Project finance in Hungarian electricity sector
Effect of feed-in tariff system's change onto power plant investments

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Abstract

The research analyses the former and the current status of the small gas-motor power plant investments in the Hungarian energy sector. It discusses the development of project financing in the segment and the major changes and effects of new regulations and subsidy-policy implemented in 2010. The objective of this paper is to present the results of an empirical research of the so called GCHP projects, and to draw conclusion concerning how classic project financing conditions were present and changed during the last decade, and how regulation affected the current and future financial status of these projects. [2]

Keywords: project financing, corporate financing, energy sector

JEL classification number: G32, G38, L94

1. Introduction and literature review

The business model of GHCP power plants[3] is a perfect example of classic project financing structures from all economic and financial points of view. The implementation of dozens of such small projects convincingly proved the concept of project financing in this segment. The classic conditions and assumptions of project financing had been fulfilled until legal regulation changed considerably in 2010. In this study we do not present the details of the vast theory behind project financing, state subsidies, structure of energy sector. We rather concentrate only on relevant issues of these local projects and on the details of an empirical research executed. There are numerous literatures presenting the practice and theory of

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[2] The results of the research were also discussed also on the Ph.D. dissertation see Madácsi (2015).
[3] GCHP power plant: gas motor, cogeneration power plant with a capacity of less than 50MW. During the production of energy from gas, it also provides heat.

project finance, general corporate finance, banking procedures and standards, which were worked out and used in the preparation phase of theoretical background of the research. From international aspects the most standard and extensive literatures about project finance are e.g. Yescombe (2008), Nevitt-Fabozzi (2000). General conditions and local specialities of structured and project finance is thoroughly discussed in Horváth et al. (2011), in Madácsi-Walter (2014), or in Walter (2014c). General and local banking procedures, banking products and standards and specific credit-decision aspects are presented in Walter (2014a) and Walter (2014b). As state subsidy in electric power plants played and plays a highly important role, therefore functions and effects of subsidies have special relevance in the research. State subsidies and their efficiencies are discussed e.g. in Walter (2014d) and in Berlinger et al. (2015).

In the following sections we analyse the Hungarian GCHP investments in the framework of an empirical research forming and examining 3 hypotheses. The major question of the research is whether the conditions of project financing were and are fulfilled, and how changes in conditions affected the status of such projects.

2. Empirical research methodology

2.1. Universe and sampling

My research primarily focuses on the domestic energy sector, in particular electrical power generation; therefore, the universe can be represented by all those companies which have domestic power generation capacities. Based on the databases assembled in my research, as of 1st July 2011 there were 21 large power plants[4] and 256 small power plants[5] operating in the territory of Hungary. Given that Ministerial Decree 56/2002 (29 December) GKM[6] was primarily designed to support small power plants through the feed-in tariff system and that the majority of large power plants also existed before 2002, I will focus on small power plants in my research.

The 256 small power plants can be divided into two categories: renewable energy power plants (using solar, wind, hydro, geothermal, biogas and biomass energy) and gas-fired cogeneration plants. Since Ministerial Decree 56/2002 (29 December) GKM as amended and effective as of 1st July 2011 excluded these latter small power plants from the feed-in tariff system, my research centres on GCHP small plants. In order to minimise the statistical error stemming from sampling, I will seek to analyse the entire sample in my research, i.e. I will study all GCHP small plants that were still in operation on 1st July 2011.

2.2. Methods of data gathering

Data collection in the research can be divided into two large stages: definition of the universe and obtaining financial and other information about it.

Since in the research I was to examine the entire universe of GCHP small plants, as a first step I had to put together that list. However, no similar list is published either by MAVIR or the Hungarian Energy Office; therefore in the primary data gathering phase I had to check

[4] Power plant possessing at least 50 MW built-in capacity.
[5] Power plant possessing less than 50 MW built-in capacity.
[6] Ministry of Economy and Transport.

the Hungarian Energy Office website to identify, one by one, each GCHP small plant that was in possession of an operating licence on 1st July 2011. The second step was to complete the list by adding the type of technology installed in the GCHP small plants; it can be grouped basically into five categories: combined cycle gas turbine; gas engine; biogas/biomass; wind energy and solar power. As of the aforesaid date 256 small power plants were in possession of operating licences, of which there were 4 combined cycle gas turbine (CCGT); 138 gas engine; 86 biogas/biomass; 22 wind; and 6 hydro power-based small power plants. Given that in the entire list 142 (4 CCGT and 138 gas engine) small power stations qualify as GCHP small plants, it is this universe that is in the focus of my research.

