BIOPLAT-EU

Promoting sustainable use of underutilized lands for bioenergy production through a web-based Platform for Europe

D6.4

Report on Business Models

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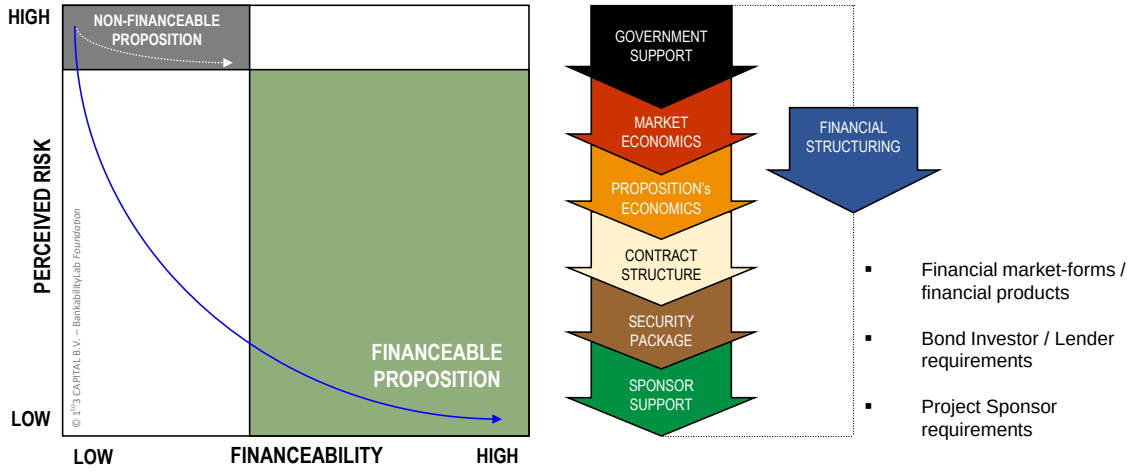
1 Background and Approach

The analysis framework which is used in this report is depicted below. 'Finance' follows a risk determination and allocation process which is presented in the 'financeability' approach by 7 building blocks ('Building Blocks'). Each block will be dealt with separately in how it plays a role in the evaluation of investment in (through equity or subordinated (shareholder) loans) or lending to (subordinated and senior debt) renewable energy propostions. This analysis framework is generic, it applies equally to investments in water, healthcare, transport, industry, etc. This section details some further considerations for the understanding of the use of this simplified framework.

Figure 1.1 Financeability Framework



Source: Author's elaboration.

The building blocks represent (perceived) major risk and risk mitigation categories and they answer high-level the following questions:

Analysis-level	Investment and/or lending lead-questions
1. Macro-Political and Economic	Why investing and/or lending to opportunities in this country, region, continent, etc.? Is the country investment-grade (or is it below investment grade) and has the country created an enabling environment with governmental support in all relevant aspects?
2. Sectoral	Why investing and/or lending to this renewable energy – energy efficiency (RE-EE) sector and not to other (sub)sectors in the area defined at 1.?
3. Project / Corporate	Why this proposition of this technology type in this (sub)sector of 2. in this area 1.?
4. (Contractual) Business Model	Why this (individual) proposition at 3. with 'business model A' (Power Purchase Agreement – PPA for example) and not business model B or C, in this sector of 2. in this area 1.?
5. Security Structure	If this proposition is the one to invest in and/or lend to what would be the minimum requirements for the security of the loan(s)

	and equity? What representations, warranties, undertakings (environmental, social and governance), etc. will need to be taken into account to safeguard reputations involved and is that possible to achieve (including full licensing)?
6. Owner / Equity	If this proposition at a certain set of investment and lending security is acceptable, then what requirements are associated with the owners / equity providers, including KYC[1], corporate governance and environmental & social management capacity and possibility of meeting expectations regarding share ownership (local shareholding requirements, dividend restrictions, etc.)?
7. Financial	Finally, the proposition will need a balanced risk-return allocation and needs to adhere to local regulations, laws, impact standards, etc. Which financial structure at what terms and conditions is optimal? And how is the finance package facilitating future scaling or refinance (bond issue for example or securitization)?

Working with building blocks as depicted allows dedicated technical assistance and capacity building programs to address certain perceived barriers associated with a building block in a certain country and / or a certain renewable energy or climate change segment.

Also, the approach through 'building' indicates that propositions will have to go through this building process. This is visualized by the different colors of the blocks – the colors represent the band-colours in 'judo' but in no particular order. There are common denominators at each level which make the integrated whole 'bankable' or 'financeable' for the majority of funding institutions but one needs to go through all levels to have it work properly; each block represents a 'go / no-go decision'.

There is a preference for the term 'bankability' because it is often mentioned when reference is made to an acceptable financeable status (appropriate for receipt by the majority of banks). However, 'financeability' is used in this chapter interchangeably because many more funders are active nowadays that operate different from 'banks' (like co-operatives or community funding, crowdfunding, funding from impact lenders / investors, countries as funders – 'donors', institutions with funding programs, specific funds, etc.). Here 'banks' are perceived to be regulated institutions. Bankability or financeability in this chapter is defined as the proposition for funding that will meet the internal policy requirements of the vast majority of funding institutes, platforms or mechanisms to invest in or lend to a specific asset class, within regulated conditions. If bank-internal policies have been drafted well the future monitoring of an asset class (including refinance or securitization for example) is taken into account from the outset. These future possibilities are a pre-condition to scaling.

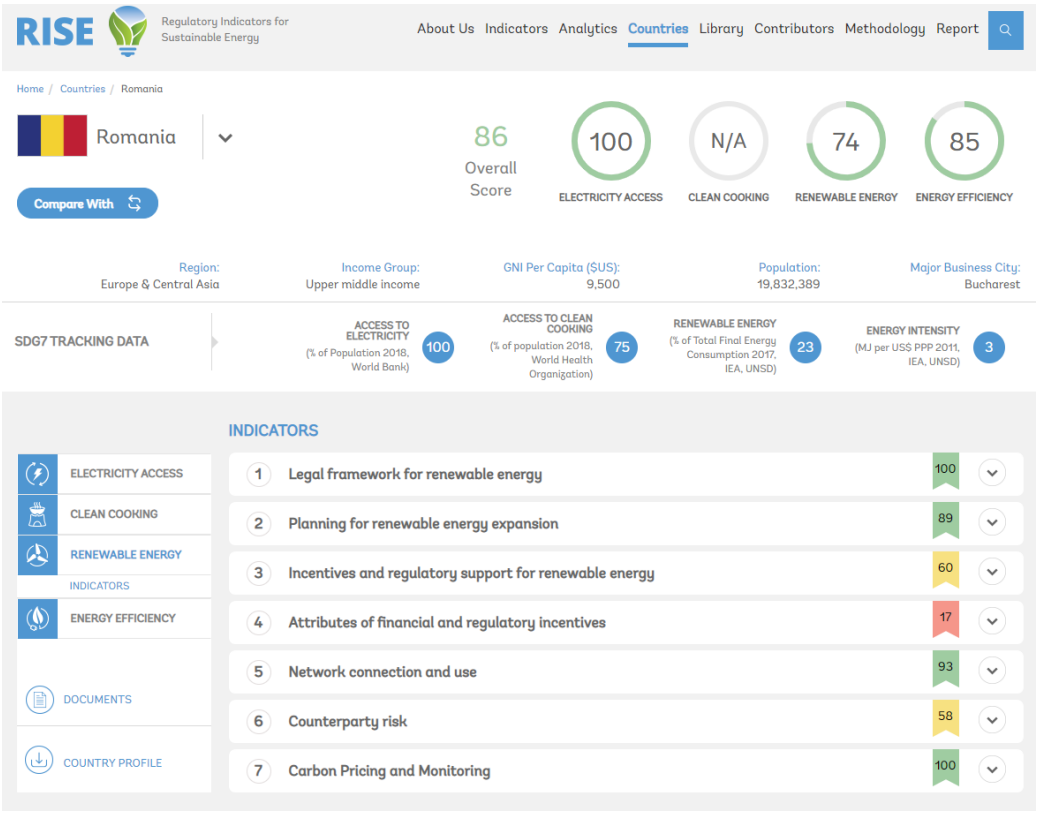
Further, the building blocks represent absolute risk categories i.e. each block represents a risk-category which can render a proposition non-bankable if a certain threshold has not been

[1] KYC stands for Know Your Customers investigations and is focussed on the ultimate ownership of the shares in the venture.

reached, for some or all possible funders. Examples for better understanding such absolute approaches are given below by showing 1) Esmap's Regulatory Indicators for Sustainable Energy (RISE), and 2) de-risking by risk-categories by the UNDP.

The indicators from Esmap in relation to a country's status on regulation are depicted below by an example from Romania. Investing in renewable energy in that country does meet a well-developed enabling environment although the overall score of '74' indicates some room for improvemen in specific in the area of regulatory support.

Figure 1.2 RISE Indicators Romania



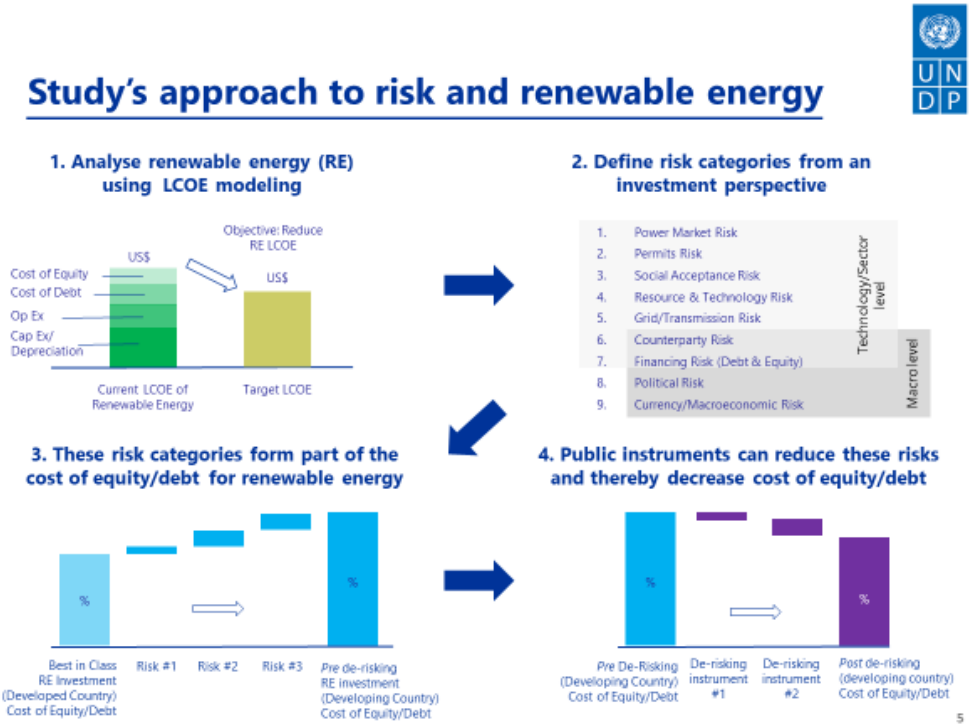
Source: Romania | RISE (esmap.org)

The approach taken by the UNDP is shown by the following diagram which not only mentions the main risk-categories (nine in total by the UNDP-approach[2]) but as well an integrated analysis to derive at defined gaps or barriers and indications for areas for technical assistance programs.

UNDP uses the Least Cost of Electricity (LCOE) as the ultimate measure for risk reduction which is a good approach if access is available to these cost levels at country-level.

[2] UNDP's approach and the building bocks mentioned in this chapter are somehow related. The building block presentation has been for years on the web-site of the UNDP but some years ago (2007-2010). The slight differences to the two approaches is that the UNDP risk-categories are defined in more detailed brackets to allow more '**de-risking**' instruments.

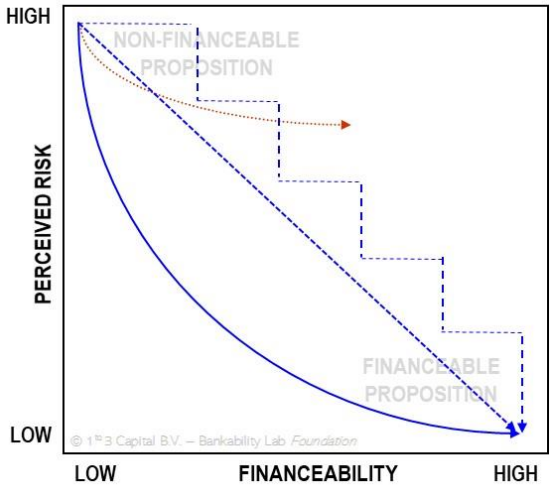
Figure 2.3 De-risking Approach UNDP

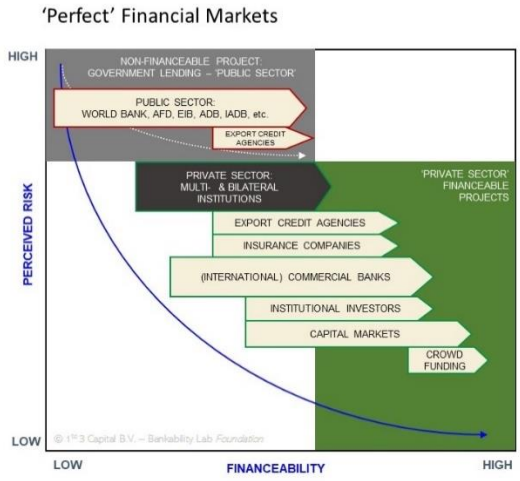


Source: UNDP. http://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climateresilientdevelopment/derisking-renewable-energy-investment.html

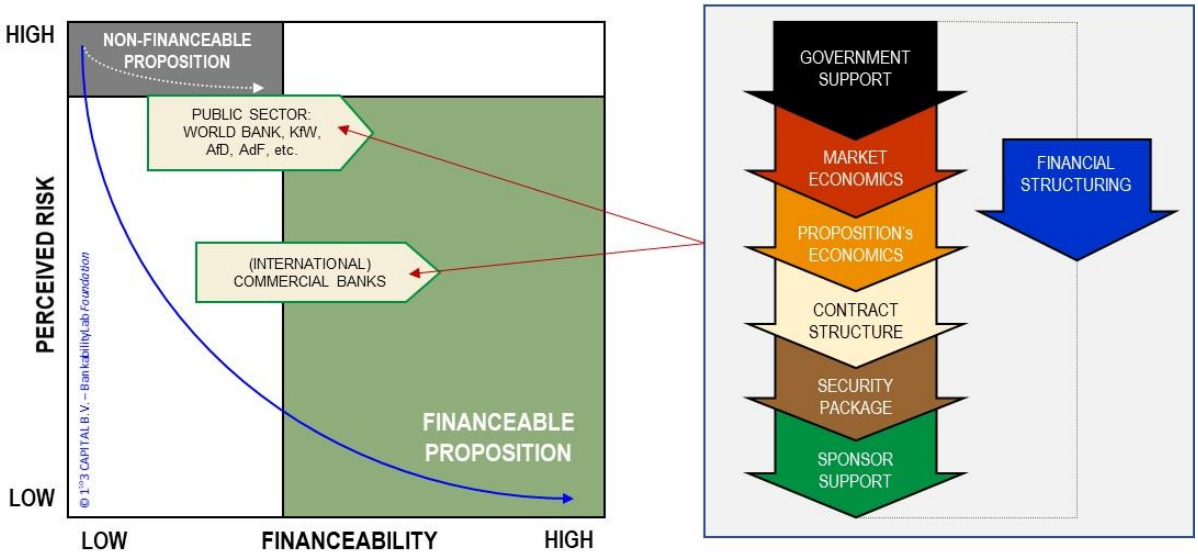
The approach on bankability / financeability of renewable energy follows the components as detailed below.

1. A simple graph is used to 'show' areas in which 'bankable / financeable' areas are shown versus non-bankable areas. Most countries adopted renewable energy (RE) targets through National Designated Programs in many technologies with accomplishment dates like 2030. The graph used in this chapter is not representing volumes of RE per country of bankable vs non-bankable opportunities yet. Also just for illustrative purposes some arrows are included showing a hypothetical direction and type of curve to end into the bankability area. The direction shown is not only to more bankable propositions or less risky ones but also crosses sub-financial markets, each with a risk/return perspective of its own. These funding blocks are not that black and white in substitution but rather more complementary in general and often included in one transaction. As a matter of fact development institutions are meant not to distort the market and catalyse commercial funding, hence, there are complementary birth-rights at the outset. *The context for BIOPLAT-EU-EU is the fact that MUC_lands production as bioenergies are in general less economic compared to for example solar energy projects, hence, more support from development banks are required, the more so in the countries Hungary, Romania and Ukraine (which have higher political risk solvency requirements for lending by commercial banks based in western Europe). New forms of finance like crowdfunding in the diagram are included in BIOPLAT-EU-EU through the CrowdPartners route by one of the consortium members. Source graph: Buiting, EU Sustainability Week, 2018.*

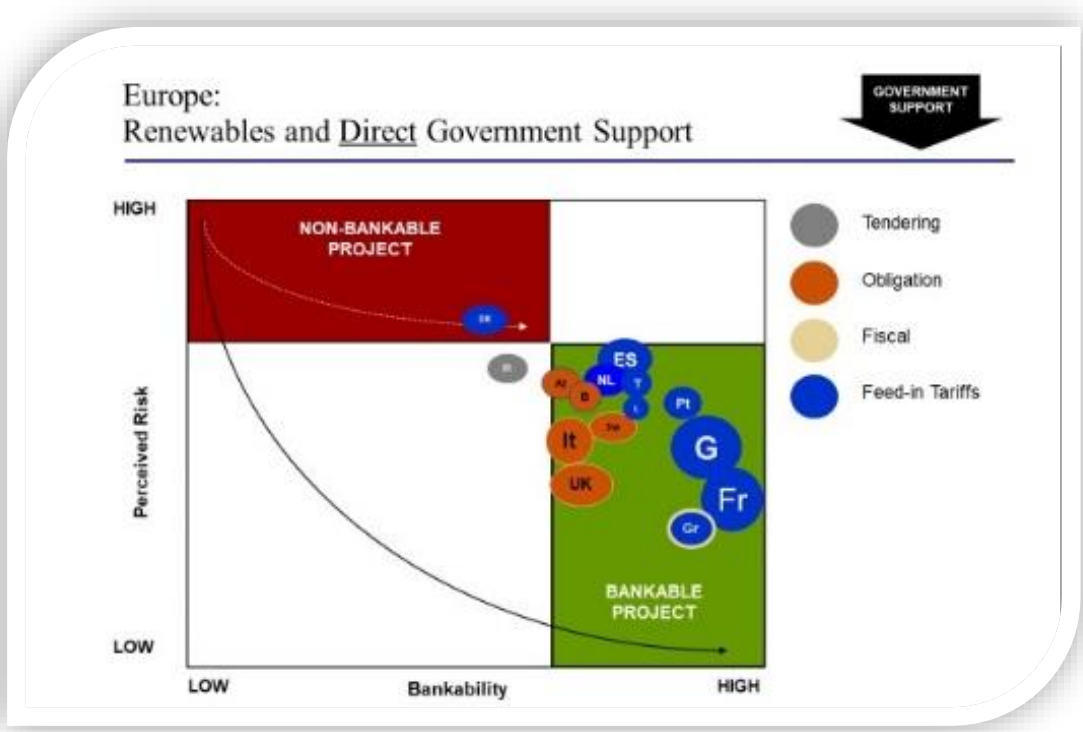




2. The simple diagram is linked to the building blocks mentioned earlier. These risk categories represented by the building blocks are quite common and are also underlying credit scoring by major credit agencies for example. The blocks here are generally visualised next to the 'bankability / financeability' areas of the diagrams above. The blocks are used to determine the bankability / financeability of a proposition from a financial sub-category (as depicted in the below diagram for two such sub-categories) and as well from a financial position (grant, equity, sub debt or debt and development phase, construction phase and / or operational phase). The way it is used here is only illustrative. The size of the blocks are for illustrative purposes only and the position of the blocks does not comprise the whole 'y-axis' of the diagram, just for illustrative purposes. However, in reality these building blocks do represent the major risk categories and are '**absolute**' in nature which implies that each block in itself can result in non-bankability / non-financeability if a certain threshold is not reached and stop the whole process for one or all funders. *In the context of the BIOPLAT-EU-EU project this relates mostly to the building block 3, representing the economic attractiveness of the combination of MUC land production with an investment in the processing of the bioenergies, and building block 4, the possibilities for long term contracts for feedstock supply and production and sales of bioenergies.*

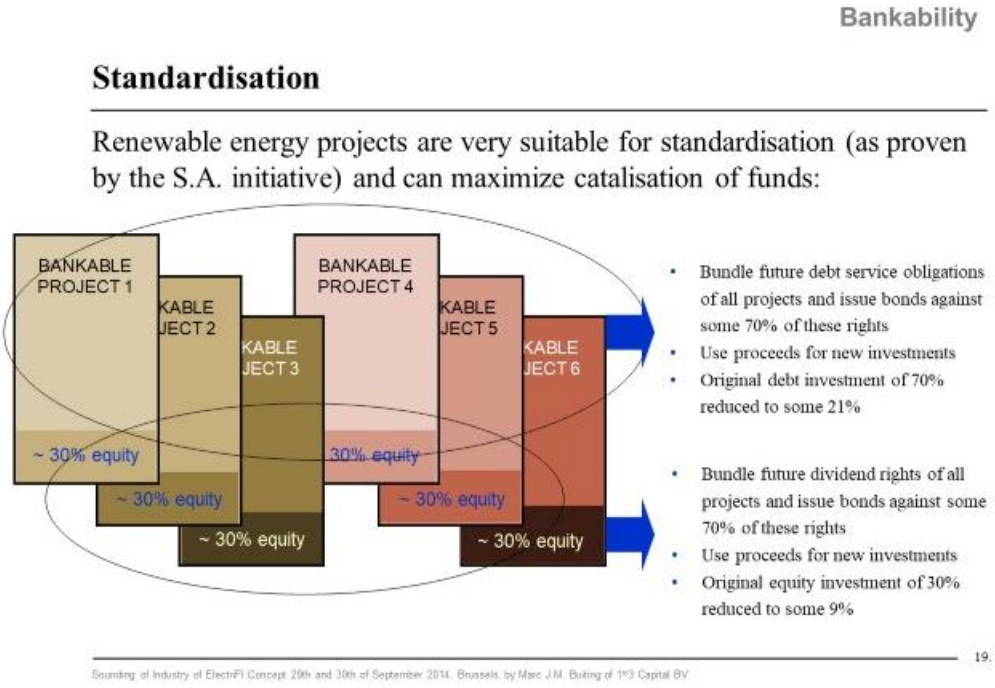


3. The sliding puzzle shown here has a focus on a '**relative**' exercise. Within each building block there is a range of options and ways of dealing with certain risks. If the building block itself is beyond a certain threshold and not stopping investing and/or lending to a proposition than the relative allocation of risks determines 'better' or 'less' bankable propositions but in relation to other elements as well – like solving a sliding puzzle where only a specific order of elements ticks all 'financeability' parameters for a certain proposition. The following diagram is an example of 'relatively' positions leading to 'better' or 'less' bankable propositions: the schemes are shown of support to RE by European countries some years ago where some support schemes are having an impact on the bankability. *In the context of the BIOPLAT-EU-EU project the relative-exercise is within the building block 'project economics' in combination with contractual structures. As shown in that analysis only 5 out of 13 case studies appear feasible within the MUC land bioenergies bracket.*



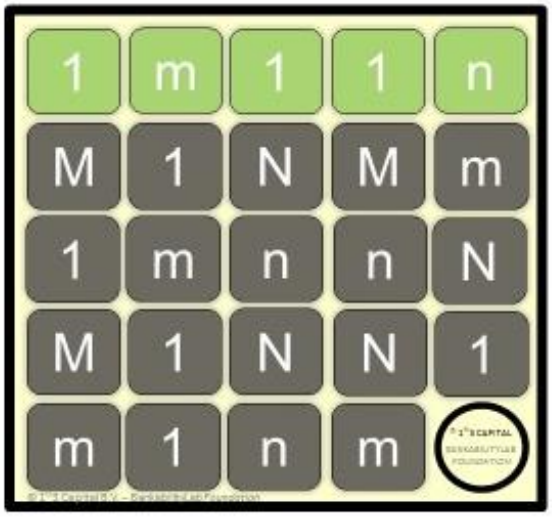
4. **Timing and strategy** further complete the bankability / financeability approach. 'Timing' refers to when the proposition is being analysed for funding: in a new or developed market (MUC land bioenergies vs rooftop solar for example), early or mature stage (pre-feaibility phase like BIOPLAT-EU-EU vs refinance of existing assets), etc. A 'Strategy' refers the underlying philosophy in determining 'bankability / financeability'. The strategy that creates most value to all stakeholders in the long run is taking a 'securitization' perspective in the establishment of a portfolio of renewable energy assets. That way as from the beginning the perspective is taken to on-sell parts of the loans or the equity at a future date preferably through the capital markets. Such strategy from the outset enforces to structure the approach to a portfolio in a highly standardised and transparent way, otherwise the securitization at a later stage is not an option. The diagram used to clarify the securitisation

strategy is depicted below. *In the BIOPLAT-EU-EU context this has been taken into account. The MUC land bioenergies constitute a new asset class. In the BIOPLAT-EU-EU project securitisation and therewith upfront standardisation have been taken into account. The financial model ('BIOPLAT-EU-EU_D6.4') has a standardised approach in structuring the case studies for financial purposes.*



5. The fifth component of the bankability / financeability framework and approach is the adaption to recent trends / modes of operation and business plans. The number of business models has exploded in energy markets although the analysis-framework is still often mostly based on fixed supply and offtake contracts as is the case in independent power producers ('IPP') projects.

