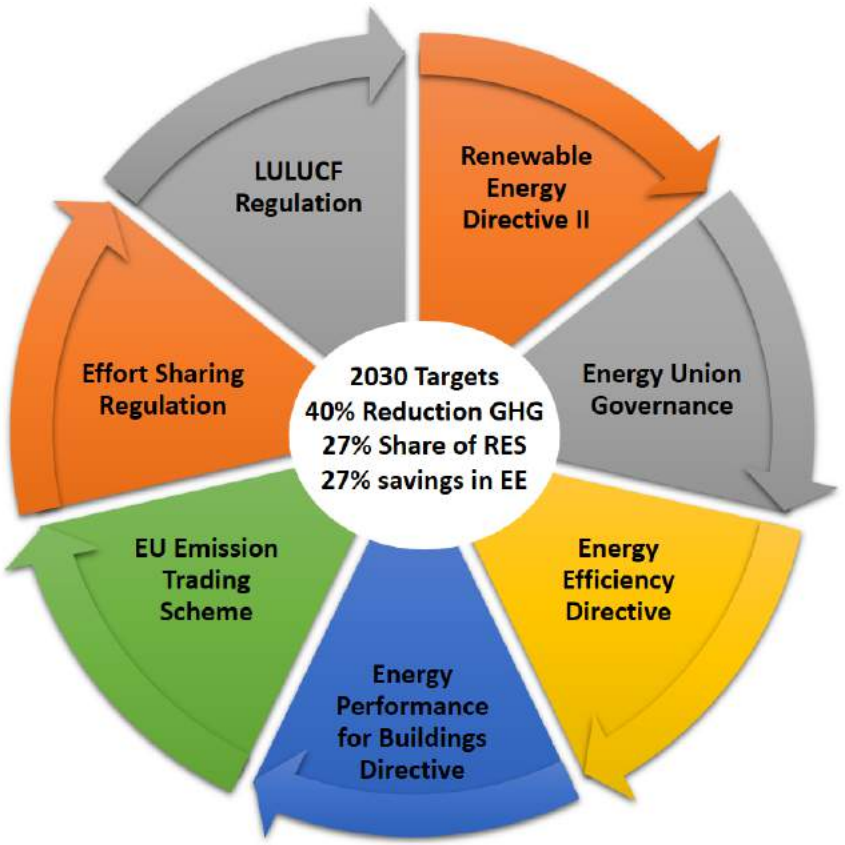
VERDEMOBIL
BIOGAZ

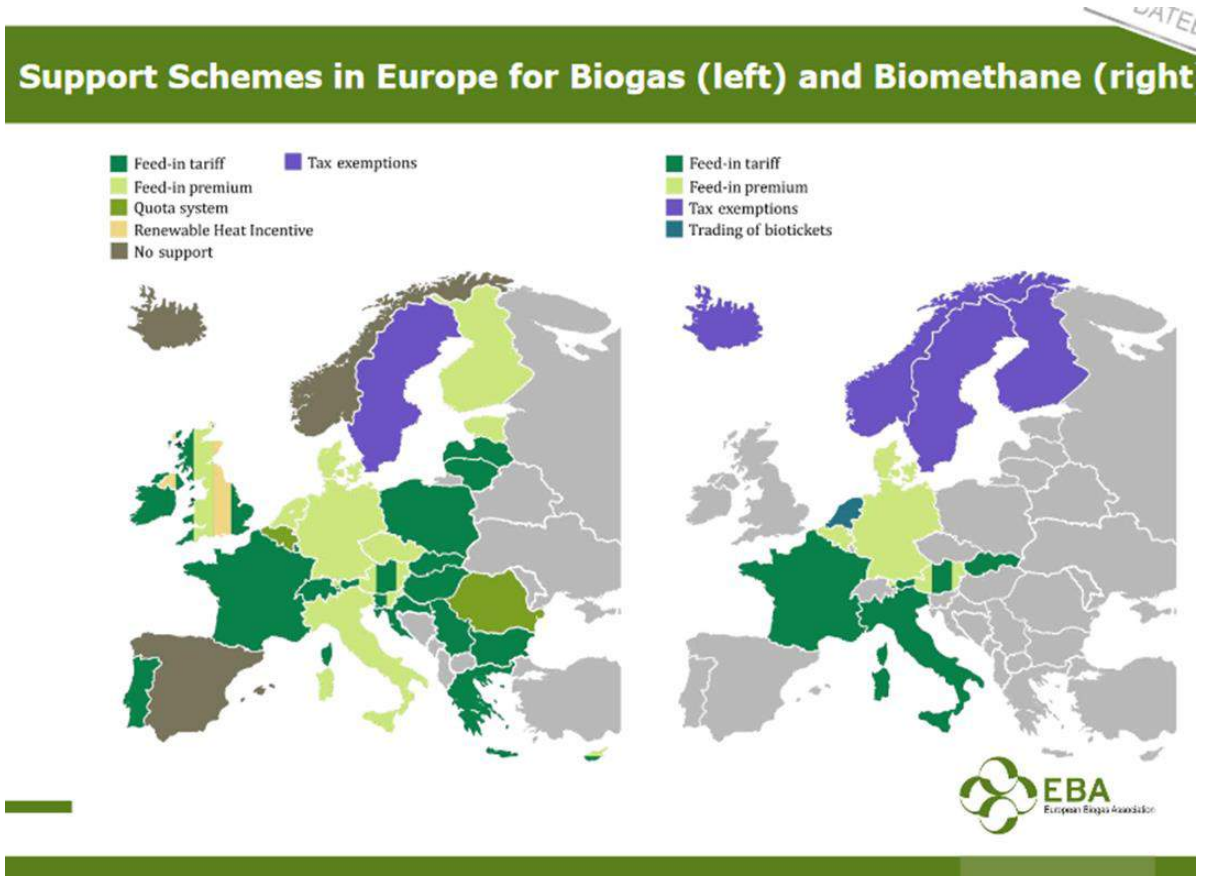
xebec
A world powered by clean energy

France’s Energy Transition For Green Growth