As a next step, I had to examine the GCHP companies. From the list in Annex 13 it can be clearly seen that in many cases the same company invested in several GCHP small plants – based on the list, the 142 GCHP small plants were constructed by 86 different companies, i.e. they constitute the universe.

With regard to the hypotheses, I also had to collect financial statements concerning the universe. Based on existing accounting regulations[7], all businesses using double-entry book-keeping must publish their annual reports by depositing them with the Court of Registration to make them available to the general public at a later stage via the Electronic Reports Portal[8] operated by the Ministry of Public Administration and Justice (KIM). With the help of this website, I have been able to collect the annual reports of GCHP companies for the business years of 2010, 2011 and 2012.

I also needed for my research the given companies' company extracts, which include the exact date of incorporation, as well as the main parameters of their bank borrowings, if any. I had access to the businesses' company extracts via KIM's free Company Information Service website[9] and relied on the supplementary annexes to their published annual reports for accurate information about external financing.

2.3. Operationalisation

The process of operationalisation was the simplest perhaps in the case of company extracts as in this document I only considered the date of foundation relevant, given that it was that date that I compared with the start date of external financing, if any, in the research.

By contrast, operationalising the available annual reports proved to be the most complex process. Since I also looked at companies' monetary positions in the research, I needed the following core data from their B/S and income statements in respect of years 2010, 2011 and 2012:

- Current assets
- Equity
- Long-term liabilities
- Short-term liabilities
- Total assets
- Net sales revenues
- Depreciation
- Earnings before interest and taxes

[7] Act C. 2000
[8] http://e-beszamolo.kim.gov.hu/
[9] http://www.e-cegjegyzek.hu/index.html

- Interest payable
- After-tax profit

The above data can be used to produce gearing; liquidity; profitability; turnover rate; and cash-flow indicators[10]. These indicators in turn allow analysing the given company's monetary position and its changes over time.
The final step was to determine the given company's EBITDA value and debt service[11], for which I relied on the companies' annual reports. I did not have any difficulty calculating the EBITDA since in operationalising the annual reports all I had to do was to take the GCHP companies' operating profits and depreciation values and then simply add them up. In the case of annual debt service, I used supplementary annexes as under the effective Accounting Act[12] the cash-flow statement, which included principal repayment and interest payable due in the current year, was a compulsory element of the supplementary annex and thereby the annual debt service was easy to calculate.

2.4. The research schedule

As a first step in the research, the universe to be studied was defined and the sample was selected. Since the universe consisted of GCHP small plants in possession of operating licences on 1st July 2011, using the Hungarian Energy Office website I started to put together their list in March 2013 and completed it containing the universe in April 2013. Based on the said list, the universe comprised 86 licenced GCHP companies that had implemented 142 GCHP small plant investments. In order to eliminate sampling errors, I chose the full sample as the subject of study, i.e. later I would look at those 86 companies.
Secondly, I had to collect the company extracts of GCHP small plants and their annual reports for the years 2010, 2011 and 2012. I was able to start downloading the first three documents in April 2013 but the compulsory publication date of 2012 annual reports was 31st May 2013 and so it was not until this date that this document had become accessible. Phase two was finally closed in June 2013.
In steps three and four, I put together a database from the available documentation and then analysed it. Taking into account the numerosity of data, compiling the database and then processing it equally took two months.
After setting up appropriate hypotheses and in order to analyse them in depth, I had to seek professional consultation on several occasions during the research that I continued to rely on in all phases thereof.
In the final phase of the research I drew conclusions and integrated them into my thesis, which I completed in November 2013.

3. Hypotheses

Given that the analytical methodology varied by hypothesis, how the analysis was performed in practice can be described as follows, with the indication of individual hypotheses.