The Original IPP Model serves as Starting Point



1 One Borrower, often a Special Purpose Company

m Limited number of banks (long term debt) and equity suppliers / developers

1 One off-taker for the electricity, the national utility under one contract in hard currency (obligation)

1 One guarantor for the obligations of the utility, the government

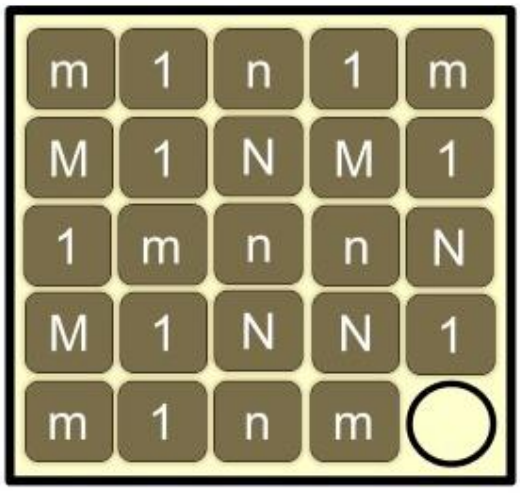
n Beneficiaries being those grid-connected users

The example below is for business models in decentralised energy propositions which might be also applicable for BIOPLAT-EU-EU project given the strong local development impact that development of the MUC lands might have.

Bankability

Offgrid Solutions: Many Business Models

The 'sliding puzzle', however, on off-grid solutions is not an easy one:



One Hand - 1 Existing MFI
Two Hand – 1 Existing MFI & 1 Service Provider
Fee for Service – 1 (New) Energy Service Company
LEASE/HIRE PURCHASE - 1 EXISTING PV SUPPLIER / DEALER
Utility based – 1 Existing Utility
Community based – 1 (New) Community
Private O&M Contractor – 1 (New) Energy Service Company
Private Concessionaire – 1 New IPP
Private Generator – IPP Model
Private Distributor – 1 (New) Distributor
A-B-C Business Model with Anchor Loads – 1 New Private Utility

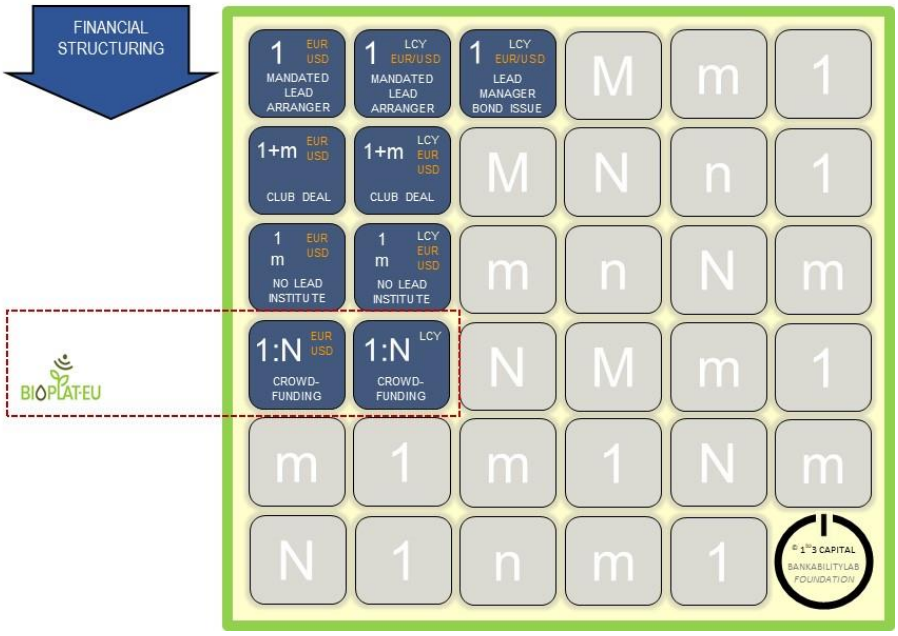
22.

Sounding of Industry of ElectriFI Concept 29th and 30th of September 2014, Brussels, by Marc J.M. Buting of 1^st^3 Capital BV

6. The final component of the approach is the evaluation-perspective that covers most interests from a funding point of view: an informal lead arranger or independent technical

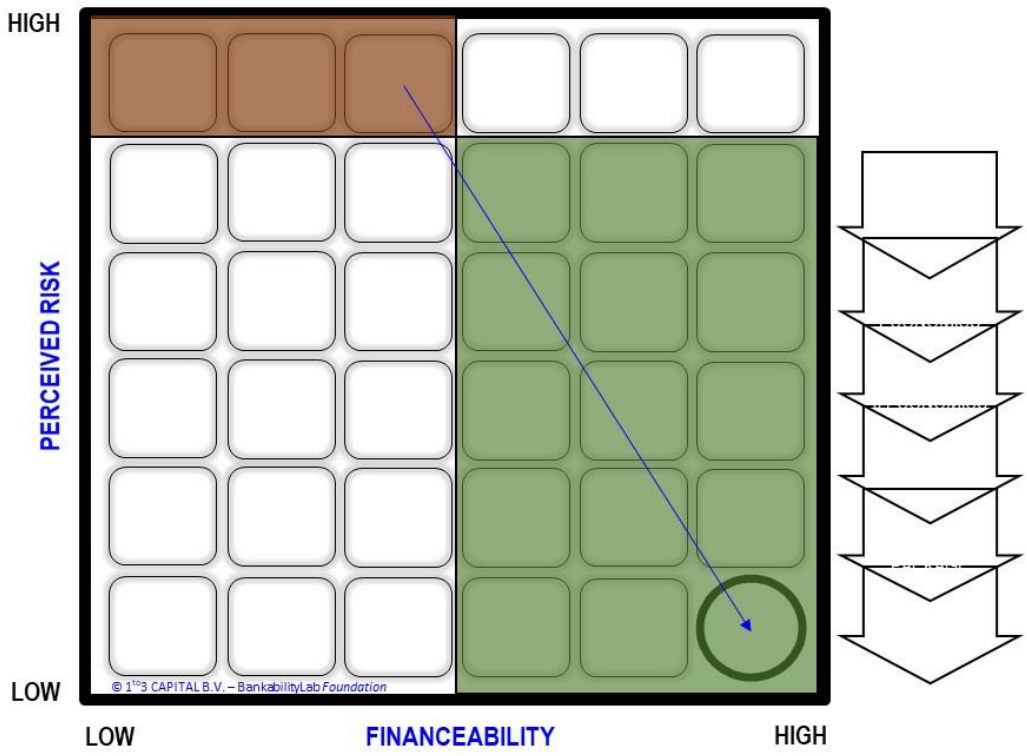
assistance provider. This component relates to the role and deliverables of stakeholders in the finance process. Renewable energy and energy efficiency propositions need to scale worldwide to mitigate to the extent possible climate change impacts which scaling is helped by parties with a community focus, also on the funding side. Much more than currently available independent sources need to bridge the different interests in the propositions without having an interest themselves. These financial technical assistance providers need to be embedded in current funding forms and need to have access to working terms and conditions. Hence, in the bankability / financeability approach the platform position is taken from a crowdfunding perspective (which helps scaling crowdfunding this way and which is one of the most economic solutions nowadays) and reaches the masses that are needed, but complementary to other funding sources. Important as well is the fact that crowdfunding has no 'fixed position' in the risk / return diagram in accordance with capital assets pricing models and does not have to bother about 'market distortion' which is the case for exampe for development agencies. *In the BIOPLAT-EU-EU project this perspective is taken by the structuring of all feasible case studies with the link to CrowdPartners[3] and therewith to a possible syndicated crowdfunding strategy, but producing material acceptable at development banks and major commercial institutions simultaneously.*

BUILDING BLOCKS AND THE ROLE OF FINANCIAL INSTITUTIONS



To conclude: a diagram for evaluation is available that 'fits' all renewable energy and energy efficiency opportunties, an absolute and a relative methodology in-one:

[3] 1to3 Capital (crowdpartners.nl)



For the BIOPLAT-EU-EU project three building blocks are relevant given the information available in this (pre-)feasibility stage (project economics, contracts and financial structuring). Therefore, not the full sliding puzzles (based on the absolute and relative analysis of 7 building blocks) can be produced for the case studies.

The model including the results of all case studies is available HERE.

2 Financially Economic Feasible Projects

2.1 Case Study 1 Germany

2.1.1 Introduction Case Study

This assessment is based on the information from the description of the case study and from a filled-out 'Project Identification Form - PIF' (see Annex).

Case study 1 Germany comprises an additional investment to an existing BBP to process 23,000 t (fresh) / year to produce 1,457,000 m³ biomethane / year (product gas) to feed a gas-fired generation unit for the production of 2.3MW.

2.1.2 Project Economics

The Base Case provides for a bankable project as per the tables below.

	1,00	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET PROFIT	232.488	240.173	248.929	258.315	268.374	298.013	309.571	321.959	330.113	330.113
INTEREST & PREFERRED DIVIDEND	92.669	83.628	73.327	62.285	50.450	37.765	24.167	9.593	0	0
DEPRECIATION	203.784	203.784	203.784	203.784	203.784	181.600	181.600	181.600	181.600	181.600
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**528.941**	**527.585**	**526.040**	**524.383**	**522.608**	**517.378**	**515.338**	**513.152**	**511.713**	**511.713**
TERM DEBT REPAYMENT	101.173	143.355	153.657	164.698	176.533	189.219	202.816	217.390	0	0
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	92.669	83.628	73.327	62.285	50.450	37.765	24.167	9.593	0	0
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**193.842**	**226.984**	**226.984**	**226.984**	**226.984**	**226.984**	**226.984**	**226.984**	**0**	**0**
DEBT SERVICE COVERAGE RATIO TERM DEBT	2,73	2,32	2,32	2,31	2,30	2,28	2,27	2,26		
DEBT SERVICE COVERAGE RATIO ALL DEBT	2,729	2,324	2,318	2,310	2,302	2,279	2,270	2,261		

DSCRs are exceeding 3.0x whereas 1.30x is the threshold, hence, the Project could easily have more debt in the financial structure from a debt service perspective.

The prospective equity returns are high. The project's feasibility is very good.

SUMMARY EQUITY RETURNS				
SPREE-NEISSE		LEVERAGED		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-578.075,35	1.227.921,36	43,85%

The summary table for this project is the following:

SUMMARY TABLE			1	2	3	4	5	6	7	8	9	10	11
SPREE-NEISSE			1,00	2	3	4	5	6	7	8	9	10	0,00
NAME MAIN INVESTOR			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
PRODUCTION	MWh		16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	0,0
TOTAL REVENUES	EUR		**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**0,00**
PROFIT BEFORE DEPRECIATION / EBITDA	EUR		**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**585.991,88**	**0,00**
NET PROFIT	EUR		**232.488,49**	**240.173,14**	**248.929,31**	**258.314,69**	**268.374,50**	**298.013,22**	**309.570,75**	**321.958,79**	**330.113,10**	**330.113,10**	**0,00**
EBITDA MARGIN	%		33,2%	33,2%	33,2%	33,2%	33,2%	33,2%	33,2%	33,2%	33,2%	33,2%	0,0%
OPERATING PROFIT MARGIN (EBIT)	%		21,6%	21,6%	21,6%	21,6%	21,6%	22,9%	22,9%	22,9%	22,9%	22,9%	0,0%
NET PROFIT MARGIN	%		13,2%	13,6%	14,1%	14,6%	15,2%	16,9%	17,5%	18,2%	18,7%	18,7%	0,0%
CASH FLOW BEFORE WC	EUR		335.098,60	635.699,95	702.267,61	759.494,36	806.189,69	838.269,28	858.249,50	846.404,87	1.048.547,22	1.238.301,54	908.188,44
CASH AT BALANCE SHEET YE	EUR		335.098,60	403.211,46	462.094,46	510.565,05	547.875,00	569.894,78	560.236,28	536.834,12	726.588,44	908.188,44	0,00
CF FROM OPERATIONS	EUR		**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**1.766.405,94**	**0,00**
GROSS CAPEX	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE	EUR		193.842,37	226.983,51	226.983,51	226.983,51	226.983,51	226.983,51	226.983,51	226.983,51	0,00	0,00	0,00
BALANCE SHEET TOTAL	EUR		2.058.232,86	1.922.562,15	1.777.661,59	1.622.348,62	1.455.875,01	1.296.294,79	1.105.036,29	900.034,13	908.188,45	908.188,45	0,00
SOLVENCY	%		39,4%	42,6%	46,5%	51,6%	58,1%	67,6%	80,3%	100,0%	100,0%	100,0%	
GROSS DEBT / EBITDA	RATIO		2,13	1,88	1,62	1,34	1,04	0,72	0,37	0,00	0,00	0,00	
CURRENT RATIO	RATIO		335098,6	403211,5	462094,5	510565,1	547875,0	569894,8	560236,3	536834,1	726588,4	908188,4	
DSCR SENIOR DEBT	RATIO		2,73	2,32	2,32	2,31	2,30	2,28	2,27	2,26			
DSCR ALL DEBT	RATIO		2,73	2,32	2,32	2,31	2,30	2,28	2,27	2,26			

The overall Project aims at a name plate capacity of 2.28MW starting in 2023.

Case Study 1 Germany seems to be financially feasible. Areas of attention for a full feasibility analysis will be, among others, the amount of feedstock needed, the price of the feedstock and logistical (including pre-treatment) and transport expenses (to be checked against STEN-output).

2.1.3 Contractual Set-Up

The Case Study 1 Germany has some major contracts lined-iup already. Since the project is only hypothetical, no definitive information can be given here yet. Therefore, the answers are assumptions.

Topic	Answer*
Power Purchasing Agreement / Purchasing Agreement	Yes
Supply Contract	Yes
Land Title	No
Shareholders Agreement	No
Operation and Maintenance Agreements	Yes
Government Support Agreement	Yes (necessary for operation)
Concession Agreement	-
Procurement Agreement	-
Engineering Agreement	Yes
Construction Permits	Yes (necessary for operation)
Connections to Utilities, Roads Permits	Yes
Draft contract for developer to construct project	Yes
Other similar Agreements, Warranties or Guarantees	-

2.2 Case Study 2 Germany

2.2.1 Introduction Case Study

This assessment is based on the information from the description of the case study as per the table below, the information disseminated through Report D1 and assumptions taken from

the internet[4] and generic details on CHP plants from the other case studies. For this case study Germany 2 there has not been a PIF filled out.

Case study 2 Germany comprises an investment into a CHP plant to produce 5.2GWh/yr of electricity. It has also been assumed the CHP plant will produce heat of the equivalent of 16,500 MWh/yr, from the 521 hectares of MUC land envisioned.

2.2.2 Summary

The Base Case provides for a bankable project – from the perspective of the debt provider - as per the table below.

	100	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
NET PROFIT	239.989	244.260	256.122	268.837	282.465	312.726	328.384	345.166	363.155	374.996
INTEREST & PREFERRED DIVIDEND	140.416	135.391	121.436	106.477	90.444	73.258	54.838	35.093	13.930	0
DEPRECIATION	176.853	176.853	176.853	176.853	176.853	158.438	158.438	158.438	158.438	158.438
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	-1	0	0	0	0	0	0	0	82.400
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**557.258**	**556.503**	**554.411**	**552.167**	**549.762**	**544.422**	**541.659**	**538.697**	**535.523**	**615.833**
TERM DEBT REPAYMENT	0	194.209	208.165	223.123	239.157	256.342	274.763	294.507	315.670	0
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	140.416	135.391	121.436	106.477	90.444	73.258	54.838	35.093	13.930	0
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**140.416**	**329.601**	**329.601**	**329.601**	**329.601**	**329.601**	**329.601**	**329.601**	**329.601**	**0**
DEBT SERVICE COVERAGE RATIO TERM DEBT	3,97	1,69	1,68	1,68	1,67	1,65	1,64	1,63	1,62	
DEBT SERVICE COVERAGE RATIO ALL DEBT	3,969	1,688	1,682	1,675	1,668	1,652	1,643	1,634	1,625	

DSCRs are exceeding the threshold of 1.30x, hence, the Project is theoretically capable of servicing the envisioned debt.

The prospective equity returns are high. The project's feasibility is therefore good, from the perspective of a commercial investor, and the project might be pursued based on this preliminary assessment.

SUMMARY EQUITY RETURNS				
DAHME-SPREEWALD		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-1.337.291,53	75.591,23	15,66%
	15	-1.337.291,53	508.913,30	21,14%
	20	-1.337.291,53	716.887,69	22,34%

The summary table for this project is the following:

[4] External information is for example obtained from the Energy Solution Center at: CHP Calculator Tool - Combined Heat and Power ROI Calculator (understandingchp.com)

SUMMARY TABLE			1	2	3	4	5	6	7	8	9	10
DAHME-SPREEWALD			1,00	2	3	4	5	6	7	8	9	10
NAME MAIN INVESTOR			2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
PRODUCTION	MWh		5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2	5,2
TOTAL REVENUES	EUR		**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**
PROFIT BEFORE DEPRECIATION / EBITDA	EUR		**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**	**599.609,02**
NET PROFIT	EUR		**239.988,94**	**244.259,59**	**256.121,93**	**268.836,68**	**282.465,09**	**312.726,43**	**328.383,87**	**345.166,44**	**363.154,99**	**374.995,80**
EBITDA MARGIN	%		47,7%	47,7%	47,7%	47,7%	47,7%	47,7%	47,7%	47,7%	47,7%	47,7%
OPERATING PROFIT MARGIN (EBIT)	%		33,6%	33,6%	33,6%	33,6%	33,6%	35,1%	35,1%	35,1%	35,1%	35,1%
NET PROFIT MARGIN	%		19,1%	19,4%	20,4%	21,4%	22,5%	24,9%	26,1%	27,5%	28,9%	29,8%
CASH FLOW BEFORE WC	EUR		416.842,42	643.745,04	628.566,59	606.873,71	570.913,48	516.898,27	446.491,55	342.861,88	220.400,31	615.833,44
CASH AT BALANCE SHEET YE	EUR		416.842,42	403.756,10	384.307,00	350.751,78	302.076,81	234.433,17	133.765,13	14.478,01	0,00	127.912,32
CF FROM OPERATIONS	EUR		**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**	**1.256.687,52**
GROSS CAPEX	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE	EUR		140.415,61	329.600,55	329.600,55	329.600,55	329.600,55	329.600,55	329.600,55	329.600,55	329.600,55	0,00
BALANCE SHEET TOTAL	EUR		3.583.217,77	3.393.279,19	3.196.976,61	2.986.567,91	2.761.039,45	2.534.958,32	2.275.852,77	1.998.128,16	1.825.212,66	1.712.287,33
SOLVENCY	%		44,0%	46,6%	49,8%	53,8%	58,7%	65,1%	73,2%	84,2%	100,0%	100,0%
GROSS DEBT / EBITDA	RATIO		3,35	3,02	2,67	2,30	1,90	1,48	1,02	0,53	0,00	0,00
CURRENT RATIO	RATIO		499241,3	486156,2	466707,1	433151,9	384476,9	316833,3	216165,3	96878,1	82400,1	127912,3
DSCR SENIOR DEBT	RATIO		3,97	1,69	1,68	1,68	1,67	1,65	1,64	1,63	1,62	
DSCR ALL DEBT	RATIO		3,97	1,69	1,68	1,68	1,67	1,65	1,64	1,63	1,62	

The preliminary assessment indicates a potentially feasible and bankable project. Refinement needs to take place in some cost categories such as the cost in the German case study 2 to get the feedstock at the plant's gate, a verification of the amount of feedstocks requested and yields, and the amount and price of the heat in this case study's context.

2.3 Case Study 2 Italy

2.3.1 Introduction Case Study

The case study for Italy is not accompanied by a completed Project Identification Form. Report D4.1. details the case study but without anticipated production figures. Also a STEN-output has not been available at this stage of the feasibility report. Case study 2 Italy comprises an investment into a biodiesel production facility of 5,000,000 liters / year, based on feedstock from 14,000 hectares of MUC-land.

2.3.2 Summary

The Base Case provides for a bankable project as per the tables below.

	1,00	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET PROFIT	888.438	893.919	899.795	906.092	912.842	920.077	927.832	936.144	945.054	954.603
INTEREST & PREFERRED DIVIDEND	95.331	88.118	80.388	72.102	63.220	53.700	43.496	32.559	20.836	8.271
DEPRECIATION	112.973	112.973	112.973	112.973	112.973	112.973	112.973	112.973	112.973	112.973
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**1.096.741**	**1.095.010**	**1.093.155**	**1.091.166**	**1.089.035**	**1.086.750**	**1.084.301**	**1.081.676**	**1.078.863**	**1.075.847**
TERM DEBT REPAYMENT	100.367	107.580	115.310	123.596	132.478	141.998	152.202	163.139	174.862	187.427
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	95.331	88.118	80.388	72.102	63.220	53.700	43.496	32.559	20.836	8.271
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**195.698**	**195.698**	**195.698**	**195.698**	**195.698**	**195.698**	**195.698**	**195.698**	**195.698**	**195.698**
DEBT SERVICE COVERAGE RATIO TERM DEBT	5,60	5,60	5,59	5,58	5,56	5,55	5,54	5,53	5,51	5,50
DEBT SERVICE COVERAGE RATIO ALL DEBT	5,604	5,595	5,586	5,576	5,565	5,553	5,541	5,527	5,513	5,497

DSCRs are exceeding 1.30x, hence, the Project is theoretically capable servicing debt at this preliminary stage.

The prospective equity returns are very high. The project's feasibility at this stage indicates that the project is feasible.