Philippe Khairallah
Amir Ghasdi

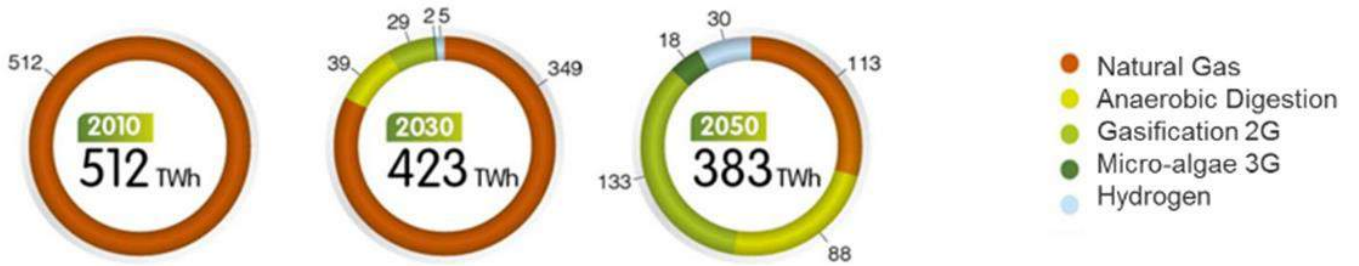
European Renewable Energy Directive (RED)



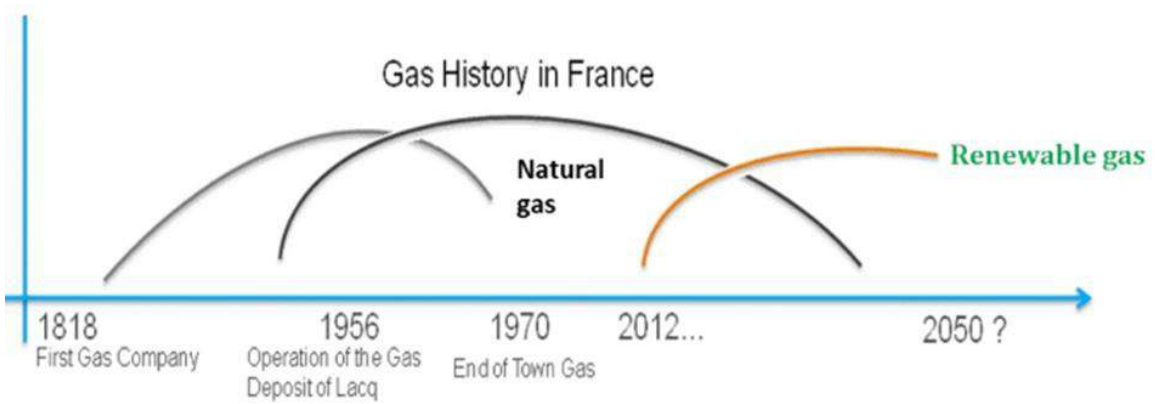


European Renewable Energy Directive (RED)