[10] Virág (2004)
[11] Debt service covers due repayment and interest paid.
[12] Act C. 2000

H1: The majority of GCHP small plants still in operation on 1st July 2011 were implemented in a project financing model, since the feed-in tariff system created more favourable conditions for the wider use of project financing in the case of these power plants before 1st July 2011.

With this hypothesis I examined how the preconditions of project financing were put in place in the case of GCHP small plants. In addition, I sought to find an answer to the question of whether GCHP small plants still in operation on 1st July 2011 had actually been implemented by way of project financing. For that I needed the date of foundation of the GCHP small plants and the exact date from which external financing, if any, was available for the investment.
My point of departure in verifying this hypothesis was the practice of domestic commercial banks whereby only companies with closed annual reports for at least two entire years were eligible for bank loans under corporate finance. If, therefore, less than two years passed between incorporation and the use of external financing, the given investment must have been realised within the scope of project financing.

H2: The feed-in tariff system ceasing to function as of 1st July 2011 substantially undermined the monetary position of GCHP companies.

This is perhaps the most complex hypothesis of all as in this case I looked at the trends of GCHP companies' financial performance via their monetary positions determined earlier by Virág, Hajdu and Jávor[13].
I analysed the members of the universe with the use of different gearing; liquidity; profitability; turnover rate; and cash-flow indicators for the years 2010, 2011 and 2012. After calculating the above indicators, I applied principal component analysis and cluster analysis to determine the monetary positions of GCHP companies. In view of the fact that I performed the analysis for three consecutive years (2010, 2011 and 2012), the study of time series data also revealed changes in the monetary position of the universe over the years.

H3: The discontinuation of the feed-in tariff system as of 1st July 2011 led to impairing GCHP companies' cash-flow generation capacity to such an extent that called even their debt servicing capability into question.

In project financing, the cash-flow generation capacity plays a key role as the EBITDA made by the business provides coverage for the debt service linked to financing. Therefore, as part of the analysis I had to determine the EBITDA values of the businesses concerned and also their debt service. In the EBITDA's case the situation was simple as I all had to do was to adjust the company's operating profit with annual depreciation. In determining the annual debt service, I could rely on the supplementary annex to the GCHP company's annual report, more specifically the cash-flow statement in it. To determine at the annual debt service I had to add up the annual principal repayment and interest payable.
After that, what I had to examine was how the EBITDA values realised by the companies related to their annual debt service. Since the feed-in tariff system was discontinued as of 1st July 2011, it made sense to look at all three relevant years. That is because while the feed-in tariff system remained unchanged in 2010 and made its effects felt for half a year in 2011,

[13] Virág – Hajdu – Jávor (1995)

GCHP small plants had to sell the electrical power generated without the feed-in tariff system in 2012.

4. Research results

4.1. Hypothesis 1.

The scrutiny of Hypothesis H1 can be divided into two parts. Firstly, I will look at what conditions were in place for relying on project financing prior to 1st July 2011 in the case GCHP small plants, and then I will compare the foundation dates of GCHP companies with the dates of their bank borrowings, if any.
The theoretical premises of structured and project financing is thoroughly discussed in literature mentioned in the first section, here I only have to present the relevant parts of that chapter in respect of GCHP small plant investments

- *Long-term provision of raw materials necessary for the project*.
  Given the nature of the technology, the primary raw material of GCHP small plants is natural gas. Prior to 1st July 2011, access to natural gas and its price was officially fixed under Ministerial Decree 96/2003 of the Ministry of Economy and Transport (GKM). Pursuant to the said decree, the regionally competent gas suppliers were not only obliged to supply gas to GCHP plants but also the gas price was determined by GKM.
- *Securing markets for products and services resulting from the projects*.
  A GCHP small plant generates electrical power and thermal power as basic products. Electricity also used to be subject to administered pricing and compulsory takeover provisions laid down by Ministerial Decree 56/2002 of the Ministry of Economy and Transport. Subject to this decree, locally competent universal suppliers were obliged to take over electricity produced by GCHP small plants at a fixed price. This price was adjusted annually by the CPI (with a 40% weight) published by the Central Statistical Office (CSO) and by the official gas price index (with a 60% weight). In respect of the sale of thermal energy, the GCHP company had to enter into a separate contract, which was not regulated by the competent authority, except in the case of public institutions. Other than that, hot steam generated by GCHP small plants was usually purchased by the locally competent district heating company – at a price which again was determined based on a formula defined in Ministerial Decree 56/2002.
- *Elimination of risk of budget overrun and late performance.*
  The GCHP companies usually concluded contracts with the company implementing the investment on a not-to-exceed basis. As a consequence, the predetermined price was only paid after timely contractual fulfilment – which amount may have been reduced by penalty charged for late performance, if any. That way, cost overruns could be avoided in implementing GCHP small plant investments.
- *Well-grounded feasibility study and financial forecasts.*
  Since, based on the above, revenues from electricity and heat sales and the gas cost, the most important cost item, related to GCHP small plant investments were equally fixed regarding to the future, it was possible to make sound financial forecasts in relation to the entire term of the GCHP small plant project. Bearing in mind that in addition to the