SUMMARY EQUITY RETURNS				
0,00		LEVERAGED		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-932.639,02	3.659.126,15	71,63%
	15	-932.639,02	4.539.349,22	71,93%
	20	-932.639,02	4.979.055,29	71,95%
	25	-932.639,02	5.220.231,29	71,95%
* NET INVESTMENT (LESS PREMIUM)				
DISTRIBUTABLE CASH FLOW	10	-932.639,02	3.026.686,44	50,43%
	15	-932.639,02	3.804.253,81	51,22%
	20	-932.639,02	4.220.653,87	51,32%
	25	-932.639,02	4.431.846,60	51,33%

The summary table for this project is the following:

SUMMARY TABLE			1	2	3	4	5	6	7	8	9	10
0,00			1,00	2	3	4	5	6	7	8	9	10
NAME MAIN INVESTOR			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
PRODUCTION	MWh		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
TOTAL REVENUES	EUR		**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**
PROFIT BEFORE DEPRECIATION / EBITDA	EUR		**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**	**1.375.102,64**
NET PROFIT	EUR		**888.437,99**	**893.919,34**	**899.794,58**	**906.092,01**	**912.841,97**	**920.076,97**	**927.831,87**	**936.144,04**	**945.053,50**	**954.603,19**
EBITDA MARGIN	%		21,2%	21,2%	21,2%	21,2%	21,2%	21,2%	21,2%	21,2%	21,2%	21,2%
OPERATING PROFIT MARGIN (EBIT)	%		19,4%	19,4%	19,4%	19,4%	19,4%	19,4%	19,4%	19,4%	19,4%	19,4%
NET PROFIT MARGIN	%		13,7%	13,8%	13,8%	13,9%	14,0%	14,2%	14,3%	14,4%	14,5%	14,7%
CASH FLOW BEFORE WC	EUR		901.043,28	1.800.355,61	1.809.374,61	1.810.923,60	1.804.465,78	1.789.425,79	1.765.186,93	1.731.088,17	1.686.421,00	1.630.425,96
CASH AT BALANCE SHEET YE	EUR		901.043,28	911.917,62	915.455,27	911.129,02	898.373,77	876.583,82	845.109,96	803.256,30	750.276,96	685.372,46
CF FROM OPERATIONS	EUR		**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**	**6.500.578,30**
GROSS CAPEX	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE	EUR		195.698,02	195.698,02	195.698,02	195.698,02	195.698,02	195.698,02	195.698,02	195.698,02	195.698,02	195.698,02
BALANCE SHEET TOTAL	EUR		3.119.668,06	3.017.569,62	2.908.134,48	2.790.835,45	2.665.107,42	2.530.344,69	2.385.898,05	2.231.071,61	2.065.119,49	1.887.242,21
SOLVENCY	%		58,4%	60,5%	63,0%	65,9%	69,2%	73,2%	78,0%	83,8%	90,9%	100,0%
GROSS DEBT / EBITDA	RATIO		0,94	0,87	0,78	0,69	0,60	0,49	0,38	0,26	0,14	0,00
CURRENT RATIO	RATIO		949983,8	960858,2	964395,8	960069,6	947314,3	925524,4	894050,5	852196,9	799217,5	734313,0
DSCR SENIOR DEBT	RATIO		5,60	5,60	5,59	5,58	5,56	5,55	5,54	5,53	5,51	5,50
DSCR ALL DEBT	RATIO		5,60	5,60	5,59	5,58	5,56	5,55	5,54	5,53	5,51	5,50

Case Study 2 Italy seems to be financially feasible but maybe too much. Areas of attention for a full feasibility analysis will be, among others, the amount of feedstock needed, the price of the feedstock and logistical (including pre-treatment) and transport expenses (to be checked against STEN-output).

2.4 Case Study 1 Romania

2.4.1 Introduction Case Study

This assessment is based on the information from the description of the case study as per the Table 2, the information disseminated through Report D1 and the PIF report in the Annex.

Case study 1 Romania comprises an investment into a biogas CHP integrated plant to produce 1.3 GWh/yr of electricity and the equivalent of heat of 1,400 MWh/yr from the 95 hectares of MUC land envisioned.

2.4.2 Summary

The Base Case provides for a bankable project – from the perspective of the debt provider - as per the table below.

	100	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
NET PROFIT	82.884	84.104	87.493	91.125	95.018	102.370	106.843	109.787	109.787	109.787
INTEREST & PREFERRED DIVIDEND	28.242	26.790	22.756	18.432	13.797	8.829	3.505	0	0	0
DEPRECIATION	36.460	36.460	36.460	36.460	36.460	32.675	32.675	32.675	32.675	32.675
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**147.586**	**147.354**	**146.709**	**146.017**	**145.275**	**143.875**	**143.023**	**142.462**	**142.462**	**142.462**
TERM DEBT REPAYMENT	0	56.138	60.172	64.496	69.130	74.098	79.422	0	0	0
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	28.242	26.790	22.756	18.432	13.797	8.829	3.505	0	0	0
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**28.242**	**82.927**	**82.927**	**82.927**	**82.927**	**82.927**	**82.927**	**0**	**0**	**0**
DEBT SERVICE COVERAGE RATIO TERM DEBT	5,23	1,78	1,77	1,76	1,75	1,73	1,72			

DSCRs are exceeding the threshold of 1.30x, hence, the Project is theoretically capable of servicing the envisioned debt.

The prospective equity returns are high.

SUMMARY EQUITY RETURNS				
BACAU		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-268.970,26	159.684,21	28,96%
	15	-268.970,26	275.410,02	31,94%
	20	-268.970,26	331.992,02	32,48%
	25	-268.970,26	335.514,37	32,52%
* NET INVESTMENT (LESS PREMIUM)				
DISTRIBUTABLE CASH FLOW	10	-268.970,26	116.125,64	23,13%
	15	-268.970,26	205.308,68	26,00%
	20	-268.970,26	255.149,90	26,76%
	25	-268.970,26	251.627,55	26,70%

The project's feasibility is therefore good, from the perspective of a commercial investor, and the project might be pursued based on this pre-liminary assessment.

The summary table for this project is the following:

SUMMARY TABLE			1	2	3	4	5	6	7	8	9	10
BACAU			1,00	2	3	4	5	6	7	8	9	10
NAME MAIN INVESTOR			2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
PRODUCTION	MWh		1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3
TOTAL REVENUES	EUR		**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**
PROFIT BEFORE DEPRECIATION / EBITDA	EUR		**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**	**163.374,00**
NET PROFIT	EUR		**82.884,47**	**84.104,42**	**87.492,98**	**91.125,04**	**95.018,09**	**102.370,41**	**106.843,07**	**109.787,16**	**109.787,16**	**109.787,16**
EBITDA MARGIN	%		49,5%	49,5%	49,5%	49,5%	49,5%	49,5%	49,5%	49,5%	49,5%	49,5%
OPERATING PROFIT MARGIN (EBIT)	%		38,5%	38,5%	38,5%	38,5%	38,5%	39,6%	39,6%	39,6%	39,6%	39,6%
NET PROFIT MARGIN	%		25,1%	25,5%	26,5%	27,6%	28,8%	31,0%	32,4%	33,3%	33,3%	33,3%
CASH FLOW BEFORE WC	EUR		119.344,60	183.771,44	164.668,37	143.653,53	118.508,59	88.331,15	60.095,67	142.462,16	142.462,16	161.794,57
CASH AT BALANCE SHEET YE	EUR		119.344,60	100.886,97	80.563,95	56.160,55	27.383,55	0,00	0,00	0,00	19.332,41	52.007,41
CF FROM OPERATIONS	EUR		**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**	**330.000,00**
GROSS CAPEX	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE	EUR		28.241,88	82.927,27	82.927,27	82.927,27	82.927,27	82.927,27	82.927,27	0,00	0,00	0,00
BALANCE SHEET TOTAL	EUR		755.310,12	700.392,36	643.609,21	582.745,68	517.508,56	457.450,01	424.775,01	392.100,01	378.757,42	378.757,42
SOLVENCY	%		46,6%	50,4%	55,4%	61,8%	70,3%	82,6%	100,0%	100,0%	100,0%	100,0%
GROSS DEBT / EBITDA	RATIO		2,47	2,13	1,76	1,36	0,94	0,49	0,00	0,00	0,00	0,00
CURRENT RATIO	RATIO		119344,6	100887,0	80563,9	56160,6	27383,6	0,0	0,0	0,0	19332,4	52007,4
DSCR SENIOR DEBT	RATIO		5,23	1,78	1,77	1,76	1,75	1,73	1,72			
DSCR ALL DEBT	RATIO		5,23	1,78	1,77	1,76	1,75	1,73	1,72			

The preliminary assessment indicates a potentially feasible and bankable project. Refinement needs to take place in some cost categories.

2.5 Case Study 2 Romania

2.5.1 Introduction Case Study

This assessment is based on the information from the description of the case study as per the table below, the information disseminated through Report D1 and the PIF report in the Annex.

Case study 2 Romania comprises an investment into a CHP plant to produce 0.93 GWh/yr of electricity as per the table below and the equivalent of heat of 5,500 MWh/yr from the 176 hectares of MUC land envisioned.

2.5.2 Summary

The Base Case provides for a bankable project – from the perspective of the debt provider - as per the table below.

	1,00	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
NET PROFIT	240.097	241.976	247.194	252.787	258.783	265.209	272.097	276.631	276.631	276.631
INTEREST & PREFERRED DIVIDEND	43.493	41.256	35.044	28.385	21.248	13.597	5.398	0	0	0
DEPRECIATION	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	0	0	0	0	0	0	31.932	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**334.247**	**333.889**	**332.895**	**331.830**	**330.688**	**329.464**	**328.152**	**359.220**	**327.288**	**327.288**
TERM DEBT REPAYMENT	0	86.453	92.665	99.324	106.461	114.111	122.311	0	0	0
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	43.493	41.256	35.044	28.385	21.248	13.597	5.398	0	0	0
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**43.493**	**127.709**	**127.709**	**127.709**	**127.709**	**127.709**	**127.709**	**0**	**0**	**0**
DEBT SERVICE COVERAGE RATIO TERM DEBT	7,69	2,61	2,61	2,60	2,59	2,58	2,57			
DEBT SERVICE COVERAGE RATIO ALL DEBT	7,685	2,614	2,607	2,598	2,589	2,580	2,570			

DSCRs are exceeding the threshold of 1.30x, hence, the Project is theoretically capable of servicing the envisioned debt.

The prospective equity returns are high. The project's feasibility is therefore good, from the perspective of a commercial investor, and the project might be pursued based on this preliminary assessment. Mind, the PIF described a capital structure including a 40% grant which is taken out in the modeling since at this stage the project seems feasible without subsidies. The PIF does mention, however, that ony a 7.5% return is allowed which has not been taken into account in this analysis.

SUMMARY EQUITY RETURNS				
GORJ COUNTY		LEVERAGED		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-414.216,64	746.603,93	57,52%
	15	-414.216,64	1.012.468,75	58,30%
	20	-414.216,64	1.145.089,76	58,37%
	25	-414.216,64	1.150.550,61	58,38%
* NET INVESTMENT (LESS PREMIUM)				
DISTRIBUTABLE CASH FLOW	10	-414.216,64	605.668,58	40,71%
	15	-414.216,64	830.383,11	42,09%
	20	-414.216,64	953.152,72	42,32%
	25	-414.216,64	947.691,88	42,31%

The summary table for this project is the following:

SUMMARY TABLE			1	2	3	4	5	6	7	8	9	10
GORJ COUNTY			1,00	2	3	4	5	6	7	8	9	10
NAME MAIN INVESTOR			2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
PRODUCTION	MWh		0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9
TOTAL REVENUES	EUR		**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**
PROFIT BEFORE DEPRECIATION / EBITDA	EUR		**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**	**380.070,48**
NET PROFIT	EUR		**240.096,86**	**241.975,58**	**247.193,99**	**252.787,40**	**258.782,74**	**265.208,90**	**272.096,84**	**276.630,77**	**276.630,77**	**276.630,77**
EBITDA MARGIN	%		67,3%	67,3%	67,3%	67,3%	67,3%	67,3%	67,3%	67,3%	67,3%	67,3%
OPERATING PROFIT MARGIN (EBIT)	%		58,3%	58,3%	58,3%	58,3%	58,3%	58,3%	58,3%	58,3%	58,3%	58,3%
NET PROFIT MARGIN	%		42,5%	42,8%	43,7%	44,7%	45,8%	46,9%	48,2%	49,0%	49,0%	49,0%
CASH FLOW BEFORE WC	EUR		290.754,17	496.934,48	462.023,95	424.169,29	379.954,25	328.921,77	270.581,95	364.593,07	419.784,31	470.441,62
CASH AT BALANCE SHEET YE	EUR		290.754,17	256.837,62	220.048,37	176.975,30	127.166,85	70.139,02	5.373,05	92.496,23	143.153,54	193.810,86
CF FROM OPERATIONS	EUR		**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**	**565.020,00**
GROSS CAPEX	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE	EUR		43.492,75	127.708,75	127.708,75	127.708,75	127.708,75	127.708,75	127.708,75	0,00	0,00	0,00
BALANCE SHEET TOTAL	EUR		1.275.638,47	1.191.064,61	1.103.618,05	1.009.887,67	909.421,90	801.736,77	686.313,49	690.847,41	690.847,41	690.847,41
SOLVENCY	%		51,3%	55,1%	59,9%	66,0%	74,0%	84,7%	100,0%	100,0%	100,0%	100,0%
GROSS DEBT / EBITDA	RATIO		1,63	1,41	1,16	0,90	0,62	0,32	0,00	0,00	0,00	0,00
CURRENT RATIO	RATIO		322686,1	288769,6	251980,3	208907,2	159098,8	102071,0	37305,0	92496,2	143153,5	193810,9
DSCR SENIOR DEBT	RATIO		7,69	2,61	2,61	2,60	2,59	2,58	2,57			
DSCR ALL DEBT	RATIO		7,69	2,61	2,61	2,60	2,59	2,58	2,57			

The preliminary assessment indicates a potentially feasible and bankable project. Refinement needs to take place in some cost categories such as certain cost elements like the ash treatment.

4 Financially Economic Non-Feasible Projects

4.1 Case Study 1 Hungary

4.1.1 Introduction Case Study

This assessment is based on the information from the description of the case study as per the table 2 and assumptions from other sources like the internet. There is no PIF for this case study.

Case study 1 Hungary comprises an investment into an ethanol production facility to produce roughly 30,000,000 liters / year as per the table below and electricty of 29GWh/yr from the 10,000 hectares of MUC land envisioned as per the case studies diagram below. Case study 1 Hungary is a feasibility study using assumptions verified against the ethanol-production case study 2 in Ukraine but at a scale of 1/3x.

4.1.2 Summary

The Base Case does not provide for a bankable project – from the perspective of the debt provider - as per the table below.

	100	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET PROFIT	-4.372.834	-4.169.356	-3.952.313	-3.735.269	-3.518.226	-2.817.131	-2.600.088	-2.383.044	-2.166.001	-1.948.958
INTEREST & PREFERRED DIVIDEND	2.075.477	1.871.999	1.654.955	1.437.912	1.220.869	1.003.825	786.782	569.739	352.695	135.652
DEPRECIATION	2.567.385	2.567.385	2.567.385	2.567.385	2.567.385	2.083.333	2.083.333	2.083.333	2.083.333	2.083.333
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**270.028**	**270.028**	**270.028**	**270.028**	**270.028**	**270.028**	**270.028**	**270.028**	**270.028**	**270.028**
TERM DEBT REPAYMENT	2.034.781	2.713.042	2.713.042	2.713.042	2.713.042	2.713.042	2.713.042	2.713.042	2.713.042	2.713.042
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	2.075.477	1.871.999	1.654.955	1.437.912	1.220.869	1.003.825	786.782	569.739	352.695	135.652
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**4.110.258**	**4.585.040**	**4.367.997**	**4.150.954**	**3.933.910**	**3.716.867**	**3.499.824**	**3.282.780**	**3.065.737**	**2.848.694**
DEBT SERVICE COVERAGE RATIO TERM DEBT	0,07	0,06	0,06	0,07	0,07	0,07	0,08	0,08	0,09	0,09

The prospective equity NPVs are also not indicating a good investment:

SUMMARY EQUITY RETURNS			
BACS-KISKUN & CSONGRAD COUNTRY		LEVERAGED	
EQUITY RETURNS	YRS	INVESTMENT*	NPV
		EUR	
POST-TAX NET CASH FLOW	10	-17.634.769,80	-24.811.492,25
	15	-17.634.769,80	-24.592.141,67
	20	-17.634.769,80	-24.507.326,74
	25	-17.634.769,80	-24.424.374,55

Therefore this project is modelled as if a grant of 60% of project cost would be requested. Next to the grant only equity has been modelled for the analysis of the feasibility of the project. The prospective equity returns are even then not at a level acceptable for investors.

SUMMARY EQUITY RETURNS				
BACS-KISKUN & CSONGRAD COUNTRY		LEVERAGED		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-16.666.666,67	-6.074.419,56	-22,93%
	15	-16.666.666,67	-5.855.068,98	-13,46%
	20	-16.666.666,67	-5.770.254,05	-9,15%
	25	-16.666.666,67	-5.687.301,86	-6,01%
* NET INVESTMENT (LESS PREMIUM)				

From a cash flow perspective it is theoretically possible to 'break-even' on an investment in this project but with 60% grant. Therefore it is not completely rendered non-feasible.

4.2 Case Study 2 Hungary

4.2.1 Introduction Case Study

This assessment is based on the information from the description of the case study as per the table on pathways identified and from internet sources (see footnote 2). Verification against other CHPs in the cases studies has been done. A detailed PIF has not been prepared.

Case study 2 Hungary comprises an investment into a CHP facility (gasification, pyrolysis) to produce roughly 4.5Mwe or 36GWh per year. The hectares of land to deliver the full feedstock needed is estimated at 10,000 hectares to grow poplar, willow and black locust.

4.2.2 Summary

The Base Case does not provide for sufficient cash flow. The debt cannot be serviced and therefore the project will be analysed from an all-equity point of view.

	100	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET PROFIT	-1.023.185	-979.351	-928.936	-874.366	-815.296	-604.846	-535.637	-460.723	-379.634	-291.860
INTEREST & PREFERRED DIVIDEND	643.013	599.179	548.764	494.193	435.124	371.186	301.977	227.062	145.973	58.199
DEPRECIATION	773.353	773.353	773.353	773.353	773.353	626.841	626.841	626.841	626.841	626.841
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	-24	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**393.181**	**393.157**	**393.181**	**393.181**	**393.181**	**393.181**	**393.181**	**393.181**	**393.181**	**393.181**
TERM DEBT REPAYMENT	427.932	611.594	662.009	716.580	775.649	839.588	908.797	983.711	1.064.800	1.152.574
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	643.013	599.179	548.764	494.193	435.124	371.186	301.977	227.062	145.973	58.199
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**1.070.945**	**1.210.773**	**1.210.773**	**1.210.773**	**1.210.773**	**1.210.773**	**1.210.773**	**1.210.773**	**1.210.773**	**1.210.773**
DEBT SERVICE COVERAGE RATIO TERM DEBT	0,37	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32

Without a grant the project is not worthwhile to invest in:

SUMMARY EQUITY RETURNS				
BALATON UPLANDS		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-12.536.829,58	-3.699.596,07	-15,94%
	15	-12.536.829,58	-3.380.205,03	-7,84%
	20	-12.536.829,58	-3.256.708,08	-4,42%

In the case of a grant assumed at a level of 60% the equity returns might provide for an investment case for impact or social investors or a public sector entity:

SUMMARY EQUITY RETURNS				
BALATON UPLANDS		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-5.014.731,83	-459.088,63	-4,38%
	15	-5.014.731,83	-150.111,59	1,56%
	20	-5.014.731,83	-16.667,93	3,83%

A refinement is required to conduct a more detailed feasibility study on the electricity and heat productoin levels and the required amounts of feedstock required and prices assumed. This can be shown by the profit and loss statement in how close operational revenues and expenses are:

PROFIT & LOSS			
EUR	100	2	3
BALATON UPLANDS	2023	2024	2025
REVENUES			
INCOME FROM SALES OF ELECTRICITY / SERVICES			
ELECTRICITY CONTRACTED 1	3.492.000	3.492.000	3.492.000
ELECTRICITY CONTRACTED 2	0	0	0
ELECTRICITY SPOT MARKET	0	0	0
	2023	2024	2025
TOTAL INCOME SALES / SERVICES	3.492.000	3.492.000	3.492.000
INCOME OTHER	1.476.240	1.476.240	1.476.240
VALUE ADDED TAX	0	0	0
INTEREST INCOME ON RESERVE(S) / BANK ACCOUNT	0	0	0
TOTAL REVENUES	**4.968.240**	**4.968.240**	**4.968.240**
OPERATIONAL EXPENSES			
VARIABLE EXPENSES			
VARIABLE O&M	792.000	792.000	792.000
FUEL [EXPENSES] [INCOME]	2.789.411	2.789.411	2.789.411
CONSUMABLES	0	0	0
ASH DISPOSAL & TRANSPORT COST	0	0	0
LAND LEASE - RENT	0	0	0
SELLING, GENERAL & ADMIN EXPENSES	993.648	993.648	993.648
SUBTOTAL VARIABLE EXPENSES	4.575.059	4.575.059	4.575.059

4.3 Case Study 3 Hungary

4.3.1 Introduction Case Study

This assessment is based on the information from the description of the case study as per the table below, from a detailed PIF (see Annex) and based on numerous e-mail exchanges regarding feedstock quantities. This project is in addtion to the projects listed on Table 2.

Case study 3 Hungary comprises an investment into a biodiesel production facility to produce roughly 150,000,000 liters / year from the 10,000 hectares of MUC land and quite some additional hectares of land to deliver the full feedstock needed. At this stage the hectares required seem to be 370,000.

4.3.2 Summary

The Base Case does not provide for a positive cash flow based on the information modelled. The cash flow is negative due to feedstock cost exceeding revenue levels all the time. A refinement is required to conduct a feasibility study on the required amounts of feedstock required.

