Urban Waste for Biomethane Grid Injection and Transport in Urban Areas

Project No: IEE/10/251



Biogas & Biomethane Production in Valmiera, Latvia

WP 4 – Task 4.3 / D 4.3

August, 2013



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The UrbanBiogas project (Urban waste for biomethane grid injection and transport in urban areas) is supported by the European Commission in the Intelligent Energy for Europe Programme). The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. Neither the EACI nor the European Commission are responsible for any use that may be made of the information contained therein. The UrbanBiogas project duration is May 2011 to April 2014 (Contract Number: IEE/10/251).

UrbanBiogas website: www.urbanbiogas.eu



Co-funded by the Intelligent Energy Europe Programme of the European Union

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Abbreviations

- AD Anaerobic digestion
- BG biogas
- CH₄ methane
- CHP combined heat and power (co-generation)
- DM Dry matter
- FF Fine fraction (of mechanically sorted organic waste)
- FM Fresh matter content
- MSW Municipal solid waste
- PSA Pressure Swing Adsorption biogas upgrading technology
- VS Volatile solids content
- WtB Waste-to-Biomethane
- WWT Waste water treatment
- Y_{gas} Specific biogas yield [m³_N/t_{VS}]
- ZAAO North Vidzeme Waste Management Company (partner of UrbanBiogas project)

Introduction

Biogas and biomethane production concept for Valmiera city and North Vidzeme Region is developed in the UrbanBiogas project, supported by the Intelligent Energy Europe program of the European Commission. The main objective of the biogas and biomethane production concept is to identify economical, organisational and technical solutions for biogas and biomethane production from waste in Valmiera city and North Vidzeme Region.

Report provides information about technical solution for biogas production, overview on legal requirements of using waste as feedstock, investigation of potential relevant national support schemes for biogas production, economical calculations of the suggested solution and provision about strategies to overcome legal and non-technical barriers for biogas project.

Biogas and biomethane production concept for Valmiera city is based on the Waste management concept that has been developed by ZAAO earlier in the UrbanBiogas project. In the waste management concept the selected option is collection of the unsorted municipal waste. It is concluded that until 2020 it is not economically and legally feasible to implement source separated organic waste collection in Valmiera city. The selected option foresees two scenarios:

- Basic scenario collection of unsorted waste, mechanical separation of organic fraction and composting (present practice);
- Combined scenario collection of unsorted municipal waste and separated food waste from companies, mechanical separation of organic fraction from MSW and dry fermentation.

Authors of this concept believes that collection of unsorted municipal waste and later mechanical separation of organic waste is not the best solution for the municipality since it does not fulfil the resource-efficiency requirements while a resource-efficient Europe is on of seven flagship initiatives under the Europe 2020 Strategy (COM (2011) 21, A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy). As it is stated in a position paper of the European municipal waste association (Municipal Waste Europe, 2011), resource-efficiency cannot be achieved without the engagement of municipalities and their waste management companies. Resources must be recovered in order to achieve overall sustainable use of resources, beginning with prevention and continuing with the retrieval of resources from the waste stream back into the production cycle or into re-use. The purity of the separated organic material after mechanical treatment is low and it can only be used in dry fermentation process. The sludge after fermentation can only be disposed in a landfill (used as a landfill cover material). Therefore in this technical solution nutrients are not recovered and the nutrient cycle is not closed.

Based on the above mentioned considerations, along with the solution proposed by ZAAO in the waste management concept the authors of this concept are proposing an alternative scenario that foresees a source separated waste collection and organic waste treatment in the wet anaerobic digestion process. The biogas and biomethane production concept is developed based on the following two scenarios:

- Combined scenario collection of unsorted municipal waste and separated food waste from companies, mechanical separation of organic fraction from MSW and dry fermentation;
- 2) Resource-efficiency scenario introduction of source separated waste collection and wet fermentation with upgrading of biogas to biomethane.

1. Survey of available feedstock

The focus of the UrbanBiogas project is set on promoting the use of the untapped fraction of organic urban waste for biogas production in order to inject biomethane in the natural gas grid or use it in transport. Therefore in this concept the basic substrate to be used for biogas production is organic fraction of the municipal solid waste (MSW) and other organic waste (landscape management, kitchen waste, expired food and industrial waste) from gardening, restaurants, supermarkets, and from the food and beverage industry.

1.1. Municipal solid waste, organic in Valmiera and vicinity

The availability of municipal solid waste has been assessed in the Waste Management Concept for Valmiera City (Niklass M. et.al, 2012) and the draft North Vidzeme Regional Waste Management Development Plan 2014-2020 (ZAAO, 2013). According to the waste management concept, for the first scenario the amount of organic waste available for biogas production is given in Table 1 and Figure 1.

	2011	2012	2015	2018	2020
Biodegradable waste separated from MSW by mechanical treatment	8 920	5 785	7 213	8 140	8 486
Separately collected green waste	-	3 020	3 071	3 103	3 125
Waste water treatment sludge	2 016	3 886	3 951	3 993	4 021
TOTAL	10 936	12 691	14 235	15 236	15 632

Table1. Available organic waste, [t] and forecast (2012-2020)

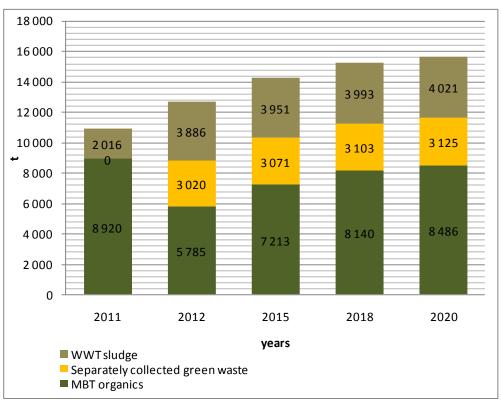


Figure 1: Availability of organic waste for biogas and biomethane production

According to this forecast, the amount of organic waste will gradually increase reaching 15.6 thousand tons in 2020. Authors of this concept have recalculated the availability of organic waste based on the latest forecast about amounts of unsorted municipal waste and other separately collected waste reported in the draft North Vidzeme Regional Waste Management Development Plan 2014-2020 (ZAAO, 2013). This has been done in order to be able to compare both proposed scenarios in this concept. The available organic waste according to this forecast is given in Figure 2.

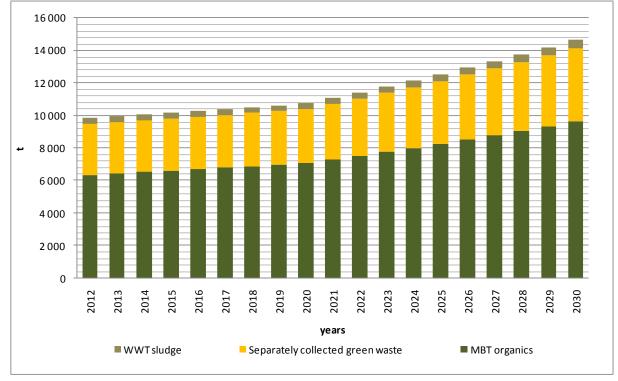


Figure 2: Availability of organic waste for biogas and biomethane production – updated forecast

The amount of available organic waste will increase from 9.86 thousand t in 2012 to 10.75 thousand t in 2020, and reaching 14.65 thousand t in 2030.

1.2. Industrial organic residues in Valmiera and vicinity

In North Vidzeme region there are several dairy processing plants, breweries and other food processing companies. Most of the dairy plants are technically advanced and do whey processing into powdered milk or into protein rich drinks. List of the largest food and beverage companies in the region and their organic waste amounts is given in the Table 2.

Majority of the organic waste from food and beverage industry is delivered to the farmers for feeding animals or fertilization of the fields. Some part of the waste goes to the biogas plants that belong to the farmers. Deliveries sometimes are based on a long term contracts and therefore it will be difficult to convert these organic waste flows to the potential biogas plant. Competition for the feedstock among biogas plants is very high. Information about existing biogas plants in the region is provided in the Chapter 2.3.

Most of the communal waste water treatment sludge in North Vidzeme region is generated in Valmiera city. Overview about WWT sludge in 2012 (2-Ūdens, 2012) is given in Table 3.

Company	Type of company	Organic waste	Waste classification code	Amount, t (year)	Current form of disposal
JSC "Valmieras piens"	Dairy (milk products)	Waste water sludge	020502/ 190805	5 487	Farmers
Cooperative "Straupe"	Dairy	Whey	020599	3 130	Farmers
"Milda KM", Ltd.	Preserved food	Biowaste	200201	3 (2010) 1.05 (2011) 1.2 (2012)	ZAAO
"Valmiermuižas alus", Ltd.	Brewery	Brewer's grains	020799	10	Farmers
JSC "Cēsu alus"	Brewery	Brewer's grains	020799	6 800	Farmers
"Piebalgas alus", Ltd.	Brewery	Brewer's grains	200207	151	Farmers
JSC "Brīvais vilnis"	Fish processing	Waste from the fat traps	190810	435 (2010) 420 (2011) 420 (2012)	Mapeteks (fish meal and oil production plant)
"Matadors", Ltd.	Meat processing	Animal waste	020102	5.3 (2012)	Reneta (animal waste processing plant)
"Aloja-Starkelsen", Ltd.	Potato starch production	Organic waste Organic waste	200203 200201	2 660 8 535	Aloja Agro (potato growers)

Table 2.Available industrial organic waste

Table 3.WWT sludge generation and flow in the region in 2012

Territory	Generated, t	Utilized, t	In agriculture, t	Composted, t	Landfilled, t	Temporarily stored, t	Recultivation of brown fields, t	Other purpose (biogas), t
Alojas novads	20	20	1	19	0	0	0	0
Balvu novads	24	24	0	0	0	23	1	0
Inčukalna novads	0	0	0	0	0	0	0	0
Jaunpiebalgas novads	23	23	0	0	0	23	0	0
Kocēnu novads	4	4	4	0	0	0	0	0
Krimuldas novads	17	17	6	0	0	12	0	0
Limbažu novads	34	37	0	28	0	0	0	9
Līgatnes novads	100	100	1	0	0	99	0	0
Mazsalacas novads	5	5	0	0	0	5	0	0
Naukšēnu novads	1	1	1	0	0	0	0	0
Priekuļu novads	27	25	6	0	0	19	0	0
Pārgaujas novads	355	355	355	0	0	0	0	0
Raunas novads	5	5	5	0	0	0	0	0

Territory	Generated, t	Utilized, t	In agriculture, t	Composted, t	Landfilled, t	Temporarily stored, t	Recultivation of brown fields, t	Other purpose (biogas), t
Rūjienas novads	6	6	4	0	0	0	0	2
Salacgrīvas novads	80	80	0	60	0	0	0	20
Siguldas novads	111	0	0	0	0	0	0	0
Smiltenes novads	23	23	0	21	0	0	0	2
Strenču novads	13	13	0	0	0	0	0	13
Sējas novads	3	3	0	3	0	0	0	0
Valkas novads	20	11	0	10	1	0	0	0
Valmiera	1 031	1 031	0	0	8	0	0	1 023
Vecpiebalgas novads	9	9	9	0	0	0	0	0
Viļakas novads	0	0	0	0	0	0	0	0
TOTAL:	1 910	1 791	391	141	8	181	1	1 070

1.3. Agricultural energy crops in vicinity of Valmiera (alternatively)

Potential use of agricultural energy crops in the biogas plant is limited due to the competition with other biogas plants that are located in the region. All together there are eight agricultural biogas plants operating in the North Vidzeme region. Information about the biogas plants located in the region is given in Table 4 and Figure 3.

No	Biogas plant	Start of the operation	Address	Installed capacity, MWe
1	BIOPAB, SIA	2012.11.08	Sējas novads, "Jurku ferma"	0.6
2	BĒRZI BIO, SIA	2013.02.04	Mālpils novads, "Bērzi"	0.5
3	BP Energy, SIA	2012.02.02	Siguldas novads, Allažu pagasts, "Krastmalas"	0.25
4	EKORIMA, SIA	2012.01.10	Krimuldas novads, Lēdurgas pagasts, "Veckļaviņas"	0.95
5	Grow Energy, SIA	2012.01.24	Limbažu novads, Limbažu pagasts, "Gravas"	1.995
6	JAUNDZELVES, ZS	2011.08.10	Limbažu novads, Katvaru pagasts,	0.52
7	SIDGUNDAS BIO, SIA	2012.10.03	Mālpils novads, Sidgunda, "Niedras"	0.8
8	ZEMTURI ZS, SIA	2010.12.29	Burtnieku novads, Burtnieku pagasts, "Zemturi"	0.68
			TOTAL:	6.295

Table 4.Biogas plants in vicinity of Valmiera



Figure 3: Location of the agricultural biogas plants in the region

In Figure 3 the eight green dots are agricultural biogas plants (see in Table 4). The location of the waste treatment centre and landfill gas collection plant in "Daibe" is marked with the red dots.

Eight mentioned biogas plants use co-fermentation of agricultural feedstock (manure and energy crops) with industrial residues and WWT sludge (both communal and industrial). Information about feedstock the biogas plants are using is given in Table 5.

No	Biogas plant	Maize silage, t	Grass silage, t	Cattle manure, t	Cattle slurry, t	Pig slurry, m3	Poultry manure, t	Whey, t	Grain, t	WWT sludge (Wet), t	WWT sludge (dry), t	Potato mash, t	Animal feed, t
1	BIOPAB, SIA	Informati	Information is not available										
2	BĒRZI BIO, SIA	4 290	5 950	7 026									
3	BP Energy, SIA					16 027							
4	EKORIMA, SIA	15 200	1 000	16 600									
5	Grow Energy, SIA		14 600	8 760			2 920	2 920					

Table 5.Feedstock for the biogas plants in vicinity of Valmiera

No	Biogas plant	Maize silage, t	Grass silage, t	Cattle manure, t	Cattle slurry, t	Pig slurry, m3	Poultry manure, t	Whey, t	Grain, t	WWT sludge (Wet), t	WWT sludge (dry), t	Potato mash, t	Animal feed, t
6	JAUNDZELVES, ZS	7 200	286	1 950	360				550				
7	SIDGUNDAS BIO, SIA	Informat	Information is not available										
8	ZEMTURI ZS, SIA			7 300				14 600		5 220	4 821	1 095	1 278
	TOTAL:	26 690	21 836	41 636	360	16 027	2 920	17 520	550	5 220	4 821	1 095	1 278

According to the data from the statistical bureau of Latvia (Agricultural Census, 2010), in 2010 about 4% of the agricultural land in the region was un-used. All together this would make 16.5 thous.ha of land that is available for growing energy crops. However, lately there is a discussion among the Ministry of the Agriculture of Latvia, farmers and biogas plant owners about sustainability of growing energy crops. It is expected that in future the land where energy crops are cultivated will not be eligible for direct agricultural payments and fuel that is used for growing, harvesting, preparation and transportation of energy crops will no longer be excluded from the excise tax payment. Therefore it is unlikely that there will be huge plantations of energy crops in the region in years to come.

2. Product biomethane

2.1. Calculation of prospective biogas and biomethane yield

2.1.1. Combined scenario

In the first scenario all collected unsorted MSW are brought to the mechanical treatment facility in Daibe landfill. During the mechanical treatment, waste is separated in three fractions – coarse, medium and fine fraction – and separately some metal parts are removed (see Figure 4).

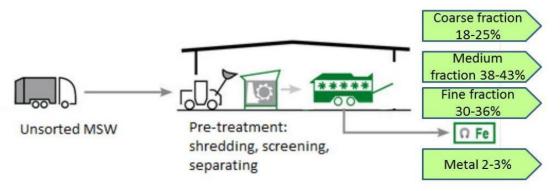


Figure 4: Mechanical treatment of waste in Daibe landfill (source: Arina D. et.al., 2012)

The fine fraction is 70% made of biologically degradable material and 27% is glass, ceramics and stones. Currently after the biological treatment (composting and stabilisation) the fine fraction is used as landfill cover material. The moisture content of the material is changing depending from the season – around 49% in summer and winter, 44% in autumn.

In addition to the mechanically treated organics, a source separated organic waste is collected from companies in very limited amounts. In 2011 only 112 m³ (about 22 t) of organic waste were separately collected from companies.

Separately collected green waste includes leafs, grass, branches etc. Collection of green waste is a service provided by the waste management company ZAAO at additional cost that is lower than cost for collection of unsorted MSW.

2.1.2. Resource-efficiency scenario

The second scenario proposed in this concept foresees that until 2017 a source separated collection of organic waste from households is introduced. Waste management company ZAAO have estimated the impact on waste management tariff if source separated organic waste collection would be introduced. Current waste management tariff for residents is 8.13 Ls/m³ (11.57 EUR/m³), excluding VAT. Green wastes are collected for 7.26 Ls/m³ (10.33 EUR/m³) + VAT. ZAAO calculations show that tariff for residents would increase by 32% and instead of 8.13 Ls/m³ the cost would be 10.70 Ls/m³ (15.22 EUR/m³).

According to the survey that has been implemented in Valmiera in the UrbanBiogas project (Dzene I., 2012), 80% of the respondents are already using the provided opportunity and separating plastic, glass and paper.

Most of the people evaluate current costs of waste management as very high. However about 12% of Valmiera inhabitants are not aware about how much they are paying for the waste management services. Others evaluated that they are paying more than 7 EUR/month (18%), 3-7 EUR/month (40%) and less than 3 EUR/month (30%). According to the results of survey 32% of people would agree to pay more for the introduction of source separated organic waste collection, but remaining 68% would need some financial incentive (decrease of waste management cost) to support source separated organic waste collection. Compared to other European countries where waste collection and recycling system is more developed, the cost for waste management in Latvia is very low.

2.1.3. Assumptions

Assumptions used for the calculation of prospective biogas and biomethane yield for both scenarios are given in Table 6.

Parameter	Value	Unit
Fine fraction (FF) after mechanical treatment	35	%
Content of organic fraction after mechanical treatment	70	% (of FF)
Organic fraction of the MSW that can be collected by source separated collection	25	%
Dry matter (DM) content:		
mechanically treated organic MSW	35	% (of FM)
source separated organic MSW	16	% (of FM)
separately collected green waste	40	% (of FM)
waste water treatment sludge	25	% (of FM)
Volatile solids (VS) content:		·
mechanically treated organic MSW	70	% (of DM)
source separated organic MSW	87	% (of DM)
separately collected green waste	50	% (of DM)
waste water treatment sludge	70	% (of DM)

Table 6.Assumptions for the calculation of biogas and biomethane yield

Parameter	Value	Unit
Specific biogas yield:		
mechanically treated organic MSW	325	m ³ _N /t _{VS}
source separated organic MSW	680	m ³ _N /t _{VS}
separately collected green waste	615	m ³ _N /t _{VS}
waste water treatment sludge	325	m ³ _N /t _{VS}
Methane (CH ₄) content:		
mechanically treated organic MSW	55	%
source separated organic MSW	60	%
separately collected green waste	60	%
waste water treatment sludge	55	%
landfill gas	55	%
Biogas upgrading efficiency	95	%

2.1.4. Calculation of indicative biogas and prospective biomethane yields

Indicative biogas and biomethane yields were calculated based on the assumptions given below and based on a forecast of available unsorted municipal waste. Detailed calculations are given in Annex 1 of this report. In the calculations the amounts of collected landfill gas has been taken into account. Calculation results are provided in Figure 5.

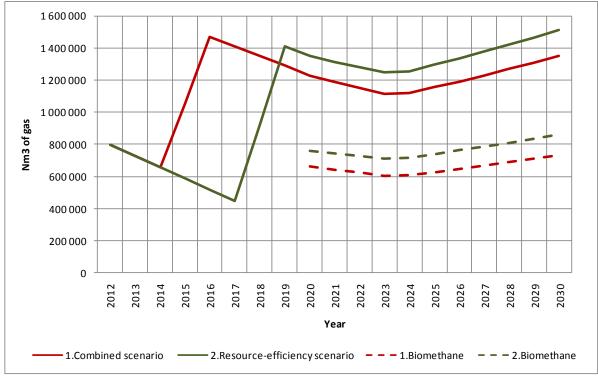


Figure 5: Calculated prospective biogas and biomethane yields, Nm³

According to the calculation results, until 2014 there will be only landfill gas production that is gradually decreasing over the last years. In 2014 if combined scenario is introduced, the generation of biogas will increase due to the installation of dry fermentation unit and over the next years (until 2023) the total outcome of gas will decrease due to reduced yields of

landfill gas production. Then around 2024 the total gas production will again start increasing because more organic waste will be generated from growing population and economical activity in the region.

In case of resource-efficiency scenario the change in existing trend will happen around 2017 when source separated organic waste collection should start. The new wet anaerobic digestion plant could be built in 2019. In wet fermentation process more biogas will be generated.

Biogas upgrading to biomethane most likely will not start before 2020. This assumption is made due to several reasons:

- ZAAO has obtained rights to sell in biogas CHP generated electricity for a feed-in tariff and this decision is valid for at least 10 years (until 2019). Currently the amount of collected landfill gas is decreasing and company can not produce as much electricity as they are allowed to sell according to the decision of the Ministry. Biogas produced either in dry or wet fermentation until 2019 will be used for CHP.
- 2) There are no incentives to use biomethane in transport sector in Latvia.
- Using biomethane for gas grid injection is not possible due to the monopoly situation in the natural gas market and the lack of the legislative framework and standards for biomethane injection.

In combined scenario 1.47 million Nm³ of biogas will be generated in dry fermentation and collected from the landfill in 2016. The lowest generation point will be reached in 2023 when the total outcome of gas will be only 1.12 million Nm³. After that the generation will gradually increase, reaching 1.35 million Nm³ of gas in 2030. If starting from 2020 biogas would be upgraded to the biomethane, then 605-732 thous.Nm³ of biomethane could be generated every year.

In resource-efficiency scenario 1.41 million Nm³ of biogas will be generated in wet fermentation and collected from the landfill in 2019. The lowest generation point will be reached in 2023 when the total outcome of gas will be 1.25 million Nm³, but it is more than in combined scenario. After 2023 the generation will gradually increase, reaching 1.51 million Nm³ of gas in 2030. If starting from 2020 biogas would be upgraded to the biomethane, then 709-861 thous.Nm³ of biomethane are generated every year.

3. Biogas Production and Upgrading Plant

3.1. Technology

3.1.1. Good practice examples

In both scenarios the amount of organic waste that is available for biogas production is around 10-15 thousand tons per year. Good practice examples described in UrbanBiogas project (Hahn.H., 2011) show that there are several good practice examples of small biogas and biomethane plants being set up and operated in Europe using organic municipal and industrial waste as feedstock.

Some examples of small scale waste biogas plants with upgrading units are given in Table 7.