gas cost there were only some other minor cost items such as operating and maintenance costs to reckon with, financial forecasts had a high degree of reliability. [14]

- *Compliance with regulations and environmental requirements.*
  A building permit for a GCHP small plant was only issued after a competent authority had verified compliance with the relevant regulatory provisions and environmental requirements. Since it was not until it was completed that the actual financing of the project had begun, the GCHP small plant investment also met that precondition.
- *Experienced and reliable partners.*
  Among the partners, the contractor and later the operator bore the greatest responsibility. That was why in the case of GCHP small plant investments the financing partner required relevant references from the operating partner in each case; furthermore, the GCHP company was not allowed to replace the contractor or the operator without the financing commercial bank's approval.
- *Involvement of independent experts.*
  The financing institutions normally involved external independent experts in GCHP small plant investments as well. Given that commercial banks' structured financing units had enough financial experts and the Ministry of Economy and Transport regulated the most important revenue and cost elements related to these investments, it was primarily technical experts who played a critical role. In most cases, a technical expert gave his/her opinion on the installed technology as well as tracking the implementation work related to the GCHP small plant, in parallel to which the commercial bank disbursed the loan for the GCHP small plant investment.

The above list shows that GCHP small plant investments indeed created favourable conditions for the spread of project financing. Even so, it is possible that these investments were not realised in this form after all. That is why we must also take a look at the second part of Hypothesis H1.

In the section on data gathering I already mentioned that 142 GCHP small plant investments were carried out by 86 GCHP companies, i.e. in this case I analysed 86 businesses. In the research I compared the foundation dates of GCHP companies and the dates of bank borrowings, if any, by the same companies of 86 GCHP companies, in the case of 51 companies the difference between these dates was less than two years, i.e. these firms were assumed to be project companies. In addition, it should be mentioned that of the 86 GCHP companies only 7 operated without any external financing.

That concluded the study of Hypothesis H1 and the hypothesis was confirmed. Based on the foregoing, prior to 1st July 2011 not only were the theoretical premises of project financing fulfilled but of 86 GCHP companies 51 were considered project companies. In other words, nearly 60% of GCHP companies relied on project financing to implement their GCHP small plant investments. [15]

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[14] Although the structure of project really improved reliability of analyses, we have to add, that the classic behavioural biases like overoptimism in planning and forecasting also appear. It is enough to remember how participants were convinces themselves that regulation will not change in 2010 and subsidy system will survive on the same level. About overoptimism and biases in planning see Jáki (2013a) and Jaki (2013b).

[15] Of course it is difficult to separate whether the decrease in project finance is based on the change of regulation or due to changes in banking strategies, the lack, diminishing appetite of bank in such financing products and risk taking. It is obvious that the decrease in lending activity of banks in Hungary had a negative effect on this segment too. See the development of banking strategies and changes in Walter (2014a).