Gas Future: 2nd Transition is Coming



France – scenario from ADEME of gas energy in the grid
Source: GRDF 2016



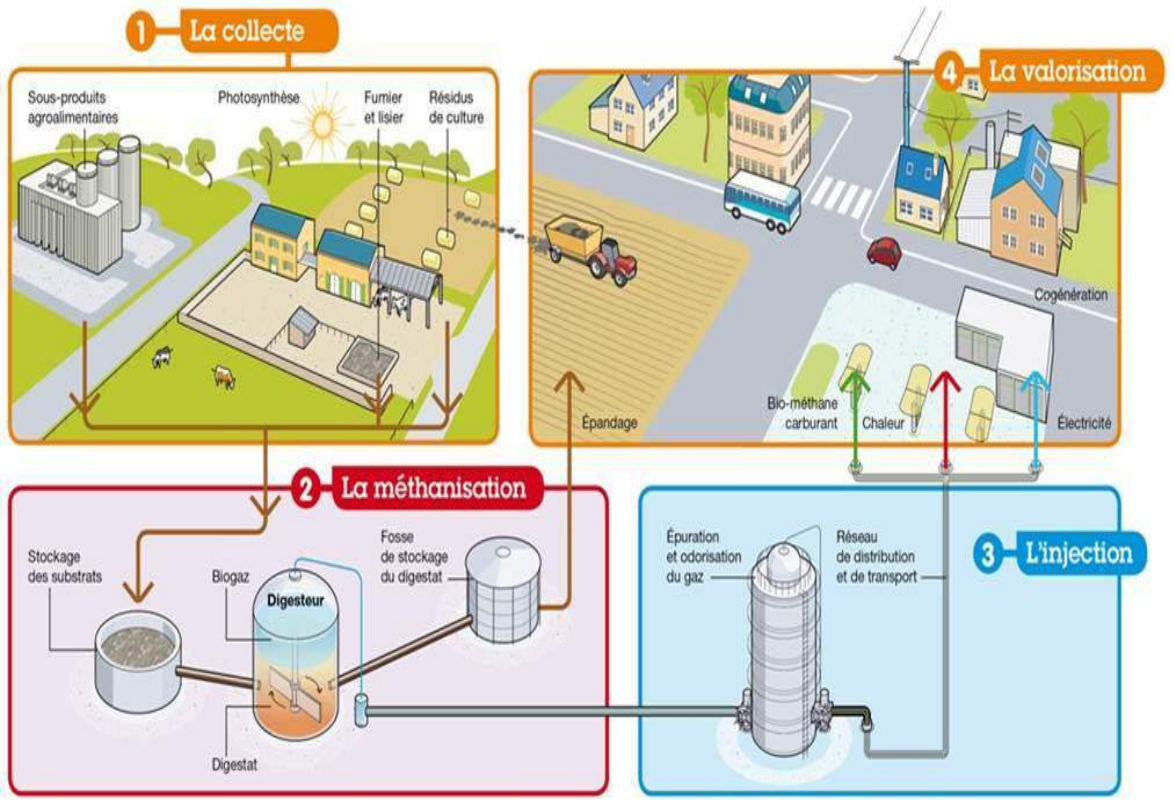
Source: ENGIE 2017

Agri-Food to RNG Projects
Case Study: Agri-Biomethane

- Location: Nantes, France
- Developer: Agri-Biomethane (10 farmers)
- Biogas Source: Manure and Commercial Food AD gas
- Raw Biogas: 58% CH4; ~150 Nm3/h
- Use: CNGV-Pipeline
- Commissioned: 2014

Agri-Food to RNG Projects
Case Study: Agri-Biomethane

- 14,900 Ton/year of Manure
- 6,050 Ton/year of Agri-food waste
- Trucks transport waste 4 times per day - 57 tons per day



Agri-Food to RNG Projects
Case Study: Agri-Biomethane

Principaux Ouvrages	Volume
Bâtiment de réception des effluents + Bureau	346m³
Fosse de stockage des graisses (Enterré)	115 m³
Fosse stockage Lisier Fumier (Enterré)	380 m³
Digesteur (Semi enterré)	1880 m³
Post digesteur (Semi enterré)	1200 m³
Poche de stockage du digestat	3000 m³