PROFIT & LOSS										
EUR	1,00	2	3	4	5	6,00	7	8	9	10
KOMáROM	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
REVENUES										
INCOME FROM SALES OF ELECTRICITY / SERVICES										
ELECTRICITY CONTRACTED 1	0	0	0	0	0	0	0	0	0	0
ELECTRICITY CONTRACTED 2	0	0	0	0	0	0	0	0	0	0
ELECTRICITY SPOT MARKET	0	0	0	0	0	0	0	0	0	0
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
TOTAL INCOME SALES / SERVICES	0	0	0	0	0	0	0	0	0	0
INCOME OTHER	156.013.879	195.017.349	195.017.349	195.017.349	195.017.349	195.017.349	195.017.349	195.017.349	195.017.349	195.017.349
VALUE ADDED TAX	0	0	0	0	0	0	0	0	0	0
INTEREST INCOME ON RESERVE(S) / BANK ACCOUNT	0	0	0	0	0	0	0	0	0	0
TOTAL REVENUES	**156.013.879**	**195.017.349**	**195.017.349**	**195.017.349**	**195.017.349**	**195.017.349**	**195.017.349**	**195.017.349**	**195.017.349**	**195.017.349**
OPERATIONAL EXPENSES										
VARIABLE EXPENSES										
VARIABLE O&M	0	0	0	0	0	0	0	0	0	0
FUEL [EXPENSES] [INCOME]	476.694.915	476.694.915	476.694.915	476.694.915	476.694.915	476.694.915	476.694.915	476.694.915	476.694.915	476.694.915
CONSUMABLES	600.000	600.000	600.000	600.000	600.000	600.000	600.000	600.000	600.000	600.000
ASH DISPOSAL & TRANSPORT COST	0	0	0	0	0	0	0	0	0	0
LAND LEASE - RENT	28.395	28.395	28.395	28.395	28.395	28.395	28.395	28.395	28.395	28.395
SELLING, GENERAL & ADMIN EXPENSES	0	0	0	0	0	0	0	0	0	0
SUBTOTAL VARIABLE EXPENSES	477.323.310	477.323.310	477.323.310	477.323.310	477.323.310	477.323.310	477.323.310	477.323.310	477.323.310	477.323.310
FIXED EXPENSES										
ADMINISTRATION / HOLDCO CHARGE	125.000	125.000	125.000	125.000	125.000	125.000	125.000	125.000	125.000	125.000
OPERATIONS & MAINTENANCE FEE	324.000	324.000	324.000	324.000	324.000	324.000	324.000	324.000	324.000	324.000
INSURANCE / BANK FEES / LICENSE FEE	460.000	460.000	460.000	460.000	460.000	460.000	460.000	460.000	460.000	460.000
PERSONNEL EXPENSES	1.355.030	1.355.030	1.355.030	1.355.030	1.355.030	1.355.030	1.355.030	1.355.030	1.355.030	1.355.030
MIGA COVERAGE	0	0	0	0	0	0	0	0	0	0
PARASITIC LOAD AS EXPENSE	0	0	0	0	0	0	0	0	0	0
SUBTOTAL FIXED EXPENSES	2.264.030	2.264.030	2.264.030	2.264.030	2.264.030	2.264.030	2.264.030	2.264.030	2.264.030	2.264.030
TOTAL OPERATIONAL EXPENSES	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**	**479.587.340**
VAT OPERATIONAL EXPENSES										
PROFIT BEFORE DEPRECIATION / EBITDA	**-323.573.461**	**-284.569.991**	**-284.569.991**	**-284.569.991**	**-284.569.991**	**-284.569.991**	**-284.569.991**	**-284.569.991**	**-284.569.991**	**-284.569.991**
DEPRECIATION	1.791.893	1.791.893	1.791.893	1.791.893	1.791.893	1.791.893	1.791.893	1.791.893	1.791.893	1.791.893
NET OPERATING REVENUES / EBIT	**-325.365.354**	**-286.361.884**	**-286.361.884**	**-286.361.884**	**-286.361.884**	**-286.361.884**	**-286.361.884**	**-286.361.884**	**-286.361.884**	**-286.361.884**
NON-OPERATING EXPENSES										
INTEREST	705.163	654.303	599.250	539.658	475.155	405.334	329.758	247.952	159.402	63.553
EXCHANGE RATE (PROFIT) / LOSS ON DEBT SERVICE	0	0	0	0	0	0	0	0	0	0
PROVISION BAD DEBT	0	0	0	0	0	0	0	0	0	0
INVESTMENT DEDUCTION CONSTRUCTION PERIOD										
RESERVE INVERTERS	0	0	0	0	0	0	0	0	0	0
TOTAL NON-OPERATING EXPENSES	*705.163*	*654.303*	*599.250*	*539.658*	*475.155*	*405.334*	*329.758*	*247.952*	*159.402*	*63.553*
PROFIT BEFORE TAXATION	**-326.070.517**	**-287.016.187**	**-286.961.134**	**-286.901.542**	**-286.837.039**	**-286.767.218**	**-286.691.642**	**-286.609.836**	**-286.521.286**	**-286.425.438**
COMMUNITY CONTRIBUTION & DEVELOPMENT	0	0	0	0	0	0	0	0	0	0
DEFERRED TAX ASSET	0	0	0	0	0	0	0	0	0	0
NET TAXATION POSITION	0	0	0	0	0	0	0	0	0	0
CAPITALISATION INTEREST SENIOR DEBT OPER. PHASE	0	0	0	0	0	0	0	0	0	0
CAPITALISATION INTEREST SUB. DEBT OPER. PHASE	0	0	0	0	0	0	0	0	0	0
INTEREST SH LOAN & SUB TD NON-TAX DEDUCTIBLE	0	0	0	0	0	0	0	0	0	0
NET PROFIT	**-326.070.517**	**-287.016.187**	**-286.961.134**	**-286.901.542**	**-286.837.039**	**-286.767.218**	**-286.691.642**	**-286.609.836**	**-286.521.286**	**-286.425.438**
NET PROFIT	-326.070.517	-287.016.187	-286.961.134	-286.901.542	-286.837.039	-286.767.218	-286.691.642	-286.609.836	-286.521.286	-286.425.438
NET PROFIT ACCUMULATED	-326.070.517	-613.086.704	-900.047.837	-1.186.949.380	-1.473.786.418	-1.760.553.636	-2.047.245.278	-2.333.855.114	-2.620.376.400	-2.906.801.838

4.4 Case Study 1 Italy

4.4.1 Introduction Case Study

This assessment is based on the information from the description of the case study of report D4.1. and on information from the discussions with the case study partners. For this project a PIF has been submitted which is annexed.

Case study 1 Italy comprises an investment into an electricity production facility, 17.1MW as per Table 2 but 1 MW as per the PIF, from biogas as a feedstock from 6,000 hectares of MUC-land.

4.4.2 Summary

The Base Case does not provide not for a bankable project as per the table below.

	0,50	1	2	3	4	5,00	6	7	8	9	10,00	11
DEBT SERVICE CAPACITY	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET PROFIT	-155.566	-304.319	-292.832	-280.520	-267.323	-245.996	-223.654	-207.403	-189.983	-171.313	-151.300	-129.850
INTEREST & PREFERRED DIVIDEND	90.520	174.227	162.740	150.428	137.231	123.086	107.924	91.673	74.253	55.583	35.570	14.120
DEPRECIATION	119.681	239.362	239.362	239.362	239.362	232.181	225.000	225.000	225.000	225.000	225.000	225.000
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**54.635**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**	**109.270**
TERM DEBT REPAYMENT	38.260	159.852	171.339	183.651	196.848	210.993	226.155	242.406	259.825	278.496	298.509	319.959
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	90.520	174.227	162.740	150.428	137.231	123.086	107.924	91.673	74.253	55.583	35.570	14.120
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**128.780**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**	**334.079**
DEBT SERVICE COVERAGE RATIO TERM DEBT	**0,42**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**	**0,33**

The prospective equity returns are also not at reasonable level.

SUMMARY EQUITY RETURNS		
SULCIS - SARDINIA	**LEVERAGED**	
EQUITY RETURNS YRS	INVESTMENT*	NPV
	EUR	
POST-TAX NET CASH FLOW 10	-2.069.034,69	-2.551.407,30
15	-2.069.034,69	-2.521.031,68
20	-2.069.034,69	-2.495.430,65

The project's feasibility at this stage indicates that the project is non-feasible.

If a grant would be assumed of 60% there might be a case for an impact investor or public sector entity:

SUMMARY EQUITY RETURNS				
SULCIS - SARDINIA		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-1.800.000,00	-924.773,73	-8,38%
	15	-1.800.000,00	-850.206,99	-1,31%
	20	-1.800.000,00	-824.110,76	1,12%

The Project's cash flow is only sufficient to support a social investment if also 60% grant is assumed. Case Study 1 Italy seems not to be financially feasible. Areas of attention for a full feasibility analysis will be, among others, the amount of feedstock needed, the price of the feedstock and logistical (including pre-treatment) and transport expenses (to be checked against STEN-output).

4.5 Case Study 1 Spain

4.5.1 Introduction Case Study

The case study for Spain is not accompanied by a completed Project Identification Form. Report D4.1. details the case study but without anticipated production figures.

As per table on the pathways the Project aims at the production of 5 million liters of HVO per year from sunflower and camelina at roughly 15,000 hectares of MUC-land.

4.5.2 Summary

The Base Case provides not for a bankable project. The HVO will be sold at a marketprice of roughly EUR 1,300/tn (EUR equivalent from NESTE: https://www.neste.com/investors/market-data/biodiesel-prices-sme-fame#3a713081) which will result in gross revenues of roughly EUR 6.5 million per annum.

The cost for the feedstock and the operational cost exceed the gross revenues every year. 15,000 hectares *1.4 (yield) * (price sun flower + camelina (average EUR 295/tn)) is roughly EUR 6.2 million/year. For operational cost 20% is added of revenues which is in current case EUR 1.3 million. The cash flow diagram below presents the negative cash flow every year and therefore the conclusion is that the project is not feasible.

CASH FLOW												
EUR		100	2	3	4	5	6,00	7	8	9	10	1100
	TOTAL	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
INCOME												
CASH INFLOW FROM SALES & INTEREST EARNED	162.514.457,5	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578
DEBTORS	0,0	0	0	0	0	0	0	0	0	0	0	0
DEBTORS T-1	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH INFLOW FROM OPERATIONS	**162.514.457,5**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**	**6.500.578**
EXPENSES												
OPERATIONAL EXPENSES	187.377.891,5	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116	7.495.116
CREDITORS	0,0	0	0	0	0	0	0	0	0	0	0	0
CREDITORS T-1	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET OPERATIONAL CASH OUTFLOW	**187.377.891,5**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**
INVESTMENT COSTS DURING OPERATION	**0,0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
INTEREST TERM LOAN	0,0	0	0	0	0	0	0	0	0	0	0	0
DEVALUATION IMPACT INTEREST	0,0	0	0	0	0	0	0	0				
REPAYMENT PRINCIPAL TERM DEBT	0,0	0	0	0	0	0	0	0	0	0	0	0
DEVALUATION IMPACT REPAYMENT	0,0	0	0	0	0	0	0	0				
INTEREST SUBORDINATED TERM LOAN	0,0	0	0	0	0	0	0	0	0	0	0	0
REPAYMENT PRINCIPAL SUBORDINATED TERM LOAN	0,0	0	0	0	0	0	0	0	0	0	0	0
DEBT SERVICE OUTFLOW	**0,0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL RESERVES	0,0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TAXATION	0,0	0	0	0	0	0	0	0	0	0	0	0
INTEREST SHAREHOLDER LOANS / PREF SHARES	0,0	0	0	0	0	0	0	0	0	0	0	0
REPAYMENT SHAREHOLDER LOANS / SHARE REDEMPTION	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH OUTFLOW	**187.377.891,5**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**	**7.495.116**
	INV											
NET CASH FLOW	-2.279.930,62	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**	**-994.537**
CUMULATIVE CASH FLOW		-994.537	-1.989.075	-2.983.612	-3.978.149	-4.972.687	-5.967.224	-6.961.762	-7.956.299	-8.950.836	-9.945.374	-10.939.911

Obviously, the net present values indicate the same conclusion:

SUMMARY EQUITY RETURNS			
CASE STUDY 1		LEVERAGED	
EQUITY RETURNS	YRS	INVESTMENT*	NPV
		EUR	
POST-TAX NET CASH FLOW	10	-2.279.930,62	-5.583.429,53
	15	-2.279.930,62	-6.391.318,70
	20	-2.279.930,62	-6.703.700,19
	25	-2.279.930,62	-7.028.834,11
* NET INVESTMENT (LESS PREMIUM)			

4.6 Case Study 2 Spain

4.6.1 Introduction Case Study

The case study for Spain is not accompanied by a completed Project Identification Form. Report D4.1. details the case study but without anticipated production figures.

As per the table on the pathways the Project aims at the production of 5 million liters of biodiesel per year from camelina at roughly 15,000 hectares of MUC-land.

4.6.2 Summary

The Base Case provides not for a bankable project. The biodiesel will be sold at a marketprice of roughly EUR 1,300/tn (EUR equivalent from NESTE: https://www.neste.com/investors/market-data/biodiesel-prices-sme-fame#3a713081) which will result in gross revenues of roughly EUR 6.5 million per annum.

The cost for the feedstock and the operational cost exceed the gross revenues every year. 15,000 hectares *1.4 (yield) * (price camelina of EUR 250/tn) is roughly EUR 5.3 million/year. For operational cost 20% is added of revenues which is in current case EUR 1.06 million. The cash flow diagram below presents the negative cash flow every year and therefore the conclusion is that the project is not feasible.

CASH FLOW												
EUR		100	2	3	4	5	6,00	7	8	9	10	1100
	TOTAL	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
INCOME												
CASH INFLOW FROM SALES & INTEREST EARNED	162.514.457,5	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578
DEBTORS	0,0	0	0	0	0	0	0	0	0	0	0	0
DEBTORS T-1	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH INFLOW FROM OPERATIONS	162.514.457,5	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578	6.500.578
EXPENSES												
OPERATIONAL EXPENSES	163.752.891,5	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116
CREDITORS	0,0	0	0	0	0	0	0	0	0	0	0	0
CREDITORS T-1	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL NET OPERATIONAL CASH OUTFLOW	163.752.891,5	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116
INVESTMENT COSTS DURING OPERATION	0,0	0	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN	0,0	0	0	0	0	0	0	0	0	0	0	0
DEVALUATION IMPACT INTEREST	0,0	0	0	0	0	0	0	0				
REPAYMENT PRINCIPAL TERM DEBT	0,0	0	0	0	0	0	0	0	0	0	0	0
DEVALUATION IMPACT REPAYMENT	0,0	0	0	0	0	0	0	0				
INTEREST SUBORDINATED TERM LOAN	0,0	0	0	0	0	0	0	0	0	0	0	0
REPAYMENT PRINCIPAL SUBORDINATED TERM LOAN	0,0	0	0	0	0	0	0	0	0	0	0	0
DEBT SERVICE OUTFLOW	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL RESERVES	0,0	0	0	0	0	0	0	0	0	0	0	0
TAXATION	0,0	0	0	0	0	0	0	0	0	0	0	0
INTEREST SHAREHOLDER LOANS / PREF SHARES	0,0	0	0	0	0	0	0	0	0	0	0	0
REPAYMENT SHAREHOLDER LOANS / SHARE REDEMPTION	0,0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH OUTFLOW	163.752.891,5	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116	6.550.116
	INV											
NET CASH FLOW	-2.166.650,00	-49.537	-49.537	-49.537	-49.537	-49.537	-49.537	-49.537	-49.537	-49.537	-49.537	-49.537
CUMULATIVE CASH FLOW		-49.537	-99.075	-148.612	-198.149	-247.687	-297.224	-346.762	-396.299	-445.836	-495.374	-544.911

Obviously, the net present values indicate the same conclusion:

SUMMARY EQUITY RETURNS			
CASE STUDY 2		LEVERAGED	
EQUITY RETURNS	YRS	INVESTMENT*	NPV
		EUR	
POST-TAX NET CASH FLOW	10	-2.166.650,00	-1.176.945,26
	15	-2.166.650,00	-1.217.185,78
	20	-2.166.650,00	-1.232.745,33
	25	-2.166.650,00	-1.248.940,07
* NET INVESTMENT (LESS PREMIUM)			

4.7 Case Study 1 Ukraine

4.7.1 Introduction Case Study

This assessment is based on the information from the description of the case study and from a filled-out 'Project Identification Form - PIF' (see Annex).

Case study 1 Ukraine comprises an investment into a CHP plant to produce during a period of 25 years 250,000 MWh/year (electric) from 44 MWe installed capacity and 200,000 MWh/year (heat) from 130 MWth installed capacity using the produce from 30,000 ha of MUC land, representing the equivalent of feedstock for the production of 10MWe and feedstock supplies from other areas and suppliers.

4.7.2 Summary

The Base Case provides for a bankable project – from the perspective of the debt provider - as per the table below.

	0,50	1	2	3	4	5,00	6	7	8	9	10,00	11	12	13	14
DEBT SERVICE CAPACITY	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
NET PROFIT	-844.103	-1.606.969	-1.381.322	-1.139.461	-880.220	-602.350	-304.512	12.077	292.664	593.415	915.777	1.261.304	1.631.660	2.028.629	2.289.931
INTEREST & PREFERRED DIVIDEND	2.240.402	4.399.568	4.173.921	3.932.060	3.672.818	3.394.948	3.097.111	2.777.871	2.435.691	2.068.922	1.675.797	1.254.423	802.769	318.660	0
DEPRECIATION	6.354.026	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052	12.708.052
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	-13	0	0	0	0	0	0	0	0	0	0	0	0	1.884.924
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**7.750.325**	**15.500.638**	**15.500.651**	**15.500.651**	**15.500.651**	**15.500.651**	**15.500.651**	**15.498.000**	**15.436.407**	**15.370.389**	**15.299.627**	**15.223.779**	**15.142.482**	**15.055.342**	**16.882.907**
TERM DEBT REPAYMENT	0	3.140.129	3.365.775	3.607.636	3.866.878	4.144.748	4.442.585	4.761.825	5.104.005	5.470.774	5.863.899	6.285.273	6.736.927	7.221.036	0
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	2.240.402	4.399.568	4.173.921	3.932.060	3.672.818	3.394.948	3.097.111	2.777.871	2.435.691	2.068.922	1.675.797	1.254.423	802.769	318.660	0
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**2.240.402**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**7.539.696**	**0**
DEBT SERVICE COVERAGE RATIO TERM DEBT	3,46	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,05	2,04	2,03	2,02	2,01	2,00	
DEBT SERVICE COVERAGE RATIO ALL DEBT	3,459	2,056	2,056	2,056	2,056	2,056	2,056	2,056	2,047	2,039	2,029	2,019	2,008	1,997	

DSCRs are exceeding 2.0x whereas 1.30x is the threshold, hence, the Project could consider to have more debt in the financial structure from a debt service perspective.

The prospective equity returns are not very high. The project's feasibility is therefore too low, from the perspective of a commercial investor, and the project might not be pursued unless the project is supported some how (like with capital grants).

SUMMARY EQUITY RETURNS				
CASE STUDY 1		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-192.034.470,36	-125.196.959,15	-12,06%
	15	-192.034.470,36	-117.839.220,09	-3,34%
	20	-192.034.470,36	-113.725.172,91	0,36%
	25	-192.034.470,36	-110.193.089,24	2,39%
* NET INVESTMENT (LESS PREMIUM)				

The summary table for this project is the following:

SUMMARY TABLE				1	2	3	4	5	6	7	8	9	10
CASE STUDY 1				0,50	1	2	3	4	5	6	7	8	9
NAME MAIN INVESTOR				2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
PRODUCTION		MWh		125,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0
USAGE													
IPP		MWh		125,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0
ANCHOR LOAD		MWh		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
PRE-PAID MINIGRID		MWh		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
POST-PAID MINIGRID		MWh		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
TARIFFS													
ENERGY CHARGE													
ENERGY CHARGE		LCY/kWh	1	123,9	123,9	123,9	123,9	123,9	123,9	123,9	123,9	123,9	123,9
ENERGY CHARGE	V	EUR/kWh		123,9	123,9	123,9	123,9	123,9	123,9	123,9	123,9	123,9	123,9
ENERGY CHARGE		USD/kWh		151,8	152,2	152,6	152,9	153,3	153,7	154,1	154,5	154,9	155,2
ENERGY CHARGE													
MARKET TARIFF													
TOTAL REVENUES		EUR		**19.625.325,45**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**
PROFIT BEFORE DEPRECIATION / EBITDA		EUR		**7.750.325,45**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**	**15.500.650,90**
NET PROFIT		EUR		**-844.102,94**	**-1.606.969,08**	**-1.381.322,49**	**-1.139.461,14**	**-880.219,88**	**-602.349,79**	**-304.512,23**	**12.076,68**	**292.664,40**	**593.414,89**
EBITDA MARGIN		%		39,5%	39,5%	39,5%	39,5%	39,5%	39,5%	39,5%	39,5%	39,5%	39,5%
OPERATING PROFIT MARGIN (EBIT)		%		7,1%	7,1%	7,1%	7,1%	7,1%	7,1%	7,1%	7,1%	7,1%	7,1%
NET PROFIT MARGIN		%		-4,3%	-4,1%	-3,5%	-2,9%	-2,2%	-1,5%	-0,8%	0,0%	0,7%	1,5%
CASH FLOW BEFORE WC		EUR		5.509.923,30	13.470.865,24	21.431.820,08	29.392.774,92	37.353.729,76	45.314.684,60	53.275.639,44	61.233.943,31	69.130.654,75	76.961.347,79
CASH AT BALANCE SHEET YE		EUR		5.509.923,30	13.470.865,24	21.431.820,08	29.392.774,92	37.353.729,76	45.314.684,60	53.275.639,44	61.233.943,31	69.130.654,75	76.961.347,79
CF FROM OPERATIONS		EUR		**19.625.325,45**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**	**39.250.650,90**
GROSS CAPEX		EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE		EUR		2.240.402,15	7.539.696,06	7.539.696,06	7.539.696,06	7.539.696,06	7.539.696,06	7.539.696,06	7.539.696,06	7.539.696,06	7.539.696,06
BALANCE SHEET TOTAL		EUR		255.201.857,54	250.454.759,91	245.707.662,29	240.960.564,67	236.213.467,04	231.466.369,42	226.719.271,79	221.969.523,19	217.158.182,16	212.280.822,73
SOLVENCY		%		74,9%	75,7%	76,6%	77,6%	78,8%	80,2%	81,7%	83,5%	85,5%	87,7%
GROSS DEBT / EBITDA		RATIO		8,26	3,93	3,71	3,48	3,23	2,96	2,67	2,37	2,04	1,68
CURRENT RATIO		RATIO		7394834,4	15355789,3	23316744,1	31277698,9	39238653,8	47199608,6	55160563,5	63118867,3	71015578,8	78846271,8
DSCR SENIOR DEBT		RATIO		3,46	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,05	2,04
DSCR ALL DEBT		RATIO		3,46	2,06	2,06	2,06	2,06	2,06	2,06	2,06	2,05	2,04

The make the project more feasible a grant would be needed of roughly 40% in combination with an increase of debt (up to 50:50 debt:equity ratio) to yield an equity return exceeding the cost level of the debt. The following diagram shows the result of such support and structuring activity:

SUMMARY EQUITY RETURNS				
CASE STUDY 1		LEVERAGED		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-76.082.571,25	-37.463.625,22	-3,52%
	15	-76.082.571,25	-31.392.141,65	3,99%
	20	-76.082.571,25	-27.038.288,03	7,21%
	25	-76.082.571,25	-24.062.107,22	8,71%
* NET INVESTMENT (LESS PREMIUM)				

4.8 Case Study 2 Ukraine

4.8.1 Introduction Case Study

This assessment is based on the information from the description of the case study and from a filled-out 'Project Identification Form - PIF' (see Annex).

Case study 2 Ukraine comprises an investment into a 2G ethanol production facility that will produce during a period of 25 years 33,400 tonnes of ethanol and produce electricity from 10.88 MWe installed capacity using the produce from 30,000 ha of MUC land.

4.8.2 Summary

The Base Case does not provide for a bankable project – from the perspective of the debt provider - as per the table below.