4.2. Hypothesis 2

For examining Hypothesis H2, I had to determine GCHP companies' monetary position, for which I will apply the methodology worked out by Virág at al. (1995).
As a first step, I had to set up a database by operationalising the 2010, 2011 and 2012 annual reports of the 86 GCHP companies. It was not until I populated the database that I had realised that the year 2012 annual reports of 6 companies in the universe were not available and so they had to be excluded from the sample. Furthermore, in studying the universe I identified 7 large enterprises that had implemented GCHP small plant investments linked to their core businesses, which were other than electric power generation. Given that the inclusion of such large companies would significantly distort the average actual monetary position of GCHP companies, I decided to exclude these firms from the sample as well. As a result, the final sample contains 73 GCHP companies, on which I will test Hypothesis H2.
In the second step, I populated the database with the main items of the balance sheet and income statements for the years of 2010, 2011 and 2012, as described in section 5.2.3. Following that, from the above data I calculated gearing; liquidity; profitability; turnover rate; and cash-flow indicators used by financial analysis literature. In determining the 13 different indicators I sought to make sure that each indicator was a ratio and that the higher value meant a more favourable financial position in each case. To this end, I used the inverse value of the original formula of the indicator in 3 cases.
Next, I examined the above indicators in respect of the years 2010, 2011 and 2012. Of the indicators, in three cases – long-term liabilities, net sales revenues and interest payable and similar charges – it happened that with some GCHP companies the denominator had "0" value, whereas division by "0" cannot be interpreted. Since I did not want to narrow the sample any further, in these cases I replaced the original "0" with "1" as by doing so the actual value of the given financial indicator was only modified to a very limited degree.
Apart form the aforesaid modification, in calculating the return on equity I was also confronted with having negative values both in the numerator and in the denominator in some cases but the result became a positive number, which would have been misleading in subsequent analysis. I solved the problem by using in these cases the worst RoE value in the given year instead of the original ratios. That way I avoided the problem of losing yet another sample item while I also observed requirements in that a GCHP company that had its own negative equity and posted negative results also stood the closest to the worst possible negative RoE value in reality.
Following that, I performed principal component analysis for 2010 with the help of the above 13 financial indicators. Since I had previously classified the financial indicators into 5 groups (gearing; liquidity; profitability; turnover rate; and cash-flow), in the analysis I sought to identify 5 factors, which was also consistent with the chosen methodology[16].
The results of principal component analysis performed by the SPSS programme for the year 2010 are as follows:

[16] Virág et al. (2013)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,310	33,154	33,154	4,310	33,154	33,154	2,539	19,527	19,527
2	2,147	16,519	49,674	2,147	16,519	49,674	2,311	17,773	37,300
3	1,782	13,710	63,383	1,782	13,710	63,383	2,200	16,920	54,220
4	1,322	10,170	73,553	1,322	10,170	73,553	2,037	15,667	69,888
5	1,061	8,163	81,716	1,061	8,163	81,716	1,538	11,828	81,716
6	,888	6,833	88,549						
7	,561	4,318	92,867						
8	,477	3,672	96,539						
9	,240	1,846	98,385						
10	,110	,850	99,235						
11	,097	,748	99,983						
12	,002	,017	100,000						
13	9,656E-008	7,428E-007	100,000						

Extraction Method: Principal Component Analysis.

a

	Component				
	1	2	3	4	5
T1	,245	,069	,826	,025	-,171
T2	,135	,138	,920	,157	-,074
T3	,263	,516	,667	,151	-,046
L1	,836	,081	,203	-,030	-,149
L2	,798	,298	-,025	,135	,061
L3	,851	,185	,197	,085	,012
J1	-,152	-,954	-,145	,049	,092
J2	,070	-,243	-,087	,048	,811
J3	,000	,059	-,120	-,024	,873
F1	-,523	,085	-,242	,026	-,198
F2	,152	,954	,145	-,049	-,092
CF1	,055	-,028	,095	,989	,010
CF2	,054	-,031	,117	,988	,010

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 6 iterations.