Les Produits	Volume annuel
Production de Biogaz brut	1 000 000 m³
Injection Bio Méthane dans réseau	550 000 m³
Exportation du digestat solide en compostage (valorisation en engrais organique)	1600 tonnes
Epandage du digestat liquide (substitution à de l'engrais chimique)	17 000 m³
Economie d'engrais chimiques (engrais azoté)	75 tonnes
Investissement	3 400 000 €

Agri Bio Méthane

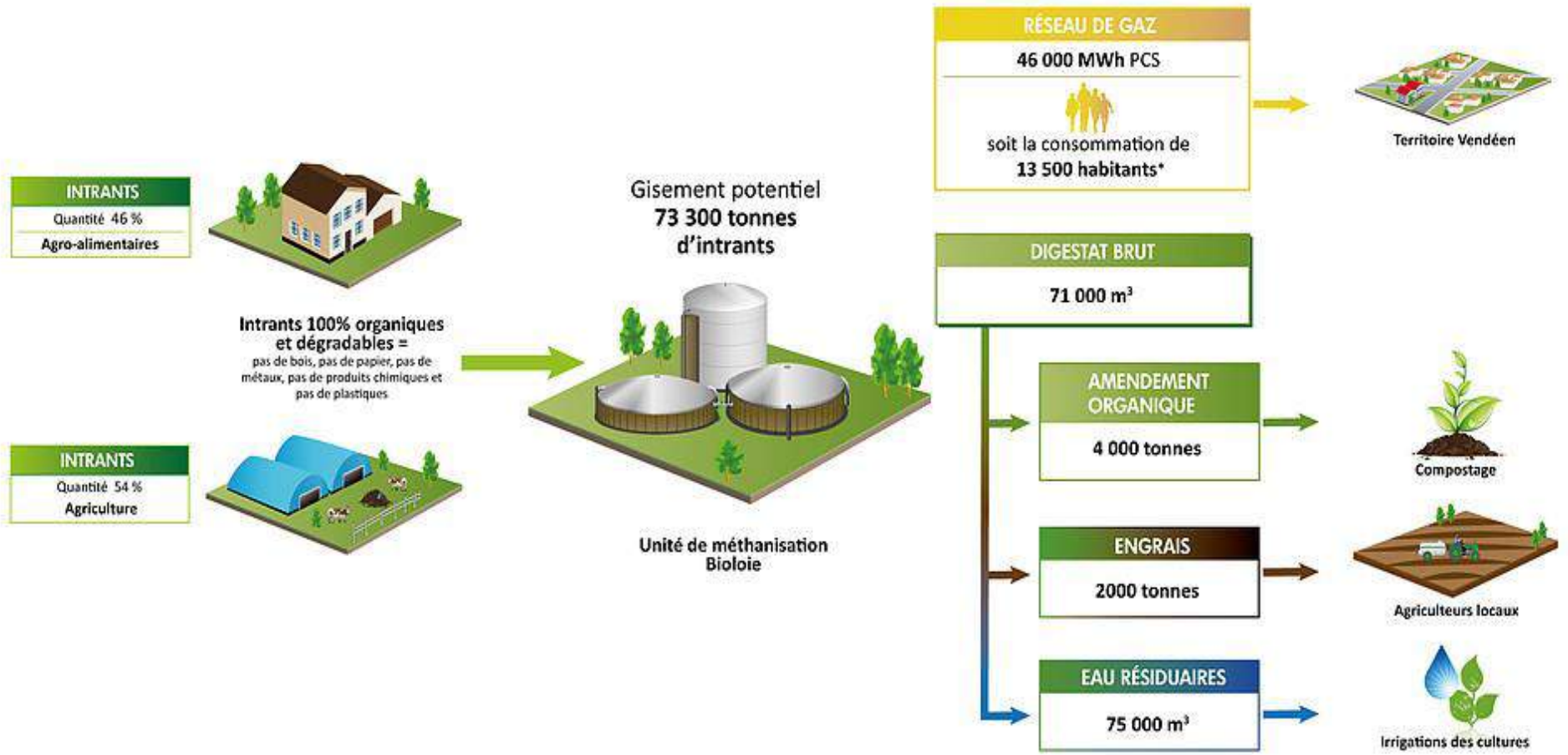
https://www.youtube.com/watch?v=t86whbf7YDc