	1,00	2	3	4	5	6,00	7	8	9	10
DEBT SERVICE CAPACITY	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NET PROFIT	-6.149.300	-5.625.844	-5.071.442	-4.483.936	-3.861.014	-3.200.199	-2.498.838	-1.754.086	-962.894	-139.373
INTEREST & PREFERRED DIVIDEND	5.494.120	5.078.458	4.632.927	4.155.380	3.643.517	3.094.873	2.506.803	1.876.475	1.200.852	476.680
DEPRECIATION	6.905.578	6.905.578	6.905.578	6.905.578	6.905.578	6.905.578	6.905.578	6.905.578	6.905.578	6.905.578
CHANGE IN WORKING CAPITAL [PRE-DIVIDENDS]	0	0	0	0	0	0	0	0	0	0
CHANGE IN WORKING CAPITAL [POST-DIVIDENDS]	0	-26	0	0	0	0	0	0	0	0
ADDITIONAL CASH	0	0	0	0	0	0	0	0	0	0
ANNUAL INVESTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL CASHFLOW FOR DSCR CALCULATION	**6.250.399**	**6.358.166**	**6.467.063**	**6.577.022**	**6.688.082**	**6.800.251**	**6.913.543**	**7.027.967**	**7.143.536**	**7.242.885**
TERM DEBT REPAYMENT	5.784.411	6.200.074	6.645.605	7.123.152	7.635.014	8.183.659	8.771.729	9.402.057	10.077.680	10.801.852
SHORT TERM DEBT REPAYMENT	0	0	0	0	0	0	0	0	0	0
SUB DEBT REPAYMENT / SHARE REDEMPTION	0	0	0	0	0	0	0	0	0	0
INTEREST TERM LOAN(S)	5.494.120	5.078.458	4.632.927	4.155.380	3.643.517	3.094.873	2.506.803	1.876.475	1.200.852	476.680
INTEREST SUBORDINATED LOAN(S) / PREF DIVIDEND	0	0	0	0	0	0	0	0	0	0
INTEREST SHORT TERM LOAN(S)	0	0	0	0	0	0	0	0	0	0
TOTAL DEBT SERVICE	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**	**11.278.532**
DEBT SERVICE COVERAGE RATIO TERM DEBT	0,55	0,56	0,57	0,58	0,59	0,60	0,61	0,62	0,63	0,64
DEBT SERVICE COVERAGE RATIO ALL DEBT	0,554	0,564	0,573	0,583	0,593	0,603	0,613	0,623	0,633	0,642

SUMMARY EQUITY RETURNS				
CASE STUDY 2		**LEVERAGED**		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-53.739.668,17	-46.082.944,79	#GETAL!
	15	-53.739.668,17	-39.466.361,09	-8,47%
	20	-53.739.668,17	-36.980.217,71	-2,41%
	25	-53.739.668,17	-34.562.025,08	1,01%
* NET INVESTMENT (LESS PREMIUM)				

Therefore, the feasiblity has been performed taking a grant of 60% into account, assuming a successful application for such grant from (an equivalent of) the Innovation Fund, next to only equity.

The prospective equity returns increase to an acceptable level. The project's feasibility is therefore good, from the perspective of a commercial investor, and the project might be pursued based on this preliminary assessment.

SUMMARY EQUITY RETURNS				
CASE STUDY 2		LEVERAGED		
EQUITY RETURNS	YRS	INVESTMENT*	NPV	IRR
		EUR		
POST-TAX NET CASH FLOW	10	-50.000.000,00	5.008.149,06	3,04%
	15	-50.000.000,00	10.427.629,22	8,03%
	20	-50.000.000,00	13.175.701,88	9,89%
	25	-50.000.000,00	15.047.184,75	10,91%
* NET INVESTMENT (LESS PREMIUM)				

The summary table for this project is the following:

SUMMARY TABLE			1	2	3	4	5	6	7	8	9	10
CASE STUDY 2			1,00	2	3	4	5	6	7	8	9	10
NAME MAIN INVESTOR			2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
PRODUCTION	MWh		87,0	87,0	87,0	87,0	87,0	87,0	87,0	87,0	87,0	87,0
TOTAL REVENUES	EUR		**41.232.398,75**	**41.340.191,75**	**41.449.062,68**	**41.559.022,32**	**41.670.081,55**	**41.782.251,38**	**41.895.542,91**	**42.009.967,35**	**42.125.536,04**	**42.242.260,41**
PROFIT BEFORE DEPRECIATION / EBITDA	EUR		**6.250.398,75**	**6.358.191,75**	**6.467.062,68**	**6.577.022,32**	**6.688.081,55**	**6.800.251,38**	**6.913.542,91**	**7.027.967,35**	**7.143.536,04**	**7.260.260,41**
NET PROFIT	EUR		**3.075.326,97**	**3.163.717,23**	**3.252.991,40**	**3.343.158,30**	**3.434.226,87**	**3.526.206,13**	**3.619.105,19**	**3.712.933,23**	**3.807.699,55**	**3.903.413,54**
EBITDA MARGIN	%		15,2%	15,4%	15,6%	15,8%	16,1%	16,3%	16,5%	16,7%	17,0%	17,2%
OPERATING PROFIT MARGIN (EBIT)	%		9,1%	9,3%	9,6%	9,8%	10,1%	10,3%	10,5%	10,8%	11,0%	11,3%
NET PROFIT MARGIN	%		7,5%	7,7%	7,8%	8,0%	8,2%	8,4%	8,6%	8,8%	9,0%	9,2%
CASH FLOW BEFORE WC	EUR		5.575.326,97	11.239.044,20	13.916.708,63	16.596.149,69	19.277.385,16	21.960.432,99	24.645.311,31	27.332.038,40	30.020.632,77	32.711.113,08
CASH AT BALANCE SHEET YE	EUR		5.575.326,97	8.163.717,23	10.752.991,39	13.343.158,29	15.934.226,86	18.526.206,12	21.119.105,17	23.712.933,22	26.307.699,54	28.903.413,53
CF FROM OPERATIONS	EUR		**41.232.398,75**	**41.340.191,75**	**41.449.062,68**	**41.559.022,32**	**41.670.081,55**	**41.782.251,38**	**41.895.542,91**	**42.009.967,35**	**42.125.536,04**	**42.242.260,41**
GROSS CAPEX	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
TOTAL DEBT SERVICE	EUR		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
BALANCE SHEET TOTAL	EUR		53.075.326,98	53.163.717,24	53.252.991,40	53.343.158,30	53.434.226,88	53.526.206,13	53.619.105,19	53.712.933,23	53.807.699,55	53.903.413,54
SOLVENCY	%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
GROSS DEBT / EBITDA	RATIO		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
CURRENT RATIO	RATIO		5575327,0	8163717,2	10752991,4	13343158,3	15934226,9	18526206,1	21119105,2	23712933,2	26307699,5	28903413,5
DSCR SENIOR DEBT	RATIO		0,00									
DSCR ALL DEBT	RATIO											

The security of cash flow for this project at this preliminary stage looks okay but only in combination with support mechanism like a 60% grant. Refinement for the ultimate feasibility study will need to occur on the total cost level of the feedstock to be used which currently is assumed at 720 EUR/t (total production cost; data taken form D3.3 of FORBIO project) and on the total tonnes of feedstock needed which are currenly assumed at the amount of 1 tonnes per production of biodiesel (but not per tonnes of yield per hectare of MUC land).

5 Feasibility and Business Models

5.1 Business Models

The business models mentioned in this report are related to the 13 defined cases studies. The categorisation and the analysis of the business propositions follow international practice of evaluaton and finance of renewable energy projects.

The business models are described in 'words' in Report D4.1 and in financial-economic terms in Report D6.3 and the financial model 'BIOPLAT-EU-EU_D6.4' which contains all projects. This report should be seen as a supplement to D6.4.

5.2 Feasibility Studies

The BIOPLAT-EU-EU Consortium defined the following pathways for the case studies that are described in Reports D4.1 and D6.3:

Country	Site Location	MUC type	Total hectares	Bioenergy crop	Bioenergy pathway	Plant capacity
Germany 1	Spree-Neiße	Underutilized (lignite mining reclamation sites)	2,100	Sorghum	Biomethane	3,200,000 m³/year
Germany 2	Dahme-Spreewald	Underutilized and contaminated (Former sewage irrigation fields)	521	Poplar (SRC) Miscanthus	CHP (solid biomass)	650 kWe (5.2 GWh/year)
Hungary 1	Bács-Kiskun and Csongrád county	Marginal - underutilized	10,000	Maize	1G ethanol	5-10,000,000 liters/year
Hungary 2	Balaton Uplands region: Veszprém County and Fejér County	Marginal - Underutilized	10,000	Poplar, Willow, Black locust	CHP (gasification/pyrolysis)	4.5 MWe (36 GWh/yr)
Italy 1	Sulcis	Contaminated - underutilized	6,000	Arundo donax	Biogas	17.1 MWe (136 GWh/year)
Italy 2	Matera, Basilicata region	Contaminated	14,000	Oil seed; Sorghum	Biodiesel	5,000,000 liters/year
Romania 1	Bacău County, Strugari and Blăgești	Underutilized	95	Miscanthus	CHP (solid biomass)	45 KWe (360 MWh/year)
Romania 2	Oltenia mining area, Gorj County, Pesteana querry (Pesteana South and North closed spoil heaps)	Underutilized	176	Lucerne; Sorghum	CHP(Biogas)	200 KWe (1.6 GWh/year)
Spain 1	Albacete	Contaminated - underutilized	15,000	Sunflower; Camelina	HVO	5,000,000 liters/year
Spain 2	Cuenca	Contaminated – Underutilized	15,000	Camelina	Biodiesel	5,000,000 liters/year
Ukraine 1	Khmelnytskyi and Ternopil	Underutilized	30,000	Miscanthus; switchgrass	CHP (solid biomass)	40MWe (320 GWh/year)
Ukraine 2	Kyiv and Chernihiv regions	Underutilized	30,000	Willow	2G ethanol	30,000,000 liters/year

Bioenergy plants are assumed to operate for 8,000 hours/year. Therefore, for instance, a 1 MWe plant will generate 8,000 MWh or 8GWh in any operating year.

The case studies explored within the BIOPLAT-EU-EU Consortium have been reviewed for financial economic feasibility in Report D6.3. A summary of the case studies and the assumptions used is depicted below.

Input-Sheet Investment Model BIOPLAT-EU-EU

BIOPLAT			1	2	3	4	5	6	7	8	9	10	11	12	13
THE INPUT IN THIS SHEET IS LINKED TO THE A(ssumptions)-SHEET	SOURCE		PIF		PIF		PIF	PIF		PIF	PIF			PIF	PIF
THIS SHEET IS FOR HIGH-LEVEL INPUT; THE A-SHEET HAS INPUT ENTRIES IN MORE DETAIL	COUNTRY		GERMANY	GERMANY	HUNGARY	HUNGARY	HUNGARY	ITALY	ITALY	ROMANIA	ROMANIA	SPAIN	SPAIN	UKRAINE	UKRAINE
	CASE STUDY		SPREE-NEISSE	DAHME-SPREEWALD	BACS-KISKUN & CSONGRAD COUNTRY	BALATON UPLANDS REGION		SULCIS - SARDINIA	MATERA, BASILICATA REGION	BACAU	GORJ COUNTY	CASE STUDY 1	CASE STUDY 2	CASE STUDY 1	CASE STUDY 2
			BIOMETHANE	CHP - SOLID BIOMASS	ETHANOL	CHP - GASIFICATION / PYROLYSIS	BIODIESEL-FAME	CHP - BIOGAS	BIODIESEL	CHP - SOLID BIOMASS	CHP - BIOGAS	HVO	BIODIESEL	CHP - SOLID BIOMASS	ETHANOL
START CONSTRUCTION (NOTICE TO PROCEED = FINANCIAL CLOSE (FC) + […] m)	DATE		1-jan-21	1-jan-21	1-jan-21	1-jan-21	1-jan-21	1-jan-21	1-jan-21	1-jan-23	1-jan-23	1-jan-21	1-jan-21	1-jan-21	1-jan-21
# OF MONTHS CONSTRUCTION	MONTHS		24	12	24	24	24	6	24	12	12	24	24	18	24
MODEL FORECAST PERIOD	YEARS		10,00	20,00	25,00	20,00	20,00	20,00	25,00	20,00	20,00	25,00	25,00	25,00	25,00
1 EUR / LOCAL CURRENCY			1,00	1,00	1,18	1,18	1,18	1,00	1,00	4,92	4,92	1,00	1,00	32,19	32,19
INVESTMENT															
INVESTMENT COST	EUR		1.816.000	3.168.750	41.666.667	12.536.830	35.000.000	4.500.000	2.166.650	653.500	975.000	2.166.650	2.166.650	250.000.000	125.000.000
OTHER COST	EUR														
PRODUCTION															
GENERATION CAPACITY	MW		2,28	0,69	3,63	4,50		1,10		0,20	0,150			44,00	10,88
CAPACITY / LOAD FACTOR	%		80,00%	85,56%	91,26%	91,26%		91,26%		74,15%	85,56%			64,82%	91,26%
OTHER PRODUCTION (e.g. FAME, BIOGAS, BIOMETHANE, ETHANOL, etc.)	TN or M^3/yr		1.457.000		10.000		150.000		5.000			5.000	5.000		33.400
% FIRST YEAR PRODUCTION	%		100%		100%		80%		100%			100%	100%		100%
HEAT PRODUCTION	MWh/yr			16.500,00		31.500				1.400,00	5.500,00			200.000,00	
PRICES END-PRODUCT															
PRICE ELECTRICITY FROM CHP IN [ ]	EUR/MWh		110,40	98,90	97,00	97,00		150,00		200,00	200,00			123,90	123,90
ETHANOL	EUR/TN/M^3				911,77										
PRICE HEAT FROM CHP IN [ ]	EUR/MWh			45,00		46,86				50,00	50,00			41,38	
BIOGAS	EUR/TN/M^3														
STRAIGHT VEGETABLE OIL	EUR/TN/M^3														
BIODIESEL	EUR/TN/M^3						1.300,12		1.300,12			1300,12	1.300,12		
BIOGAS	EUR/TN/M^3														
CELLULOSIC ETHANOL	EUR/TN/M^3														911,77
BIOMETHANE	EUR/TN/M^3														
HYDROTREATED VEGETABLE OIL	EUR/TN/M^3														
BIOMASS-TO-LIQUID FUEL	EUR/TN/M^3														
OTHER	EUR/TN/M^3														

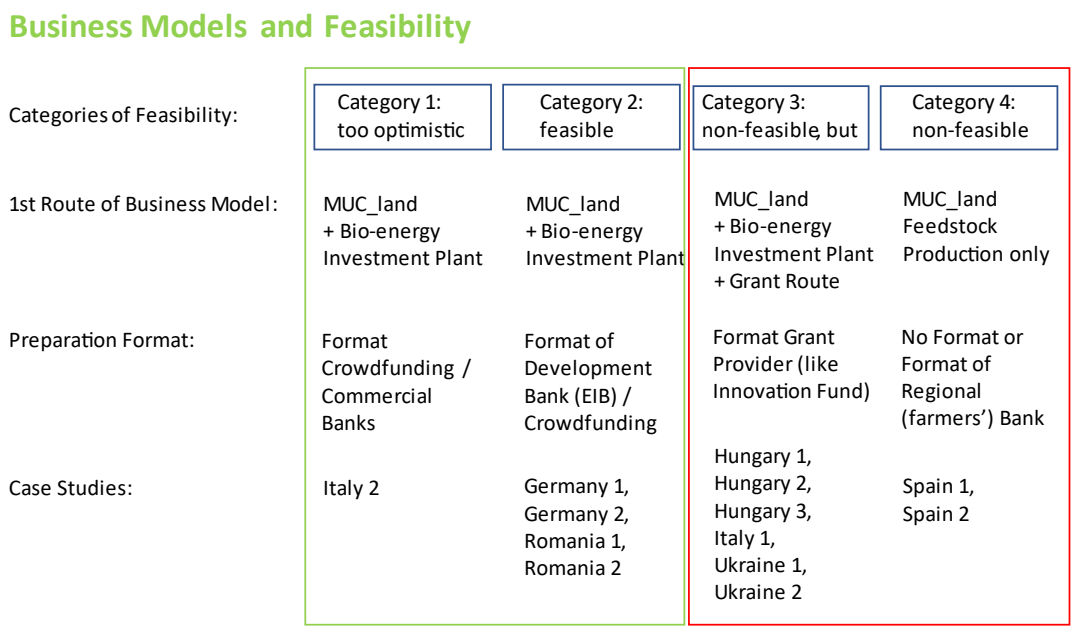
VARIABLE EXPENSES																
VARIABLE O&M	EUR/kWh															
VARIABLE O&M	EUR/MWh		22		22					22	18			75		
CONSUMABLES	EUR	290.000		3.596.667		600.000									10.790.000	
COST ALL-IN RAW MATERIAL (FROM STEN)	EUR/TN	23	70	720	70	506	25	23	91	80	295	250			720	
QUANTITY RAW MATERIAL (FROM STEN)	TN	23.000	6.609	10.000	39.849	794.492	28.834	80.677	1.286	1.510	21.000	21.000		30.000	30.000	
PRE-TREATMENT COST PER [TONNE][LITER], IN	EUR/TN															
TRANSPORTATION COST RAW MATERIAL	EUR/TN	9	10													
ASH DISPOSAL & TRANSPORT COST	EUR/TN									30						
LAND LEASE - RENT	EUR					28.395	221.800									
SELLING, GENERAL & ADMIN EXPENSES	%	1,00%			20,00%		20,00%	20,00%			20,00%	20,00%				
FIXED EXPENSES																
ADMINISTRATION / HOLDCO CHARGE	EUR	1.750	13.000			125.000			17.000	13.000				2.500.000		
OPERATIONS & MAINTENANCE FEE	EUR	80.000				324.000										
INSURANCE / BANK FEES / LICENSE FEE	EUR	20.000	1.000			460.000			4.000	1.000						
PERSONNEL EXPENSES	EUR	35.000		864.000		1.355.030								2.500.000	2.592.000	
CORPORATE INCOME TAX IN % YEARS 1 to N	%	15,00%	15,00%	9,00%	9,00%	9,00%	24,00%	24,00%	16,00%	16,00%	25,00%	25,00%		18,00%	18,00%	
DEBT SERVICE RESERVE(S)	MONTHS		3		3	3	3	3	3	3				3		
DEPRECIATION IN YEARS	YEARS	10	20	20	20	20	20	20	20	20	20	20		20	20	
METHOD (1=SLN, 2=DB, 3=DDB, 4=VDB, 5=SYD, 6=MACRS, 7=WDV)		1	1	1	1	1	1	1	1	1	1	1		1	1	
EQUITY																
TARGET EQUITY % OF TOTAL CAPITAL (INCLUDING SUB DEBT)	%	30,00%	40,00%	100,00%	100,00%	100,00%	100,00%	40,00%	40,00%	40,00%	100,00%	100,00%		75,00%	60,00%	
TARGET REAL EQUITY % OF EQUITY [REMAINDER IS SUB DEBT OR SHAREHOLDER LOAN]	%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%		100,00%	100,00%	
GRANT				60,00%	60,00%		60,00%								60,00%	
DEBT																
BASE FIXED FUNDING RATE INCL. SWAP RATE IN %	%	7,00%	7,00%	8,00%	8,00%	8,00%	7,00%	7,00%	7,00%	7,00%	7,00%	7,00%		7,00%	7,00%	
MARGIN CONSTRUCTION PERIOD IN %	%															
MARGIN OPERATIONAL PERIOD IN %	%															
TENOR IN YEARS (INCLUDING GRACE PERIOD)	YEARS	10	10	12	12	12	12	12	8	8	12	12		15	12	
GRACE PERIOD IN YEARS (CONVENTION: 1 YR GRACE IS 1st REPAYMENT 1.(2)5 FROM NTP)	YEARS	2,0	2,0	2,0	2,0	2,0	0,5	2,0	2,0	2,0	2,0	2,0		2,0	2,0	

Case studies range from ideas to additional investment to existing facilities. Information available for some projects is detailed (through the use of Project Identification Forms ("PIF") as annexed to this report for 8 projects) but for others the information at this stage is very limited. Where possible and available information from the STEN-tool has been used for verification of the quantity of feedstock needed and the feedstock price. All information needed for a feasibility study is being modelled for all projects in one excel-based model. The information from the PIFs is perceived most up-to-date, hence, in case of deviations between information in the table above and in PIFs, information from the latter will prevail. The approach taken in this report for the description of the business models of the case studies relates to the categorisation resulting from the feasibility analyses.

5.3 Feasibility Studies and Business Models

The financial-economic aspect of the feasibility of projects is important but only one of many aspects like the legal structure, the licenses and permits, the background and track record of the stakeholders, the contractual set-up, etc., etc. Important though is understanding at an early stage whether a project might become financial-economic feasible in order not to spend time and money on projects that will never lead to reaching financial close.

The feasibility results of the case studies are depicted in the diagram below.



Categories 1 and 2 represent feasible propositions for the *combination* of feedstock from MUC lands and further processing in envisioned investments in CHP or production facilities for biomethane, biodiesel, HVO and ethanol. Hence, the business model for the Categories 1 and 2 might be an integrating approach of feedstock production from MUC lands and production facilities. Three of the feasible case studies are 'hypothetical' in nature (Germany 1, Romania 1 and 2) as per the PIFs in the Annex, and the other two case studies are not based on detailed information (no PIF for Germany 2 and Italy 2). From all five feasible cases only one case (Germany 1) has some contractual set-up at this stage as per PIF with supply and offtake contracts. Hence, the overall conclusion on business models for the feasible projects is positive but with the remark that much needs to be sorted out. The format for preparation in due course will likely be a combination of crowdfunding and development finance (EIB). The templates for such applications (including a full manual on the writing of business plans which was developed by Mr. Vitchev at an earlier occasion for the UNDP) have been made available and are an integrated whole with the Project Identification Forms and the Financial Model, including a manual for the model-functioning (Report D6.1).

Categories 3 and 4 represent non-feasible propositions, at least at this early stage and based on the information available, for the *combination* of feedstock from MUC lands and further

exclusive processing in production facilities. The feedstock produced from the MUC lands might be mixed with other (less expensive at the gate) feedstocks to become economic and / or might be deemed eligible for grant applications in a combined feedstock + investment case. Grant programs at European level like the Innovation Fund have been considered by the Consortium but at this stage applications are not being prepared. The case studies in Spain are not feasible at the moment even if grants would be considered and therefore it is assumed these projects will be feedstock-production only and might appeal to an offtaker willing to pay a premium. Possible local banks might be approached for support who will bring their own templates.

At this stage the analyses has been performed for all projects taking a project finance route into mind because investors are not yet known (and corporate finance options cannot be assessed therefore).

60% of the feasible projects comprise Combined Heat and Power plants. Almost 40% of the non-feasible projects are also CHPs, hence, it appears that business models are very sensitive to the local context.

ANNEX 1 Project Identification Forms

Case Study 1 Germany

PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION

Project Identification Form

1. This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalising a model and business plan. Please give special care and attention to every item of the Form. Missing essential elements may cause unnecessary delays in the process or lead to misinterpretation of the merits of the project.

2. The form is identical for all type of projects, the most widely considered being:

- Biogas
- Biomass
- Biodiesel
- Ethanol
- Electricity generation from biomass or biogas
- CHP

3. The definition of "Owner/Project Sponsor" is a person or entity that initiates, owns and promotes the project and has decision making power on borrowing or equity distribution.

4. There is questionnaire for each of the following project categories:

- Owner/Project Sponsor
- Financial Information
- Resources and Tariffs
- Supply Resources
- Transportation
- Availability or cost of plant
- Land
- Major Contracts
- Various Financial Inputs

Instructions for completing and submitting the form

a). Provide answers in the boxes as indicated

b) Attach any documents to support your answers separately. Please indicate where relevant documentation is attached.

c) Once completed, send this form and any supporting documentation to buiting@1to3capital.com and deltcho.vitchev@gmail.com.