Name of the plant	Country	Feedstock, t/year	Technology	Investment costs, € (year)
Biogas plant Västerås	Sweden	Household waste – 15 400 Grease trap removal – 2 150 Grass silage – 2 990 TOTAL: 20 550	Source separated household waste; Wet digestion, gas outcome 280 Nm ³ /h; Water scrubber (700 Nm ³ /h) – treating gas also from other plant	6 million (2005), without upgrading

Name of the plant	Country	Feedstock, t/year	Technology	Investment costs, € (year)
Biogas plant Rostock	Germany	Food waste – 4 000 Municipal waste – 36 000 TOTAL: 40 000	Source separated household waste; Wet digestion, gas outcome 1000 Nm ³ /h; Water scrubber (350 Nm ³ /h)	n/a (2010)
Biogas plant Altenstadt	Germany	Municipal waste (food waste, canteen waste, fats, slaughterhouse waste) – 40 000	Wet digestion, gas outcome 1200 Nm³/h; Water scrubber (690 Nm³/h)	4 million (2001), without upgrading
Biogas plant Bruck an der Leitha	S plant Bruck Austria Vigner waste, kitchen debris, food waste, remains from food industry,		Wet digestion, gas outcome 650-800 Nm³/h; Membrane (180 Nm³/h)	6.5 million (2004), without upgrading

3.1.2. Dry fermentation (combined scenario)

Each biogas production process involves several steps (see Figure 6):

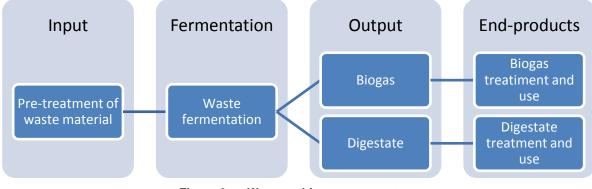


Figure 6: Waste-to-biogas process tree

In combined scenario the following waste material is available:

Organic MSW after mechanical treatment Separately collected green waste	6 370-9 640 t/year 3 140 - 4 510 t/year
Waste water treatment sludge	340 - 490 t/year
TOTAL:	9 850 - 14 650 t/year

Before fermentation waste is mechanically treated. In dry fermentation the pre-treatment requirements are generally lower compared to wet fermentation technology. In dry fermentation separated organic fraction of MSW will be mixed together with green waste and WWT sludge.

In dry fermentation the mixture of waste is inoculated with digestate and fed in the digester. This is a batch process. Continuous inoculation with bacterial biomass occurs through recirculation of percolation liquid, which is sprayed over the substrate in the digester. Unlike wet digestion, dry digestion needs no stirring or mixing of the AD substrate during digestion. The temperature of the process and of percolation liquid are regulated by a built-in floor heating system, inside the digester, and by a heat exchanger, which acts as a reservoir for percolation liquid (Rutz, D. et.al., 2009).

Schematic design of the dry fermentation unit designed by company "Kompoferm" for treating 10 000 t of organic waste per year can be seen in Figure 7.

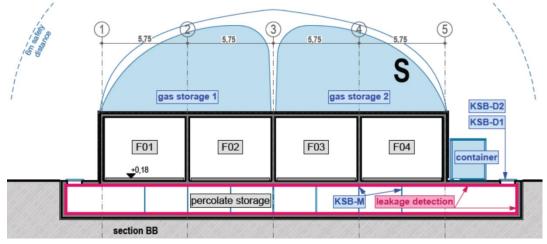


Figure 7: Design of the dry fermentation unit (ZAAO, 2012)

In this scenario the calculated biogas outcome is $105 - 150 \text{ Nm}^3/\text{h}$. The other product is the dry digestate (about 9 000 - 13 500 t/year). If biogas is used for CHP production process, gas cleaning and treatment requirements are lower than those for the biogas upgrading to biomethane. Basically desulphurisation and drying of the gas is required. If biogas is upgraded to biomethane, more sophisticated technologies are used (see Chapter 3.1.4).

Due to the low quality of the input material, the quality of digestate after the dry fermentation process is not appropriate for using it as fertilizer. It contains glass particles and other contaminants. In order to use digestate as fertilizer, it must be further processed. Currently it is not economically feasible because of the low demand in the local market for high quality compost. The solution proposed by waste management company ZAAO is to use digestate for daily cover of the landfill. However, as mentioned in the introduction part of this concept, this solution does not guarantee that nutrients are returned back to the soil.

3.1.3. Wet fermentation (resource efficiency scenario)

In resource efficiency scenario the following waste material is available:

Organic fraction of MSW Separately collected green waste	6 500 – 9 840 t/year 3 140 – 4 510 t/year
Waste water treatment sludge	340 – 490 t/year
TOTAL:	9 990 – 14 850 t/year

In wet fermentation scenario it is assumed that separately collected waste will be delivered to the biogas plant. After the basic pre-treatment of the separately collected organic waste, the feedstock for the biogas production is on much better quality and can be used for wet fermentation. Continuous wet fermentation process gives higher biogas outcome compared to dry fermentation and is generally more effective.

Example of a single-stage wet fermentation process is given in Figure 8 (Waste-to-Energy Research and Technology Council, 2009). The complexity of the technology depends on the quality of the input material, design of the bioreactor and desired quality of the digestate.

In this scenario the calculated biogas outcome is $115 - 170 \text{ Nm}^3/\text{h}$. Biogas treatment requirements are not much different from the dry fermentation. Again desulphurisation and drying is needed if biogas will be used in CHP. To reach the biomethane quality, in addition the CO₂ must be removed (see Chapter 3.1.4.).

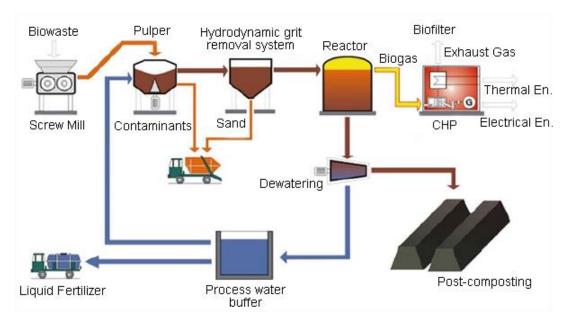


Figure 8: Process scheme of the BTA® Single-stage wet fermentation (Image: BTA International GmbH)

As can be seen in Figure 8, there are two options for the digestate treatment. It can be collected and used directly as a liquid fertilizer or additional treatment step can be applied. In this treatment step the solid and liquid part is separated having two products – liquid fertilizer and compost. This compost is much higher quality compared to the compost after the dry fermentation. In Figure 8 one important part of the municipal waste fermentation process is missing. In order to be able to use compost and fertilizer for the agricultural purposes, the sanitation of the waste is needed before pumping the feedstock into the bioreactor.

3.1.4. Biogas upgrading to biomethane

Several biogas upgrading technological solutions exists. Commercially available are 6 of them: pressure swing adsorption (PSA), water scrubber, physical absorption with organic solvents, and chemical absorption with organic solvents, high and low pressure membrane separation methods (see Figure 9).

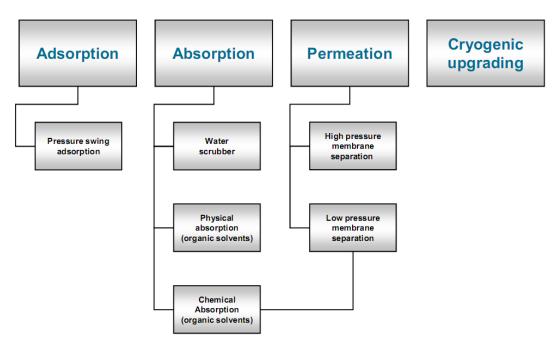


Figure 9: Biogas upgrading technology overview (Beil M., 2012)

Most commonly used are PSA, water scrubber and amine scrubber (chemical absorption) biogas upgrading systems. Currently in Latvia there are no biogas upgrading plant and no local upgrading technology suppliers. Therefore the services of the foreign supplier must be used.

Upgrading method should be selected based on the biogas characteristics and intended use of the biomethane. The best technology to choose is based on specific parameters at the plant, such as the availability of cheap heat and the electricity price. It should also be noted that it is often possible to lower the methane loss, but at the expense of a higher energy consumption (Petersson A., Wellinger A., 2009). The key parameters for upgrading technologies according to (Beil M., 2012) are summarized in the Table 8.

Parameter	Unit	PSA	Water scrubber	Physical absorption (organic solvents)	Chemical absorption (organic solvents)	Membrane (high pressure, dry)	Cryogenic
Electricity demand	kWh/m ³ _{BG}	~0.2-0.25	~0.2-0.3	0.23-0.33	>0.10	~0.25	0.18-0.33
Heat demand (temperature level)	°C	No	No	55-80	~160	No	No
Operation pressure	bar	4-7	5-10	4-7	0.1	5-10	
Methane loss	%	1-5	0.5-2	1-4	0.1		0.5 (?)
Exhaust gas treatment (methane loss >1%)	suggested	Yes	Yes	Yes	No	Yes	Yes
Precision desulphurization required		Yes	No	No	Yes	Suggested	Yes
Water demand		No	Yes	No	Yes	No	No
Demand on chemical substances		No	No	Yes	Yes	No	No

Table 8 Kev	narameters	of upgrading	technologies	(Beil M.,2012)
Table 0.rtey	parameters	or upgrauling	lecillougies	

In order to recommend the technology for upgrading of gas in Valmiera biogas plant, further references were analyzed based on the list of upgrading plants given by Petersson A., Wellinger A., 2009. From the list it can be seen that also small scale biogas upgrading plants are installed and operating in Europe (see Table 9).

Table 9.List of relevant upgrading plants in Europe (after Petersson A., Wellinger A., 2009)

Country	Place	Substrate	Utilisation	CH₄ (%)	Technology	Plant capacity, Nm ³ /h raw gas	In operation since
Austria	Margarethen am Moos	Energy crops & manure	Vehicle fuel	>95	Membrane	70	2007
Austria	Pucking	Manure	Gas grid	97	PSA	10	2005
Austria	Reitbach / Eugendorf	Energy crops	Gas grid, Vehicle fuel	97	PSA	150	2008
France	Lille Marquette				Water srubber	100	2009
Germany	Bottrop	Sewage sludge	Vehicle fuel		PSA	120	2008
Germany	Jameln	Manure & Energy crops	Gas grid, Vehicle fuel		Genosorb scrubber	160	2005
Germany	Utzensdorf	Biowaste	Gas grid	96	PSA	100	2009
Spain	Vacarisses (Barcelona)	Landfill gas	Vehicle fuel	>85	Chemical scrubber	100	2005
Sweden	Eslöv	Biowaste, sewage sludge	Vehicle fuel	97	Water scrubber	80	1999

Country	Place	Substrate	Utilisation	CH₄ (%)	Technology	Plant capacity, Nm ³ /h raw gas	In operation since
Sweden	Katrineholm	Sewage sludge	Vehicle fuel	97	Water scrubber	80	2009
Sweden	Motala	Sewage sludge	Vehicle fuel	97	Water scrubber	80	2009
Sweden	Skövde	Sewage sludge, slaughter waste	Vehicle fuel	97	PSA	140	2002
Sweden	Ulricehamn	Sewage sludge	Vehicle fuel	97	PSA	20	2003
Sweden	Västervik	Sewage sludge	Vehicle fuel	97	Water scrubber	130	2009
Switzerland	Bachenbülach	Biowaste	Gas grid, Vehicle fuel	96	PSA	50	1996
Switzerland	Bischofszell	Sewage sludge	Gas grid	96	Genosorb scrubber	100	2007
Switzerland	Jona	Biowaste	Gas grid	96	Genosorb scrubber	55	2005
Switzerland	Lavigny	Biowaste	Gas grid	96	PSA	150	2009
Switzerland	Lucerne	Sewage sludge	Gas grid	96	PSA	75	2004
Switzerland	Obermeilen	Sewage sludge	Gas grid	96	Chemical scrubber	100	2008
Switzerland	Otelfingen	Biowaste	Vehicle fuel	96	PSA	50	1998
Switzerland	Romanshorn	Sewage sludge	Gas grid	96	Genosorb scrubber	100	2007
Switzerland	Rümlang	Biowaste	Vehicle fuel	96	PSA	30	1995
Switzerland	Samstagern	Biowaste	Gas grid	96	PSA	50	1998
Switzerland	Utzensdorf	Biowaste	Gas grid	96	PSA	100	2009
Switzerland	Widnau	Agricultural co- digestion	Gas grid	96	PSA	100	2007

It can be seen in Table 9 that among the small capacity upgrading plants (up to 170 Nm³/h) in most cases PSA technology is used. In Switzerland and Germany PSA is used in particular in a small scale biowaste treatment plants. Therefore as a base scenario in this concept we assume that PSA technology for the upgrading of biogas will be used.

3.2. Plant location

For selection of the plant location site, in general three options are evaluated:

- 1) Biogas plant at Daibe landfill site
- 2) Biogas plant close to Valmiera city
- 3) Delivery of the waste to one of the existing biogas plants

3.2.1. Biogas plant at Daibe landfill site

One of the options is to use the advantage of Daibe location and to build the biogas plant in the territory of Daibe landfill. As it can be seen from the Figure 10, the Daibe landfill is located in the central part of the North Vidzeme region in Pargauja district.

Daibe landfill is located in rather remote area and it has a potential to extend the territory, so the potential biogas plant could be located very close to the landfill. The area is connected with the 20 kV power line. Pargauja district is crossed by the major state road A3 and Daibe landfill is located approximately 7km from the main road A3 (see Figure 11). Also the main gas transmission pipeline is crossing North Vidzeme region, however not over the Pargauja district. Therefore at Daibe the access to the pipeline is not provided.



Figure 10: Location of Daibe landfill (source: http://www.zaao.lv/public/lat/par_sia_zaao/)

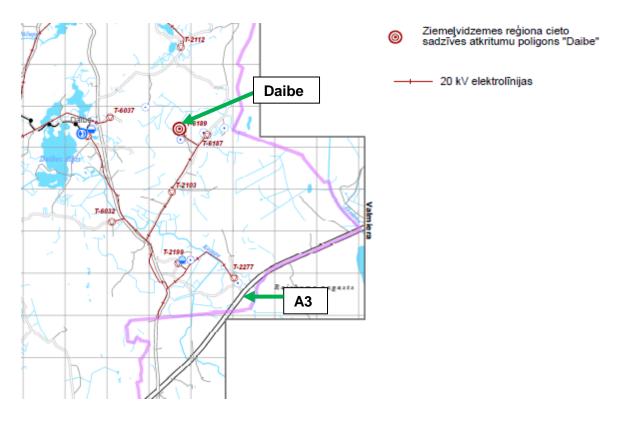


Figure 11: Location of Daibe landfill (source: <u>http://www.pargaujasnovads.lv/lv/pargaujas-novada-teritorijas-planojuma-2013.-2024.gadam-galiga-redakcija---/</u>)

Around the landfill there are no major residential areas or industrial or commercial areas. And also there are no historical sites are around the area.

In 2009 the project on landfill gas extraction and use in CHP has started. The capacity of the CHP unit was 175 kW_e and 201 kW_{th}. In 2010 the 2nd part of the landfill gas collection project was launched by increasing the landfill gas extraction rate and installation of additional CHP unit. Electricity generated in the CHP is sold for the feed-in tariff. If the

intended biogas is located in Daibe landfill, then biogas plant could be connected to the existing CHP plant. The capacity of the plant allows combustion of more biogas since the amount of landfill gas that is collected is decreasing over the years.

3.2.2. New biogas plant close to Valmiera city

Since the main organic waste producers are located in and around Valmiera city, one of the considered options is to build the biogas plant next to Valmiera.

Currently organic waste in Valmiera is not source separated. Location of the biogas plant in Valmiera might be economically feasible in case if source separated organic waste are collected and delivered to the biogas plant near the city. This would allow to save on the transportation costs compared to the scenario if biogas plant is located in Daibe landfill.

Another advantage of locating the biogas plant in Valmiera is access to the existing natural gas pipeline. The main gas line with several distribution points is crossing the Eastern part of the city (see Figure 12).

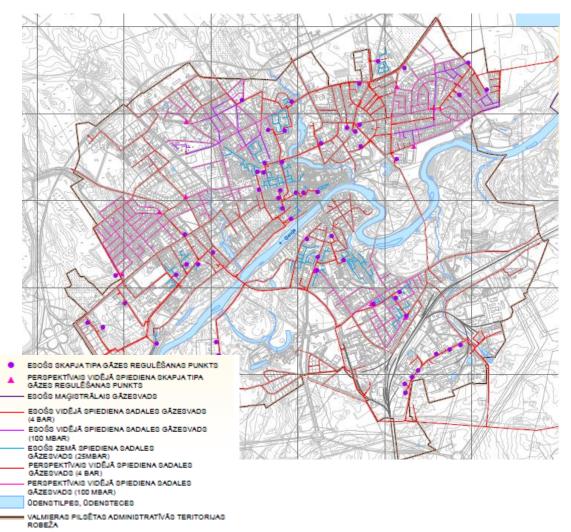


Figure 12: Gas supply network in Valmiera city

Road infrastructure is well developed and Valmiera has sufficient electrical power supply.

The main problem when considering building the biogas plant next to the city is selection of particular area and potential impact on the neighbourhood. The results of the survey (Dzene I., 2012) show that 80% of the survey participants supported UrbanBiogas idea and project activities, however many of them were concerned about building the biogas plant

close to the city and about odour and noise problem that it might create. The inhabitants of Valmiera are very sensitive to the odour issue because of the historically bad experience they had with some of the food processing companies located in the city. However when it happened years ago the environmental performance requirements were much lower than it is in our days for a new plants.

3.2.3. New biogas plant as the part of some existing biogas plant

According to the Figure 3, there are 8 biogas plants in North Vidzeme area and the closest one to Valmiera city is biogas plant "Zemturi" (see Figure 13).

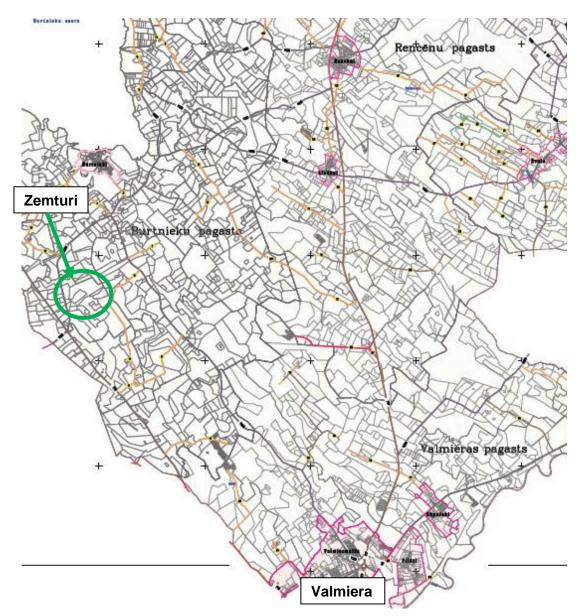


Figure 13: Location of "Zemturi" farm (source: http://www.burtniekunovads.lv/teritorijas-planojums)

Biogas plant is located in a remote area, approx. 16 km from Valmiera. The closest residential areas are located about 6 km away from the farm. The biogas plant is located in the territory of North Vidzeme Biosphere National Park; however this particular area does not have any limitations for economical activity since it is not a part of Natura 2000.

Disadvantage for this location is the lack of the natural gas grid in Burtnieki parish, where the biogas plant is located.

If this option for biogas plant location is selected, the role of ZAAO will be collection, transportation and treatment of organic waste and selling it as biogas feedstock to the "Zemturi" biogas plant. The advantage of this option is the fact that distance to Valmiera city is shorter than to Daibe landfill. This would significantly reduce the transportation costs. Another advantage is suitability of the location for the biogas plant. All the necessary permits and infrastructure for biogas production is already there. In this case the source separated organic waste collection system in Valmiera must be introduced.

3.3. Economy

3.3.1. Dry fermentation

Evaluation of the investment cost for the dry fermentation garage type biogas plant is based on the offer provided by company "Kompoferm" upon ZAAO call for quotations in 2012 (see Table 10).

Investments	Cost (excl	uding VAT)
investments	LVL	EUR
Preparation of the site, local engineering works	17 570	25 000
Bering constructions	224 897	320 001
Technological equipment	768 692	1 093 756
Torch	10 191	14 501
Supply costs for technological equipment	2 811	4 000
Start-up, control, training	2 811	4 000
Margin of the unforeseen expenses (5%)	51 349	73 063
TOTAL:	1 078 321	1 534 321

Table 10.Investment costs for dry fermentation unit (ZAAO, 2012)

The batch digestion has a number of advantages compared to other systems, in terms of lower costs of the process and of the mechanical technology behind it. This in turn has an adverse effect on process energy consumption and on maintenance costs (Rutz, D. et.al., 2009). Operation and maintenance costs are assumed as 5% from the total investment – 76 716 EUR/year. Operation and maintenance costs include regular maintenances of biogas plant, staff costs, administration costs, energy (electricity) cost and insurance costs. Depreciation costs are equally distributed over the first 10 years.

The economical evaluation of this scenario was done by using a cash flow analysis. Two alternative solutions were investigated:

- Dry fermentation + CHP
- Dry fermentation + CHP + biogas upgrading

Alternative 1: Dry fermentation + CHP

In the first alternative the income is generated from sales of electricity according to the feed-in tariff. The guaranteed feed-in tariff for company "ZAAO Energija" (ZAAO Energy) is 212.64 EUR/MWh until 2019 and 170.11 EUR/MWh until 2029. In 2030 it is assumed that electricity will be sold at the market price that at that time could be around 103 EUR/MWh. Assumption is made by taking the electricity market price in 2012 in Latvia with an escalation rate of 4.5% per year.

The waste management tariff in Latvia is calculated based on the following equation:

$$T_{wm} = \frac{C_{\rm T} + C_{\rm A} + C_{\rm L} + \mathrm{K} + \mathrm{N}}{\mathrm{W}_{\rm L}} \times \mathrm{R}$$

Where

 T_{wm} – waste management tariff [LVL/t or LVL/m³]

 C_{T} – transportation costs [LVL/year]

 C_A – administration costs [LVL/year]

C_L – landfilling costs [LVL/year]

K – long term loans [LVL/year]

N – taxes and fees [LVL/year]

 W_L – amount of treated waste per year [t/year or m³/year]

R – profit margin [%]

The profit margin for the waste management companies is limited. If costs for the long-term loan are included in the tariff costs, then profit margin is limited to 3.5%. If cost for the long-term loan is included in the tariff, the depreciation of the equipment, that has been purchased using the loan, can not be included in the tariff costs. Otherwise the profit margin is limited to 7%.

Now the biogas part and waste management part in company ZAAO is legally separated. The daughter company "ZAAO Energija", Ltd. has been established to operate CHP plant and sell electricity for the feed-in tariff. Mother company ZAAO is selling landfill gas to its daughter company "ZAAO Energija" and each company is keeping its own cash flow.