Agri-Food to RNG Projects
Case Study: Agri-Biomethane

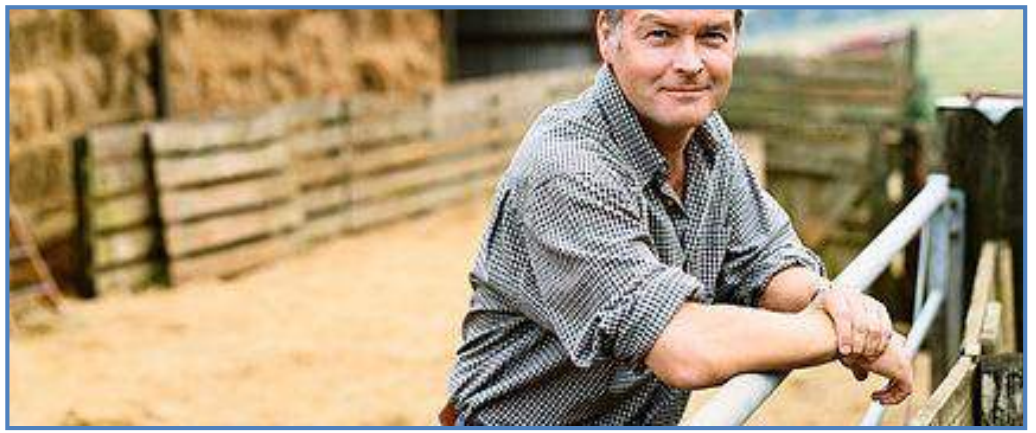
Agri-Food to RNG Projects
Case Study: Bioloie

- Location: France
- Developer: Fonroche Énergie
- Biogas Source: Organic Waste
- Raw Biogas: 62% CH4; ~1300 Nm3/h
- End-use: Pipeline
- Pipeline Operator – GRDF
- Commissioned: 2017

Agri-Food to RNG Projects
Case Study: Bioloie



Agri-Food to RNG Projects
Case Study: Bioloie



Innovative

- **1967** • Dehydration technology for natural gas
- **1997** • Fast-cycle PSA for H2 application
- **2004** • BGX® Solutions
- **2010** • O_2/N_2 removal from Landfill Gas
- **2016** • Higher recovery (>99%) solution