MAIN PROJECT INPUT – Potential sponsor

Topic	Answer
Project name:	BIOPLAT-EU-EU_Germany_1
Project sponsor[5]:	only hypothetical (e.g. Rösch Terra GmbH)
Contact person:	Virtual person
City:	Welzow
Region:	Brandenburg
Country:	Germany
Site location name and coordinates:	Reclaimed lignite mine areas in Welzow-Süd & Jänschwalde
Telephone number (primary)	-
Mobile number	-
Email	-
Project sector[6]: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	Biomethane
Type of technology:	Biomethane
Equipment supplied by:	-
Sponsor's relevant sector experience (attach any supporting documentation) [7]:	Farming, cattle farming, power generation (biogas), trading
Project brief description: (if different from the Case Study description D4)	Case Study Germany 1

OUTLINE FINANCING PLAN OF THE PROJECT

	Type (in kind/equity/cash)	Currency	% of Total	Interest rate (cost of capital)%
Owner's Equity		EURO		
Other Equity		EURO		
Bank Loans, Local		EURO		
Other Loans (Senior/ Mezzanine)		EURO		
Grants		EURO		
What kind of guarantees were used (company/bank/utility/government)?				

[5] This is a person or entity that initiates, owns and promotes the project and has decision-making power on borrowings or the allocation of equity.

[6] Sector relates to the type of technology that the project will deploy. The project financing, including mezzanine and equity investments in bio energy projects or companies developing, manufacturing, distributing or installing bio energy equipment or services which have or are expected to have a quantifiable impact on the reduction of greenhouse gas emissions, are environmentally beneficial and/or generate energy, carbon credits and/or tradable renewable energy certificates.

[7] The answer should provide the track record or prior experience the sponsor has with the technology, including the number of years of experience and in which capacity.

RESOURCES AND TARIFFS

Topic	Answer
Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	Expansion of the existing biogas plant for upgrading to biomethane (small unit: 350 m³/h), which will be injected into the regional gas grid or used for the production of electricity (this last option is subject of the feasibility study)
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	Available from MUC land (extracted from STEN-tool result): 4,550 tons (dry) biomass / year 1,067,000 m³ biomethane / year The original area (2100 ha) must be divided because Sorghum is not self-sustaining. Thus, only 700 ha area potentially available for bioenergy production in each year. The biomass amount is too small for a sufficient load of the plant, and therefore additional biomass must be purchased. Optimal utilization of BBP: 23,000 t (fresh) / year 1,457,000 m³ biomethane / year (product gas)
Projected project output (units / year, if production)	Gained bioenergy from MUC land: 38,412 GJ / year Calculated from biomethane yield and mean energy content of 36 MJ/m³ (source: https://biogas.fnr.de/daten-und-fakten/faustzahlen)
Projected project life	10 years
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	BIOPLAT-EU-EU-EU WebGIS tool/STEN
Is Off-take agreement secured and when does it expire.	No
Off-Take entity	No
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	No
Capacity/energy tariffs in the country/market - €/MW and €/kWh	Concerning electricity the Renewable Energies Act applies in Germany. With the current version (EEG 2017) the fixed remuneration of former version has been replaced by a bidding system. In contrast to the fixed remuneration, the amount of the remuneration is no longer determined by the state. Nevertheless, the remuneration period continues to be 20 years, as with the fixed remuneration. For plants launched in 4th quartal of 2020 the so-called values to be applied (in german "anzulegender Wert") for electritiy from biomas, which is the remuneration for the plant owner, are: 12.80 ct/kWh (plants <150 kw), 11.04 ct/kWh (plants from 150 - 500 kw), 9,89 ct/hWh (plants from 500 kw - 5 MW) and 5.49 ct/kWh (plants from 5 - 20 MW), https://www.netztransparenz.de/portals/1/EEG-Verguetungskategorien_EEG_2020_20200821.xls. An additional bonus in ct/kWh electricity for CHP plants is granted in different amounts, depending on the share of produced heat and the power category of the plant (https://www.netztransparenz.de/portals/1/Content/Kraft-W%c3%a4rme-Kopplungsgesetz/Gesetze-Umsetzungshilfen/KWK-Zuschlagskategorientabelle_nach%20KAG_20200903.xlsx). This is based on the Law for the maintenance, modernization and expansion of combined heat and power

	generation (https://www.bmwi.de/Redaktion/DE/Downloads/Energie/kwkg.pdf?__blob=publicationFile&v=6). Further information about the possible tariffs regarding biomethane injection can be found in: https://www.dena.de/fileadmin/dena/Publikationen/PDFs/2019/biogaspartner_-_gemeinsam_einspeisen.pdf
Details of the energy/equipment/services purchaser(s)	Not clearly identifiable, as the company can sell the biomethane to energy provider, but the NBB (Netzgesellschaft Berlin-Brandenburg) is the network operator of the regional gas distribution network
Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	The tariffs are not directly linked with retail prices or power prices. In 2000 the feed-in tariffs were higher and the consumer prices were lower than today.
Ability to Integrate Project into Existing Infrastructure	Yes
Evidence that the Government/ Off-taker support the project	Currently only a hypothetical project
Evidence of the Risk to the project, competitors	Currently only a hypothetical project
Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	Currently only a hypothetical project
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	Currently only a hypothetical project

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	Yes (feedstock), no (upgraded processing plant for biomethane)
The cost of the resources/raw materials per kWh, or per unit of production/output?	About 23 €/ ton (fresh matter), The price varies depending on supply and demand
Will the project be connected to the grid or to an isolated grid?	connected to the gas grid
Has the technology supplier been determined	Currently only a hypothetical project
Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	Currently only a hypothetical project
Equipment degradation assumption in percentage	-

LAND

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	Current fields owner: LEAG Farmers manage the reclaimed fields. The fields will later be transferred to the farmers who owned them before the mining operation.
Topographical study	Flat, levelled terrain
Environmental and Social Impact Assessment (ESIA)	STEN-Tool?
Is the land occupied	No
Resettlement requirements	No
Local community compensation	No
Cost of Land or land lease charge/year	-
Transmission and power/products evacuation/transportation cost	In the district, 50Hertz is the power grid operator. The power transportation costs could be found in https://www.50hertz.com/Portals/1/Dokumente/Vertragspartner/Netzkunden/Netzzugang/201208_PB%202021.pdf?ver=2020-12-11-094433-243
Title of land plots, or land leases	-
Contract(s) for transfer of the land	-
Any other Studies?	-

MAJOR CONTRACTS

Since the project is only hypothetical, no definitive information can be given here yet. Therefore, the answers are assumptions.

Topic	Answer*
Power Purchasing Agreement / Purchasing Agreement	Yes
Supply Contract	Yes
Land Title	No
Shareholders Agreement	No
Operation and Maintenance Agreements	Yes
Government Support Agreement	Yes (necessary for operation)
Concession Agreement	-
Procurement Agreement	-
Engineering Agreement	Yes
Construction Permits	Yes (necessary for operation)

Connections to Utilities, Roads Permits	Yes
Draft contract for developer to construct project	Yes
Other similar Agreements, Warranties or Guarantees	-

**YES or NO answer will be sufficient at this stage*

FINANCIAL INPUT

The financial input data are extracted from the KTBL biogas calculator for a hypothetical biomethane processing plant (350m³/h) (https://www.ktbl.de/webanwendungen/wirtschaftlichkeitsrechner-biogas)

Topic	Answer
Total Project Cost	11,750,000 Euro (variable and fixed cost over 10 years)
Timing of The Project	10 years
Cost of Construction for the expansion	1,780,000 EURO (cost of upgrading and injection plant)
Months of Construction	6 month
Completion Bond	-
Foundation Cost / Site infrastructure	additional cost (estimated for upgrading and injection buildings of 400 m²): 4,000 Euro (excavations, 10 Euro/m³) 32,000 Euro (foundation, 80 Euro/m²)
Generation Assets / Machinery	1,440,000 Euro (investment of upgrading, already included in 'Cost of Construction')
Insurance	0,50% of new investment/of total bioenergy production system: 8,900 Euro per year / 20,000 Euro per year
Connection	Investment for connection system (injection) to grid: 250,000 Euro
EPC Management	Currently only a hypothetical project
Contingency	
Generation/Production Capacity	1,500,000 m³ / year (production gas) 15,775,000 kWh / year
What is the project's projected source of cash flow? Amount/year?	Bank loan, sales of electricity and biomethane
Is this under a fixed contract and if so, for how many years?	Currently only a hypothetical project
Projected Project output (KWh/year and/or unit €year)	About 16,000,000 kWh/year (optimal utilization of BPP)
Amount pre-spent, development cost/feasibility study	Currently only a hypothetical project

EXPENSES VARIABLE

Topic	Answer
Operation & Management (O&M) cost per kW/h or unit of production	575,000 Euro / year (feedstock) 80,000 Euro / year (repair, maintenance)
Consumables	290,000 Euro / year
Transport	-

Land Lease	-
General & Administrative Expenses	1,750 Euro / year

EXPENSES FIXED

Topic	Answer
Administration Cost per year	1,750 Euro / year
Operation & Management Fee per year	See 'Expense variable'
Insurance expenditure	20,000 Euro / year
Personnel Expenses	35,000 Euro / year
Security & Social Programmes	-

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	- Value added tax: 19% - no CO2-taxe for biomethane production and use - according to Section 19 (1) Sentence 3 GasNEV, the network operator may not charge any feed-in fees insofar as the biomethane is fed into the long-distance gas network. - There is tax relief for business electricity consumption in biogas production: https://www.goerg.de/de/aktuelles/veroeffentlichungen/27-04-2020/ausgewaehlte-energiewirtschaftliche-beguenstigungen-fuer-biogasanlagen-im-ueberblick
Reserves	
Annual Investments	300,000 Euro / year (amortization)
New/Renewal of Equipment	
Funding Priority	
Target Sponsor Equity	
Dividends	
Short Term Debt	
Subordinated Debt and in how many tranches	
Senior Debt and in how many tranches	
Preferred Debt repayment method – equal repayment, amortising debt	

Case Study 3 Hungary

PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION

Project Identification Form

1. This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalising a model and business plan. Please give special care and attention to every item of the Form. Missing essential elements may cause unnecessary delays in the process or lead to misinterpretation of the merits of the project.

2. The form is identical for all type of projects, the most widely considered being:

- Biogas
- Biomass
- Biodiesel
- Ethanol
- Electricity generation from biomass or biogas
- CHP

3. The definition of "Owner/Project Sponsor" is a person or entity that initiates, owns and promotes the project and has decision making power on borrowing or equity distribution.

4. There is questionnaire for each of the following project categories:

- Owner/Project Sponsor
- Financial Information
- Resources and Tariffs
- Supply Resources
- Transportation
- Availability or cost of plant
- Land
- Major Contracts
- Various Financial Inputs

Instructions for completing and submitting the form

a). Provide answers in the boxes as indicated

b) Attach any documents to support your answers separately. Please indicate where relevant documentation is attached.

c) Once completed, send this form and any supporting documentation to buiting@1to3capital.com and deltcho.vitchev@gmail.com.

MAIN PROJECT INPUT

Topic	Answer
Project name:	Biodiesel production from rapeseed and sunflower
Project sponsor[8]:	Owner of the industry
Contact person:	Anita Szeder
City:	Komárom
Region:	Veszprém and Fejér county vicinity
Country:	Hungary
Site location name and coordinates:	2922 Komárom, Kőolaj utca 2., (47.72867324614832, 18.19787340005915
Telephone number (primary)	+36-34-526-429
Mobile number	+36 20 268 1517
Email	info@rossibiofuel.hu
Project sector[9]: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	biodiesel
Type of technology:	Conversion of rapeseed and sunflower into biodiesel
Equipment supplied by:	N.A.
Sponsor's relevant sector experience (attach any supporting documentation) [10]:	Production of biodiesel since 2008
Project brief description: (if different from the Case Study description D4)	The sunflower and rapeseed is collected, transported and processed into Fatty Acid Methyl Esther (FAME)

OUTLINE FINANCING PLAN OF THE PROJECT

	Type (in kind/equity/cash)	Currency	% of Total	Interest rate (cost of capital)%
Owner's Equity	Cash	26.250.000 EUR	75%	8%
Other Equity	No Other Equity was used	8.750.000 EUR	25%	8%
Bank Loans, Local	No Bank Loans were used	-	-	-
Other Loans (Senior/ Mezzanine)	No Other Loans were used	-	-	-

[8] This is a person or entity that initiates, owns and promotes the project and has decision-making power on borrowings or the allocation of equity.

[9]Sector relates to the type of technology that the project will deploy. The project financing, including mezzanine and equity investments in bio energy projects or companies developing, manufacturing, distributing or installing bio energy equipment or services which have or are expected to have a quantifiable impact on the reduction of greenhouse gas emissions, are environmentally beneficial and/or generate energy, carbon credits and/or tradable renewable energy certificates.

[10] The answer should provide the track record or prior experience the sponsor has with the technology, including the number of years of experience and in which capacity.

Grants	No grants were used	-	-	-
What kind of guarantees were used (company/bank/utility/government)? The 25% share of the government was used as guarantee				

RESOURCES AND TARIFFS

Topic	Answer
Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	Biodiesel
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	150.000 tonnes of FAME output yearly (https://index.hu/belfold/2011/10/03/kozep-europai_csoda_gazbol_biodizel/)
Projected project output (units / year, if production)	1st operation year: 120.000 tonnes of FAME 2nd operation year: 150.000 tonnes of FAME . . . 18th operation year: 150.000 tonnes of FAME 19th operation year: 150.000 tonnes of FAME 20th operation year: 150.000 tonnes of FAME
Projected project life	20 years (Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4413003/)
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	Not applicable.
Is Off-take agreement secured and when does it expire.	Not applicable.
Off-Take entity	Not applicable.
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	Not applicable.
Capacity/energy tariffs in the country/market - €/MW and €/kWh	Not applicable.
Details of the energy/equipment/services purchaser(s)	Information not available
Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	Not applicable.
Ability to Integrate Project into Existing Infrastructure	Not applicable.
Evidence that the Government/ Off-taker support the project	25% share was bought by the government in the beginning of the project
Evidence of the Risk to the project, competitors	No competitors in Hungary
Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	Information not available
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	Information not available

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	Yes
The cost of the resources/raw materials per kWh, or per unit of production/output?	1 tonnes of rapeseed costs around 506 EUR (estimated value)
Will the project be connected to the grid or to an isolated grid?	Not applicable.
Has the technology supplier been determined	No
Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	Not applicable
Equipment degradation assumption in percentage	2% annually

LAND

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	Information not available
Topographical study	Flat land
Environmental and Social Impact Assessment (ESIA)	Information not available
Is the land occupied	No
Resettlement requirements	No
Local community compensation	No
Cost of Land or land lease charge/year	5.679 EUR / hectare (data from 2020)
Transmission and power/products evacuation/transportation cost	Not applicable
Title of land plots, or land leases	Information not available
Contract(s) for transfer of the land	Information not available
Any other Studies?	No other studies were found

MAJOR CONTRACTS

Topic	Answer*
Power Purchasing Agreement / Purchasing Agreement	Information not available
Supply Contract	Information not available

Land Title	Information not available
Shareholders Agreement	Information not available
Operation and Maintenance Agreements	Information not available
Government Support Agreement	Information not available
Concession Agreement	Information not available
Procurement Agreement	Information not available
Engineering Agreement	Information not available
Construction Permits	Information not available
Connections to Utilities, Roads Permits	Information not available
Draft contract for developer to construct project	Information not available
Other similar Agreements, Warranties or Guarantees	Information not available

**YES or NO answer will be sufficient at this stage*

FINANCIAL INPUT

Topic	Answer
Total Project Cost	35.000.000 EUR (Source: https://bbj.hu/recycling/environment/economy/mol-buys-stake-in-rossi-biofuel3795
Timing of The Project	From 2008 (https://molgroupcareers.info/hu/investor-relations-mobile/regulated-information-mobile/2909-mol-and-rossi-beteiligungs-ltd-to-build-a-biodiesel-component-plant)
Cost of Construction	30.000.000 EUR (https://bbj.hu/recycling/environment/economy/mol-buys-stake-in-rossi-biofuel3795)
Months of Construction	2006 December – 2008 December
Completion Bond	No completion bond.
Foundation Cost / Site infrastructure	1.600.000 EUR (estimated value, from source: http://www.globalbioenergy.org/uploads/media/0305_Duncan_-_Cost-of-biodiesel-production.pdf)
Generation Assets / Machinery	17.000.000 EUR spent on machinery (estimated value, from source: http://www.globalbioenergy.org/uploads/media/0305_Duncan_-_Cost-of-biodiesel-production.pdf)
Insurance	995.000 EUR (estimated value)
Connection	Not applicable
EPC Management	Not applicable
Contingency	2.200.000 EUR / year (Source: http://www.globalbioenergy.org/uploads/media/0305_Duncan_-_Cost-of-biodiesel-production.pdf)

Generation/Production Capacity	150.000 tonnes of FAME / year
What is the project's projected source of cash flow? Amount/year?	Information not available.
Is this under a fixed contract and if so, for how many years?	Fixed contract with the state-owned Hungarian oil and gas company (MOL), who will use 120.000 tonnes of FAME from the total production for its own purposes
Projected Project output (KWh/year and/or unit €year)	150.000 tonnes of FAME / year
Amount pre-spent, development cost/feasibility study	Technical pre-feasibility study cost: 120.000 EUR (estimated value)

EXPENSES VARIABLE

Topic	Answer
Operation & Management (O&M) cost per kW/h or unit of production	0,6 EUR / liter biodiesel produced
Consumables	0,6 million EUR / year (estimated value from source: http://www.globalbioenergy.org/uploads/media/0305_Duncan_-_Cost-of-biodiesel-production.pdf)
Transport	1,4 EUR / km (estimated value)
Land Lease	The land is owned by the plant, so no land lease has to be paid.
General & Administrative Expenses	430.000 EUR / year (estimated value)

EXPENSES FIXED

Topic	Answer
Administration Cost per year	125.000 EUR / year (estimated value)
Operation & Management Fee per year	324.000 EUR / year (estimated value)
Insurance expenditure	460.000 EUR (estimated value)
Personnel Expenses	Gross 1.138.000 EUR / per year (estimated value)
Security & Social Programmes	Social security fee paid by the company: 210.530 EUR / year (estimated value) Pension insurance: 6500 EUR / year (estimated value)

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	9% of company duty
Reserves	Information not available
Annual Investments	230.000 EUR (estimated value)

New/Renewal of Equipment	Information not available
Funding Priority	Information not available
Target Sponsor Equity	Information not available
Dividends	Information not available
Short Term Debt	Information not available
Subordinated Debt and in how many tranches	Information not available
Senior Debt and in how many tranches	Information not available
Preferred Debt repayment method – equal repayment, amortising debt	Information not available

Case Study 1 Italy

PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION-

Project Identification Form

1. This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalising a model and business plan. Please give special care and attention to every item of the Form. Missing essential elements may cause unnecessary delays in the process or lead to misinterpretation of the merits of the project.

2. The form is identical for all type of projects, the most widely considered being:

- Biogas
- Biomass
- Biodiesel
- Ethanol
- Electricity generation from biomass or biogas
- CHP

3. The definition of "Owner/Project Sponsor" is a person or entity that initiates, owns and promotes the project and has decision making power on borrowing or equity distribution.

4. There is questionnaire for each of the following project categories:

- Owner/Project Sponsor
- Financial Information
- Resources and Tariffs
- Supply Resources
- Transportation
- Availability or cost of plant
- Land
- Major Contracts
- Various Financial Inputs

Instructions for completing and submitting the form

a). Provide answers in the boxes as indicated

b) Attach any documents to support your answers separately. Please indicate where relevant documentation is attached.

c) Once completed, send this form and any supporting documentation to buiting@1to3capital.com and deltcho.vitchev@gmail.com.

MAIN PROJECT INPUT

Topic	Answer
Project name:	SULCIS BIOGAS
Project sponsor[11]:	To be identified
Contact person:	n.a.
City:	Carbonia
Region:	Sardegna
Country:	Italy
Site location name and coordinates:	Contaminated and marginal areas in the Sulcis district
Telephone number (primary)	n.a.
Mobile number	n.a.
Email	n.a.
Project sector[12]: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	Biogas
Type of technology:	CHP Biogas
Equipment supplied by:	n.a.
Sponsor's relevant sector experience (attach any supporting documentation) [13]:	n.a.
Project brief description: (if different from the Case Study description D4)	The project aims at the creation of a biogas plant using crop residues, animal manure and biomass crops (wheat grown in the underutilized areas), for the production of biogas and immediate conversion to electricity (1 MW)

OUTLINE FINANCING PLAN OF THE PROJECT

	Type (in kind / equity / cash)	Currency	% of Total	Interest rate (cost of capital)%
Owner's Equity	2 million	EUR		
Other Equity				
Bank Loans, Local	2,5 million	EUR		
Other Loans (Senior/ Mezzanine)				
Grants				
What kind of guarantees were used (company/bank/utility/government)?				

[11] This is a person or entity that initiates, owns and promotes the project and has decision-making power on borrowings or the allocation of equity.

[12] Sector relates to the type of technology that the project will deploy. The project financing, including mezzanine and equity investments in bio energy projects or companies developing, manufacturing, distributing or installing bio energy equipment or services which have or are expected to have a quantifiable impact on the reduction of greenhouse gas emissions, are environmentally beneficial and/or generate energy, carbon credits and/or tradable renewable energy certificates.

[13] The answer should provide the track record or prior experience the sponsor has with the technology, including the number of years of experience and in which capacity.

RESOURCES AND TARIFFS

Topic	Answer
Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	Electricity generation from biomass or biogas
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	1 MW
Projected project output (units / year, if production)	8.000 MW
Projected project life	20 years
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	BIOPLAT-EU-EU-EU / GIS amd STEN tool
Is Off-take agreement secured and when does it expire.	The agreement is secured
Off-Take entity	Electricity company
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	
Capacity/energy tariffs in the country/market - €/MW and €/kWh	0,15 €/kWh
Details of the energy/equipment/services purchaser(s)	
Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	No
Ability to Integrate Project into Existing Infrastructure	Yes, it is possible to connect to the electricity network
Evidence that the Government/ Off-taker support the project	
Evidence of the Risk to the project, competitors	No
Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	Yes
The cost of the resources/raw materials per kWh, or per unit of production/output?	About 25 €/ton of fresh (sileage) material
Will the project be connected to the grid or to an isolated grid?	It will be connected to the grid
Has the technology supplier been determined	No

Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	n.a.
Equipment degradation assumption in percentage	-

LAND

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	No
Topographical study	Flat area
Environmental and Social Impact Assessment (ESIA)	Calculated using the STEN tools
Is the land occupied	No
Resettlement requirements	No
Local community compensation	Might be provided by the regional paln for Rural Development, but is not defined yet.
Cost of Land or land lease charge/year	100 Euros lease per hectare
Transmission and power/products evacuation/transportation cost	
Title of land plots, or land leases	
Contract(s) for transfer of the land	
Any other Studies?	