In reality two separate cash flows would have to be analysed. In the cash flow of ZAAO two sources of revenues are identified – the income from the waste management tariff and income from the biogas sales to "ZAAO Energija". In the cash flow of "ZAAO Energija" the revenues are coming from the sales of electricity, but costs are related to the purchase of biogas that is supplied by ZAAO.

In this cash flow analysis the cost for the feedstock and revenues from the waste management are assumed zero. In this way the biogas project is separated from the waste management part and cost analysis are made only on the project base. The cash flow analysis for this alternative scenario is given in Annex 2. The IRR for this project is 26% without investment subsidy.

Alternative 2: Dry fermentation + CHP + biogas upgrading

In the second alternative it is assumed that biogas from dry fermentation will be used in CHP until 2019 and in 2020 the biogas upgrading will start. In this case the income will be generated by electricity sales until 2019 and by biomethane sales after that. Investment costs for the dry fermentation plant are assumed the same as given in the Table 10. However in this scenario another investment is made in 2019 for the installation of biogas upgrading plant.

Investment costs for the biogas upgrading plant are assumed based on the specific costs curve given by Hahn, H. and Hoffstede, U. (2011) – see Figure 14.

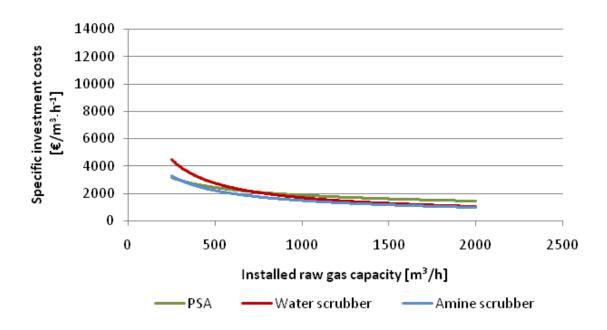


Figure 14: Specific Investment costs of upgrading plants (Hahn H., Hoffstede U., 2011)

It is assumed that biogas upgrading plant will treat 120 Nm³ of raw biogas per hour. Specific cost for this scale of plant is 4 207 EUR/m³ \cdot h⁻¹. By this assumption the total investment cost would be about 0.5 million EUR. Previous studies about agricultural biogas plants in Latvia show that actual costs in the market are at least 20% above the reference capital costs from Western-European countries. Therefore 20% more to the reference costs are added to adapt them to the local market situation. Additional 5% are added as unforeseen expenses. The summary of the investment costs for biogas upgrading plant is given in Table 11.

Reference Investments	504 850	EUR
Investment costs adapted to the Latvian market (+20%)	605 821	EUR
Margin of the unforeseen expenses (+5%)	30 291	EUR
Total Investment costs	636 112	EUR

Biogas upgrading plant operation costs are assumed to make 7% from the investment costs. Operation and maintenance costs for dry fermentation plant in 2020 are reduced by 50% because of shutting down the CHP part.

Like in alternative 1, also in this cash flow analysis the cost for the feedstock and revenues from the waste management are assumed zero. In order to get the cash flow positive, the revenues from selling biomethane should be at least 0.35 EUR/Nm³ with annual increase of 3% due to the inflation. The cash flow of this alternative is enclosed to the Annex 3.

3.3.2. Wet fermentation

Evaluation of the investment cost for the wet fermentation biogas plant is based on the cost reference values given in the study (ARCADIS, 2009). According to this study, the country specific CAPEX for Latvia for the waste anaerobic digestion (AD) plant with upgrading to biomethane is 342 EUR/t of treated waste.

In this scenario it is calculated that in average 12 500 t of waste will be treated. This results to the total investment cost of 4.275 million EUR.

The economical evaluation of this scenario was done by using a cash flow analysis. Two alternative solutions were investigated:

- Wet fermentation + CHP
- Wet fermentation + CHP + biogas upgrading

Alternative 3: Wet fermentation + CHP

In the first alternative the income is generated only from sales of electricity according to the feed-in tariff. The guaranteed feed-in tariff for company "ZAAO Energija" is 212.64 EUR/MWh until 2019 and 170.11 EUR/MWh until 2029. In 2030 it is assumed that electricity will be sold at the market price that at that time could be around 103 EUR/MWh. Assumption is made by taking the electricity market price in 2012 in Latvia with an escalation rate of 4.5% per year.

In this case the investment costs are reduced because they do not include installation of the biogas upgrading unit. The investment cost for biogas upgrading plant is calculated based on the same specific investment curve that have been used in the 1.scenario (see Figure 14). It is assumed that biogas upgrading plant will treat 135 Nm³ of raw biogas per hour. Specific cost for this scale of plant is 4 023 EUR/m³ \cdot h⁻¹. By this assumption the total investment cost would be about 0.54 million EUR. Previous studies about agricultural biogas plants in Latvia show that actual costs in the market are at least 20% above the reference costs are added to adapt them to the local market situation. Additional 5% are added as unforeseen expenses. The summary of the investment costs for biogas upgrading plant is given in Table 12.

Reference Investments	543 097	EUR
Investment costs adapted to the Latvian market (+20%)	651 716	EUR
Margin of the unforeseen expenses (+5%)	32 586	EUR
Total Investment costs	684 302	EUR

The investment cost for the wet fermentation plant only is calculated as total investment cost of 4.275 million EUR minus 684 302 EUR.

Operational costs

If the cost for the feedstock and revenues from the waste management are assumed zero, the cash flow is negative and project is not economically feasible (see Annex 4). The project may pay back in two ways:

- If part of the investment costs are covered by the subsidy
- If additional revenues from the waste management are received (the waste management tariff is increased).

The second option could be replaced by the gate fee, which is currently not applicable in Latvia.

In order to have the project IRR = 7%, at least 71% of the investment costs must be covered by the subsidy (see Annex 4). If more revenues are intended from increasing the waste management tariff, then existing waste management tariff must be increased by 1.88 EUR/m³ to get the project IRR = 7% (see Annex 4).

Alternative 4: Wet fermentation + CHP + biogas upgrading

In the second alternative it is assumed that biogas from wet fermentation will be used in CHP until 2019 and in 2020 the biogas upgrading will start. In this case the income will be generated by electricity sales until 2019 and by biomethane sales after that. The investment costs for the wet fermentation plant are assumed the same as for alternative 3. Additional investment is made in 2019 for the installation of biogas upgrading plant at the cost that is calculated in Table 12.

Operation and maintenance costs for operating the wet AD plant are assumed at 7% from the investment costs. Biogas upgrading plant operation costs are assumed to make 7% from the investment costs into the biogas upgrading plant. Operation and maintenance costs for AD plant in 2020 are reduced by 50% because of shutting down the CHP part.

The cost for the feedstock and revenues from the waste management are assumed zero. In order to get the cash flow positive, the revenues from selling biomethane should be at least 0.74 EUR/Nm³ with annual increase of 3% due to the inflation. The cash flow of this alternative is enclosed to the Annex 5.

If the biomethane sale price is equal to the price given in Alternative 2 (0.35 EUR/Nm³), then investment cost subsidy or additional revenues from the waste management tariff is needed. The project IRR=7% if 63% of the investment into the AD plant investment is covered by the subsidy (see Annex 5). Alternatively the project IRR=7% if existing waste management tariff will be increased by 1.66 EUR/m³ starting from 2018 (see Annex 5).

4. Stakeholders

Economical calculations of several waste-to-biomethane scenarios show that implementation of the full waste-to-biomethane chain is not always economically feasible. Either public subsidy or/and increase of waste management tariff is needed. Increasing the waste management tariff requires strong political will and explanatory work with society.

The main responsibility on making this political decision lies is on the city council that is responsible for organisation of the waste management services in the city. Other stakeholders that are involved in the WtB chain are:

- Public services:
 - Valmieras Namsaimnieks (house management, green areas management)
 - VTU-Valmiera (public transport company)
 - Valmieras ūdens (water and wastewater management company)
- Waste management company ZAAO
- Company "ZAAO Enerģija"
- Other existing and planned biogas plants in the region
- Environmental protection organisations (Regional Environmental Board, environmental NGOs)
- Society and inhabitants of Valmiera city
- Industrial companies

4.1. Combined scenario (unsorted waste + dry fermentation)

In combined scenario the main investor in the WtB concept will be ZAAO. In this scenario ZAAO will invest into the dry fermentation unit, probably with a support from public funds. The need for the public funding will be justified by the fact that ZAAO and "ZAAO Energija" are legally two separate companies and investments into the dry fermentation unit might not be covered by the income from sales of biogas. Otherwise the price for the biogas that is now agreed between ZAAO and ZAAO Energija must be increased, that, however, is not favourable for both companies. ZAAO profit margin is limited by the waste management tariff, and income of ZAAO Energija depends directly on the biogas price.

Nevertheless combined scenario is not the best from the environmental and resource efficiency point of view, both ZAAO and ZAAO Energija are very much interested in the unsorted waste – dry fermentation scenario. This is because ZAAO will be able to operate and pay back the investments of the mechanical waste treatment centre and ZAAO Energija will get more biogas and will be able to produce more electricity to fill the feed-in tariff allowance and maximize the income from electricity sales. Valmiera city council supports this scenario because it does not affect the current waste management system and the waste management tariff. Tariffs are always very sensitive issue in communication with society. Municipality is rarely supportive to un-popular decisions, like increasing waste management tariffs, especially before elections.

The organisational model of the combined scenario is provided in Figure 15.

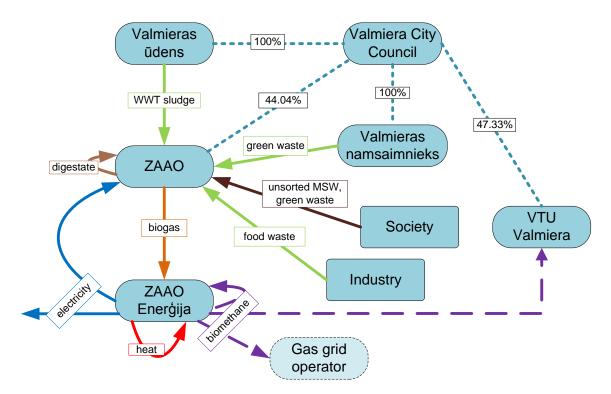


Figure 15: Organisational model of the combined scenario (unsorted MSW and dry fermentation)

4.2. Resource-efficiency scenario (source separated waste + wet fermentation)

In order to realize the resource-efficiency scenario, the strong political decision and strong support from the environmental organisations is needed. In this scenario the location of potential WtB plant should be selected based on economical criteria. It should not become necessarily a part of ZAAO. The biogas production facility might be jointly owned by the city council, ZAAO, private investors and/or even some industry. One of the options for organisational model of the resource-efficiency scenario is provided in Figure 16.

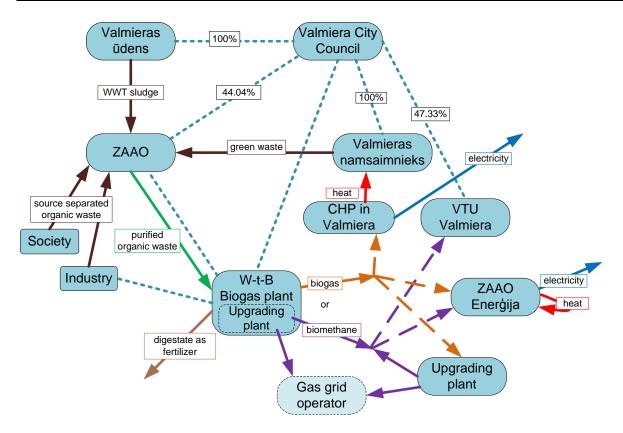


Figure 16: Organisational model of the resource-efficiency scenario (source separated organic waste collection and wet fermentation)

5. Proposal of preferable solution of biomethane production in Valmiera

Preferable WtB solution in Valmiera is a source separated organic waste collection, delivery of the waste to a wet anaerobic digestion plant located near Valmiera (in order to reduce the transportation costs and allow collection and delivery of other organic waste (e.g. from the industry) to the plant), biogas upgrading to the biomethane and using biomethane for the public transport of the city. This solution is the most beneficial for society and for environment in the long term perspective. Society and inhabitants of Valmiera will benefit from improved environmental quality, from more sustainable transport in the city and reduced odour disturbances from existing waste water treatment plants.

However in reality because of the reasons described in Chapter 4.1, the solution proposed by ZAAO in combined scenario will be implemented.

6. Strategies for a successful biomethane production in Valmiera

6.1. Creating and maintaining a sustainable demand for biomethane

Currently there is no demand for biomethane in Valmiera city. First it is because of the absence of the biomethane infrastructure. In order to create the demand for compressed biomethane in the transport, the gradual change of existing vehicles to CNG/CBG vehicles is needed. Discussions with Valmiera city council regarding the transition of the public transport fleet has started during the biomethane task force meetings.

This issue will be more discussed in the biomethane use concept for Valmiera city.

6.2. Inspiring investors

Investors will be inspired if they see a clear economical benefit for making the investment. However, at this stage of the project, it is not quite clear who will be investor in the proposed resource efficiency solution. In case of implementation of the dry fermentation plant, external investors are not needed.

6.3. Convincing authorities and oppositional groups

If the city council and ZAAO will decide to go for the first option – dry fermentation plant, there will not be much opposition. The only groups to oppose for this scenario must be the environmental protection groups and NGOs that in case of Valmiera are not very eager to act against the policy of the local waste management company.

If the other scenario is proposed, there are two main challenges:

- 1) Increase of the waste management tariff
- 2) Building the biogas plant near the city

Oppositional groups might be convinced with a strong and targeted information campaign, including public discussions and demonstration of the good practice examples. However, to raise awareness of the society, a strong commitment from all involved parties – the city council, waste management company, environmental board, NGOs – is needed. Currently because of the reasons mentioned in this concept, the commitment is lacking in all parts of the system.

6.4. Safeguarding a sound plant operation

At this point it is difficult to give recommendations and develop a strategy regarding the plant operation. In general the plant operation is successful if continuous feedstock (waste) flow is provided and there is a sustainable demand for the end-products (biogas or biomethane and digestate). The owner or the main shareholder of the biogas plant will be responsible for the sound plant operation.

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Annexes

Annex 1: Calculation of prospective biogas and biomethane yield

1	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	26 009	26 330	26 681	27 036	27 397	27 762	28 132	28 507	28 887	29 794	30 730	31 694	32 690	33 716	34 775	35 867	36 993	38 155	39 35
Landfill gas generation, m3 800	000 000	730 000	660 000	590 000	520 000	450 000	380 000	310 000	240 000	170 000	100 000	30 000	0	0	0	0	0	0	
1.Combined scenario																			
1. Feedstock, t (FM):																			
Biodegradable waste separated from MSW by mechanical treatment	6 372	6 451	6 537	6 624	6 712	6 802	6 892	6 984	7 077	7 300	7 529	7 765	8 009	8 260	8 520	8 787	9 063	9 348	9 64
Separately collected green waste	3 143	3 162	3 183	3 204	3 226	3 247	3 269	3 291	3 313	3 417	3 524	3 635	3 749	3 867	3 988	4 113	4 243	4 376	4 53
Waste water treatment sludge	343	345	347	350	352	354	357	359	362	373	385	397	410	423	436	449	464	478	49
2. Biogas, Nm3	0	0	0																
Biodegradable waste separated from MSW by mechanical treatment 503	07 387	513 649	520 496	527 422	534 464	541 585	548 803	556 118	563 531	581 226	599 477	618 300	637 715	657 739	678 392	699 694	721 664	744 324	767 69
Separately collected green waste 386	36 589	388 926	391 509	394 092	396 798	399 381	402 087	404 793	407 499	420 294	433 492	447 103	461 142	475 622	490 557	505 960	521 847	538 233	555 13
Waste water treatment sludge 19	19 508	19 622	19 736	19 906	20 020	20 134	20 304	20 418	20 589	21 235	21 902	22 590	23 299	24 031	24 785	25 563	26 366	27 194	28 04
3. Methane, Nm3																			
Biodegradable waste separated from MSW by mechanical treatment 279	79 063	282 507	286 273	290 082	293 955	297 872	301 841	305 865	309 942	319 674	329 712	340 065	350 743	361 756	373 116	384 831	396 915	409 378	422 23
Separately collected green waste 23:	31 953	233 356	234 905	236 455	238 079	239 629	241 252	242 876	244 499	252 177	260 095	268 262	276 685	285 373	294 334	303 576	313 108	322 940	333 08
Waste water treatment sludge 10	LO 729	10 792	10 855	10 948	11 011	11 074	11 167	11 230	11 324	11 679	12 046	12 424	12 814	13 217	13 632	14 060	14 501	14 957	15 42
Methane TOTAL, Nm3 521	1 746	526 655	532 033	537 486	543 045	548 574	554 261	559 971	565 765	583 530	601 853	620 751	640 243	660 347	681 082	702 468	724 525	747 275	770 74
Biogas outcome for CHP, Nm3 800	000 000	730 000	660 000	1 060 710	1 471 282	1 411 099	1 351 194	1 291 329	1 231 619	1 192 756	1 154 870	1 117 993	1 122 156	1 157 392	1 193 734	1 231 217	1 269 878	1 309 752	1 350 87
Biomethane, Nm3									662 877	643 179	624 011	605 389	608 231	627 329	647 027	667 344	688 299	709 911	732 20
2.Resource-efficiency scenario																			
1. Feedstock, t (FM):																			
Organic fraction of MSW	6 502	6 583	6 670	6 759	6 849	6 941	7 033	7 127	7 222	7 449	7 682	7 924	8 172	8 4 2 9	8 694	8 967	9 248	9 539	9 83
Separately collected green waste	3 143	3 162	3 183	3 204	3 226	3 247	3 269	3 291	3 313	3 417	3 524	3 635	3 749	3 867	3 988	4 113	4 243	4 376	4 51
Waste water treatment sludge	343	345	347	350	352	354	357	359	362	373	385	397	410	423	436	449	464	478	49
2. Biogas, Nm3																			
Organic fraction of MSW 61	15 477	623 073	631 379	639 780	648 323	656 960	665 716	674 590	683 582	705 046	727 185	750 019	773 569	797 859	822 912	848 751	875 402	902 890	931 24
Separately collected green waste 386	36 589	388 926	391 509	394 092	396 798	399 381	402 087	404 793	407 499	420 294	433 492	447 103	461 142	475 622	490 557	505 960	521 847	538 233	555 13
Waste water treatment sludge 19	19 508	19 622	19 736	19 906	20 020	20 134	20 304	20 418	20 589	21 235	21 902	22 590	23 299	24 031	24 785	25 563	26 366	27 194	28 04
3. Methane, Nm3																			
Organic fraction of MSW 369	59 286	373 844	378 828	383 868	388 994	394 176	399 429	404 754	410 149	423 028	436 311	450 011	464 141	478 715	493 747	509 251	525 241	541 734	558 74
Separately collected green waste 23:	31 953	233 356	234 905	236 455	238 079	239 629	241 252	242 876	244 499	252 177	260 095	268 262	276 685	285 373	294 334	303 576	313 108	322 940	333 08
Waste water treatment sludge 10	10 729	10 792	10 855	10 948	11 011	11 074	11 167	11 230	11 324	11 679	12 046	12 424	12 814	13 217	13 632	14 060	14 501	14 957	15 42
Methane TOTAL , Nm3 611	1 969	617 992	624 588	631 272	638 083	644 878	651 849	658 860	665 972	686 884	708 452	730 697	753 641	777 306	801 713	826 887	852 851	879 631	907 25
Biogas outcome for CHP, Nm3 800	0 000	730 000	660 000	590 000	520 000	450 000	924 054	1 409 801	1 351 670	1 316 576	1 282 579	1 249 712	1 258 011	1 297 512	1 338 254	1 380 275	1 423 616	1 468 317	1 514 42
Biomethane, Nm3									758 074	741 365	725 279	709 838	715 959	738 440	761 627	785 543	810 209	835 649	861 88

Annex 2: Cash flow analysis – dry fermentation + CHP

Investments Investment Dry Fermentation Unit Subsidy Investment (minus) subsidy	EURO 1 534 321 0 1 534 321		Post-Finan Debt Capital Equity Capita Total	75.0%	EURO 1 150 741 383 580 1 534 321		Debt term (ye Interest rate : Subsidy	-	10 6% 0%		Electricity fe	/ feed-in tarif ed-in tariff (a rket price (af	fter year 10)	212.64 € 170.11 € 103.07 €	/MWh			
Cash Flow Model, EUR	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Year of contract in exploitation		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Energy sale Energy price inflation, % General price inflation, % Feedstock price inflation, % Electricity sale				4.5% 3.0% 2.0% 396 606	4.5% 3.0% 2.0% 400 717	4.5% 3.0% 2.0% 404 845	4.5% 3.0% 2.0% 327 228	4.5% 3.0% 2.0% 337 503	4.5% 3.0% 2.0% 348 100	4.5% 3.0% 2.0% 359 031	4.5% 3.0% 2.0% 370 304	4.5% 3.0% 2.0% 381 932	4.5% 3.0% 2.0% 393 925	4.5% 3.0% 2.0% 406 294	4.5% 3.0% 2.0% 419 051	4.5% 3.0% 2.0% 432 210	4.5% 3.0% 2.0% 270 098	5 834 747
Heat sale		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Income from waste management tariff Income		•	392 609	396 606	0 400 717	404 845	327 228	337 503	0	359 031	370 304	381 932	393 925	406 294	419 051	432 210	270 098	5 834 747
Cost for the feedstock O&M cost		0	0 -79 018	0 -81 388	0 -83 830	0 -86 345	0 -88 935	0 -91 603	0 -94 351	0 -97 182	0 -100 097	0 -103 100	0 -106 193	0 -109 379	-112 660	0 -116 040	0	0 -1 546 357
Corporate income tax 15.0%		0	-15 268	-16 289	-17 361	-18 468	-7 351	-9 455	-11 650	-13 937	-16 322	-41 825	-43 160	-44 537	-45 959	-47 425	-22 587	-371 594
Operational Cashflow		117 579	298 323	298 928	299 527	300 032	230 942	236 444	242 100	247 912	253 885	237 007	244 572	252 378	260 433	268 744	127 991	3 916 796
Investment and Financing Investment Debt financing Subsidy Pre-subsidy debt cost	-1 534 321 1 150 741 0																	-1 534 321 1 150 741 0 0
Return of subsidy to bank Debt service Own financing	383 580	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	0	0	0	0	0	0	0 -1 526 662 383 580
FREE CASH FLOW	0	-35 088	145 657	146 262	146 861	147 366	78 276	83 778	89 434	95 246	101 219	237 007	244 572	252 378	260 433	268 744	127 991	2 390 134
Annual return on investment: Oper. Cash Flow/ Debt payment:		0.77	1.95	1.96	1.96	1.97	1.51	1.55	1.59	1.62	1.66	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.6
ROI		7.7%	19.4%	19.5%	19.5%	19.6%	15.1%	15.4%	15.8%	16.2%	16.5%	15.4%	15.9%	16.4%	17.0%	17.5%	8.3%	
NPV - 16 years @6.4%	Ls 939 088.32																	
IRR	26%																	
Debt Capital payments		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Annual loan repayment		152 666	152 666	152 666	152 666	152 666	152 666	152 666	152 666	152 666	152 666	0	0	0	0	0	0	1 526 662
Interest payment		63 291	<i>58 375</i>	53 189	47 718	41 946	35 856	29 431	22 654	15 503	7 959	0	0	0	0	0	0	375 921
Payment on principal		<i>89 375</i>	94 291	99 477	<i>104 948</i>	110 721	116 810	123 235	130 013	137 163	144 707	0	0	0	0	0	0	1 150 741
Balance		1 061 365	967 074	867 597	762 649	651 928	535 118	411 883	281 871	144 707	0	0	0	0	0	0	0	1 150 741
Corporate Income tax		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16 years
Part of Investment Expensed in Year 1, %											10	11	12	1.5		13		10 years
Part of Investment Depreciated over years		100%																
Taxable income		54 288	255 216	262 028	269 170	276 555	202 437	216 468	231 096	246 346	262 248	278 832	287 732	296 915	306 391	316 170	150 577	3 912 469
Investment expensed		0															/	
Investment depreciated		-153 432	-153 432	-153 432	-153 432	-153 432	-153 432	-153 432	-153 432	-153 432	-153 432							-1 534 321
Subsidy		0	0	0	0	0	0	0	0	0	0							
Accumultated Taxable income		-99 144	101 784	108 596	115 738	123 123	49 005	63 036	77 664	92 914	108 816	278 832	287 732	296 915	306 391	316 170	150 577	2 378 148
Corporate income tax 15.0%		0	-15 268	-16 289	-17 361	-18 468	-7 351	-9 455	-11 650	-13 937	-16 322	-41 825	-43 160	-44 537	-45 959	-47 425	-22 587	-371 594