Escondido WWTP Project

BGX SOLUTIONS

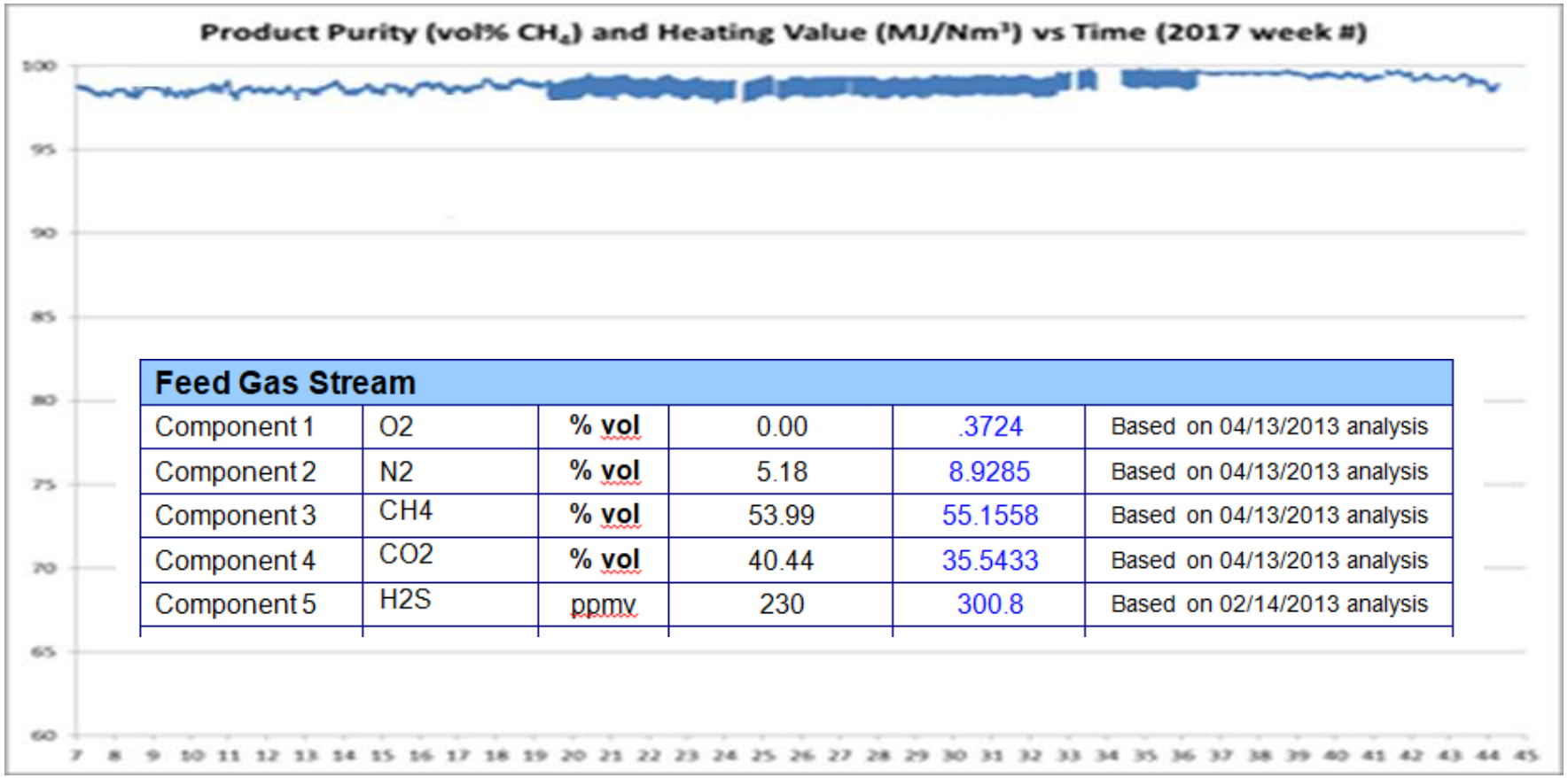
xebec
DANGER
NO SMOKING
DANGER
COMPRESSED GAS

Biogas to RNG Upgrading Case Study

High-BTU Landfill

- Location: Salmon Arm, Canada
- Developer: FortisBC
- Biogas Source: Landfill at Salmon Arm
- Raw Biogas: 58% CH4; ~700 Nm3/h,
- 8-12% N2/O2
- Pipeline: FortisBC
- Commissioned: 2012

FORTIS BC



Feed Gas Stream					
Component 1	O2	% vol	0.00	.3724	Based on 04/13/2013 analysis
Component 2	N2	% vol	5.18	8.9285	Based on 04/13/2013 analysis
Component 3	CH4	% vol	53.99	55.1558	Based on 04/13/2013 analysis
Component 4	CO2	% vol	40.44	35.5433	Based on 04/13/2013 analysis
Component 5	H2S	ppmv	230	300.8	Based on 02/14/2013 analysis

Biogas Project Installations

BGX SOLUTIONS PSA Project List

DATE	PRODUCT	INDUSTRY	GAS SOURCE	PRODUCT FLOW (NCMH)	OPERATING PRESSURE (PSIG)	COUNTRY
2004	BGX50 PLANT	Biogas - High BTU	Digester Gas	26	215	USA
2006	BGX750 PLANT	Biogas - High BTU	High BTU Landfill Gas	440	135	USA
2006	BGX3000 PLANT	Biogas - High BTU	High BTU Landfill Gas	1700	150	USA
2006	BGX3000 PLANT	Biogas - High BTU	High BTU Landfill Gas	1700	150	USA
2006	BGX250 PLANT	Biogas - High BTU	Digester Gas	119	135	USA
2007	BGX250 PLANT	Biogas - High BTU	Digester Gas	108	160	Switzerland
2007	BGX750 PLANT	Biogas - High BTU	Digester Gas	108	160	Switzerland
2007	BGX150 PLANT	Biogas - High BTU	Digester Gas	61	145	Switzerland
2007	BGX5000 PLANT	Biogas - High BTU	High BTU Landfill Gas	2900	150	USA
2007	BGX5000 PLANT	Biogas - High BTU	High BTU Landfill Gas	2900	150	USA
2007	BGX5000 PLANT	Biogas - High BTU	Digester Gas	2900	150	USA
2007	BGX5000 PLANT	Biogas - High BTU	Digester Gas	2900	150	USA
2007	BGX50 PLANT	Biogas - High BTU	Digester Gas	21	175	Austria
2007	BGX5000 PLANT	Biogas - High BTU	High BTU Landfill Gas	2490	170	USA
2007	BGX5000 PLANT	Biogas - High BTU	High BTU Landfill Gas	2490	170	USA
2007	BGX250 PLANT	Biogas - High BTU	Digester Gas	116	145	Switzerland
2007	BGX350 PLANT	Biogas - High BTU	Digester Gas	146	160	Switzerland
2008	BGX250 PLANT	Biogas - High BTU	Digester Gas	137	165	USA
2008	BGX250 PLANT	Biogas - High BTU	Landfill Gas	122	130	S. Korea
2008	BGX150 PLANT	Biogas - High BTU	Digester Gas	77	116	Austria
2010	BGX150 PLANT	Biogas - High BTU	Digester Gas	77	116	Austria
2010	BGX150 PLANT	Biogas - High BTU	Digester Gas	77	116	Austria
2010	BGX100 PLANT	Biogas - High BTU	High BTU Landfill Gas	40	150	France
2010	BGX350 PLANT	Biogas - High BTU	WWTP Gas	200	90	USA
2010	BGX750 PLANT	Biogas - High BTU	High BTU Landfill Gas	418	120	S. Korea