MAJOR CONTRACTS

Topic	Answer*
Power Purchasing Agreement / Purchasing Agreement	
Supply Contract	
Land Title	
Shareholders Agreement	
Operation and Maintenance Agreements	
Government Support Agreement	
Concession Agreement	
Procurement Agreement	
Engineering Agreement	
Construction Permits	
Connections to Utilities, Roads Permits	
Draft contract for developer to construct project	
Other similar Agreements, Warranties or Guarantees	

**YES or NO answer will be sufficient at this stage*

FINANCIAL INPUT

Topic	Answer
Total Project Cost	4.5 million Euros
Timing of The Project	20 years
Cost of Construction	
Months of Construction	6
Completion Bond	
Foundation Cost / Site infrastructure	
Generation Assets / Machinery	
Insurance	
Connection	
EPC Management	
Contingency	
Generation/Production Capacity	
What is the project's projected source of cash flow? Amount/year?	
Is this under a fixed contract and if so, for how many years?	
Projected Project output (KWh/year and/or unit €year)	
Amount pre-spent, development cost/feasibility study	

EXPENSES VARIABLE

Topic	Answer
Operation & Management (O&M) cost per kW/h or unit of production	
Consumables	
Transport	
Land Lease	
General & Administrative Expenses	

EXPENSES FIXED

Topic	Answer
Administration Cost per year	

Operation & Management Fee per year	
Insurance expenditure	
Personnel Expenses	
Security & Social Programmes	

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	
Reserves	
Annual Investments	
New/Renewal of Equipment	
Funding Priority	
Target Sponsor Equity	
Dividends	
Short Term Debt	
Subordinated Debt and in how many tranches	
Senior Debt and in how many tranches	
Preferred Debt repayment method – equal repayment, amortising debt	

Case Study 1 Romania

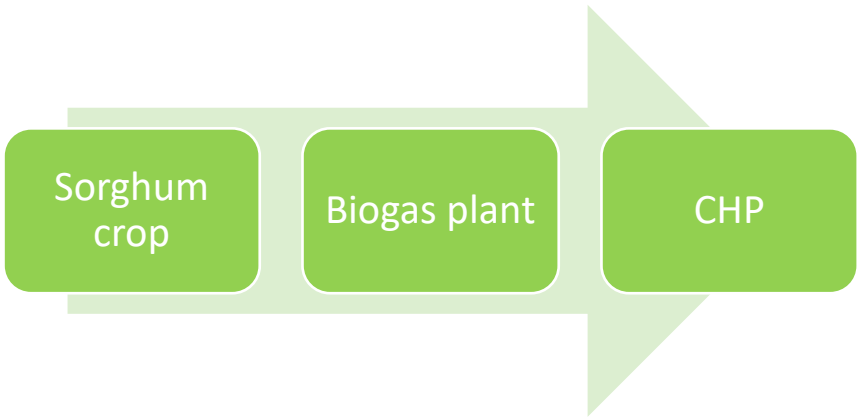
PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION-

Romanian case study Buhusi- Bacau county

Project Identification Form

PREMISES

- This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalizing a model and business plan.
- The MUC terrain for the case study was identified with the BIOPLAT-EU-EU webGIS platform (https://webgis.BIOPLAT-EU-EU.eu/#/map), under the name RO21120778RO00007485, near the Buhusi city.
- Details on the project may be found in deliverable 4.1, work package WP4, as one of the Romanian case studies.
- The project regards a new CHP able **to valorize locally the biogas produced from a Sorghum crop harvested on the MUC terrain.**
- The pathway from sorghum to power and heat contains the following steps[14].



- The information presented in this Form regards an investment in an **integrated Biogas + CHP Plant.** The main biogas -CHP plant components are
  - silo,
  - feeder,
  - stirrer and pumps,
  - digester,
  - digestate storage tanks.
  - CHP,
  - power grid connection,
  - heat use

- The chosen technology for the CHP for this case study is **biogas combustion in an internal combustion engine** (Gas Otto or pilot injection) which drives a generator that generates electrical energy. There are

[14] https://www.iea.org/reports/outlook-for-biogas-and-biomethane-prospects-for-organic-growth/an-introduction-to-biogas-and-biomethane

also other engine types and combustion processes available for converting biogas into electricity: gas turbines, fuel cells etc. Internal combustion engines are a versatile option, as they are based on tried and tested technology using common-place design and components, now commercially available from 30 kWel output.

- The project is in the incipient phase, as a **possible, hypothetical, investment** based on theoretical assumptions.

- The data for the integrate biogas+CHP plant project were built **by researching separately the data for the biogas plant and the CHP plant** and finally combined.

- The data in the form were obtained from the STEN platform, best expert estimations, own calculations, crosschecked with data from literature.

MAIN PROJECT INPUT

Topic	Answer
Project name:	
Project sponsor:	To be identified
Contact person:	Cristian Tantareanu, ENERO
City:	
Region:	Bacau County
Country:	Romania
Site location name and coordinates:	Buhusi municipality, (26.7011 E, 46.6966 N)
Telephone number (primary)	
Mobile number	+400723 544 653
Email	
Project sector: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	CHP fuelled by biogas form a sorghum crop
Type of technology:	Biogas production and combustion in an internal combustion power unit
Equipment supplied by:	To be identified
Sponsor's relevant sector experience (attach any supporting documentation):	Limited experience
Project brief description and premises	See Deliverable 4.1. , BIOPLAT-EU-EU project

OUTLINE FINANCING PLAN OF THE PROJECT

We consider as a working hypothesis the following variant. Different percentages for the financing sources may be subject of a sensitivity analyse.

	Type (in kind / equity / cash)	Currency	% of Total	Interest rate (cost of capital) %
Owner's Equity	cash	Euro	25%	
Other Equity				

Bank Loans, Local	cash	Euro	35%	7%
Other Loans (Senior/ Mezzanine)				
Grants[15].	cash	Euro	40%	0%
What kind of guarantees were used (company/bank/utility/government)? Company.				

10446	in biogaz	GJ	486	mii m3 biogaz

RESOURCES AND TARIFFS

Topic	Answer
Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	CHP fuelled by biogas from a sorghum crop.
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	486,000 m3 biogas/year gross (10446 GJ) as estimated by STEN for the Biogas plant and 1,100 MWh/year, for the CHP plant
Projected project output (units / year, if production)	NA
Projected project life	20
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	STEN tool. Best expert estimations. Probability P50.
Is Off-take agreement secured and when does it expire.	No. Today on the Romanian energy market the PPAs are operational only on a centralized market. Direct PPAs are expected to be permitted starting the year 2022.
Off-Take entity	NA
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	NA
Capacity/energy tariffs in the country/market - €/MW and €/kWh	Around 50 Euro/MWh today
Details of the energy/equipment/services purchaser(s)	NA
Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	NA
Ability to Integrate Project into Existing Infrastructure	NA
Evidence that the Government/ Off-taker support the project	NA
Evidence of the Risk to the project, competitors	The main risks of the input data regard: • The variation of the real crop yield • The possibility to valorize the heat output of the CHP

[15] E.g. a grant obtained from the EU Innovation Fund

Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	NA
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	NA

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	The sorghum resource for the Biogas-CHP plant is approx. 3 km far
The cost of the resources/raw materials per kWh, or per unit of production/output?	The cost of the dry sorghum for the Biogas + CHP integrated plant is 91 Euro/tone therefore the quota of the raw material in the cost of the resulted electricity is 106 Euro/MWh
Will the project be connected to the grid or to an isolated grid?	Connected to the power grid. Today there is no local DH or industrial consumer for the heat output.
Has the technology supplier been determined	No yet
Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	NA
Equipment degradation assumption in percentage	1.5 % per year

LAND

This land section regards the land needed for the biogas and CHP plant. Most probably this land will be available also within the MNC terrain, at no cost.

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	NA
Topographical study	No
Environmental and Social Impact Assessment (ESIA)	No.
Is the land occupied	No
Resettlement requirements	No
Local community compensation	No
Cost of Land or land lease charge/year	No
Transmission and power/products evacuation/transportation cost	There is an existing local power grid for the CHP output distribution/transport

Title of land plots, or land leases	NA
Contract(s) for transfer of the land	NA
Any other Studies?	NA

MAJOR CONTRACTS

No contracts are in force as the project is only in an incipient and theoretical phase.

FINANCIAL INPUT

Topic	Answer for the Biogas Plant	Answer for the CHP Plant
Total Project Cost	433.5 kEuro	220 kEuro
Timing of The Project		
Cost of Construction		
Months of Construction	12	12
Completion Bond	No	No
Foundation Cost / Site infrastructure	117 kEuro	45 kEuro
Generation Assets / Machinery	265 kEuro	135 kEuro
Insurance	Yes. See below.	Yes. See below.
Connection	0 kEuro	18 kEuro
EPC Management	40 kEuro	17 kEuro
Contingency	12 kEuro	5 kEuro

Generation/Production Capacity	54 m3/hour for Biogas plant 200 kW rated electrical capacity for CHP Plant
What is the project's projected source of cash flow? Amount/year?	Selling the electricity at the CFD price. Two scenarios: • 190 Eur/MWh • 220 Eur/MWh
Is this under a fixed contract and if so, for how many years?	NA
Projected Project output (KWh/year and/or unit €year)	470,000 m3 net biogas for the Biogas Plant 1100 MWh/year net electrical output 1,400 MWh/year heat output
Amount pre-spent, development cost/feasibility study	None

EXPENSES VARIABLE

Topic	Answer

Operation & Management (O&M) cost per kW/h or unit of production	19+23=42 Euro/MWh for the integrated Biogas and CHP plant (without fuel cost)
Consumables	No
Transport	No
Land Lease	None
General & Administrative Expenses	No

EXPENSES FIXED

Topic	Answer
Administration Cost per year	17 kEur/year
Operation & Management Fee per year	No
Insurance expenditure	4 kEur/year
Personnel Expenses	Included in O&M expenses
Security & Social Programmes	No

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	16% corporation tax
Reserves	
Annual Investments	No
New/Renewal of Equipment	No
Funding Priority	
Target Sponsor Equity	
Dividends	
Short Term Debt	
Subordinated Debt and in how many tranches	
Senior Debt and in how many tranches	
Preferred Debt repayment method – equal repayment, amortising debt	

Case Study 2 Romania

PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION-

Romanian case study Pesteana- Gorj county

Project Identification Form

PREMISES

- This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalizing a model and business plan.
- The MUC terrain was identified with the BIOPLAT-EU-EU webGIS platform (https://webgis.BIOPLAT-EU-EU.eu/#/map), under the name RO41280285RO00001842, near the Pesteana de Jos village.
- Details on the project may be found in deliverable 4.1, work package WP4, as one of the Romanian case study.
- The project regards a new CHP able to valorize locally the Miscanthus harvested from the a MUC terrain becoming available on a closed mining heap.
- The chosen technology for the CHP for this case study is direct biomass combustion in grate or fluidized bed boilers to fed externally fired micro steam turbine. Other possible technologies working with direct combustion are steam engine, ORC turbine, Stirling engine, hot air turbine, micro gas turbine. Biomass steam driven CHP systems are a versatile option, as they are based on tried and tested technology using common-place design and components, now commercially available from 100 kW el output.
- The project is in the incipient phase, as a possible, hypothetical, investment in the area. Part of the information bellow were supplied by the STEN platform. Other technical and economic data are based on best expert estimation, but still remain theoretical assumptions.
- The Annex provides the data discussion and justification for main and relevant parameters. Other general data, not mentioned in the Annex, are obtained by a desk research.

MAIN PROJECT INPUT

Topic	Answer
Project name:	
Project sponsor:	To be identified
Contact person:	Cristian Tantareanu, ENERO
City:	
Region:	Gorj County
Country:	Romania
Site location name and coordinates:	Pesteana municipality, (23.277 E, 44842 N)
Telephone number (primary)	
Mobile number	+400723 544 653
Email	
Project sector: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	CHP from solid biomass-miscanthus crop
Type of technology:	Direct combustion in grate or fluidized bed boilers to fed externally fired turbine
Equipment supplied by:	To be identified
Sponsor's relevant sector experience (attach any supporting documentation):	Limited experience

Project brief description and premises	See Deliverable 4.1. , BIOPLAT-EU-EU project

OUTLINE FINANCING PLAN OF THE PROJECT

We consider as a working hypothesis the following variant. Different percentages for the financing sources may be subject of a sensitivity analyse.

	Type (in kind/equity/cash)	Currency	% of Total	Interest rate (cost of capital) %
Owner's Equity	cash	Euro	25%	
Other Equity				
Bank Loans, Local	cash	Euro	35%	7%
Other Loans (Senior/ Mezzanine)				
Grants[16].	cash	Euro	40%	0%
What kind of guarantees were used (company/bank/utility/government)? Company.				

RESOURCES AND TARIFFS

Topic	Answer
Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	CHP from solid biomass-miscanthus crop. Steam turbine
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	990 MWh/year, as estimated by STEN
Projected project output (units / year, if production)	NA
Projected project life	20
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	STEN tool within BIOPLAT-EU-EU project. Probability P50.
Is Off-take agreement secured and when does it expire.	No. Today on the Romanian energy market the PPAs are operational only on a centralized market. Direct PPAs are expected to be permitted starting the year 2022.
Off-Take entity	NA
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	NA
Capacity/energy tariffs in the country/market - €/MW and €/kWh	Around 48 Euro/MWh
Details of the energy/equipment/services purchaser(s)	NA

[16] E.g. a grant obtained from the EU Innovation Fund

Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	NA
Ability to Integrate Project into Existing Infrastructure	NA
Evidence that the Government/ Off-taker support the project	NA
Evidence of the Risk to the project, competitors	The main risks of the input data regard: • The real crop yield to be obtained • The possibility to valorize the heat output of the CHP
Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	NA
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	NA

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	Yes, on a short distance approx. 6 km
The cost of the resources/raw materials per kWh, or per unit of production/output?	80 Euro/tone DM Miscanthus ballot
Will the project be connected to the grid or to an isolated grid?	Connected to the power grid. Today there is no local DH or industrial consumer for the heat output.
Has the technology supplier been determined	No yet
Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	NA
Equipment degradation assumption in percentage	1.5 % per year

LAND

As mentioned in the premises, our understanding is that this land section regards the land needed for the CHP and not the land for the biomass crop. Most probably the land for CHP will be available also within the terrain of the closed carrier Pesteana, at no cost.

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	NA
Topographical study	No
Environmental and Social Impact Assessment (ESIA)	No.

	Taking into account that an open mining carrier was operational in the area, it is very likely that a CHP on biomass will receive as well the Environmental permits.
Is the land occupied	No
Resettlement requirements	No
Local community compensation	No
Cost of Land or land lease charge/year	No
Transmission and power/products evacuation/transportation cost	There is an existing local power grid for the CHP output distribution/transport
Title of land plots, or land leases	NA
Contract(s) for transfer of the land	NA
Any other Studies?	NA

MAJOR CONTRACTS

No contracts are in force as the project is only in an incipient and theoretical phase.

FINANCIAL INPUT

Topic	Answer
Total Project Cost	975 kEur
Timing of The Project	
Cost of Construction	
Months of Construction	12
Completion Bond	No
Foundation Cost / Site infrastructure	55 kEur
Generation Assets / Machinery	800 kEur
Insurance	Yes. See below.
Connection	30 kEur
EPC Management	75 kEur
Contingency	15 kEur
Generation/Production Capacity	150 kW rated electrical
What is the project's projected source of cash flow? Amount/year?	Selling the electricity at the CFD price. Two scenarios: • 175Eur/MWh • 220 Eur/MWh

Is this under a fixed contract and if so, for how many years?	NA
Projected Project output (KWh/year and/or unit €year)	930 MWh/year net electrical output 5,000 MWh/year heat output
Amount pre-spent, development cost/feasibility study	None

EXPENSES VARIABLE

Topic	Answer
Operation & Management (O&M) cost per kW/h or unit of production	18 Euro/MWh
Consumables	No
Transport	No
Land Lease	None
General & Administrative Expenses	No

EXPENSES FIXED

Topic	Answer
Administration Cost per year	13 kEur/year
Operation & Management Fee per year	No
Insurance expenditure	1 kEur/year
Personnel Expenses	Included in O&M expenses
Security & Social Programmes	No

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	16% corporation tax
Reserves	
Annual Investments	No
New/Renewal of Equipment	No
Funding Priority	
Target Sponsor Equity	
Dividends	
Short Term Debt	
Subordinated Debt and in how many tranches	
Senior Debt and in how many tranches	

Preferred Debt repayment method – equal repayment, amortising debt	

DATA FROM STEN

- The crop size and other agronomical and economic evaluations are given by the STEN tool, with some inputs from ENERO as advanced user.

Table of variances from STEN default input data related to the energy balance

Input Parameter	STEN default data	Suggested by ENERO
Yield	0.99	**10**
MJ of Bioenergy product(s)/ MJ FSTK	15%	**14%**

The variances were analysed and justified according to the document[17]

Other variances

- The plant gate cost of biomass is around **80 Eur/t**, less than the average European price., as Romania is a net exporter for biomass in Europe[18],[19]. The default STEN value is 100 Eur/tone
- In the present biomass chain, STEN indicates that the final energy product is the electrical output of the CHP. The 14% efficiency is in fact the efficiency of the power generation station.
- The resulted by STEN electrical output of the CHP is **990 MWh/year**

TECHNICAL DATA

- The technologies available for the direct combustion of solid fuels are very mature and reliability is high. Biomass steam boilers use standard combustion principles, with automatic fuel delivery and adjustment of combustion air to optimize burning efficiency There are two main direct combustion technologies suitable for solid fuel fired renewable CHP; moving grates and fluidized beds. These technologies differ on how the fuel is introduced, fuel and air are mixed and how the fuel moves within the combustion chamber. The prime mover technologies available to convert the thermal energy released from the combustion of solid biomass into power are limited to steam turbines or Organic Rankine Cycle (ORC) turbines. The technologies are available from >150 kWe. For this case study the steam turbine technology is selected. The steam boiler is normally mounted directly on top of the combustion chamber ensuring a simple, compact design and efficient heat transfer. Although these technologies have low power to heat ratios they are reliable and offer a high degree of operational flexibility[20].

- The yearly operation hours of a CHP depend on the size, feedstock supply and the heat demand. According to the real data for biomass CHP it is around 7,500 hours[21].

- Considering the 7500 operation hours, it results a rated power of the unit of 132 kW. This is a theoretical value, assuming the unit works continuously on the rated power. In real operation there are fluctuations of the CHP charge due to the fuel supply process or voluntary variation due to the heat demand or to better cope with the peak hours of electricity demand and therefore with a more advantageous electricity price.

[17] ENERO, STEN TOOL Test- Summary Report, 4th June 2021

[18] BIOBOOST project, Feedstock costs, 2013, https://www.bioboost.eu/uploads/files/bioboost_d1.1-syncom_feedstock_cost-vers_1.0-final.pdf

[19] Tzelepi et al, Biomass Availability in Europe as an Alternative Fuel for Full Conversion of Lignite Power Plants: A Critical Review, 2020, https://www.mdpi.com/1996-1073/13/13/3390/htm

[20] UK Department for Business, Energy and Industrial Strategy, Combined Heat and Power –Technologies, A detailed guide for CHP developers, 2021

[21] IRENA, Solid Biomass Supply for Heat and Power- Technology Brief, 2019

Therefore, the rated power of the CHP will be chosen some 15%…20% higher than 132 kW, depending also on the rated power range available on the market. A rated power of **150 kW** seems the best assumption.

- Internal consumption of CHP plant = 6%; it results **930 MWh/year net output.**

- For the CHP technology and size there is a high proportion of heat to electricity**: 5…6 parts output heat to 1 part output electricity.** This is a disadvantage if no corresponding and continuous heat demand is present.

ENERGY TARIFFS

- Up to now, the Renewables projects in Romania were subsidized by a Green Certificates – GC mechanism linked to the generated electricity. The GC mechanism is no longer valid for new projects. Despite quite generous for the biomass projects, the GC mechanism led to only 124 MW biomass plants (all types), while the wind and PV plants, as the "lower-hanging fruits" accumulated 2,960 MW respectively 1,358 MW[22].

A new mechanism based on Contract for Differences concept – CfD is under preparation and probably will be operational in 2023.

A CfD is a contract between developers of RES projects and a government-owned company (the CfD Counterparty). The developer is paid the difference between the 'strike price' – a price for electricity reflecting the cost of investing in a particular low carbon technology – and the 'reference price'– a measure of the average market price for electricity.

Most probably the strike price will be fully or partially index linked to the consumer price index (CPI) and adjusted accordingly on an annual basis

We may estimate the future considered strike price by two approaches:

a. Comparison with the income supplied by the former GC mechanism
b. The profitability limit imposed by the former GC and RES support mechanism

a. Within the former GC mechanism, an efficient biomass CHP technology receives 4 Green Certificates, in addition to the price of the electricity on the market. In the last years the GCs were sold in average with 29 Euro/MWh. The average price of the MWh on the electricity market was around 48 Euro/ MWh[23]. Therefore, it results a total income of 164 Euro/MWh.

b. In order to avoid an excessive profit from the GCs system, the Regulatory Body performs an overcompensation check of the RES producer's revenue. For biomass CHP the accepted IRR of the investment is considered **IRR = 7.5% max[24].**

In Europe only UK has a CfD mechanism so there are limited references on the strike price. An EC document[25] shows the strike prices, which were considered by UK for dedicated biomass (with CHP) projects: 171…222 £$_{2012}$/MWh.

Taking into account the above information we propose to work on two scenarios for the electricity income (strike price):

- **A minimal value of 175 Eur/MWh**
- **An optimistic value of 220 Eur/MWh**

[22] Regulatory Body ANRE report, 2021, https://www.anre.ro/download.php?f=fqeCg6E%3D&t=vdeyut7dlcecrLbbvbY%3D

[23] Market Operator OPCOM, Annual Report 2020.

[24] https://ec.europa.eu/competition/state_aid/cases/257518/257518_1688819_123_2.pdf

[25] EC, State aid SA.36196 (2014/N) – United Kingdom Electricity Market Reform - Contract for Difference for Renewables https://ec.europa.eu/competition/state_aid/cases/253263/253263_1583351_110_2.pdf

- For the profitability of the project, it is very important to consider as well to valorize the heat resulted in the process, as this is the reason of the CHP technology. The estimated heat production is some **5,000 MWht/year**. Part of the heat may be used internally e.g., for drying the feedstock, and securing the heat value of the miscanthus ballots to a high level.

  The rest of the heat is available on the market The heat may be sold hypothetically in a local small District Heating system for the residents nearby, if such system is additionally built. This may be a further development of the business.

  The cost of heat from the national DH systems varies between 40 and 100 Eur/MWh depending of the size, technology and efficiency of the generating CHP and the DH system. In Romania, the DH heat cost for the residential use is subsidised. Also, the heat cost from a possible rural DH should compete with the traditional low local heating costs, meaning burning wood or coal mainly in old type stoves. So, the possible income from a residential use of heat in Pesteana is very limited. The asked price for the heat delivered locally to the households may be around **24 Euro/MWht**.

  More promising is the existence of a industrial heat demand from a small local bussines. In this case the heat price may be around **75 Euro/MWht.**

COSTS

- Specific up-front cost for the CHP may be considered from the literature[26],[27], according to the size and technology. A realistic value for our project is **6.5 kEuro/kWel**, leading to an investment of around **975 kEuro.**

- Total O&M costs of 20 to 40 Eur/MWh for biomass-based electricity are mentioned in the same references as above. Without administration and insurance costs which are considered separately, we will consider a **16 Euro/MWh O&M costs.**
- Biomass ash discharge costs are accounted for assuming unitary cost of **30 Eur/t of ash.**

FINANCIAL DATA

- The financial appraisal of the investment will be carried out assuming the following general hypotheses:
  - **20 years** of operating life;
  - no 're-powering' throughout the 20 years;
  - zero decommissioning costs;
  - maintenance costs, biomass supply costs, electricity and heat selling prices increase held constant (in real 2020 values);
  - capital assets depreciated using a straight-line depreciation over 20 years;
  - corporate income tax in Romania **16%**
- The cost of capital (net of inflation) depends on the borrower and lender status. We may appreciate it in the range 6% to 9% for this kind of project. Assuming the loan is also obtained (at least partially) through a European/national financing programme dedicated to renewables investments (e.g., a National fund, the Modernization Fund etc), a **7% cost of capital** is considered.

June 2021

[26] Pantaleo et al., Thermo-economic assessment of small scale biomass CHP:

steam turbines vs ORC in different energy demand segments, Energy Procedia, 2015

[27] IRENA, Power renewables generation costs in 2019, 2020

Case Study 1 Ukraine

PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION

Project Identification Form

1. This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalising a model and business plan. Please give special care and attention to every item of the Form. Missing essential elements may cause unnecessary delays in the process or lead to misinterpretation of the merits of the project.