Annex 3: Cash flow analysis – dry fermentation + CHP + upgrading

1.Combined Scenario (Biomethane) - Ca	sh Flow																	
Investments	EURO		Post-Finan		EURO		Debt term (ye	ars)	10			Biome	ethane price	0.35€	/Nm3			
Investment Dry Fermentation Unit	1 534 321		Debt Capital	75.0%	1 150 741		Interest rate:		6%		Electricity	feed-in tariff	(year 1-10)	212.64€	/MWh			
Investment Biogas Upgrading Facility	636 112		Debt Capital	75.0%	477 084						-							
Subsidy Dry Fermentation Unit	0		Equity Capit	al 25.0%	383 580		Subsidy 1		0%		Electricity fee	ed-in tariff (af	ter year 10)	170.11€	/MWh			
Subsidy Biogas Upgrading Facility	0		Equity Capit	al 25.0%	159 028		Subsidy 2		0%		-							
Investment (minus) subsidy 1	1 534 321		Total 1		1 534 321													
Investment (minus) subsidy 2	636 112		Total 2		636 112													
Cash Flow Model, EUR	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Year of contract in exploitation		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Energy sale																		
Energy price inflation, %			4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	
General price inflation, %			3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Feedstock price inflation, %			2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
Electricity sale		194 295	392 609	396 606	400 717	404 845	0	0	0	0	0	0	0	0	0	0	0	1 789 072
Heat sale		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income from waste management tariff		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biomethane sale		0	0	0	0	0	241 151	241 284	241 405	241 525	239 599	254 536	270 405	287 262	305 171	324 196	344 407	2 990 941
Income		194 295	392 609	396 606	400 717	404 845	241 151	241 284	241 405	241 525	239 599	254 536	270 405	287 262	305 171	324 196	344 407	4 780 012
Cost for the feedstock		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
O&M cost		-76 716	-79 018	-81 388	-83 830	-86 345	-45 763	-47 136	-48 550	-50 006	-51 506	-53 051	-54 643	-56 282	-57 971	-59 710	-61 501	-993 415
O&M cost upgrading plant		0	0	0	0	0	-44 528	-45 864	-47 240	-48 657	-50 116	-51 620	-53 169	-54 764	-56 407	-58 099	-59 842	-570 303
Corporate income tax 15.0%		0	-15 268	-16 289	-17 361	-18 468	0	0	0	0	0	-20 681	-22 823	-25 105	-27 538	-30 131	-42 436	-236 100
Operational Cashflow		117 579	298 323	298 928	299 527	300 032	150 860	148 285	145 616	142 862	137 977	129 184	139 771	151 111	163 255	176 256	180 628	2 980 194
Investment and Financing																		
Investment	-1 534 321					-636 112			i									-2 170 433
Debt financing	1 150 741					477 084												1 627 825
Subsidy	0					0												0
Pre-subsidy debt cost																		0
Return of subsidy to bank									1									0
Debt service 1		-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666	-152 666							-1 526 662
Debt service 2							-63 294	-63 294	-63 294	-63 294	-63 294	-63 294	-63 294	-63 294	-63 294	-63 294		-632 936
Own financing	383 580					159 028												542 608
FREE CASH FLOW	0	-35 088	145 657	146 262	146 861	147 366	-65 100	-67 675	-70 344	-73 097	-77 983	65 890	76 477	87 817	99 961	112 962	180 628	820 595
Annual return on investment:																		
Oper. Cash Flow/ Debt payment:		0.77		1.96	1.96	1.97	0.70	0.69	0.67	0.66	0.64	2.04	2.21	2.39	2.58	2.78	#DIV/0!	1.20
Oper. Cash Flow/ Debt payment: ROI		0.77 7.7%		1.96 19.5%	1.96 19.5%	1.97 19.6%	0.70 7.0%	0.69 6.8%	0.67 6.7%	0.66 6.6%	0.64 6.4%	2.04 20.3%	2.21 22.0%	2.39 23.8%	2.58 25.7%	2.78 27.7%	#DIV/0! 28.4%	1.20
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4%	-Ls 55 867.03																	1.20
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR	-Ls 55 867.03 6%					19.6%	7.0%		6.7%	6.6%	6.4%	20.3%	22.0%	23.8%	25.7%	27.7%		1.20
Oper. Cash Flow/ Debt payment: ROI IRR Debt Capital payments		1	19.4% 2	19.5% 3	19.5%	19.6%	7.0%	6.8% 7	6.7% 8	6.6% 9	6.4%	20.3%	22.0% 12	23.8%	25.7% 14	27.7%	28.4% 16	
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1		7.7% 1 152 666	19.4% 2 152 666	19.5% 3 152 666	19.5% 4 152 666	19.6% 5 152 666	7.0% 6 152 666	6.8% 7 152 666	6.7% 8 152 666	6.6% 9 152 666	6.4% 10 152 666	20.3% 11 0	22.0% 12 0	23.8%	25.7% 14 0	27.7% 15 0	28.4% 16 0	1 526 662
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment		1 1 52 666 <i>63 291</i>	19.4% 2 152 666 <i>58 375</i>	19.5% 3 152 666 <i>53 189</i>	4 152 666 <i>47 718</i>	19.6% 5 152 666 <i>41 946</i>	6 152 666 <i>35 856</i>	6.8% 7 152 666 <i>29 431</i>	6.7% 8 152 666 <i>22 654</i>	9 1 52 666 15 503	6.4% 10 152 666 <i>7 959</i>	20.3%	22.0% 12 0 0	23.8%	25.7% 14 0 0	27.7% 15 0	28.4% 16 <i>0</i>	1 526 662 <i>375 921</i>
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810	6.8% 7 152 666 <i>29 431</i> <i>123 235</i>	6.7% 8 152 666 22 654 130 013	6.6% 9 152 666 <i>15 503</i> <i>137 163</i>	6.4% 10 152 666 <i>7 959</i> 144 707	20.3% 11 0	22.0% 12 0	23.8%	25.7% 14 0	27.7% 15 0 0	28.4% 16 0	1 526 662 <i>375 921</i> <i>1 150 741</i>
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance		1 1 52 666 <i>63 291</i>	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i>	4 152 666 <i>47 718</i>	19.6% 5 152 666 <i>41 946</i>	6 152 666 <i>35 856</i> <i>116 810</i> 535 118	6.8% 7 152 666 <i>29 431</i> <i>123 235</i> 411 883	6.7% 8 152 666 <i>22 654</i> <i>130 013</i> 281 871	6.6% 9 152 666 <i>15 503</i> <i>137 163</i> 144 707	6.4% 10 152 666 <i>7 959</i> <i>144 707</i> 0	20.3%	22.0%	23.8% 13 0 0 0 0	25.7% 14 0 0 0	27.7% 15 0 0 0 0	28.4% 16 0 0 0 0	1 526 662 <i>375 921</i> <i>1 150 741</i> 1 150 741
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loar repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	6 152 666 <i>35 856</i> <i>116 810</i> 535 118 63 294	6.8% 7 152 666 29 431 123 235 411 883 63 294	6.7% 8 152 666 22 654 130 013 281 871 63 294	6.6% 9 152 666 <i>15 503</i> <i>137 163</i> 144 707 63 294	6.4% 10 152 666 7 959 144 707 0 63 294	20.3% 11 0 0 0 0 63 294	22.0% 12 0 0 0 0 63 294	23.8% 13 0 0 0 0 63 294	25.7% 14 0 0 0 0 63 294	27.7% 15 0 0 0 0 63 294	28.4% 16 0 0 0 0 0 0	1 526 662 <i>375 921</i> <i>1 150 741</i> 1 150 741 632 936
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783	6.4% 10 152 666 7 959 144 707 0 63 294 17 390	20.3% 11 0 0 0 0 63 294 14 865	22.0% 12 0 0 0 0 63 294 12 202	23.8% 13 0 0 0 0 63 294 9 392	25.7% 14 0 0 0 0 63 294 6 427	27.7% 15 0 0 0 0 63 294 3 300	28.4% 16 0 0 0 0 0 0 0	1 526 662 <i>375 921</i> <i>1 150 741</i> 1 150 741 632 936 <i>155 853</i>
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Balance Annual loan repayment 2 Interest payment Payment on principal		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903	20.3% 11 0 0 0 63 294 14 865 48 428	22.0% 12 0 0 0 63 294 12 202 51 092	23.8% 13 0 0 0 63 294 9 392 53 902	25.7% 14 0 0 0 63 294 6 427 56 866	27.7% 15 0 0 0 63 294 3 300 59 994	28.4% 16 0 0 0 0 0 0	1 526 662 375 921 1 150 741 1 150 741 632 936 155 853 477 084
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783	6.4% 10 152 666 7 959 144 707 0 63 294 17 390	20.3% 11 0 0 0 0 63 294 14 865	22.0% 12 0 0 0 0 63 294 12 202	23.8% 13 0 0 0 0 63 294 9 392	25.7% 14 0 0 0 0 63 294 6 427	27.7% 15 0 0 0 0 63 294 3 300	28.4% 16 0 0 0 0 0 0 0	1 526 662 <i>375 921</i> <i>1 150 741</i> 1 150 741 632 936 <i>155 853</i>
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903	20.3% 11 0 0 0 63 294 14 865 48 428	22.0% 12 0 0 0 63 294 12 202 51 092	23.8% 13 0 0 0 63 294 9 392 53 902 116 860	25.7% 14 0 0 0 63 294 6 427 56 866	27.7% 15 0 0 0 63 294 3 300 59 994	28.4% 16 0 0 0 0 0 0 0	1 526 662 <i>375 921</i> 1 150 741 1 150 741 632 936 155 853 477 084 477 084
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax		7.7% 1 152 666 63 291 89 375	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903	20.3% 11 0 0 0 63 294 14 865 48 428	22.0% 12 0 0 0 63 294 12 202 51 092	23.8% 13 0 0 0 63 294 9 392 53 902	25.7% 14 0 0 0 63 294 6 427 56 866	27.7% 15 0 0 0 63 294 3 300 59 994	28.4% 16 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 1 150 741 632 936 155 853 477 084
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, %		7.7% 1 152 666 63 291 89 375 1 061 365	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903	20.3% 11 0 0 0 63 294 14 865 48 428	22.0% 12 0 0 0 63 294 12 202 51 092	23.8% 13 0 0 0 63 294 9 392 53 902 116 860	25.7% 14 0 0 0 63 294 6 427 56 866	27.7% 15 0 0 0 63 294 3 300 59 994	28.4% 16 0 0 0 0 0 0 0	1 526 662 <i>375 921</i> 1 150 741 1 150 741 632 936 155 853 477 084 477 084
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1, %		7.7% 1 152 666 63 291 89 375 1 061 365 1 1 100%	19.4% 2 152 666 <i>58 375</i> <i>94 291</i> 967 074	19.5% 3 152 666 <i>53 189</i> <i>99 477</i> 867 597	19.5% 4 152 666 <i>47 718</i> <i>104 948</i> 762 649	19.6% 5 152 666 <i>41 946</i> <i>110 721</i> 651 928	7.0% 6 35 856 35 856 116 810 535 118 63 294 26 240 37 054 440 030 6	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092 400 938 7	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242 359 696 8	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510 316 185 9	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10	20.3% 11 0 0 0 0 63 294 14 865 49 428 221 854 11	22.0% 12 0 0 0 0 63 294 12 202 51 092 170 762 12	23.8% 13 0 0 0 0 0 0 63 294 9 392 53 902 116 860 13	25.7% 14 0 0 0 0 6 3294 6 427 56 866 59 994 14	27.7% 15 0 0 0 0 63.294 3 300 59 994 0 15	28.4%	1 526 662 375 921 1 150 741 1 150 741 632 936 155 853 477 084 477 084 16 years
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable Income		7.7% 1 152 666 63 291 89 375 1 061 365	19.4% 2 152 666 <i>58 375</i> <i>94 291</i>	19.5% 3 152 666 <i>53 189</i> <i>99 477</i>	4 152 666 <i>47 718</i> <i>104 948</i>	19.6% 5 152 666 <i>41 946</i> <i>110 721</i>	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903	20.3% 11 0 0 0 63 294 14 865 48 428	22.0% 12 0 0 0 63 294 12 202 51 092	23.8% 13 0 0 0 63 294 9 392 53 902 116 860	25.7% 14 0 0 0 63 294 6 427 56 866	27.7% 15 0 0 0 63 294 3 300 59 994	28.4% 16 0 0 0 0 0 0 0	1 526 662 <i>375 921</i> 1 150 741 1 150 741 632 936 155 853 <i>477 084</i> 477 084
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1 Taxable Income Investment Expensed		7.7% 1 152 666 <i>63 291</i> <i>89 375</i> 1 061 365 1 1 1 100% 54 288 0	19.4% 2 152 666 58 375 94 291 967 074 2 255 216	19.5% 3 152 666 53 189 99 477 867 597 3 262 028	19.5% 4 152 666 <i>47 718</i> <i>104 948</i> 762 649 4 4 269 170	19.6% 5 152 666 <i>110 721</i> 651 928 5 276 555	7.0% 6 35 856 116 810 535 118 63 294 26 240 37 054 440 030 6 159 532	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092 400 938 7 7 164 717	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 242 359 696 8 8 170 202	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510 316 185 9 176 016	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134	20.3% 11 0 0 0 0 63 294 14 865 49 428 221 854 11	22.0% 12 0 0 0 0 63 294 12 202 51 092 170 762 12	23.8% 13 0 0 0 0 0 0 63 294 9 392 53 902 116 860 13	25.7% 14 0 0 0 0 6 3294 6 427 56 866 59 994 14	27.7% 15 0 0 0 0 63.294 3 300 59 994 0 15	28.4%	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 16 years 3 410 676
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed Investment depreciated 1		7.7% 1 152 666 63 291 89 375 1 061 365 1 1 100% 54 288	19.4% 2 152 666 <i>58 375</i> <i>94 291</i> 967 074	19.5% 3 152 666 <i>53 189</i> <i>99 477</i> 867 597	19.5% 4 152 666 <i>47 718</i> <i>104 948</i> 762 649	19.6% 5 152 666 <i>41 946</i> <i>110 721</i> 651 928	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054 440 030 6 159 532 -153 432	6.8% 7 152 666 29 431 123 235 4111 883 63 294 24 202 39 092 400 938 7 7 164 717 -153 432	6.7% 8 152 666 22 654 130 013 281 871 63 294 42 20 52 41 242 359 696 8 170 202 -153 432	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510 316 185 9 9 176 016 -153 432	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485	22.0% 12 0 0 0 63 294 12 202 51 092 170 762 12 215 762	23.8% 13 0 0 0 63 294 9 392 53 902 116 860 13 230 980	25.7% 14 0 0 0 63 294 6 427 56 866 59 994 14 247 200	27.7% 15 0 0 0 63 294 3 300 59 994 0 15 264 486	28.4%	1 526 662 375 921 1 150 741 1 150 741 6 32 936 155 853 477 084 477 084 16 years 3 410 676 -1 534 321
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1, % Part of Investment Expensed Investment Expensed Investment depreciated 1 Investment depreciated 2		7.7% 152 666 <i>63 291</i> <i>89 375</i> 1 061 365 1 100% 54 288 0 -153 432	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432	19.5% 4 152 666 <i>47 718</i> <i>104 948</i> 762 649 4 269 170 -153 432	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054 440 030 6 6 159 532 -153 432 -63 611	6.8% 7 152 666 29 431 123 235 411 883 63 294 24 202 39 092 400 938 7 7 164 717 -153 432 -63 611	6.7% 8 152 666 22 654 130 013 281 871 63 294 22 052 41 22 052 41 242 359 696 8 170 202 -153 432 -63 611	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510 316 185 9 176 016 -153 432 -63 611	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611	20.3% 11 0 0 0 0 63 294 14 865 49 428 221 854 11	22.0% 12 0 0 0 0 63 294 12 202 51 092 170 762 12	23.8% 13 0 0 0 0 0 0 63 294 9 392 53 902 116 860 13	25.7% 14 0 0 0 0 6 3294 6 427 56 866 59 994 14	27.7% 15 0 0 0 0 63.294 3 300 59 994 0 15	28.4%	1 526 662 375 921 1 150 741 1 150 741 1 150 741 6 32 936 1 55 853 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed Investment depreciated 0 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Subsidy 1		7.7% 1 152 666 <i>63 291</i> <i>89 375</i> 1 061 365 1 1 1 100% 54 288 0	19.4% 2 152 666 58 375 94 291 967 074 2 255 216	19.5% 3 152 666 53 189 99 477 867 597 3 262 028	19.5% 4 152 666 <i>47 718</i> <i>104 948</i> 762 649 4 4 269 170	19.6% 5 152 666 <i>110 721</i> 651 928 5 276 555	7.0% 6 152 666 35 856 116 810 535 118 63 294 26 240 37 054 440 030 6 159 532 -153 432	6.8% 7 152 666 29 431 123 235 4111 883 63 294 24 202 39 092 400 938 7 7 164 717 -153 432	6.7% 8 152 666(22 654 130 013 281 871 63 294 22 052 41 242 359 696 8 170 202 -153 432 -153 432 -153 432 0	6.6% 9 152 666 15 503 137 163 144 707 63 294 19 783 43 510 316 185 9 9 176 016 -153 432	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432	20.3% 11 0 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611	22.0% 12 0 0 0 63 294 12 202 51 092 170 762 12 215 762	23.8% 13 0 0 0 63 294 9 392 53 902 116 860 13 230 980	25.7% 14 0 0 0 63 294 6 427 56 866 59 994 14 247 200 -63 611	27.7% 15 0 0 0 63 294 3 300 59 994 0 15 264 486	28.4%	1 526 662 375 921 1 150 741 1 150 741 6 32 936 155 853 477 084 477 084 16 years 3 410 676 -1 534 321
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 2 Subsidy 1		7.7% 1 152 666 63 291 89 375 1 061 365 1 100% 54 288 0 -153 432 0	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0	19.5% 4 152 666 47 718 104 948 762 649 4 269 170 -153 432 0	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432 0	7.0% 6 152 666 35 856 116 815 533 118 63 294 26 240 37 054 440 030 6 159 532 -153 432 -63 611 0 0 0	6.8% 7 152 666 29 431 122 235 411 883 63 294 24 202 39 092 400 938 7 164 717 -153 432 -63 611 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 63 294 41 242 359 696 8 170 202 -153 432 -63 611 0 0	6.6% 9 152 666 15 503 137 163 144 707 63 294 177 63 294 19 783 43 510 316 185 9 9 176 016 -153 432 -63 611 0 0	6.4% 10 152 666 7 959 147 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0	22.0% 12 0 0 0 63 294 12 202 51 092 170 762 12 215 762 -63 611 0	23.8% 13 0 0 0 0 0 0 0 0 0 0 0 0 0	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0	27.7% 15 0 0 0 0 0 53 294 3 300 59 994 0 15 264 486 -63 611 0	28.4% 16 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 1 150 741 155 853 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 0 0
Oper. Cash Flow/ Debt payment: ROJ NPV - 16 years @6.4% IRR Debt Capital payments Annual loar repayment 1 Interest payment Payment on principal Balance Annual loar repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment expensed Investment depreciated 0 2 Subsidy 1 Subsidy 1 Subsidy 2		7.7% 1 152 666 63 291 89 375 1 061 365 1 100% 54 288 0 -153 432 0 -99 144	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0 108 596	19.5% 4 152 666 47 718 104 948 762 649 4 4 269 170 -153 432 0 115 738	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432 0 123 123	7.0% 6 152 666 38 856 116 810 535 118 6 32 924 26 240 37 054 440 030 6 6 159 532 -153 432 -63 611 0 0 0	6.8% 7 152 666 29 431 123 256 411 883 63 294 24 202 39 092 400 938 7 164 717 -153 432 -63 611 0 0 0 0 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 42 052 41 242 359 696 8 170 202 -153 432 -63 611 0 0 -46 841	6.6% 9 152 666 15 503 137 163 144 707 63 294 43 510 316 185 9 9 176 016 -153 432 -63 611 0 0 0	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0 -36 909	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0 137 874	22.0% 12 0 0 0 51 092 170 762 12 215 762 -63 611 0 152 150	23.8% 13 0 0 0 0 0 0 0 0 53 294 9.392 53 902 116 860 13 230 980 -63 611 0 167 369	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0 183 589	27.7% 15 0 0 0 0 0 3.300 59.994 0 15 264.486 -63.611 0 200.875	28.4% 15 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 -636 112 -0 0 1 240 243
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1, % Part of Investment depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Subsidy 2 Accumultated Taxable income Corporate income tax 15.0%		7.7% 1 152 666 63 291 89 375 1 061 365 1 100% 54 288 0 -153 432 0	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0	19.5% 4 152 666 47 718 104 948 762 649 4 269 170 -153 432 0	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432 0	7.0% 6 152 666 35 856 116 815 533 118 63 294 26 240 37 054 440 030 6 159 532 159 532 159 532 153 432 -63 611 0 0	6.8% 7 152 666 29 431 122 235 411 883 63 294 24 202 39 092 400 938 7 164 717 -153 432 -63 611 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 63 294 41 242 359 696 8 170 202 -153 432 -63 611 0 0	6.6% 9 152 666 15 503 137 163 144 707 63 294 177 63 294 19 783 43 510 316 185 9 9 176 016 -153 432 -63 611 0 0	6.4% 10 152 666 7 959 147 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0	22.0% 12 0 0 0 63 294 12 202 51 092 170 762 12 215 762 -63 611 0	23.8% 13 0 0 0 0 0 0 0 0 0 0 0 0 0	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0	27.7% 15 0 0 0 0 0 53 294 3 300 59 994 0 15 264 486 -63 611 0	28.4% 16 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 1 150 74
Oper. Cash Flow/ Debt payment: ROJ NPV - 16 years @6.4% IRR Debt Capital payments Annual loar repayment 1 Interest payment Payment on principal Balance Annual loar repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment expensed Investment depreciated 0 2 Subsidy 1 Subsidy 1 Subsidy 2		7.7% 1 152 666 63 291 89 375 1 061 365 1 100% 54 288 0 -153 432 0 -99 144	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0 108 596	19.5% 4 152 666 47 718 104 948 762 649 4 4 269 170 -153 432 0 115 738	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432 0 123 123	7.0% 6 152 666 38 856 116 810 535 118 6 32 924 26 240 37 054 440 030 6 6 159 532 -153 432 -63 611 0 0 0	6.8% 7 152 666 29 431 123 256 411 883 63 294 24 202 39 092 400 938 7 164 717 -153 432 -63 611 0 0 0 0 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 42 052 41 242 359 696 8 170 202 -153 432 -63 611 0 0 -46 841	6.6% 9 152 666 15 503 137 163 144 707 63 294 43 510 316 185 9 9 176 016 -153 432 -63 611 0 0 0	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0 -36 909	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0 137 874	22.0% 12 0 0 0 51 092 170 762 12 215 762 -63 611 0 152 150	23.8% 13 0 0 0 0 0 0 0 0 53 294 9.392 53 902 116 860 13 230 980 -63 611 0 167 369	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0 183 589	27.7% 15 0 0 0 0 0 3.300 59.994 0 15 264.486 -63.611 0 200.875	28.4% 15 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 -636 112 0 0 1 240 243
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Taxable income Investment depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Subsidy 2 Accumultated Taxable income Corporate income tax 15.0%		7.7% 1 152 666 63 291 89 375 1 061 365 1 100% 54 288 0 -153 432 0 -99 144	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0 108 596	19.5% 4 152 666 47 718 104 948 762 649 4 4 269 170 -153 432 0 115 738	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432 0 123 123	7.0% 6 152 666 38 856 116 810 535 118 6 32 924 26 240 37 054 440 030 6 6 159 532 -153 432 -63 611 0 0 0	6.8% 7 152 666 29 431 123 256 411 883 63 294 24 202 39 092 400 938 7 164 717 -153 432 -63 611 0 0 0 0 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 42 052 41 242 359 696 8 170 202 -153 432 -63 611 0 0 -46 841	6.6% 9 152 666 15 503 137 163 144 707 63 294 43 510 316 185 9 9 176 016 -153 432 -63 611 0 0 0	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0 -36 909	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0 137 874	22.0% 12 0 0 0 51 092 170 762 12 215 762 -63 611 0 152 150	23.8% 13 0 0 0 0 0 0 0 0 53 294 9.392 53 902 116 860 13 230 980 -63 611 0 167 369	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0 183 589	27.7% 15 0 0 0 0 0 3.300 59.994 0 15 264.486 -63.611 0 200.875	28.4% 15 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 -636 112 -0 0 1 240 243
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Taxable income Investment depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Subsidy 2 Accumultated Taxable income Corporate income tax 15.0%		7.7% 1 152 666 63 291 89 375 1 061 365 1 100% 54 288 0 -153 432 0 -99 144	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0 108 596	19.5% 4 152 666 47 718 104 948 762 649 4 4 269 170 -153 432 0 115 738	19.6% 5 152 666 41 946 110 721 651 928 5 276 555 -153 432 0 123 123	7.0% 6 152 666 38 856 116 810 535 118 6 32 924 26 240 37 054 440 030 6 6 159 532 -153 432 -63 611 0 0 0	6.8% 7 152 666 29 431 123 256 411 883 63 294 24 202 39 092 400 938 7 164 717 -153 432 -63 611 0 0 0 0 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 42 052 41 242 359 696 8 170 202 -153 432 -63 611 0 0 -46 841	6.6% 9 152 666 15 503 137 163 144 707 63 294 43 510 316 185 9 9 176 016 -153 432 -63 611 0 0 0	6.4% 10 152 666 7 959 144 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0 -36 909	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0 137 874	22.0% 12 0 0 0 51 092 170 762 12 215 762 -63 611 0 152 150	23.8% 13 0 0 0 0 0 0 0 0 53 294 9.392 53 902 116 860 13 230 980 -63 611 0 167 369	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0 183 589	27.7% 15 0 0 0 0 0 3.300 59.994 0 15 264.486 -63.611 0 200.875	28.4% 15 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 -636 112 -0 0 1 240 243
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1, % Part of Investment depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Subsidy 2 Accumultated Taxable income Corporate income tax 15.0%	<u>6%</u>	7.7% 1 152 666 <i>83 291</i> <i>89 375</i> 1 061 365 1 100% 54 288 0 -153 432 0 -99 144 0	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784 -15 268	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0 108 596 -16 289	19.5% 4 152 666 47 718 104 948 762 649 4 269 170 -153 432 0 115 738 -17 361	19.6% 5 152 666 41 946 41 946 (551 928) 5 276 555 -153 432 0 123 123 -18 468	7.0% 6 152 666 35 855 116 810 533 118 63 294 26 240 37 054 440 030 6 159 532 159 532 159 532 -153 432 -63 611 0 0 0 -57 511 0	6.8% 7 152 666 29 431 122 235 411 883 63 294 24 202 30 092 400 938 7 164 717 -153 432 -63 611 0 0 0 0 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 42 2052 41 242 359 696 8 170 202 -153 432 -63 611 0 0 -46 841 0 0	6.6% 9 152 666 15 503 137 163 144 707 63 294 177 60 316 185 9 9 176 016 -153 432 -63 611 0 0 -41 027 0	6.4% 10 152 666 7 959 147 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0 -36 909 0	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0 137 874 -20 681	22.0% 12 0 0 0 63 294 12 202 51 092 170 762 12 215 762 -63 611 0 152 150 -22 823	23.8% 13 0 0 0 0 53 294 9 332 53 902 116 860 13 230 980 -63 611 0 167 369 -25 105	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0 183 589 -27 538	27.7% 15 0 0 0 0 59 994 0 15 264 486 -63 611 0 200 875 -30 131	28.4% 16 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 -0 0 1 240 243
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1, % Part of Investment depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Investment depreciated 1 Subsidy 2 Accumultated Taxable income Corporate income tax 15.0%	<u>6%</u>	7.7% 1 152 666 <i>83 291</i> <i>89 375</i> 1 061 365 1 100% 54 288 0 -153 432 0 -99 144 0	19.4% 2 152 666 58 375 94 291 967 074 2 255 216 -153 432 0 101 784 -15 268	19.5% 3 152 666 53 189 99 477 867 597 3 262 028 -153 432 0 108 596 -16 289	19.5% 4 152 666 47 718 104 948 762 649 4 269 170 -153 432 0 115 738 -17 361	19.6% 5 152 666 41 946 41 946 51 928 5 276 555 -153 432 0 123 123 -18 468	7.0% 6 152 666 35 855 116 810 533 118 63 294 26 240 37 054 440 030 6 159 532 159 532 159 532 -153 432 -63 611 0 0 0 -57 511 0	6.8% 7 152 666 29 431 122 235 411 883 63 294 24 202 30 092 400 938 7 164 717 -153 432 -63 611 0 0 0 0 0 0	6.7% 8 8 152 666 22 654 130 013 281 871 42 2052 41 242 359 696 8 170 202 -153 432 -153 432 0 0	6.6% 9 152 666 15 503 137 163 144 707 63 294 177 60 316 185 9 9 176 016 -153 432 -63 611 0 0 -41 027 0	6.4% 10 152 666 7 959 147 707 0 63 294 17 390 45 903 270 282 10 180 134 -153 432 -63 611 0 0 -36 909 0	20.3% 11 0 0 0 63 294 14 865 48 428 221 854 11 201 485 -63 611 0 137 874 -20 681	22.0% 12 0 0 0 63 294 12 202 51 092 170 762 12 215 762 -63 611 0 152 150 -22 823	23.8% 13 0 0 0 0 53 294 9 332 53 902 116 860 13 230 980 -63 611 0 167 369 -25 105	25.7% 14 0 0 0 6 3 294 6 427 56 866 59 994 14 247 200 -63 611 0 183 589 -27 538	27.7% 15 0 0 0 0 59 994 0 15 264 486 -63 611 0 200 875 -30 131	28.4% 16 0 0 0 0 0 0 0 0 0 0 0 0 0	1 526 662 375 921 1 150 741 632 936 155 853 477 084 477 084 477 084 16 years 3 410 676 -1 534 321 -636 112 0 1 240 243 -236 100