Ohio, USA - landfill gas to pipeline - 2006

Incheon, South Korea - landfill gas to pipeline - 2010

Biogas Project Installations

BGX SOLUTIONS PSA Project List xebec

DATE	PRODUCT	INDUSTRY	GAS SOURCE	PRODUCT FLOW (NCMH)	OPERATING PRESSURE (PSIG)	COUNTRY
2010	BGX500 PLANT	Biogas - High BTU	High BTU Landfill Gas	290	90	Canada
2010	BGX350 PLANT	Biogas - High BTU	WWTP Gas	214	90	USA
2011	BGX250 PLANT	Biogas - High BTU	Digester Gas	150	120	Austria
2011	BGX1500 PLANT	Biogas - High BTU	Digester Gas	822	120	S. Korea
2012	BGX750 PLANT	Biogas - High BTU	High BTU Landfill Gas	387	120	China
2013	BGX150 PLANT	Biogas - High BTU	Digester Gas	70	200	France
2015	BGX350 PLANT	Biogas - High BTU	WWTP Gas	150	116	Austria
2015	BGX500 Plant	Biogas - High BTU	Digester Gas	255	210	Malaysia
2016	BGX250 PLANT	Biogas - High BTU	Digester Gas	120	120	France
2016	BGX500 PLANT	Biogas - High BTU	Digester Gas	320	120	France
2016	BGX750 PLANT	Biogas - High BTU	Digester Gas	336	120	France
2016	BGX500 PLANT	Biogas - High BTU	Digester Gas	240	120	France
2016	BGX250 PLANT	Biogas - High BTU	Digester Gas	106	120	France
2016	BGX1250 PLANT	Biogas - High BTU	Digester Gas	743	120	France
2016	BGX1250 PLANT	Biogas - High BTU	Digester Gas	743	120	France
2016	BGX1250 PLANT	Biogas - High BTU	Digester Gas	743	120	France
2017	BGX100 PLANT	Biogas - High BTU	Digester Gas	47.5	120	France
2017	BGX500 PLANT**	Biogas - High BTU	Digester Gas	260	120	France
2017	BGX250 PLANT**	Biogas - High BTU	Digester Gas	150	120	France
2017	BGX350 PLANT**	Biogas - High BTU	Digester Gas	174	120	France
2017	BGX350 PLANT**	Biogas - High BTU	Digester Gas	160	120	France
2017	BGX500 PLANT**	Biogas - High BTU	Digester Gas	320	120	France
2017	BGX150 PLANT**	Biogas - High BTU	Digester Gas	91	120	France
2018		Biogas - High BTU	Organic Waste			Italy
2018		Biogas - High BTU	WWTP Gas			China
2018	BGX350 PLANT**	Biogas - High BTU	Digester Gas	200	120	France
51	TOTAL					

** under construction

Salmon Arm, Fortis – Landfill Gas to Pipeline - 2010

City of Anshan, China – Landfill Gas to CNGV City Taxis - 2012

VERDEMOBIL
BIOGAZ

xebec 50 ANS • YEARS

Thank You