The 5 factors created on the basis of principal component analysis explain nearly 82% of the dispersion of the 13 financial indicators. From the study of the sets of indicators it can be concluded that the first principal component is of a liquidity type, the second responds sensitively to both profitability and the turnover rate, the third one is a gearing-type indicator group, the fourth one is related to cash-flow while the fifth to profitability. Performing the same principal component analysis for 2011 yields the following results:

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,835	37,196	37,196	4,835	37,196	37,196	3,590	27,616	27,616
2	2,826	21,735	58,931	2,826	21,735	58,931	2,312	17,787	45,403
3	1,300	9,996	68,927	1,300	9,996	68,927	1,819	13,994	59,397
4	1,245	9,579	78,506	1,245	9,579	78,506	1,670	12,850	72,246
5	,751	5,774	84,281	,751	5,774	84,281	1,564	12,034	84,281
6	,690	5,308	89,588						
7	,540	4,153	93,741						
8	,367	2,822	96,563						
9	,245	1,881	98,444						
10	,138	1,058	99,502						
11	,055	,422	99,924						
12	,010	,076	100,000						
13	5,277E-007	4,059E-006	100,000						

Extraction Method: Principal Component Analysis.

a

	Component				
	1	2	3	4	5
T1	,624	,464	,231	,228	-,006
T2	,691	,249	,064	,558	,070
T3	,002	,120	-,021	-,014	,924
L1	-,101	,014	,953	-,004	,005
L2	,021	-,362	,302	,167	,739
L3	-,007	-,149	,722	,414	,233
J1	,937	,230	-,180	-,026	,051
J2	,881	,049	,010	,105	-,084
J3	,348	,003	,026	,830	-,083
F1	,195	,052	-,381	-,636	-,290
F2	-,845	-,355	,232	-,030	-,022
CF1	,216	,955	-,072	,006	-,047
CF2	,371	,878	-,059	-,029	-,039

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 6 iterations.

The above findings suggest that the 5 principal components explain nearly 84% of the dispersion of the 13 financial indicators. Taking a closer look at the 5 principal components we find that they are more difficult to identify than in the case of 2010. The first set of indicators respond sensitively to profitability and the turnover rate, the second one is a cash-flow-type group, the third one is of a liquidity type, the fourth group responds to profitability and the turnover rate to almost the same extent, and the fifth indicator group is sensitive to gearing and liquidity.

Continuing the testing of Hypothesis H2, I also carried out principal component analysis for 2012 with the results below:

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,567	27,441	27,441	3,567	27,441	27,441	2,802	21,556	21,556
2	2,350	18,076	45,516	2,350	18,076	45,516	2,193	16,866	38,422
3	2,153	16,562	62,078	2,153	16,562	62,078	2,143	16,483	54,905
4	1,810	13,921	75,999	1,810	13,921	75,999	2,016	15,509	70,414
5	1,124	8,644	84,643	1,124	8,644	84,643	1,850	14,229	84,643
6	,651	5,009	89,652						
7	,446	3,432	93,084						
8	,417	3,206	96,290						
9	,311	2,389	98,678						
10	,154	1,183	99,861						
11	,017	,130	99,991						
12	,001	,006	99,997						
13	,000	,003	100,000						

Extraction Method: Principal Component Analysis.

a

	Component				
	1	2	3	4	5
T1	,347	-,067	,339	,014	,824
T2	-,014	,534	,036	,001	,771
T3	-,799	,136	-,015	,113	,404
L1	,894	-,162	,129	-,045	,267
L2	,760	,344	-,088	,018	,089
L3	,763	,300	,039	,148	,244
J1	-,079	-,004	,050	,993	,051
J2	-,030	,800	,245	,056	-,152
J3	-,017	,757	-,065	-,033	,454
F1	-,262	-,655	,052	,077	-,135
F2	-,084	,036	-,054	-,989	,036
CF1	,030	,054	,982	,051	,096
CF2	,021	,057	,981	,054	,115

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Rotation converged in 11 iterations.

Similarly to the preceding years, the 5 principal components explain close to 85% of the dispersion of the 13 indicators. Analysing the indicator groups we can conclude that the first principal component is sensitive to gearing and liquidity, the second group responds to profitability and the turnover rate to nearly the same extent, the third principal component is of a cash-flow type, the fourth one is sensitive to profitability and the turnover rate while the fifth one is of a gearing type.

The above principal component analysis clearly reveals that in the years 2010, 2011 and 2012 differences between the 73 GCHP companies were explained by the 5 sets of indicators, whose explanatory power did, however, change from year to year. These principal components proved adequate in every year, as they explained at least 80% of the dispersion of the 13 indicators from year to year.