Annex 4: Cash flow analysis – wet fermentation + CHP

Investments Investments Investment waste separation and wet digestion Subsidy Investment (minus) subsidy	ogas CHP) - Cash Flo EURO 3 590 698 0 3 590 698	l	Post-Financi Debt Capital 7 Equity Capital Total	5.0% 25.0%	EURO 2 693 023 897 674 3 590 698		Debt term (ye Interest rate Subsidy		10 6% 0%		Electricity fee	feed-in tarifi ed-in tariff (a ket price (afi	fter year 10)	212.64 € / 170.11 € / 103.07 € /	/MWh			
Cash Flow Model, EUR	2017	2018	2019	2020	2021 4	2022	2023	2024	2025 <i>8</i>	2026	2027	2028	2029 12	2030	2031	2032	2033	
Year of contract in exploitation Energy sale		1	2	3	4	5	6	/	8	9	10	11	12	13	14	15	16	
Energy price inflatio			4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	
General price inflatio			3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Feedstock price inflatio	n, %	235 636	<i>2.0%</i> 476 340	2.0% 385 186	<i>2.0%</i> 397 280	<i>2.0%</i> 409 755	<i>2.0%</i> 422 621	2.0% 435 892	2.0% 449 579	2.0% 463 695	<i>2.0%</i> 478 256	2.0% 493 273	2.0% 508 761	2.0% 317 937	2.0%	2.0% 0	2.0% 0	5 474 211
Heat sale		255 050	0	0	0	0	0	433 052	0	0	0	455 275	0	0	õ	0	Ő	54/4211
Income from waste management tariff		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Income		235 636	476 340	385 186	397 280	409 755	422 621	435 892	449 579	463 695	478 256	493 273	508 761	317 937	0	0	0	5 474 211
Cost for the feedstock O&M cost		0 -251 349	-258 889	0 -266 656	0 -274 656	0 -282 895	0 -291 382	0 -300 124	0 -309 127	0 -318 401	0 -327 953	0 -337 792	0 -347 926	0 -358 363	0	0	0	0 -3 925 514
Corporate income tax 15.0%		-251 545	-230 009	-200 050	-274 050	-202 095	-291 302	-500 124	-303 127	-510+01	-527 555	-23 322	-24 125	0	-0	-0	-0	-47 448
Operational Cashflow		-15 713	217 450	118 530	122 625	126 860	131 239	135 768	140 451	145 294	150 302	132 159	136 711	-40 426	-0	-0	-0	1 501 250
Investment and Financing	2 500 500																	
Investment Debt financing	-3 590 698 2 693 023																	-3 590 698 2 693 023
Subsidy	2 055 025																	2 035 025
Pre-subsidy debt cost																		0
Return of subsidy to bank												_			_	_		0
Debt service Own financing	897 674	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	0	0	0	0	0	0	-3 572 774 897 674
FREE CASH FLOW	097 074	-372 991	-139 827	-238 748	-234 653	-230 418	-226 038	-221 509	-216 826	-211 983	-206 975	132 159	136 711	-40 426	-0	-0	-0	-2 071 524
			100 010	200710							2000000	101 100	100711					
Annual return on investr	ment:																	
Oper. Cash Flow/ Debt payment:		-0.04	0.61	0.33	0.34	0.36	0.37	0.38	0.39	0.41	0.42	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.36
ROI																		
		-0.4%	6.1%	3.3%	3.4%	3.5%	3.7%	3.8%	3.9%	4.0%	4.2%	3.7%	3.8%	-1.1%	0.0%	0.0%	0.0%	
NPV - 16 years @6.4%	-Ls 2 472 181.92	-0.4%	6.1%	3.3%	3.4%	3.5%	3.7%	3.8%	3.9%	4.0%	4.2%	3.7%	3.8%	-1.1%	0.0%	0.0%	0.0%	
NPV - 16 years @6.4% IRR	-Ls 2 472 181.92 #DIV/0!	-0.4%	6.1%	3.3%	3.4%	3.5%	3.7%	3.8%	3.9%	4.0%	4.2%	3.7%	3.8%	-1.1%	0.0%	0.0%	0.0%	
IRR		-0.4%	6.1%	3.3%	4	5	6	3.8%	8	4.0%	4.2%		3.8%	-1.1%	14			
IRR Debt Capital payments		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	3 572 774
IRR Debt Capital payments Annual loan repayment		1 357 277	2 357 277	3 357 277	4 357 277	5 357 277	6 357 277	7 357 277	8 357 277	9 357 277	10 357 277	11 0	12 0	13 0	14 0	15 0	16 0	3 572 774 <i>879 751</i>
IRR Debt Capital payments Annual loan repayment Interest payment		1 357 277 <i>148 116</i>	2 357 277 <i>136 612</i>	3 357 277 <i>124 476</i>	4 357 277 <i>111 672</i>	5 357 277 <i>98 163</i>	6 357 277 <i>83 912</i>	7 357 277 68 877	8 357 277 <i>53 015</i>	9 357 277 <i>36 281</i>	10 357 277 <i>18 626</i>	11 0 0	12 0 0	13 0 0	14 0 0	15 0 0	16 0	879 751
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal		1 357 277 148 116 209 161	2 357 277 136 612 220 665	3 357 277 124 476 232 802	4 357 277 <i>111 672</i> <i>245 606</i>	5 357 277 <i>98 163</i> <i>259 114</i>	6 357 277 <i>83 912</i> <i>273 365</i>	7 357 277 68 877 288 400	8 357 277 53 015 304 262	9 357 277 <i>36 281</i> <i>320 997</i>	10 357 277 <i>18 626</i> <i>338 652</i>	11 0 0 0	12 0 0 0	13 0 0 0	14 0 0 0	15 0 0 0	16 0	879 751 2 693 023
IRR Debt Capital payments Annual loan repayment Interest payment		1 357 277 <i>148 116</i>	2 357 277 136 612 220 665	3 357 277 <i>124 476</i>	4 357 277 <i>111 672</i>	5 357 277 <i>98 163</i>	6 357 277 <i>83 912</i>	7 357 277 68 877	8 357 277 <i>53 015</i>	9 357 277 <i>36 281</i>	10 357 277 <i>18 626</i>	11 0 0	12 0 0	13 0 0	14 0 0	15 0 0	16 0	879 751
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance		1 357 277 <i>148 116</i> <i>209 161</i> 2 483 862	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197	3 357 277 124 476 232 802	4 357 277 <i>111 672</i> <i>245 606</i>	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311	7 357 277 <i>68 877</i> <i>288 400</i> 963 911	8 357 277 <i>53 015</i> <i>304 262</i> 659 648	9 357 277 <i>36 281</i> <i>320 997</i> 338 652	10 357 277 <i>18 626</i> <i>338 652</i> 0	11 0 0 0 0	12 0 0 0 0	13 0 0 0 0	14 0 0 0 0	15 0 0 0 0	16 0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax		1 357 277 148 116 209 161	2 357 277 136 612 220 665	3 357 277 124 476 232 802	4 357 277 <i>111 672</i> <i>245 606</i>	5 357 277 <i>98 163</i> <i>259 114</i>	6 357 277 <i>83 912</i> <i>273 365</i>	7 357 277 68 877 288 400	8 357 277 53 015 304 262	9 357 277 <i>36 281</i> <i>320 997</i>	10 357 277 <i>18 626</i> <i>338 652</i>	11 0 0 0	12 0 0 0	13 0 0 0	14 0 0 0	15 0 0 0	16 0	879 751 2 693 023
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance		1 357 277 <i>148 116</i> <i>209 161</i> 2 483 862 1	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197	3 357 277 124 476 232 802	4 357 277 <i>111 672</i> <i>245 606</i>	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311	7 357 277 <i>68 877</i> <i>288 400</i> 963 911	8 357 277 <i>53 015</i> <i>304 262</i> 659 648	9 357 277 <i>36 281</i> <i>320 997</i> 338 652	10 357 277 <i>18 626</i> <i>338 652</i> 0	11 0 0 0 0	12 0 0 0 0	13 0 0 0 0	14 0 0 0 0	15 0 0 0 0	16 0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax		1 357 277 <i>148 116</i> <i>209 161</i> 2 483 862	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197	3 357 277 124 476 232 802	4 357 277 <i>111 672</i> <i>245 606</i>	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311	7 357 277 <i>68 877</i> <i>288 400</i> 963 911	8 357 277 <i>53 015</i> <i>304 262</i> 659 648	9 357 277 <i>36 281</i> <i>320 997</i> 338 652	10 357 277 <i>18 626</i> <i>338 652</i> 0	11 0 0 0 0	12 0 0 0 0	13 0 0 0 0	14 0 0 0 0	15 0 0 0 0	16 0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, %		1 357 277 <i>148 116</i> <i>209 161</i> 2 483 862 1	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197	3 357 277 124 476 232 802	4 357 277 <i>111 672</i> <i>245 606</i>	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311	7 357 277 <i>68 877</i> <i>288 400</i> 963 911	8 357 277 <i>53 015</i> <i>304 262</i> 659 648	9 357 277 <i>36 281</i> <i>320 997</i> 338 652	10 357 277 <i>18 626</i> <i>338 652</i> 0	11 0 0 0 0	12 0 0 0 0	13 0 0 0 0	14 0 0 0 0	15 0 0 0 0	16 0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years		1 357 277 <i>148 116</i> <i>209 161</i> 2 483 862 1 100%	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7	8 357 277 <i>53 015</i> <i>304 262</i> 659 648	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9	10 357 277 <i>18 626</i> <i>338 652</i> 0 10	11 0 0 0 11	12 0 0 0 12	13 0 0 0 13	14 0 0 0 14	15 0 0 0 15	16 0 0 0 16	879 751 2 693 023 2 693 023 16 years
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income		1 357 277 <i>148 116</i> <i>209 161</i> 2 483 862 1 100% -163 830	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7	8 357 277 <i>53 015</i> <i>304 262</i> 659 648	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9	10 357 277 <i>18 626</i> <i>338 652</i> 0 10	11 0 0 0 11	12 0 0 0 12	13 0 0 0 13	14 0 0 0 14	15 0 0 0 15	16 0 0 0 16	879 751 2 693 023 2 693 023 16 years
IRR		1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 2 80 838 -359 070 0	3 357 277 124 476 232 802 2 030 396 3 3 -5 946 -359 070 0	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 -359 070 0	5 357 277 98 163 259 114 1 525 676 5 28 696 -359 070 0	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 6 47 327 - 359 070 0	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 7 <i>66 891</i> -359 070 0	8 357 277 53 015 304 262 659 648 8 8 8 8 8 8 8 7 436 -359 070 0	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 9 109 014 -359 070 0	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0	11 0 0 0 11 155 481	12 0 0 0 12 160 836	13 0 0 0 13 -40 426	14 0 0 0 14	15 0 0 0 15 0	16 0 0 0 16 16	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0
IRR		1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0 -359 070 0 -359 2899	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 80 838 -359 070 0 -278 232	3 357 277 124 476 232 802 2 030 396 3 -5 946 -359 070 0 0	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 - 359 070 0 - 348 117	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 28 696 - 359 070 0 - 330 374	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 47 327 -359 070 0 -311 743	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 66 891 -359 070 0 -292 179	8 357 277 <i>53 015</i> <i>304 262</i> 659 648 8 8 8 87 436 -359 070 0 -271 634	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 9 109 014 -359 070 0 -250 056	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0 -227 393	11 0 0 0 11 155 481	12 0 0 0 12 160 836	13 0 0 0 13 -40 426 -40 426	14 0 0 0 14 0	15 0 0 0 0 15 0	16 0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment expensed Investment depreciated Subsidy Accumultated Taxable income Corporate income tax 15.0%		1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 2 80 838 -359 070 0	3 357 277 124 476 232 802 2 030 396 3 3 -5 946 -359 070 0	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 -359 070 0	5 357 277 98 163 259 114 1 525 676 5 28 696 -359 070 0	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 6 47 327 - 359 070 0	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 7 <i>66 891</i> -359 070 0	8 357 277 53 015 304 262 659 648 8 8 8 8 8 8 8 7 436 -359 070 0	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 9 109 014 -359 070 0 -250 056	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0	11 0 0 0 11 155 481	12 0 0 0 12 160 836	13 0 0 0 13 -40 426	14 0 0 0 14	15 0 0 0 15 0	16 0 0 0 16 16	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751
IRR		1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0 -359 070 0 -359 2899	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 80 838 -359 070 0 -278 232	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 -5 946 -359 070 0 -355 016	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 - 359 070 0 - 348 117	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 28 696 - 359 070 0 - 330 374	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 47 327 -359 070 0 -311 743	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 66 891 -359 070 0 -292 179	8 357 277 <i>53 015</i> <i>304 262</i> 659 648 8 8 8 87 436 -359 070 0 -271 634	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 9 109 014 -359 070 0 -250 056	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0 -227 393	11 0 0 0 11 155 481	12 0 0 0 12 160 836	13 0 0 0 13 -40 426 -40 426	14 0 0 0 14 0	15 0 0 0 0 15 0	16 0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment expensed Investment depreciated Subsidy Accumultated Taxable income Corporate income tax 15.0%		1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0 -359 070 0 -359 2899	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 80 838 -359 070 0 -278 232	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 -5 946 -359 070 0 -355 016	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 - 359 070 0 - 348 117	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 28 696 - 359 070 0 - 330 374	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 47 327 -359 070 0 -311 743	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 66 891 -359 070 0 -292 179	8 357 277 <i>53 015</i> <i>304 262</i> 659 648 8 8 8 87 436 -359 070 0 -271 634	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 9 109 014 -359 070 0 -250 056	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0 -227 393	11 0 0 0 11 155 481 -23 322	12 0 0 0 12 160 836	13 0 0 0 13 -40 426 -40 426 0	14 0 0 0 14 0	15 0 0 0 0 15 0	16 0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751
IRR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment expensed Investment depreciated Subsidy Accumultated Taxable income Corporate income tax 15.0%		1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0 -359 070 0 -359 2899	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 80 838 -359 070 0 -278 232	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 -5 946 -359 070 0 -355 016	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 - 359 070 0 - 348 117	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 28 696 - 359 070 0 - 330 374	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 47 327 -359 070 0 -311 743	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 66 891 -359 070 0 -292 179	8 357 277 <i>53 015</i> <i>304 262</i> 659 648 8 8 8 87 436 -359 070 0 -271 634	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 9 109 014 -359 070 0 -250 056	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0 -227 393	11 0 0 0 11 155 481	12 0 0 0 12 160 836	13 0 0 0 13 -40 426 -40 426	14 0 0 0 14 0	15 0 0 0 0 15 0	16 0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751
IRR	#DIV/0!	1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0 -359 070 0 -522 899 0 -372 991	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 2 80 838 -359 070 0 -278 232 0 -139 827	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 -5 946 -359 070 0 -365 016 0 -325 078 0	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 -359 070 0 -348 117 0 -234 653	5 357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 28 696 -359 070 0 -330 374 0 -330 374 -330 418	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 47 327 -359 070 0 -311 743 0 -226 038	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 7 666 891 -359 070 0 -292 179 0 -221 509	8 357 277 <i>53 015</i> <i>304 262</i> 659 648 8 8 8 87 436 -359 070 0 -271 634 0 -2216 826	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 109 014 -359 070 0 -250 056 0 -211 983	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 131 676 -359 070 0 -227 393 0 -226 975	11 0 0 11 155 481 -23 322 132 159	12 0 0 12 160 836 -24 125 136 711	13 0 0 13 -40 426 -40 426 0 -40 426	14 0 0 14 0 -0 -0	15 0 0 0 15 15 0 0 -0	16 0 0 0 16 16 0 -0	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751 -47 448
IRR	#DIV/0!	1 357 277 148 116 209 161 2 483 862 1 100% -163 830 0 -359 070 0 -359 070 0 -522 899 0	2 357 277 <i>136 612</i> <i>220 665</i> 2 263 197 2 80 838 -359 070 0 -278 232 0	3 357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 3 -5 946 -359 070 0 -365 016 0	4 357 277 <i>111 672</i> <i>245 606</i> 1 784 790 4 10 953 -359 070 0 -348 117 0	5 357 277 98 163 259 114 1 525 676 5 28 696 -359 070 0 -330 374 0	6 357 277 <i>83 912</i> <i>273 365</i> 1 252 311 6 47 327 -359 070 0 -311 743 0	7 357 277 <i>68 877</i> <i>288 400</i> 963 911 7 7 66 891 -359 070 0 -292 179 0	8 357 277 <i>53 015</i> <i>304 262</i> 659 648 8 8 8 87 436 -359 070 0 -271 634 0	9 357 277 <i>36 281</i> <i>320 997</i> 338 652 9 109 014 -359 070 0 -250 056 0	10 357 277 <i>18 626</i> <i>338 652</i> 0 10 10 131 676 -359 070 0 -227 393 0	11 0 0 0 11 155 481 -23 322	12 0 0 0 12 160 836 -24 125	13 0 0 0 13 -40 426 -40 426 0	14 0 0 0 14 0 0 -0	15 0 0 0 15 15 0 0	16 0 0 0 16 16 0 0 0 -0	879 751 2 693 023 2 693 023 16 years 668 947 -3 590 698 0 -2 921 751