2. The form is identical for all type of projects, the most widely considered being:

- Biogas
- Biomass
- Biodiesel
- Ethanol
- Electricity generation from biomass or biogas
- CHP

3. The definition of "Owner/Project Sponsor" is a person or entity that initiates, owns and promotes the project and has decision making power on borrowing or equity distribution.

4. There is questionnaire for each of the following project categories:

- Owner/Project Sponsor
- Financial Information
- Resources and Tariffs
- Supply Resources
- Transportation
- Availability or cost of plant
- Land
- Major Contracts
- Various Financial Inputs

Instructions for completing and submitting the form

a). Provide answers in the boxes as indicated

b) Attach any documents to support your answers separately. Please indicate where relevant documentation is attached.

c) Once completed, send this form and any supporting documentation to buiting@1to3capital.com and deltcho.vitchev@gmail.com.

MAIN PROJECT INPUT

Topic	Answer
Project name:	Khmelnytsky Biomass Power Plant
Project sponsor[28]:	Khmelnytsky Biomass Power Plant
Contact person:	Max Lebediev, KBPP Director
City:	Khmelnytsky
Region:	Khmelnytsky
Country:	Ukraine

[28] This is a person or entity that initiates, owns and promotes the project and has decision-making power on borrowings or the allocation of equity.

Site location name and coordinates:	Village of Pechesky
Telephone number (primary)	+44 28 7137 6828
Mobile number	
Email	info@kbpp.com.ua https://www.kbpp.com.ua/
Project sector[29]: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	Electricity generation from biomass (potentially CHP)
Type of technology:	Direct combustion in lair
Equipment supplied by:	Burmeister & Wain Scandinavian Contractor (BWSC)
Sponsor's relevant sector experience (attach any supporting documentation) [30]:	Subcontractors of the project are companies with more than 20 years and 20+ similar projects: Northern Straw (UK): https://www.northern-straw.co.uk/ (straw logistics and EPC contracting of CHP construction) UTEM Ukraine: https://utem-group.com/en/projects/ (design and development, EPC contractor Ukraine)
Project brief description: (if different from the Case Study description D4)	Project plans construction of the biomass power plant on straw feedstock. Miscanthus is considered as additional alternative feedstock.

OUTLINE FINANCING PLAN OF THE PROJECT

	Type (in kind/equity/cash)	Currency	% of Total	Interest rate (cost of capital)%
Owner's Equity	Ca. 50 million	EUR	25%	n/a
Other Equity	Ca. 100 million	EUR	50%	n/a
Bank Loans, Local	Ca. 50 million	EUR	25%	7-10%
Other Loans (Senior/ Mezzanine)	n/a	n/a	n/a	n/a
Grants	n/a	n/a	n/a	n/a
What kind of guarantees were used (company/bank/utility/government)?				

RESOURCES AND TARIFFS

Topic	Answer

[29]Sector relates to the type of technology that the project will deploy. The project financing, including mezzanine and equity investments in bio energy projects or companies developing, manufacturing, distributing or installing bio energy equipment or services which have or are expected to have a quantifiable impact on the reduction of greenhouse gas emissions, are environmentally beneficial and/or generate energy, carbon credits and/or tradable renewable energy certificates.

[30] The answer should provide the track record or prior experience the sponsor has with the technology, including the number of years of experience and in which capacity.

Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	Electricity generation from biomass (potentially CHP)
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	MWh/year generated
Projected project output (units / year, if production)	44 MWel installed capacity, 130 MWth installed capacity. Annual production: ca. 250,000 MWh/year (electric). Potential (in project design, but not realized on first stage of construction): 200,000 MWh/year (heat)
Projected project life	25 years (according to feasibility study and design documentation)
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	SECB (logistics study), UTEM (design documentation)
Is Off-take agreement secured and when does it expire.	no data
Off-Take entity	Electricity offtake – UPS (national electricity grid, SE Guaranteed Buyer), heat offtake (potential) – local heat supply company (Khmelnytskyy city and surrounding)
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	If commissioned until end of 2022 – green tariff (123.9 EUR/MWh). Most likely – auctioning price (10-20% lower than green tariff) as a result of auctions between biomass CHPs in Ukraine (20 years contract).
Capacity/energy tariffs in the country/market - €/MW and €/kWh	Average CAPEX for CHP on biomass: 1) Wood chips: 2000-2300 EUR/MW 2) Sunflower husk: 1700-1900 EUR/WM 3) Straw bales: ~4000 EUR/MW According to the data om Market Operator[31] for wholesale electricity prices average DAM (day-ahead market) prices are: - 41.84 EUR/MWh (without VAT) - Ukraine IPS (Integrated Power System) - 48.61 EUR/MWh (without VAT) - Ukraine BEI (Burshtyn Energy Island)
Details of the energy/equipment/services purchaser(s)	State Enterprise “Guaranteed Buyer” purchases electricity produced from RES at a “green” tariff. Starting from March 2020 State Enterprise "Guaranteed buyer" blocked the payment for generated energy. On 21.07.2021 Law of Ukraine №810-IX on reducing "green" tariffs for electricity producers from renewable sources energy (RES) was adopted. “Green” tariff for biomass/biogas remained unchanged. As of April 2, 2021, SE "Guaranteed Buyer" paid only UAH 29,4 billion at the "green" tariff. Currently, the payment rate for February is 90% and 87% for March (29 days). The average level of payment since the beginning of the year is 90% (for the first three months of 2021).
Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	Electricity produced at the biomass power plant receives “green” tariff that is 123.9 EUR/MWh for installations put into operation before 01.01.2023. Heat tariff from biomass is linked to the average heat tariff from gas published by the State Agency on Energy

[31] https://www.oree.com.ua/

	Efficiency and Energy Saving for each region of Ukraine on a quarterly basis. Heat tariff is set by local governments at the level of 90% of the published average weighted tariffs. According to the last publication from 25.03.2021 average weighted tariffs for Khmelnytska region[32] are: - for the needs of the population: 1 457,01 UAH/Gcal (without VAT), - for the needs of institutions and organizations financed from the state or local budget: 1 751,28 UAH/Gcal (without VAT).
Ability to Integrate Project into Existing Infrastructure	heat – no (currently); electricity - yes
Evidence that the Government/ Off-taker support the project	For electricity produced from biomass, "green" tariff is set and starting from 2023 auctions will come instead of "green" tariff. For heat there is no evidence.
Evidence of the Risk to the project, competitors	There are municipal utilities that own district heating network and can refuse to purchase heat for the Khmelnytsky city from the CHP on biomass.
Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	There is no credit history of the Khmelnytsky Biomass Power Plant
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	Financial statements of the SE Guaranteed Buyer for 2020[33] and 2019[34] can be found on the website: https://www.gpee.com.ua/

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	The local construction will be done by UTEM (local contractor) under supervision of BWSC. The land plot is available. The portion of the construction materials (for site land plot, civil works, transport, concrete, metalworking) are Ukrainian origin, the generating equipment (turbine, boiler, auxiliary) – foreign origin, generator, electric automation, condenser – Ukrainian origin.
The cost of the resources/raw materials per kWh, or per unit of production/output?	The cost of straw is 1000 UAH/t (30 EUR/t) at the gate of the CHP or 290 UAH/MWh (8.7 EUR/MWh) (primary energy) or 1200 UAH/ MWh of power output (36 EUR/MWh). Total cost of the resources/raw materials (including also water, electricity consumption, fuels and lubricants, unscheduled repairs) is 1600 UAH/ MWh (48 EUR/MWh).
Will the project be connected to the grid or to an isolated grid?	to the national grid (UPS) through local connection point 35 kV.
Has the technology supplier been determined	yes
Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	Burmeister & Wain Scandinavian Contractor (BWSC) https://www.bwsc.com/about/financials

[32] https://saee.gov.ua/sites/default/files/Taryfy_1kv_2021.pdf
[33] https://www.gpee.com.ua/accounting_results/2020
[34] https://www.gpee.com.ua/accounting_results/2019

Equipment degradation assumption in percentage	4%/year

LAND

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	Yes, the site land plot is in the property of KBPP (according to Ukrainian land cadastre 6825086400:03:007:0058) 16.1 ha
Topographical study	Carried out in 2015-2018
Environmental and Social Impact Assessment (ESIA)	Carried out during design documentation development as the obligatory part of it (2018)
Is the land occupied	No (see Google map coordinates: 49°31'04.2"N 27°07'03.5"E)
Resettlement requirements	not applicable
Local community compensation	not applicable
Cost of Land or land lease charge/year	No cost, land is in property of KBPP (private property)
Transmission and power/products evacuation/transportation cost	Tariff for **electricity transmission** starting from 01.01.2021 according to Resolution of the National Energy and Utilities Regulatory Commission of Ukraine №2353 dated 09.12.2020 (https://www.nerc.gov.ua/?id=57072) is 293.93 UAH/MWh (without VAT). Tariffs for **electricity distribution** of JSC "Khmelnytskoblenergo" according to Resolution of the National Energy and Utilities Regulatory Commission of Ukraine№2381 dated 09.12.2020 (https://www.nerc.gov.ua/?id=57104) starting from 01.01.2021 are: - 192.18 UAH/MWh (without VAT) for 1 class of voltage (voltage level of 27.5 kV and above); - 1121,43 UAH/MWh (without VAT) for 2 class of voltage (voltage level below 27.5 kV). CHP does not pay these costs, as they lie on consumers.
Title of land plots, or land leases	See land cadaster 6825086400:03:007:0058 (type of land: land for construction of energy objects)
Contract(s) for transfer of the land	confidential
Any other Studies?	n/a

MAJOR CONTRACTS

Topic	Answer*
Power Purchasing Agreement / Purchasing Agreement	no
Supply Contract	no
Land Title	type of land: land for construction of energy objects See land cadastre: 6825086400:03:007:0058
Shareholders Agreement	yes
Operation and Maintenance Agreements	no

Government Support Agreement	no
Concession Agreement	n/a
Procurement Agreement	yes
Engineering Agreement	yes
Construction Permits	yes
Connections to Utilities, Roads Permits	yes
Draft contract for developer to construct project	yes
Other similar Agreements, Warranties or Guarantees	yes

**YES or NO answer will be sufficient at this stage*

FINANCIAL INPUT

Topic	Answer
Total Project Cost	Ca. 250 million EUR (hereinafter all figure are approximate according to one of the versions of project design documentation (real costs – undisclosed)
Timing of The Project	25 years (according to DD)
Cost of Construction	55 million EUR
Months of Construction	18
Completion Bond	no data
Foundation Cost / Site infrastructure	20 million EUR
Generation Assets / Machinery	152 million EUR
Insurance	no data
Connection	3.2 million EUR
EPC Management	10 million EUR
Contingency	10 million EUR
Generation/Production Capacity	44 MWel, 130 MWth
What is the project's projected source of cash flow? Amount/year?	Selling of 250,000 MWh/year electricity (SE Guaranteed Buyer) 200,000 MWh/year heat (local DH company)
Is this under a fixed contract and if so, for how many years?	If "green" tariff – till 2030 (fixed level 123.9 EUR/MWh) If auction – 20 years after auction completion and contract concluding (10-15% lower than "green" tariff) For heat – tariff to population and institutions and organizations financed from the state or local budget will be updated each three months based on the level of the average weighted tariff for heat from natural gas (biomass tariff will be 90% of gas tariff).
Projected Project output (KWh/year and/or unit €year)	250,000 MWh/year electricity, 200,000 MWh/year heat
Amount pre-spent, development cost/feasibility study	Total EPC contracting costs: ca. 20 million EUR

EXPENSES VARIABLE

Topic	Answer
Operation & Management (O&M) cost per kW/h or unit of production	Ca. 65 EUR/MWh with fuel feedstock costs Ca. 25 EUR/MWh w/o fuel feedstock costs
Consumables	n/a (such type of costs are not described in DD)
Transport	n/a (such type of costs are not described in DD)
Land Lease	0
General & Administrative Expenses	Ca. 10 EUR/MWh

EXPENSES FIXED

Topic	Answer
Administration Cost per year	Ca. 2.5 million EUR/year
Operation & Management Fee per year	n/a (such type of costs not described in DD)
Insurance expenditure	n/a
Personnel Expenses	Ca. 2.5 million EUR/year
Security & Social Programmes	n/a

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	Undisclosed information
Reserves	Undisclosed information
Annual Investments	Undisclosed information
New/Renewal of Equipment	Undisclosed information
Funding Priority	Undisclosed information
Target Sponsor Equity	Undisclosed information
Dividends	Undisclosed information
Short Term Debt	Undisclosed information
Subordinated Debt and in how many tranches	Undisclosed information
Senior Debt and in how many tranches	Undisclosed information
Preferred Debt repayment method – equal repayment, amortising debt	Undisclosed information

Case Study 2 Ukraine

PROMOTING SUSTAINABLE USE OF UNDERUTILIZED LANDS FOR BIOENERGY PRODUCTION

Project Identification Form

1. This Form is intended for early identification of technically and financially viable projects in the field of bioenergy energy. It is designed to help the specialists reviewing it to understand the context, key issues and requirements of the project / case study and for finalising a model and business plan. Please give special care and attention to every item of the Form. Missing essential elements may cause unnecessary delays in the process or lead to misinterpretation of the merits of the project.

2. The form is identical for all type of projects, the most widely considered being:

- Biogas
- Biomass
- Biodiesel
- Ethanol
- Electricity generation from biomass or biogas
- CHP

3. The definition of "Owner/Project Sponsor" is a person or entity that initiates, owns and promotes the project and has decision making power on borrowing or equity distribution.

4. There is questionnaire for each of the following project categories:

- Owner/Project Sponsor
- Financial Information
- Resources and Tariffs
- Supply Resources
- Transportation
- Availability or cost of plant
- Land
- Major Contracts
- Various Financial Inputs

Instructions for completing and submitting the form

a). Provide answers in the boxes as indicated

b) Attach any documents to support your answers separately. Please indicate where relevant documentation is attached.

c) Once completed, send this form and any supporting documentation to buiting@1to3capital.com and deltcho.vitchev@gmail.com.

MAIN PROJECT INPUT

Topic	Answer
Project name:	Khmelnytsky Biomass Power Plant
Project sponsor[35]:	Khmelnytsky Biomass Power Plant
Contact person:	
City:	Slavutych
Region:	Kyiv (official), Chernihiv (actual)
Country:	Ukraine
Site location name and coordinates:	
Telephone number (primary)	
Mobile number	
Email	
Project sector[36]: Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP	2G Ethanol
Type of technology:	PROESA® (steam-explosion, Enzymatic liquefaction, SSF) belonging to Biochemtex
Equipment supplied by:	
Sponsor's relevant sector experience (attach any supporting documentation) [37]:	
Project brief description: (if different from the Case Study description D4)	Hypothetical construction of the 2G ethanol plant on willow biomass feedstock.

OUTLINE FINANCING PLAN OF THE PROJECT

	Type (in kind/equity/cash)	Currency	% of Total	Interest rate (cost of capital) %
Owner's Equity				
Other Equity				
Bank Loans, Local				
Other Loans (Senior/ Mezzanine)				
Grants				
What kind of guarantees were used (company/bank/utility/government)?				

[35] This is a person or entity that initiates, owns and promotes the project and has decision-making power on borrowings or the allocation of equity.

[36] Sector relates to the type of technology that the project will deploy. The project financing, including mezzanine and equity investments in bio energy projects or companies developing, manufacturing, distributing or installing bio energy equipment or services which have or are expected to have a quantifiable impact on the reduction of greenhouse gas emissions, are environmentally beneficial and/or generate energy, carbon credits and/or tradable renewable energy certificates.

[37] The answer should provide the track record or prior experience the sponsor has with the technology, including the number of years of experience and in which capacity.

RESOURCES AND TARIFFS

Topic	Answer
Project Technology (Biogas, Biomass, Biodiesel, Ethanol, Electricity generation from biomass or biogas, CHP)	2G ethanol
Projected Project output (MWh/year generated, or Litres, or m3, or Tonnes)	t/year produced
Projected project output (units / year, if production)	33,400 t/year produced, 87 GWh/year surplus electricity produced by the CHP of the biorefinery (data taken form D3.3 of FORBIO project https://forbio-project.eu/assets/content/publication/D3.3_FINAL_02.07.2018.pdf)
Projected project life	25 years
Source of the output data. Independent study, by whom? What probability P50/P90, if relevant?	n/a
Is Off-take agreement secured and when does it expire.	n/a
Off-Take entity	2g ethanol Electricity offtake – UPS (national electricity grid, SE Guaranteed Buyer)
Off-Take Tariff/Price €/kWh or €/unit and in the currency in which it will be paid.	If commissioned until end of 2022 – green tariff (123.9 EUR/MWh). Most likely – auctioning price (10-20% lower than green tariff) as a result of auctions between biomass CHPs in Ukraine (20 years contract).
Capacity/energy tariffs in the country/market - €/MW and €/kWh	Average CAPEX for CHP on biomass: 4) Wood chips: 2000-2300 EUR/MW 5) Sunflower husk: 1700-1900 EUR/WM 6) Straw bales: ~4000 EUR/MW According to the data om Market Operator[38] for wholesale electricity prices average DAM (day-ahead market) prices are: - 41.84 EUR/MWh (without VAT) - Ukraine IPS (Integrated Power System) - 48.61 EUR/MWh (without VAT) - Ukraine BEI (Burshtyn Energy Island)
Details of the energy/equipment/services purchaser(s)	For electricity: State Enterprise “Guaranteed Buyer” purchases electricity produced from RES at a “green” tariff. Starting from March 2020 State Enterprise "Guaranteed buyer" blocked the payment for generated energy. On 21.07.2021 Law of Ukraine №810-IX on reducing "green" tariffs for electricity producers from renewable sources energy (RES) was adopted. “Green” tariff for biomass/biogas remained unchanged. As of April 2, 2021, SE "Guaranteed Buyer" paid only UAH 29,4 billion at the "green" tariff. Currently, the payment rate for February is 90% and 87% for March (29 days). The average level of payment since the beginning of the year is 90% (for the first three months of 2021).

[38] https://www.oree.com.ua/

Is the tariff/price linked to the Retail Pricing Index (RPI) or the Power Pricing Index (PPI)	Electricity produced at the biomass power plant receives "green" tariff that is 123.9 EUR/MWh for installations put into operation before 01.01.2023.
Ability to Integrate Project into Existing Infrastructure	electricity - yes
Evidence that the Government/ Off-taker support the project	For electricity produced from biomass, "green" tariff is set and starting from 2023 auctions will come instead of "green" tariff.
Evidence of the Risk to the project, competitors	n/a
Credit Worthiness of Sponsor (if not available please provide financial statements of the last 2 years)	n/a
Credit Worthiness of Purchaser (if not available please provide financial statements of the last 2 years)	Financial statements of the SE Guaranteed Buyer for 2020[39] and 2019[40] can be found on the website: https://www.gpee.com.ua/

SUPPLY RESOURCES

Topic	Answer
Are the generating/manufacturing resources available on site?	
The cost of the resources/raw materials per kWh, or per unit of production/output?	The cost of willow chips at the farm gate is 1200 UAH/t (36 EUR/t) at a moisture content of 30-35%. Transportation costs: - 0.031 EUR/t·km (vehicle that belongs to a willow chips producer) - 0.058 EUR/ t·km (rented vehicle) * the considered vehicle is a lorry with a trailer of 110 m^3 total volume and 20 t total capacity. The vehicle mileage includes distance of a round trip).
Will the project be connected to the grid or to an isolated grid?	to the national grid (UPS) through local connection point 35 kV.
Has the technology supplier been determined	Biochemtex
Credit Worthiness of Supplier of Technology (if not available please provide financial statements of the last 2 years)	
Equipment degradation assumption in percentage	

[39] https://www.gpee.com.ua/accounting_results/2020
[40] https://www.gpee.com.ua/accounting_results/2019

LAND

Topic	Answer
Has the project been secured by a land agreement or similar, and for how long? Who owns it?	n/a
Topographical study	n/a
Environmental and Social Impact Assessment (ESIA)	n/a
Is the land occupied	n/a
Resettlement requirements	n/a
Local community compensation	n/a
Cost of Land or land lease charge/year	n/a
Transmission and power/products evacuation/transportation cost	Tariff for **electricity transmission** starting from 01.01.2021 according to Resolution of the National Energy and Utilities Regulatory Commission of Ukraine №2353 dated 09.12.2020 (https://www.nerc.gov.ua/?id=57072) is 293.93 UAH/MWh (without VAT). Tariffs for **electricity distribution** of JSC "Chernihivoblenergo" according to Resolution of the National Energy and Utilities Regulatory Commission of UkraineNo2384 dated 09.12.2020 (https://www.nerc.gov.ua/?id=57110) starting from 01.01.2021 are: - 194.56 UAH/MWh (without VAT) for 1 class of voltage (voltage level of 27.5 kV and above); - 1188.69 UAH/MWh (without VAT) for 2 class of voltage (voltage level below 27.5 kV). CHP does not pay these costs, as they lie on consumers.
Title of land plots, or land leases	n/a
Contract(s) for transfer of the land	n/a
Any other Studies?	n/a

MAJOR CONTRACTS

Topic	Answer*
Power Purchasing Agreement / Purchasing Agreement	
Supply Contract	
Land Title	
Shareholders Agreement	
Operation and Maintenance Agreements	
Government Support Agreement	
Concession Agreement	
Procurement Agreement	
Engineering Agreement	
Construction Permits	
Connections to Utilities, Roads Permits	

Draft contract for developer to construct project	
Other similar Agreements, Warranties or Guarantees	

**YES or NO answer will be sufficient at this stage*

FINANCIAL INPUT

Topic	Answer
Total Project Cost	Ca. 125 million EUR (CAPEX for a hypothetical biorefinery, data taken from FORBIO project D3.3)
Timing of The Project	25 years
Cost of Construction	n/a
Months of Construction	n/a
Completion Bond	n/a
Foundation Cost / Site infrastructure	n/a
Generation Assets / Machinery	n/a
Insurance	n/a
Connection	n/a
EPC Management	n/a
Contingency	n/a
Generation/Production Capacity	33,400 t of 2G ethanol
What is the project's projected source of cash flow? Amount/year?	Selling of bioethanol and electricity
Is this under a fixed contract and if so, for how many years?	If "green" tariff – till 2030 (fixed level 123.9 EUR/MWh) If auction – 20 years after auction completion and contract concluding (10-15% lower than "green" tariff)
Projected Project output (KWh/year and/or unit €year)	33,400 t/year of 2G ethanol, 87 GWh/year electricity (data taken form D3.3 of FORBIO project)
Amount pre-spent, development cost/feasibility study	n/a

EXPENSES VARIABLE

Topic	Answer
Operation & Management (O&M) cost per kW/h or unit of production	720 EUR/t (total production cost; data taken form D3.3 of FORBIO project)
Consumables	Ca. 10.79 million EUR/year (enzymes, yeast, catalysts, other input; data taken form D3.3 of FORBIO project)
Transport	n/a
Land Lease	n/a
General & Administrative Expenses	n/a

EXPENSES FIXED

Topic	Answer
Administration Cost per year	n/a
Operation & Management Fee per year	n/a
Insurance expenditure	n/a
Personnel Expenses	Ca. 2.592 million EUR/year
Security & Social Programmes	n/a

GENERAL FINANCIALS

Topic	Answer
Taxation & Duties	n/a
Reserves	n/a
Annual Investments	n/a
New/Renewal of Equipment	n/a
Funding Priority	n/a
Target Sponsor Equity	n/a
Dividends	n/a
Short Term Debt	n/a
Subordinated Debt and in how many tranches	n/a
Senior Debt and in how many tranches	n/a
Preferred Debt repayment method – equal repayment, amortising debt	n/a