With subsidy

2.Resource-efficiency Scenario (Biogas CHP) - Cash Flow

Investments	EURO	Post-Financing	EURO	Debt term (years)	10	Electricity feed-in tariff (year 1-10)	212.64 € /MWh
Investment waste separation and wet digestion	3 590 698	Debt Capital 75.0%	768 276	Interest rate:	6%	Electricity feed-in tariff (after year 10)	170.11 € /MWh
Subsidy	2 566 330	Equity Capital 25.0%	256 092			Market price (after 20 years)	103.07 € /MWh
Investment (minus) subsidy	1 024 368	Total	1 024 368	Subsidy	71%	Increase in the waste management tariff	0.00 € /m3

Cash Flow Model, EUR	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Year of contract in exploitation	2017	1	2019	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Energy sale		*	-							-	10			10	- 1	10	10	
Energy price inflation, %			4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	
General price inflation, %			3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Feedstock price inflation, %			2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
Electricity sale		235 636	476 340	385 186	397 280	409 755	422 621	435 892	449 579	463 695	478 256	493 273	508 761	317 937	0	0	0	5 474 211
Heat sale		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Income from waste management tariff		0	0	0 385 186	0 397 280	0 409 755	0 422 621	0 435 892	0	0	0 478 256	0 493 273	0 508 761	0 317 937	0	0	0	5 474 211
Income Cost for the feedstock		235 636	476 340	303 100	397 280	409755	422 021	433 692	449 579	463 695	4/6 250	495 275	508 761	31/93/	0	U	U	5 4/4 211
O&M cost		-251 349	-258 889	-266 656	-274 656	-282 895	-291 382	-300 124	-309 127	-318 401	-327 953	-337 792	-347 926	-358 363	0	0	0	-3 925 514
Corporate income tax 15.0%		0	0	0	0	0	0	0	0	0	0	-23 322	-24 125	0	-0	-0	-0	-47 448
Operational Cashflow		-15 713	217 450	118 530	122 625	126 860	131 239	135 768	140 451	145 294	150 302	132 159	136 711	-40 426	-0	-0	-0	1 501 250
Investment and Financing																		
Investment	-3 590 698																	-3 590 698
Debt financing	768 276								1									768 276
Subsidy	2 566 330																	2 566 330
Pre-subsidy debt cost									ł									0
Return of subsidy to bank Debt service		-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	0	0	0	0	0	0	-1 019 254
Own financing	256 092	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	-101 925	0	0	0	0	0	0	256 092
FREE CASH FLOW		-117 639	115 525	16 604	20 699	24 934	29 314	33 843	38 526	43 369	48 377	132 159	136 711	-40 426	-0	-0	-0	481 995
Annual return on investment:									1									
Oper. Cash Flow/ Debt payment:		-0.15	2.13	1.16	1.20	1.24	1.29	1.33	1.38	1.43	1.47	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.25
201		-1.5%	21.2%	11.6%	12.0%	12.4%	12.8%	13.3%	13.7%	14.2%	14.7%	12.9%	13.3%	-3.9%	0.0%	0.0%	0.0%	
PV - 16 years @6.4%																		
4FV - 10 years @0.4%	Ls 13 703.67								1									
	Ls 13 /03.6/ 7%																	
RR Debt Capital payments		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
RR		1 101 925	2 101 925	3 101 925	4 101 925	5 101 925	6 101 925	7 101 925	8 101 925	9 101 925	10 101 925	11 0	12 0	13 0	14 0	15 0	16 0	1 019 254
RR Debt Capital payments		-	_					<i>,</i>									16 0 0	1 019 254 <i>250 979</i>
RR Debt Capital payments Annual loan repayment Interest payment		101 925 <i>42 255</i>	101 925 <i>38 973</i>	101 925 <i>35 511</i>	101 925 <i>31 858</i>	101 925 28 004	101 925 23 939	101 925 <i>19 650</i>	101 925 <i>15 124</i>	101 925 <i>10 350</i>	101 925 5 314	0 0	0 0	0 0	0 0	0 <i>0</i>	16 0 0	250 979
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal		101 925 42 255 59 670	101 925 <i>38 973</i> <i>62 952</i>	101 925 <i>35 511</i> <i>66 415</i>	101 925 <i>31 858</i> <i>70 067</i>	101 925 28 004 73 921	101 925 23 939 77 987	101 925 <i>19 650</i> <i>82 276</i>	101 925 <i>15 124</i> <i>86 801</i>	101 925 <i>10 350</i> <i>91 575</i>	101 925 5 314 96 612	0 0 0	0 0	0 0	0 0 0	0 0 0	16 0 0	250 979 768 276
RR Debt Capital payments Annual loan repayment Interest payment		101 925 <i>42 255</i>	101 925 <i>38 973</i>	101 925 <i>35 511</i>	101 925 <i>31 858</i>	101 925 28 004	101 925 23 939	101 925 <i>19 650</i>	101 925 <i>15 124</i>	101 925 <i>10 350</i>	101 925 5 314	0 0	0 0	0 0	0 0	0 <i>0</i>	16 0 0 0 0	250 979
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance		101 925 42 255 59 670	101 925 <i>38 973</i> <i>62 952</i>	101 925 <i>35 511</i> <i>66 415</i>	101 925 <i>31 858</i> <i>70 067</i>	101 925 28 004 73 921	101 925 23 939 77 987	101 925 <i>19 650</i> <i>82 276</i>	101 925 <i>15 124</i> <i>86 801</i>	101 925 <i>10 350</i> <i>91 575</i>	101 925 5 314 96 612	0 0 0	0 0	0 0	0 0 0	0 0 0	0 0 0	250 979 768 276 768 276
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal		101 925 42 255 59 670	101 925 <i>38 973</i> <i>62 952</i> 645 653	101 925 <i>35 511</i> <i>66 415</i>	101 925 <i>31 858</i> <i>70 067</i>	101 925 28 004 73 921	101 925 23 939 77 987	101 925 <i>19 650</i> <i>82 276</i>	101 925 <i>15 124</i> <i>86 801</i> 188 187	101 925 <i>10 350</i> <i>91 575</i>	101 925 5 314 96 612 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	16 0 0 0 16	250 979 768 276
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax		101 925 42 255 59 670	101 925 <i>38 973</i> <i>62 952</i> 645 653	101 925 <i>35 511</i> <i>66 415</i>	101 925 <i>31 858</i> <i>70 067</i>	101 925 28 004 73 921	101 925 23 939 77 987	101 925 <i>19 650</i> <i>82 276</i>	101 925 <i>15 124</i> <i>86 801</i> 188 187	101 925 <i>10 350</i> <i>91 575</i>	101 925 5 314 96 612 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	250 979 768 276 768 276
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, %		101 925 <i>42 255</i> <i>59 670</i> 708 606	101 925 <i>38 973</i> <i>62 952</i> 645 653	101 925 <i>35 511</i> <i>66 415</i>	101 925 <i>31 858</i> <i>70 067</i>	101 925 28 004 73 921	101 925 23 939 77 987	101 925 <i>19 650</i> <i>82 276</i>	101 925 <i>15 124</i> <i>86 801</i> 188 187	101 925 <i>10 350</i> <i>91 575</i>	101 925 5 314 96 612 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	250 979 768 276 768 276 16 years
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years		101 925 42 255 59 670 708 606 1 100%	101 925 <i>38 973</i> <i>62 952</i> 645 653 2	101 925 <i>35 511</i> <i>66 415</i> 579 239 3	101 925 <i>31 858</i> <i>70 067</i> 509 172	101 925 28 004 73 921 435 251 5	101 925 23 939 77 987 357 264 6	101 925 <i>19 650</i> <i>82 276</i> 274 988	101 925 <i>15 124</i> <i>86 801</i> 188 187 8	101 925 10 350 91 575 96 612 9	101 925 5 314 96 612 0	11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	250 979 768 276 768 276 16 years
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income		101 925 42 255 59 670 708 606 1 100% -57 968	101 925 <i>38 973</i> <i>62 952</i> 645 653 2	101 925 <i>35 511</i> <i>66 415</i> 579 239 3	101 925 <i>31 858</i> <i>70 067</i> 509 172	101 925 28 004 73 921 435 251 5	101 925 23 939 77 987 357 264 6	101 925 <i>19 650</i> <i>82 276</i> 274 988	101 925 <i>15 124</i> <i>86 801</i> 188 187 8	101 925 10 350 91 575 96 612 9	101 925 5 314 96 612 0	11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	250 979 768 276 768 276 16 years 1 297 719
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment expensed Investment depreciated		101 925 42 255 59 670 708 606 1 100% -57 968 0	101 925 <i>38 973</i> <i>62 952</i> 645 653 2 178 477	101 925 35 511 66 415 579 239 3 83 019	101 925 <i>31 858</i> <i>70 067</i> 509 172 4 90 767	101 925 28 004 73 921 435 251 5 98 855	101 925 23 939 77 987 357 264 6 107 300	101 925 19 650 82 276 274 988 7 116 119	101 925 15 124 86 801 188 187 8 125 327	101 925 10 350 91 575 96 612 9 134 944	101 925 5 314 96 612 0 10 144 989	11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	250 979 768 276 768 276 16 years 1 297 719 -1 024 368
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment expensed		101 925 42 255 59 670 708 606 1 100% -57 968 0 -102 437	101 925 <i>38 973</i> <i>62 952</i> 645 653 2 178 477 -102 437	101 925 35 511 66 415 579 239 3 83 019 -102 437	101 925 31 858 70 067 509 172 4 4 90 767 -102 437	101 925 28 004 73 921 435 251 5 98 855 -102 437	101 925 23 939 77 987 357 264 6 107 300 -102 437	101 925 19 650 82 276 274 988 7 116 119 -102 437	101 925 15 124 86 801 188 187 8 125 327 -102 437	101 925 10 350 91 575 96 612 9 134 944 -102 437	101 925 5 314 96 612 0 10 144 989 -102 437	11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	250 979 768 276 768 276 16 years 1 297 719 -1 024 368 -2 566 330
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment depreciated Subsidy Accumultated Taxable income		101 925 42 255 59 670 708 606 1 100% -57 968 0 -102 437 -256 633	101 925 <i>38 973</i> <i>62 952</i> 645 653 2 178 477 -102 437 -256 633	101 925 <i>35 511</i> <i>66 415</i> 579 239 3 83 019 -102 437 -256 633	101 925 31 858 70 067 509 172 4 90 767 -102 437 -256 633	101 925 28 004 73 921 435 251 5 98 855 -102 437 -256 633	101 925 23 939 77 987 357 264 6 107 300 -102 437 -256 633	101 925 19 650 82 276 274 988 7 116 119 -102 437 -256 633	101 925 15 124 86 801 188 187 8 125 327 -102 437 -256 633	101 925 <i>10 350</i> <i>91 575</i> 96 612 9 134 944 -102 437 -256 633	101 925 5 314 96 612 0 10 144 989 -102 437 -256 633	0 0 0 11 155 481	0 0 0 12 160 836	0 0 0 13 -40 426	0 0 0 14	0 0 0 15	0 0 0 16	250 979 768 276 768 276 16 years 1 297 719 -1 024 368 -2 566 330 -2 292 979
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment depreciated Subsidy Accumultated Taxable income Corporate income tax 15.0%		101 925 42 255 59 670 708 606 1 100% -57 968 0 -102 437 -256 633 -417 038	101 925 <i>38 973</i> <i>62 952</i> 645 653 2 178 477 -102 437 -256 633 -180 593	101 925 <i>35 511</i> <i>66 415</i> 579 239 3 83 019 -102 437 -256 633 -276 051	101 925 31 858 70 067 509 172 4 90 767 -102 437 -256 633 -268 303	101 925 28 004 73 921 435 251 5 98 855 -102 437 -256 633 -260 214	101 925 23 939 77 987 357 264 6 107 300 -102 437 -256 633 -251 769	101 925 19 650 82 276 274 988 7 116 119 -102 437 -256 633 -242 951	101 925 15 124 86 801 188 187 8 125 327 -102 437 -256 633 -233 743	101 925 <i>10 350</i> <i>91 575</i> 96 612 9 134 944 -102 437 -256 633 -224 126	101 925 5 314 96 612 0 10 144 989 -102 437 -256 633 -214 081	0 0 0 11 155 481	0 0 0 12 160 836	0 0 0 13 -40 426 -40 426	0 0 0 14 0	0 0 0 15 0	0 0 0 16 0	250 979 768 276 768 276 16 years 1 297 719 -1 024 368 -2 566 330 -2 292 979
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment depreciated Subsidy Accumultated Taxable income Corporate income tax 15.0%		101 925 42 255 59 670 708 606 1 100% -57 968 0 -102 437 -256 633 -417 038	101 925 <i>38 973</i> <i>62 952</i> 645 653 2 178 477 -102 437 -256 633 -180 593	101 925 <i>35 511</i> <i>66 415</i> 579 239 3 83 019 -102 437 -256 633 -276 051	101 925 31 858 70 067 509 172 4 90 767 -102 437 -256 633 -268 303	101 925 28 004 73 921 435 251 5 98 855 -102 437 -256 633 -260 214	101 925 23 939 77 987 357 264 6 107 300 -102 437 -256 633 -251 769	101 925 19 650 82 276 274 988 7 116 119 -102 437 -256 633 -242 951	101 925 15 124 86 801 188 187 8 125 327 -102 437 -256 633 -233 743	101 925 <i>10 350</i> <i>91 575</i> 96 612 9 134 944 -102 437 -256 633 -224 126	101 925 5 314 96 612 0 10 144 989 -102 437 -256 633 -214 081	0 0 0 11 155 481	0 0 0 12 160 836	0 0 0 13 -40 426 -40 426	0 0 0 14 0	0 0 0 15 0	0 0 0 16 0	250 979 768 276 768 276 16 years 1 297 719 -1 024 368 -2 566 330 -2 292 979
RR Debt Capital payments Annual loan repayment Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment expensed Investment depreciated Subsidy		101 925 42 255 59 670 708 606 1 100% -57 968 0 -102 437 -256 633 -417 038	101 925 <i>38 973</i> <i>62 952</i> 645 653 2 178 477 -102 437 -256 633 -180 593	101 925 <i>35 511</i> <i>66 415</i> 579 239 3 83 019 -102 437 -256 633 -276 051	101 925 31 858 70 067 509 172 4 90 767 -102 437 -256 633 -268 303	101 925 28 004 73 921 435 251 5 98 855 -102 437 -256 633 -260 214	101 925 23 939 77 987 357 264 6 107 300 -102 437 -256 633 -251 769	101 925 19 650 82 276 274 988 7 116 119 -102 437 -256 633 -242 951	101 925 15 124 86 801 188 187 8 125 327 -102 437 -256 633 -233 743	101 925 <i>10 350</i> <i>91 575</i> 96 612 9 134 944 -102 437 -256 633 -224 126	101 925 5 314 96 612 0 10 144 989 -102 437 -256 633 -214 081	0 0 0 11 155 481	0 0 0 12 160 836	0 0 0 13 -40 426 -40 426	0 0 0 14 0	0 0 0 15 0	0 0 0 16 0	250 979 768 276 768 276 16 years 1 297 719 -1 024 368 -2 566 330 -2 292 979

With increased waste management tariff

2.Resource-efficiency Scenario (Biogas CHP) - Cash Flow

Investments	EURO	Post-Financing	EURO	Debt term (years)	10	Electricity feed-in tariff (year 1-10)	212.64 € /MWh
Investment waste separation and wet digestion	3 590 698	Debt Capital 75.0%	2 693 023	Interest rate:	6%	Electricity feed-in tariff (after year 10)	170.11 € /MWh
Subsidy	0	Equity Capital 25.0%	897 674			Market price (after 20 years)	103.07 € /MWh
Investment (minus) subsidy	3 590 698	Total	3 590 698	Subsidy	0%	Increase in the waste management tariff	1.88 € /m3

Cash Flor	w Model, EUR	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
	ract in exploitation		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Energy sale																			
	Energy price inflation, % General price inflation, %			4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	4.5% 3.0%	
	Feedstock price inflation, %			2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	
Electricity sale	recusiock price milation, 70		235 636	476 340	385 186	397 280	409 755	422 621	435 892	449 579	463 695	478 256	493 273	508 761	317 937	2.070	2.070	2.0%	5 474 211
Heat sale			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Income from waste	e management tariff		264 454	267 979	271 551	280 078	288 873	297 943	307 299	316 948	326 900	337 165	347 752	358 671	369 933	0	0	0	
Income			500 090	744 319	656 737	677 359	698 628	720 565	743 190	766 526	790 595	815 420	841 024	867 432	687 871	0	0	0	9 509 756
Cost for the feedstock			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
O&M cost	45.00/		-251 349	-258 889	-266 656	-274 656 0	-282 895 0	-291 382	-300 124	-309 127	-318 401	-327 953	-337 792	-347 926	-358 363	0	0	0	-3 925 514
Corporate income tax Operational Cashflo			248 741	485 430	390 081	402 703	415 732	429 182	-2 268 440 799	-6 797 450 602	-11 527 460 668	- <u>16 466</u> 471 001	-75 485 427 748	-77 926 441 581	-49 426 280 081	 -0	-0 -0	-0 -0	-239 894 5 344 348
Investment and Fin			240 741	485 430	390 081	402 703	415752	429 102	440 7 9 9	450 002	400 008	4/1001	427 740	441 561	280 081	-0	-0	-0	5 544 546
Investment	lancing	-3 590 698																	-3 590 698
Debt financing		2 693 023																	2 693 023
Subsidy		0																	0
Pre-subsidy debt cost																			0
Return of subsidy to be	ank																		0
Debt service		007 (74	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	0	0	0	0	0	0	-3 572 774
Own financing FREE CASH FLOW		897 674	-108 537	128 152	32 804	45 425	58 455	71 905	83 521	93 325	103 390	113 724	427 748	441 581	280 081	-0	-0	-0	897 674 1 771 574
FREE CASH FLOW		U	-108 557	120 152	52 804	43 423	36433	71 905	65 521	95 525	103 390	113724	427 740	441 301	200 001	-0	-0	-0	17/13/4
	Annual return on investment:																		
Oper. Cash Flow/ Deb	bt payment:		0.70	1.36	1.09	1.13	1.16	1.20	1.23	1.26	1.29	1.32	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.17
ROI			6.9%	13.5%	10.9%	11.2%	11.6%	12.0%	12.3%	12.5%	12.8%	13.1%	11.9%	12.3%	7.8%	0.0%	0.0%	0.0%	
NPV - 16 years @6.4%	%	Ls 50 823.76																	
NPV - 16 years @6.4% IRR	Ж	Ls 50 823.76 7%																	
• •			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
IRR	ents		1 357 277	2 357 277	3 357 277	4 357 277	5 357 277	6 357 277	7 357 277	8 357 277	9 357 277	10 357 277	11	12 0	13 0	<u>1</u> 4 0	15 0	16 0	3 572 774
IRR Debt Capital payme	ents		1 357 277 <i>148 116</i>	2	5	4 357 277 <i>111 672</i>	3	6 357 277 <i>83 912</i>	,										3 572 774 <i>879 751</i>
IRR Debt Capital payme Annual loan repaym Interest payment	ents		148 116	357 277 <i>136 612</i>	357 277 124 476	111 672	357 277 98 163	83 912	357 277 68 877	357 277 <i>53 015</i>	357 277 <i>36 281</i>	357 277 18 626	0	0		0	0		879 751
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal	ents		148 116 209 161	357 277 136 612 220 665	357 277 124 476 232 802	111 672 245 606	357 277 98 163 259 114	83 912 273 365	357 277 68 877 288 400	357 277 53 015 304 262	357 277 <i>36 281</i> <i>320 997</i>	357 277	0 0 0	0 0 0	0 0	0 0	0 0		879 751 2 693 023
IRR Debt Capital payme Annual loan repaym Interest payment	ents		148 116	357 277 <i>136 612</i>	357 277 124 476	111 672	357 277 98 163	83 912	357 277 68 877	357 277 <i>53 015</i>	357 277 <i>36 281</i>	357 277 18 626 338 652	0 0	0 0	0 0	0 0	0 0		879 751
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal	ents ment		148 116 209 161	357 277 136 612 220 665	357 277 124 476 232 802	111 672 245 606	357 277 98 163 259 114	83 912 273 365	357 277 68 877 288 400	357 277 53 015 304 262	357 277 <i>36 281</i> <i>320 997</i>	357 277 18 626 338 652	0 0 0	0 0 0	0 0	0 0	0 0		879 751 2 693 023
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance	ents ment tax		148 116 209 161	357 277 <i>136 612</i> <i>220 665</i> 2 263 197	357 277 124 476 232 802	111 672 245 606	357 277 <i>98 163</i> <i>259 114</i> 1 525 676	83 912 273 365	357 277 68 877 288 400	357 277 <i>53 015</i> <i>304 262</i> 659 648	357 277 <i>36 281</i> <i>320 997</i> 338 652	357 277 18 626 338 652 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income to	ants ment tax pensed in Year 1, %		148 116 209 161	357 277 <i>136 612</i> <i>220 665</i> 2 263 197	357 277 124 476 232 802	111 672 245 606	357 277 <i>98 163</i> <i>259 114</i> 1 525 676	83 912 273 365	357 277 68 877 288 400	357 277 <i>53 015</i> <i>304 262</i> 659 648	357 277 <i>36 281</i> <i>320 997</i> 338 652	357 277 18 626 338 652 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Exp	ants ment tax pensed in Year 1, %		148 116 209 161 2 483 862 1	357 277 <i>136 612</i> <i>220 665</i> 2 263 197	357 277 124 476 232 802	111 672 245 606	357 277 <i>98 163</i> <i>259 114</i> 1 525 676	83 912 273 365	357 277 68 877 288 400	357 277 <i>53 015</i> <i>304 262</i> 659 648	357 277 <i>36 281</i> <i>320 997</i> 338 652	357 277 18 626 338 652 0	0 0 0	0 0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	<i>879 751</i> <i>2 693 023</i> 2 693 023
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Exp Part of Investment Dep	ants ment tax pensed in Year 1, %		148 116 209 161 2 483 862 1 100%	357 277 136 612 220 665 2 263 197 2	357 277 124 476 232 802 2 030 396	111 672 245 606 1 784 790 4	357 277 <i>98 163</i> <i>259 114</i> 1 525 676	<i>83 912</i> <i>273 365</i> 1 252 311 6	357 277 68 877 288 400 963 911	357 277 <i>53 015</i> <i>304 262</i> 659 648	357 277 <i>36 281</i> <i>320 997</i> 338 652 9	357 277 18 626 338 652 0 10	0 0 0 11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	879 751 2 693 023 2 693 023 16 years
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Dep Taxable income	ents ment tax pensed in Year 1, % preciated over years		148 116 209 161 2 483 862 1 100%	357 277 136 612 220 665 2 263 197 2	357 277 124 476 232 802 2 030 396	111 672 245 606 1 784 790 4	357 277 <i>98 163</i> <i>259 114</i> 1 525 676	<i>83 912</i> <i>273 365</i> 1 252 311 6	357 277 68 877 288 400 963 911	357 277 <i>53 015</i> <i>304 262</i> 659 648	357 277 <i>36 281</i> <i>320 997</i> 338 652 9	357 277 18 626 338 652 0 10	0 0 0 11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	879 751 2 693 023 2 693 023 16 years
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Exp Part of Investment Dep Taxable income Investment expensed	ents ment tax pensed in Year 1, % preciated over years		148 116 209 161 2 483 862 1 100% 100 624 0	357 277 136 612 220 665 2 263 197 2 348 817	357 277 124 476 232 802 2 030 396 3 265 605	111 672 245 606 1 784 790 4 291 031	357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 317 569	83 912 273 365 1 252 311 6 345 270	357 277 68 877 288 400 963 911 7 374 189	357 277 53 015 304 262 659 648 8 8 404 384	357 277 <i>36 281</i> <i>320 997</i> 338 652 9 435 914	357 277 18 626 338 652 0 10 468 841	0 0 0 11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	879 751 2 693 023 2 693 023 16 years 4 704 491
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Exp Part of Investment Dep Taxable income Investment expensed Investment depreciate	ents ment kax pensed in Year 1, % preciated over years ed		148 116 209 161 2 483 862 1 100% 100 624 0	357 277 136 612 220 665 2 263 197 2 348 817	357 277 124 476 232 802 2 030 396 3 265 605 -359 070	111 672 245 606 1 784 790 4 291 031 -359 070	357 277 <i>98 163</i> <i>259 114</i> 1 525 676 5 317 569 -359 070	83 912 273 365 1 252 311 6 345 270	357 277 68 877 288 400 963 911 7 374 189 -359 070	357 277 53 015 304 262 659 648 8 404 384 -359 070	357 277 <i>36 281</i> <i>320 997</i> 338 652 9 435 914 -359 070	357 277 18 626 338 652 0 10 468 841 -359 070	0 0 0 11	12 0 0 0 12	0 0 0 13	0 0 0 14	0 0 0 15	0 0 0 16	879 751 2 693 023 2 693 023 16 years 4 704 491
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Dep Taxable income Investment expensed Investment expensed Investment expensed Subsidy	ents ment tax pensed in Year 1, % preciated over years ed : income		148 116 209 161 2 483 862 1 100% 100 624 0 -359 070 0	357 277 136 612 220 665 2 263 197 2 348 817 - 359 070 0	357 277 124 476 232 802 2 030 396 3 265 605 -359 070 0	111 672 245 606 1 784 790 4 291 031 -359 070 0	357 277 98 163 259 114 1 525 676 5 317 569 -359 070 0	83 912 273 365 1 252 311 6 345 270 -359 070 0	357 277 68 877 288 400 963 911 7 374 189 - 359 070 0	357 277 53 015 304 262 659 648 8 8 404 384 - 359 070 0	357 277 <i>36 281</i> <i>320 997</i> 338 652 9 435 914 -359 070 0	357 277 <i>18 626</i> <i>338 652</i> 0 10 468 841 -359 070 0	0 0 0 11 503 232	0 0 0 12 519 507	0 0 0 13 329 507	0 0 0 14	0 0 0 15	0 0 0 0 16	879 751 2 693 023 2 693 023 16 years 4 704 491 -3 590 698 0
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income t Part of Investment Exp Part of Investment Dep Taxable income Investment expensed Investment depreciate Subsidy Accumultated Taxable	ents ment tax pensed in Year 1, % preciated over years ed : income		148 116 209 161 2 483 862 1 100% 100 624 0 -359 070 0 -258 445	357 277 136 612 220 665 2 263 197 2 348 817 -359 070 0 -10 253	357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 265 605 -359 070 0 -93 465	111 672 245 606 1 784 790 4 291 031 -359 070 0 -68 039	357 277 98 163 259 114 1 525 676 5 317 569 -359 070 0 -41 501	83 912 273 365 1 252 311 6 345 270 -359 070 0 -13 800	357 277 68 877 288 400 963 911 7 374 189 -359 070 0 15 120	357 277 53 015 304 262 659 648 8 404 384 -359 070 0 45 314	357 277 <i>36 281</i> <i>320 997</i> 338 652 9 435 914 - 359 070 0 76 844	357 277 <i>18 626</i> <i>338 652</i> 0 10 468 841 -359 070 0 109 771	0 0 0 11 503 232	0 0 0 12 519 507 519 507	0 0 0 13 329 507	0 0 0 14 0	0 0 0 15 0	0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 4 704 491 -3 590 698 0 1 113 793
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income ta Part of Investment Dep Taxable income Investment expensed Investment depreciate Subsidy Accumultated Taxable Corporate income taxable	ents ment tax pensed in Year 1, % preciated over years ed : income		148 116 209 161 2 483 862 1 100% 100 624 0 -359 070 0 -258 445	357 277 136 612 220 665 2 263 197 2 348 817 -359 070 0 -10 253	357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 265 605 -359 070 0 -93 465	111 672 245 606 1 784 790 4 291 031 -359 070 0 -68 039	357 277 98 163 259 114 1 525 676 5 317 569 -359 070 0 -41 501	83 912 273 365 1 252 311 6 345 270 -359 070 0 -13 800	357 277 68 877 288 400 963 911 7 374 189 -359 070 0 15 120	357 277 53 015 304 262 659 648 8 404 384 -359 070 0 45 314	357 277 <i>36 281</i> <i>320 997</i> 338 652 9 435 914 - 359 070 0 76 844	357 277 <i>18 626</i> <i>338 652</i> 0 10 468 841 -359 070 0 109 771	0 0 0 11 503 232	0 0 0 12 519 507 519 507	0 0 0 13 329 507	0 0 0 14 0	0 0 0 15 0	0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 4 704 491 -3 590 698 0 1 113 793
IRR Debt Capital payme Annual loan repaym Interest payment Payment on principal Balance Corporate Income ta Part of Investment Dep Taxable income Investment expensed Investment depreciate Subsidy Accumultated Taxable Corporate income taxable	ents ment tax pensed in Year 1, % preciated over years ed : income		148 116 209 161 2 483 862 1 100% 100 624 0 -359 070 0 -258 445	357 277 136 612 220 665 2 263 197 2 348 817 -359 070 0 -10 253	357 277 <i>124 476</i> <i>232 802</i> 2 030 396 3 265 605 -359 070 0 -93 465	111 672 245 606 1 784 790 4 291 031 -359 070 0 -68 039	357 277 98 163 259 114 1 525 676 5 317 569 -359 070 0 -41 501	83 912 273 365 1 252 311 6 345 270 -359 070 0 -13 800	357 277 68 877 288 400 963 911 7 374 189 -359 070 0 15 120	357 277 53 015 304 262 659 648 8 404 384 -359 070 0 45 314	357 277 <i>36 281</i> <i>320 997</i> 338 652 9 435 914 - 359 070 0 76 844	357 277 <i>18 626</i> <i>338 652</i> 0 10 468 841 -359 070 0 109 771	0 0 0 11 503 232	0 0 0 12 519 507 519 507	0 0 0 13 329 507	0 0 0 14 0	0 0 0 15 0	0 0 0 16 0	879 751 2 693 023 2 693 023 16 years 4 704 491 -3 590 698 0 1 113 793

Annex 5: Cash flow analysis – wet fermentation + CHP + biogas upgrading

2.Resource-efficiency Scenario (Biometha Investments Investment Wef Fermentation Unit Investment Biogas Upgrading Facility Subsidy Mogas Upgrading Facility Subsidy Investment (minus) subsidy 1 Investment (minus) subsidy 2	ane) - Cash Fl EURO 3 590 698 684 302 0 0 3 590 698 684 302		Post-Finan Debt Capital Debt Capital Equity Capita Equity Capita Total 1 Total 2	75.0% 75.0% al 25.0%	EURO 2 693 023 513 227 897 674 171 076 3 590 698 684 302		Debt term (ye Interest rate: Subsidy 1 Subsidy 2		10 6% 0% 0%			feed-in tariff	ethane price (year 1-10) (ter year 10)	0.74 € 212.64 € 170.11 €	/MWh			
Cash Flow Model, EUR Year of contract in exploitation	2017	2018	2019 2	2020 3	2021 4	2022 5	2023 6	2024 7	2025 8	2026 9	2027 10	2028 <i>11</i>	2029 12	2030 13	2031 14	2032 15	2033 16	
Energy sale		1	2	5	7	5	U		0	9	10	11	12	15	17	15	10	
Energy price inflation, % General price inflation, % Feedstock price inflation, % Electricity sale Heat sale		194 295 0	4.5% 3.0% 2.0% 392 609 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0	4.5% 3.0% 2.0% 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0	4.5% 3.0% 2.0% 0	4.5% 3.0% 2.0% 0 0	4.5% 3.0% 2.0% 0	4.5% 3.0% 2.0% 0	4.5% 3.0% 2.0% 0	586 903 0
Income from waste management tariff		Ó	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ó	Ó
Biomethane sale		0	0	581 613	586 297	591 229	596 452	597 647	634 906	674 487	716 536	761 206	808 662	859 075	0	0	0	7 408 111
Income Cost for the feedstock		194 295	392 609	581 613 0	586 297 0	591 229 0	596 452 0	597 647 0	634 906 0	674 487 0	716 536 0	761 206 0	808 662 0	859 075 0	0	0	0	7 995 014 0
O&M cost		-76 716	-79 018	-81 388	-83 830	-86 345	-45 763	-47 136	-48 550	-50 006	-51 506	-53 051	-54 643	-56 282	0	0	0	-814 233
O&M cost upgrading plant		0	0	0	0	0	-44 528	-45 864	-47 240	-48 657	-50 116	-51 620	-53 169	-54 764	0	0	0	-395 956
Corporate income tax 15.0%		0	0	-2 502	-4 759	-7 148	-5 892	-8 120	-15 876	-24 105	-32 836	-95 959	-102 838	-110 154	0	0	-0	-410 189
Operational Cashflow Investment and Financing		117 579	313 591	497 723	497 708	497 737	500 270	496 528	523 241	551 719	582 078	560 576	598 012	637 875	0	0	-0	6 374 637
Investment	-3 590 698					-684 302												-4 275 000
Debt financing	2 693 023					513 227												3 206 250
Subsidy	0					0												0
Pre-subsidy debt cost Return of subsidy to bank																		0
Debt service 1		-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277							-3 572 774
Debt service 2		557 277	557 277	557 277	557 277	557 277	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	0	0		-648 160
Own financing	897 674					171 076												1 068 750
FREE CASH FLOW	0	-239 699	-43 686	140 446	140 431	140 460	61 972	58 231	84 943	113 422	143 780	479 556	516 992	556 855	0	0	-0	2 153 703
Annual return on investment:																		
Oper. Cash Flow/ Debt payment: ROI		0.33 3.3%		1.39 13.9%	1.39 13.9%	1.39 13.9%	1.14 11.7%	1.13 11.6%	1.19 12.2%	1.26 12.9%	1.33 13.6%	6.92 81.9%	7.38 87.4%	7.87 93.2%	#DIV/0! 0.0%	#DIV/0! 0.0%	#DIV/0! 0.0%	1.14
NPV - 16 years @6.4%	Ls 7 453.68								1									
IRR	7%	4	2	2	4	5	6	-	8	9	10		42	10		15	16	
Debt Capital payments Annual loan repayment 1		357 277	357 277	357 277	4 357 277	357 277	357 277	357 277	357 277		357 277	0	12	1.5	14	15	16	3 572 774
Interest payment		148 116		124 476	111 672	98 163	83 912	68 877	53 015	36 281	18 626	ō	0	0	0	0	0	879 751
Payment on principal		209 161	220 665	232 802	245 606	259 114	273 365	288 400	304 262	320 997	338 652	0	0	0	0	0	0	2 693 023
Balance		2 483 862	2 263 197	2 030 396	1 784 790	1 525 676	1 252 311	963 911	659 648	338 652	0	0	0	0	0	0	0	2 693 023
Annual loan repayment 2							81 020	81 020	81 020	81 020	81 020	81 020	81 020	81 020	0	0 0	0	648 160
Interest payment Payment on principal							28 227 52 793	25 324 55 696	22 261 58 759	19 029 61 991	15 619 65 401	12 022 68 998	8 227 72 793	4 224 76 796	0	0	0	134 933 513 227
Balance							460 434	404 738	345 978	283 987	218 587	149 589	76 796	0	0	0	0	513 227
									1									
Corporate Income tax		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	16 years
Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years		100%																
Taxable income		-30 538	176 979	375 749	390 795	406 721	466 777	481 635	533 341	588 201	646 404	708 155	754 019	802 793	0	0	0	6 301 031
Investment expensed		0													-	-	-	
Investment depreciated 1		-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070							-3 590 698
Investment depreciated 2 Subsidy 1		0	0	0	0	0	-68 430 0	-68 430 0	-68 430 0	-68 430 0	-68 430 0	-68 430	-68 430	-68 430	-68 430	-68 430		-684 302 0
Subsidy 1 Subsidy 2		0	U	U	U	U	0	0	0 !	0	0	0	0	0	0	0		0
Accumultated Taxable income		-389 608	-182 091	16 679	31 726	47 652	39 277	54 135	105 841	160 701	218 904	639 725	685 588	734 363	-68 430	-68 430	0	2 026 031
Corporate income tax 15.0%		0	0	-2 502	-4 759	-7 148	-5 892	-8 120	-15 876	-24 105	-32 836	-95 959	-102 838	-110 154	0	0	-0	
8																		
Rec																		
Ket.																		
Kec	-897 674	-239 699	-43 686	140 446	140 431	-30.616	61 972	58 231	84 943	113 422	143 780	479 556	516 992	556 855	n	n	-0	
Net.	-897 674	-239 699	-43 686	140 446	140 431	-30 616	61 972	58 231	84 943	113 422	143 780	479 556	516 992	556 855	0	0	-0	

With subsidy

2.Resource-efficiency	Scenario	(Biomethane)	- Cash	Flow
Zinesource-entrient	Juliano	Diomethane	- Casii	110 44

Investments	EURO		Post-Finan	cing	EURO	1	Debt term (ye	ars)	10			Biome	thane price	0.35€	/Nm3			
Investment Wet Fermentation Unit	3 590 698		Debt Capital		1 007 628		Interest rate:		6%		Electricity	feed-in tariff	(year 1-10)	212.64 €	/MWh			
Investment Biogas Upgrading Facility	684 302		Debt Capital	75.0%	513 227													
Subsidy Wet AD plant	2247194		Equity Capita	al 25.0%	335 876	:	Subsidy 1		63%		Electricity fee	ed-in tariff (af	ter year 10) _	170.11€	/MWh			
Subsidy Biogas Upgrading Facility	0		Equity Capita	al 25.0%	171 076		Subsidy 2		0%									
Investment (minus) subsidy 1	1 343 504		Total 1		1 343 504													
Investment (minus) subsidy 2	684 302		Total 2		684 302													
Cash Flow Model, EUR	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Year of contract in exploitation		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Energy sale									1									
Energy price inflation, %			4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	
General price inflation, %			3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Feedstock price inflation, %		194 295	<i>2.0%</i> 392 609	2.0%	2.0% 0	2.0% 0	2.0%	2.0% 0	2.0%	2.0%	2.0% 0	2.0%	2.0% 0	2.0% 0	2.0%	2.0% 0	2.0%	586 903
		194 295	392 609	0	0	0	0	0	0	0	0	0	0	0	0	0	0	586 903
Heat sale		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income from waste management tariff		-	0	•	276 600		0	202.026	0	210.200	0		•	405 407	0	0	-	2 405 070
Biomethane sale Income		0 194 295	392 609	274 470 274 470	276 680 276 680	279 008 279 008	281 472 281 472	282 036 282 036	299 619 299 619	318 298 318 298	338 141 338 141	359 222 359 222	381 616 381 616	405 407 405 407	0	0	0	3 495 970 4 082 873
Cost for the feedstock		194 295	392 009	2/4 4/0	2/0 000	279 008	281 472	282 036	299.019	318 298	338 141	359 222	381 616	405 407	U	0	U	+ 002 0/3
		-76 716	-79 018	•	02 020	-86 345	0	0	-48 550	•	-51 506	-53 051	0	•	0	0	0	-814 233
O&M cost		-/6/16	-13 018	-81 388 0	-83 830 0	-86 345	-45 763 -44 528	-47 136 -45 864	-48 550 -47 240	-50 006 -48 657	-51 506	-53 051 -51 620	-54 643 -53 169	-56 282 -54 764	0	0	0	-814 233
O&M cost upgrading plant		0	0	0	0	0	-44 528	-45 864 0	-47 240	-48 057 0	-50 116	-35 661	-38 781	-54 764	0	0	-0	-395 956
Corporate income tax 15.0%		0	313 591	193 081	192 850	192 663	191 182	189 037	203 830	219 635	236 519	218 889	235 023	-42 104 252 257	0	0	-0 -0	-116 547 2 756 137
Operational Cashflow Investment and Financing		11/ 5/9	212 231	192 001	192 050	192 003	191 102	109 03/	203 830	219 033	220 219	210 009	235 023	232 23/	U	U	-0	2750137
Investment	-3 590 698					-684 302												-4 275 000
Debt financing	1 007 628					513 227												1 520 854
Subsidy	2 247 194					0												2 247 194
Pre-subsidy debt cost	2 247 194					0												2 247 194
Return of subsidy to bank									1									0
Debt service 1		-133 680	-133 680	-133 680	-133 680	-133 680	-133 680	-133 680	-133 680	-133 680	-133 680							-1 336 797
Debt service 2		155 000	155 000	155 000	155 000	155 000	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	0	0		-648 160
Own financing	335 876					171 076	01 020	01 020	01 020	01 020	01 020	01 020	01 020	01 020	0	0		506 951
FREE CASH FLOW	0	-16 101	179 911	59 402	59 171	58 983	-23 518	-25 662	-10 870	4 936	21 819	137 869	154 003	171 237	0	0	-0	771 180
Annual return on investment:																		
Oper. Cash Flow/ Debt payment:		0.88	2.35	1.44	1.44	1.44	0.89	0.88	0.95	1.02	1.10	2.70	2.90	3.11		#DIV/0!	#DIV/0!	1.24
Oper. Cash Flow/ Debt payment: ROI		0.88 8.8%	2.35 23.3%	1.44 14.4%	1.44 14.4%	1.44 14.3%	0.89 9.4%	0.88 9.3%	0.95 10.1%	1.02 10.8%	1.10 11.7%	2.70 32.0%	2.90 34.3%	3.11 36.9%	#DIV/0! 0.0%	#DIV/0! 0.0%	#DIV/0! 0.0%	1.24
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4%	-Ls 30 042.00																	1.24
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR	-Ls 30 042.00 7%			14.4%	14.4%	14.3%	9.4%	9.3%	10.1%	10.8%	11.7%	32.0%			0.0%			1.24
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments		8.8%	23.3%	14.4% 3	14.4% 4	14.3% 5	9.4% 6	9.3% 7	10.1% 8	10.8% 9	11.7%	32.0%	34.3%	36.9% 13	0.0%	0.0%	0.0% 16	
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1		8.8% 1 133 680	23.3% 2 133 680	14.4% 3 133 680	14.4% 4 133 680	14.3% 5 133 680	9.4% 6 133 680	9.3% 7 133 680	10.1% 8 133 680	10.8% 9 133 680	11.7% 10 133 680	32.0% 11 0	34.3% 12 0	36.9% 13 0	0.0% 14 0	0.0% 15 0	0.0% 16 0	1 336 797
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment		1 133 680 55 420	23.3% 2 133 680 51 115	14.4% 3 133 680 <i>46 574</i>	4 133 680 41 783	14.3% 5 133 680 <i>36 729</i>	9.4% 6 133 680 <i>31 397</i>	9.3% 7 133 680 <i>25 771</i>	10.1% 8 133 680 <i>19 836</i>	9 133 680 13 575	11.7% 10 133 680 <i>6 969</i>	32.0%	34.3%	36.9% 13 <i>0</i>	0.0% 14 0 0	0.0% 15 <i>0</i>	0.0% 16 0	1 336 797 <i>329 169</i>
Oper. Cash Flow/ Debt payment: ROI IRR Debt Capital payments Annual Ioan repayment 1 Interest payment Payment on principal		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 <i>31 397</i> <i>102 283</i>	9.3% 7 133 680 25 771 107 909	10.1% 8 133 680 <i>19 836</i> <i>113 843</i>	10.8% 9 133 680 <i>13 575</i> <i>120 105</i>	11.7% 10 133 680 <i>6 969</i> <i>126 711</i>	32.0%	34.3% 12 0 0 0	36.9% 13 0	0.0% 14 0	0.0%	0.0% 16 0	1 336 797 <i>329 169</i> 1 007 628
Oper. Cash Flow/ Debt payment: ROI IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance		1 133 680 55 420	23.3% 2 133 680 51 115	14.4% 3 133 680 <i>46 574</i>	4 133 680 41 783	14.3% 5 133 680 <i>36 729</i>	9.4% 6 133 680 <i>31 397</i> <i>102 283</i> 468 567	9.3% 7 133 680 25 771 107 909 360 659	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816	9 133 680 <i>13 575</i> <i>120 105</i> 126 711	11.7% 10 133 680 6 969 126 711 0	32.0%	34.3%	36.9% 13 0 0 0	0.0% 14 0 0 0 0 0	0.0% 15 0 0 0 0	0.0%	1 336 797 <i>329 169 1 007 628</i> 1 007 628
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 31 397 102 283 468 567 81 020	9.3% 7 133 680 25 771 107 909 360 659 81 020	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020	9 133 680 <i>13 575</i> <i>120 105</i> 126 711 81 020	11.7% 10 133 680 6 969 126 711 0 81 020	32.0% 11 0 0 0 0 81 020	34.3% 12 0 0 0 0 81 020	36.9% 13 0 0 0 81 020	0.0% 14 0 0 0 0 0	0.0%	0.0%	1 336 797 <i>329 169</i> <i>1 007 628</i> 1 007 628 648 160
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 <i>31 397</i> <i>102 283</i> 468 567 81 020 <i>28 227</i>	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020 <i>22 261</i>	9 133 680 <i>13 575</i> <i>120 105</i> 126 711 81 020 <i>19 029</i>	11.7% 10 133 680 6 969 126 711 0 81 020 15 619	32.0% 11 0 0 0 0 81 020 12 022	34.3% 12 0 0 0 81 020 8 227	36.9% 13 0 0 0 81 020 4 224	0.0% 14 0 0 0 0 0 0 0	0.0% 15 0 0 0 0 0 0 0	0.0%	1 336 797 <i>329 169</i> <i>1 007 628</i> 648 160 <i>134 933</i>
Oper. Cash Flow/ Debt payment: ROI IRN Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020 <i>22 261</i> <i>58 759</i>	10.8% 9 133 680 <i>13 575</i> <i>120 105</i> 126 711 81 020 <i>19 029</i> <i>61 991</i>	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401	32.0% 11 0 0 0 81 020 12 022 68 998	34.3% 12 0 0 0 81 020 8 227 72 793	36.9% 13 0 0 0 81 020 4 224 76 796	0.0% 14 0 0 0 0 0 0 0 0 0 0	0.0%	0.0%	1 336 797 <i>329 169</i> <i>1 007 628</i> 1 007 628 648 160 <i>134 933</i> <i>513 227</i>
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 <i>31 397</i> <i>102 283</i> 468 567 81 020 <i>28 227</i>	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020 <i>22 261</i>	9 133 680 <i>13 575</i> <i>120 105</i> 126 711 81 020 <i>19 029</i>	11.7% 10 133 680 6 969 126 711 0 81 020 15 619	32.0% 11 0 0 0 0 81 020 12 022	34.3% 12 0 0 0 81 020 8 227	36.9% 13 0 0 0 81 020 4 224	0.0% 14 0 0 0 0 0 0 0	0.0% 15 0 0 0 0 0 0 0	0.0%	1 336 797 <i>329 169</i> <i>1 007 628</i> 648 160 <i>134 933</i>
Oper. Cash Flow/ Debt payment: ROI IRN Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020 <i>22 261</i> <i>58 759</i>	10.8% 9 133 680 <i>13 575</i> <i>120 105</i> 126 711 81 020 <i>19 029</i> <i>61 991</i>	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401	32.0% 11 0 0 0 81 020 12 022 68 998	34.3% 12 0 0 0 81 020 8 227 72 793	36.9% 13 0 0 0 81 020 4 224 76 796	0.0% 14 0 0 0 0 0 0 0 0 0 0	0.0%	0.0%	1 336 797 <i>329 169</i> <i>1 007 628</i> 1 007 628 648 160 <i>134 933</i> <i>513 227</i>
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance		8.8% 1 133 680 55 420 78 260 929 368	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401 218 587	32.0% 11 0 0 0 81 020 12 022 68 998 149 589	34.3% 12 0 0 0 81 020 8 227 72 793 76 796	36.9% 13 0 0 0 81 020 4 224 76 796 0	0.0% 14 0 0 0 0 0 0 0 0 0 0	0.0%	0.0%	1 336 797 329 169 1 007 628 1 007 628 6 48 160 1 34 933 5 13 227 5 13 227
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax		8.8% 1 133 680 55 420 78 260	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401 218 587	32.0% 11 0 0 0 81 020 12 022 68 998 149 589	34.3% 12 0 0 0 81 020 8 227 72 793 76 796	36.9% 13 0 0 0 81 020 4 224 76 796 0	0.0% 14 0 0 0 0 0 0 0 0 0 0	0.0%	0.0%	1 336 797 329 169 1 007 628 1 007 628 6 48 160 1 34 933 5 13 227 5 13 227
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, %		8.8% 1 133 680 55 420 78 260 929 368	23.3% 2 133 680 <i>51 115</i> <i>82 565</i>	14.4% 3 133 680 <i>46 574</i> <i>87 106</i>	4 133 680 <i>41 783</i> <i>91 896</i>	14.3% 5 133 680 <i>36 729</i> <i>96 951</i>	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401 218 587	32.0% 11 0 0 0 81 020 12 022 68 998 149 589	34.3% 12 0 0 0 81 020 8 227 72 793 76 796	36.9% 13 0 0 0 81 020 4 224 76 796 0	0.0% 14 0 0 0 0 0 0 0 0 0 0	0.0%	0.0%	1 336 797 329 169 1 007 628 1 007 628 648 160 134 933 513 227 513 227 16 years
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Pebt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years		8.8% 1 133 680 55 420 78 260 929 368 1 100%	23.3% 2 133 680 51 115 82 565 846 803	14.4% 3 133 680 46 574 87 106 759 697	14.4% 4 133 680 <i>41 783</i> <i>91 896</i> 667 801	14.3% 5 133 680 36 729 96 951 570 850 5	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434 6	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696 404 738 7	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978 8 231 233	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987 9	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401 218 587 10 279 666	32.0% 11 0 0 0 81020 12022 68998 149589 11	34.3% 12 0 0 0 0 8 1020 8 227 72 793 76 796 12	36.9% 13 0 0 0 81 020 4 224 76 796 0 13	0.0% 14 0 0 0 0 0 0 0 0 0 14	0.0% 15 0 0 0 0 0 0 0 0 0 0 15	0.0%	1 336 797 329 169 1 007 628 1 007 628 648 160 134 933 513 227 513 227 16 years 2 939 471
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Depreciated over years Taxable income		8.8% 1 133 680 <i>55 420</i> <i>78 260</i> 929 368 1 1 100% 62 159	23.3% 2 133 680 51 115 82 565 846 803	14.4% 3 133 680 46 574 87 106 759 697	14.4% 4 133 680 <i>41 783</i> <i>91 896</i> 667 801	14.3% 5 133 680 36 729 96 951 570 850 5	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434 6	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696 404 738 7	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020 <i>22 261</i> <i>58 759</i> 345 978 8	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987 9	11.7% 10 133 680 6 969 126 711 0 81 020 81 020 15 619 65 401 218 587 10	32.0% 11 0 0 0 81020 12022 68998 149589 11	34.3% 12 0 0 0 0 8 1020 8 227 72 793 76 796 12	36.9% 13 0 0 0 81 020 4 224 76 796 0 13	0.0% 14 0 0 0 0 0 0 0 0 0 14	0.0% 15 0 0 0 0 0 0 0 0 0 0 15	0.0%	1 336 797 329 169 1 007 628 1 007 628 648 160 134 933 513 227 513 227 16 years 2 939 471
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Depreciated over years Taxable income Investment expensed		8.8% 133 680 55 420 78 260 929 368 1 100% 62 159 0	23.3% 2 133 680 51 115 82 565 846 803 2 2 262 476	14.4% 3 133 660 46 574 87 106 759 697 3 146 507 -134 350	14.4% 4 133 680 <i>41 783</i> <i>91 896</i> 667 801 4 151 067	14.3% 5 133 680 36 729 96 951 570 850 5 5 155 934	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434 6 204 313	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696 404 738 7 209 130	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978 8 231 233	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987 9 9 254 717	11.7% 10 133 680 6 969 126 711 0 81 020 15 619 65 401 218 587 10 279 666	32.0% 11 0 0 0 81020 12022 68998 149589 11	34.3% 12 0 0 0 0 8 1020 8 227 72 793 76 796 12	36.9% 13 0 0 0 81 020 4 224 76 796 0 13	0.0% 14 0 0 0 0 0 0 0 0 0 14	0.0% 15 0 0 0 0 0 0 0 0 0 0 15	0.0%	1 336 797 329 169 1 007 628 1 007 628 648 160 134 933 513 227 513 227 16 years 2 939 471 -1 343 504
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Expensed in Year 1, % Taxable income Investment depreciated over years Taxable income Investment depreciated 1		8.8% 133 680 55 420 78 260 929 368 1 100% 62 159 0	23.3% 2 133 680 51 115 82 565 846 803 2 2 262 476	14.4% 3 133 680 <i>46 574</i> <i>87 106</i> 759 697 3 146 507	14.4% 4 133 680 <i>41 783</i> <i>91 896</i> 667 801 4 151 067	14.3% 5 133 680 36 729 96 951 570 850 5 5 155 934	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434 6 204 313 -134 350	9.3% 7 133 680 25 771 107 909 360 659 360 650 360 650	10.1% 8 133 680 <i>19 836</i> <i>113 843</i> 246 816 81 020 <i>22 261</i> <i>58 759</i> 345 978 8 8 231 233 -134 350	10.8% 9 133 680 13 575 120 705 126 711 81 029 61 991 283 987 9 254 717 -134 350	11.7% 10 133 680 6 969 126 711 0 81 020 81 020 15 619 65 401 218 587 10 279 666 -134 350	32.0% 11 0 0 0 0 81020 12022 68 998 149 589 11 306 170	34.3% 12 0 0 0 8 1020 8 227 72 793 76 796 12 326 973	36.9% 13 0 0 0 81020 4 224 76 796 0 13 349 125	0.0% 14 0 0 0 0 0 0 0 0 14 14 0	0.0% 15 0 0 0 0 0 0 0 0 15 0	0.0%	1 336 797 329 169 1 007 628 1 007 628 6 48 160 134 933 513 227 513 227 16 years 2 939 471 -1 343 504 -684 302
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Depreciated over years Taxable income Investment depreciated 1 Investment depreciated 1 Investment depreciated 2 Subsidy 1		8.8% 1 133 680 55 420 78 260 929 368 1 100% 62 159 0 -134 350 -224 719	23.3% 2 133 680 51 115 82 565 846 803 2 2 262 476 -134 350	14.4% 3 133 660 46 574 87 106 759 697 3 146 507 -134 350	4 133 680 <i>41 783 91 896</i> 667 801 4 151 067 -134 350 -224 719	14.3% 5 133 6729 96 951 570 850 5 5 155 934 -134 350 -224 719	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434 6 204 313 -134 350 -68 430	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696 404 738 7 209 130 -134 350 -68 430	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978 8 231 233 -134 350 -68 430	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987 9 254 717 -134 350 -68 430	11.7% 10 133 680 6 969 126 711 0 81 020 81 020 85 401 218 587 10 279 666 -134 350 -68 430 -68 430 -24 719 0	32.0% 11 0 0 0 81 020 12 022 68 998 149 589 11 306 170 -68 430 0	34.3% 12 0 0 0 8 1020 8 227 72 793 76 796 12 326 973 -68 430 0	36.9% 13 0 0 0 81020 4 224 76 796 0 13 349 125 -68 430 0	0.0% 14 0 0 0 0 0 0 0 0 14 -68 430 0	0.0% 15 0 0 0 0 0 0 0 0 0 0 0 0 0	0.0%	1 336 797 329 169 1 007 628 1 007 628 648 160 134 933 513 227 513 227 16 years 2 939 471 -1 343 504 -684 302 -2 247 194
Oper. Cash Flow/ Debt payment: ROI NPV - 16 years @6.4% IRR Debt Capital payments Annual loan repayment 1 Interest payment Balance Annual loan repayment 2 Interest payment Payment on principal Balance Annual loan repayment 2 Interest payment Payment on principal Balance Corporate Income tax Part of Investment Expensed in Year 1, % Part of Investment Depreciated over years Taxable income Investment depreciated 1 Investment depreciated 2 Subsidy 1		8.8% 1 133 680 55 420 78 260 929 368 1 100% 62 159 0 -134 350	23.3% 2 133 680 51 115 82 565 846 803 2 2 262 476 -134 350	14.4% 3 133 660 46 574 87 106 759 697 3 146 507 -134 350	14.4% 4 133 680 <i>41 783</i> <i>91 896</i> 667 801 4 151 067 -134 350	14.3% 5 133 680 36 729 96 951 570 850 5 5 155 934 -134 350	9.4% 6 133 680 31 397 102 283 468 567 81 020 28 227 52 793 460 434 6 204 313 -134 350 -68 430 -224 719	9.3% 7 133 680 25 771 107 909 360 659 81 020 25 324 55 696 404 738 7 209 130 -134 350 -68 430 -224 719	10.1% 8 133 680 19 836 113 843 246 816 81 020 22 261 58 759 345 978 8 231 233 -134 350 -68 430 -224 719	10.8% 9 133 680 13 575 120 105 126 711 81 020 19 029 61 991 283 987 9 9 254 717 -134 350 -68 430 -224 719	11.7% 10 13 680 6 969 126 711 0 81 020 15 619 65 401 218 587 10 279 666 -134 350 -68 430 -224 719	32.0% 11 0 0 0 81 020 12 022 68 998 149 589 11 306 170 -68 430	34.3% 12 0 0 0 81020 8227 72793 76796 12 12 326973 -68430	36.9% 13 0 0 0 81 020 4 224 76 796 0 13 349 125 -68 430	0.0% 14 0 0 0 0 0 0 14 14 0 14 -68 430	0.0% 15 0 0 0 0 0 15 15 0 -68 430	0.0%	1 336 797 329 169 1 007 628 648 160 134 933 513 227 513 227 16 years 2 939 471 -1 343 504 -684 302 -2 247 194 0

With increased waste management tariff

Investments Investment Wet Fermentation Unit Investment Biogas Upgrading Facility Subsidy Wet AD plant Subsidy Biogas Upgrading Facility Investment (minus) subsidy 1 Investment (minus) subsidy 2	EURO 3 590 698 684 302 0 0 3 590 698 684 302		Post-Financing Debt Capital 75.0% Debt Capital 75.0% Equity Capital 25.0% Equity Capital 25.0% Total 1 Total 2		EURO 2 693 023 513 227 897 674 171 076 3 590 698 684 302	-	Debt term (years) Interest rate: Subsidy 1 Subsidy 2		10 6% 0%	Biomethane price Electricity feed-in tariff (year 1-10) Electricity feed-in tariff (after year 10) Increase in the waste management tariff				0.35€/Nm3 212.64€/MWh 170.11€/MWh 1.66€/m3				
Cash Flow Model, EUR	2017	2018	2019	2020	2021 4	2022	2023	2024 7	2025 <i>8</i>	2026 9	2027 10	2028 <i>11</i>	2029 <i>12</i>	2030 <i>13</i>	2031 <i>14</i>	2032 <i>15</i>	2033 <i>16</i>	
Year of contract in exploitation Energy sale		1	2	3	4	5	D	/	8	9	10	11	12	13	14	15	10	
Energy price inflation, % General price inflation, % Feedstock price inflation, %			4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	4.5% 3.0% 2.0%	
Electricity sale			392 609	0	0	0	0	0	0	0	0	0	0	0	0	0	0	586 903
Heat sale Income from waste management tariff		0 232 915	236 019	239 166	246 675	0 254 421	262 410	270 649	279 148	287 913	296 954	0 306 278	315 895	325 814	0	0	0	0 3 554 256
Biomethane sale		252 515	230 019	274 470	276 680	279 008	281 472	282 036	299 619	318 298	338 141	359 222	381 616	405 407	0	0	0	3 495 970
Income		427 209	628 628	513 635	523 355	533 429	543 882	552 686	578 767	606 211	635 095	665 500	697 511	731 221	0	0	0	7 637 129
Cost for the feedstock		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O&M cost O&M cost upgrading plant		-76 716 0	-79 018	-81 388 0	-83 830	-86 345	-45 763 -44 528	-47 136 -45 864	-48 550 -47 240	-50 006 -48 657	-51 506 -50 116	-53 051 -51 620	-54 643 -53 169	-56 282 -54 764	0	0	0	-814 233 -395 956
Corporate income tax 15.0%		0	-8 089	0	0	0	0	-1 376	-7 455	-13 864	-20 619	-81 603	-86 166	-90 976	0	0	-0	-310 148
Operational Cashflow		350 493	541 521	432 247	439 526	447 084	453 591	458 311	475 523	493 685	512 853	479 226	503 534	529 199	0	0	-0	6 116 792
Investment and Financing																		
Investment Debt financing	- <mark>3 590 698</mark> 2 693 023					- <mark>684 302</mark> 513 227												-4 275 000 3 206 250
Subsidy	2 093 023					515 227												3 200 250
Pre-subsidy debt cost	Ŭ					0												ŏ
Return of subsidy to bank																		0
Debt service 1		-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277	-357 277							-3 572 774
Debt service 2							-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	-81 020	0	0		-648 160
Own financing FREE CASH FLOW	897 674	-6 784	184 244	74 970	82 248	171 076 89 807	15 294	20 013	37 225	55 387	74 555	398 206	422 514	448 179	0	0	-0	1 068 750 1 895 858
FREE CASH FLOW	U	-0.704	104 244	74 970	02 240	09 007	15 294	20 013	57 225	55 367	74 333	398 200	422 514	440 179		U	-0	1 895 858
Annual return on investment:																		
Oper. Cash Flow/ Debt payment:		0.98	1.52	1.21	1.23	1.25	1.03	1.05	1.08	1.13	1.17	5.91	6.21	6.53		#DIV/0!	#DIV/0!	1.17
ROI		9.8%	15.1%	12.0%	12.2%	12.5%	10.6%	10.7%	11.1%	11.5%	12.0%	70.0%	73.6%	77.3%	0.0%	0.0%	0.0%	
NPV - 16 years @6.4% IRR	-Ls 124.11 7%																	
Debt Capital payments	7 70	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Annual loan repayment 1		357 277	357 277	357 277	357 277	357 277	357 277	357 277	357 277	357 277	357 277	0	0	0	0	0	0	3 572 774
Interest payment		148 116	136 612	124 476	111 672	<i>98 163</i>	83 912	68 877	53 015	36 281	18 626	0	0	0	0	0	0	879 751
Payment on principal		209 161	220 665	232 802	245 606	259 114	273 365	288 400	304 262	320 997	338 652	0	0	0	0	0	0	2 693 023
Balance Annual loan repayment 2		2 483 862	2 263 197	2 030 396	1 784 790	1 525 676	1 252 311 81 020	963 911 81 020	659 648 81 020	338 652 81 020	0 81 020	0 81 020	0 81 020	0 81 020	0	0	0	2 693 023 648 160
Annuai ioan repayment 2 Interest payment							28 227	25 324	22 261	19 020	15 619	12 022	81 020 <i>8 227</i>	4 224	0 0	0	0	134 933
Payment on principal							52 793	55 696	58 759	61 991	65 401	68 998	72 793	76 796	0	0	0	513 227
Balance							460 434	404 738	345 978	283 987	218 587	149 589	76 796	0	0	0	0	513 227
				2						~	10		42	12			10	
Corporate Income tax Part of Investment Expensed in Year 1, %		1	2	3	4	5	6	/	8	9	10	11	12	13	14	15	16	16 years
Part of Investment Depreciated over years		100%																
Taxable income		202 377	412 998	307 771	327 854	348 921	414 207	436 673	477 202	519 924	564 963	612 448	642 868	674 939	0	0	0	5 943 146
Investment expensed		0																
Investment depreciated 1		-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	-359 070	60.420	60.422	60.422	60.422	C0 422		-3 590 698
Investment depreciated 2 Subsidy 1		0	0	0	0	0	-68 430 0	- <mark>68 430</mark> 0	-68 430 0	-68 430 0	-68 430 0	-68 430	-68 430	-68 430	-68 430	-68 430		-684 302 0
Subsidy 1 Subsidy 2		0	0	0	U	0	0	0	0	0	0	0	0	0	0	0		0
Accumultated Taxable income		-156 693	53 928	-51 299	-31 216	-10 149	-13 293	9 173	49 702	92 424	137 463	544 018	574 438	606 509	-68 430	-68 430	0	1 668 146