The next step in the scrutiny of Hypothesis H2 was to determine the monetary positions of the GCHP companies for the above three years. To this end, each GCHP company's indicator group-based value, calculated by the SPSS programme, had to be weighted by the variance value representing the importance of the given indicator group. After that, I assigned the monetary positions of the companies to 5 clusters with the use of the K-means clustering algorithm. Since the cluster analysis produced homogenous groups, the results showed the extent of similarity between the monetary positions assumed by GCHP companies. In addition, with the help of cluster analysis it was possible to find a centroid GCHP company in each year, whose monetary position most approximated the "0" value – which, at the same time, was the predicted value of the companies' monetary position. To confirm the hypothesis, I then only had to compare the 13 financial indicators of these 3 GCHP companies, since Hypothesis H2 posits that the indicators must assume decreasing values in the consecutive years.
In examining the financial indicators I made an interesting conclusion, since gearing, profitability and cash-flow indicators clearly reflected the tendency outlined in the hypothesis, namely that the relevant indicators of the centroid GCHP companies would show a declining trend from year to year, i.e. assume a lower value. By contrast, liquidity and turnover rate indicators showed a mixed picture and, in addition, there were differences even within individual indicators. As a consequence, I had to dismiss Hypothesis H2, since the monetary position of GCHP companies did not deteriorate on the basis of all factors in the period 2010-2012; that statement was only correct for the gearing, profitability and cash-flow positions of those companies.

4.3. Hypothesis H3

In relation to Hypothesis H3, I studied the trends of GCHP companies' cash-flow generation capacity, regardless of their worsening monetary positions. For, according to the hypothesis, after the termination of the feed-in tariff system even the debt service payment capability of these companies could be questionable.
Using the procedure defined in the analytical methodology I calculated each GCHP company's EBITDA value, which is treated in financial analysis literature and applied in commercial banking practice as a relevant indicator of cash-flow generation capacity. In performing this step, all I needed to do was to adjust the operating profit realised by the GCHP company with annual depreciation. The next step was to determine the annual debt service, whereby using the cash-flow statement in the annual report's supplementary annex as a basis I took principal repayment and interest payable for the given year, as the sum of these two figures corresponds to the annual debt service. Finally, all I had left to do was to look at whether EBITDA exceeded the value of annual debt service in the individual years.
Given the fact that the feed-in tariff system for GCHP companies was discontinued as of 1st July 2011, I considered it important also to examine the years 2010, 2011 and 2012. That is because in 2010 the feed-in tariff system operated smoothly; in 2011 its impact was only felt for half a year; while in 2012 GCHP companies had to operate without it throughout the whole year. In other words, if we look at the time series for the period 2010-2012, we can gain more information about changes in the cash-flow generation capacity of these companies.
Studying the time series leads us to conclude that the EBITDA realised by 10 of the 73 GCHP companies could no longer cover the annual debt service in as early as 2010;

however, that figure only represents about 14% of the entire sample. The further scrutiny of the time series reveals that in 2011 there were as many as 48 GCHP companies (or 66% of the sample) that were no longer able to cover their annual debt service, while in 2012 there were already 52 GCHP companies, or 71% of the entire sample, facing a similarly difficult situation.
The above conclusions have therefore confirmed Hypothesis H3, since the debt service capacity of GCHP company's sharply deteriorated from 2010; by 2012, as many as 71% of them could no longer generate sufficient cash-flow from their core activities to meet their actual debt service obligations.

5. Conclusions and summary

Project financing is indeed a peculiar and popular form of finance. Not only can it be relied on in any combination of arrangements depending on the source and type of capital, but it also has a number of characteristics that sets it apart from conventional types of corporate finance.

In my research, I verified how the theoretical premises of project financing were realised in practice. My assumption was that the best example of that was the financing of domestic GCHP small plants, thanks to the mandatory feed-in tariff system. Other than that, I also analysed the development of GCHP companies' monetary position over time, also taking into account the effects of the regulatory environment. In testing my hypotheses, I managed to confirm that while project financing was the preferred funding option for GCHP small plants prior to the discontinuation of the feed-in tariff system on 1st July 2011, it has by now completely disappeared from this market segment and also deteriorated the financial status of the running projects. These findings can have a profound impact even on supply security in the domestic electricity market due to the withering away of GCHP small plant investments.

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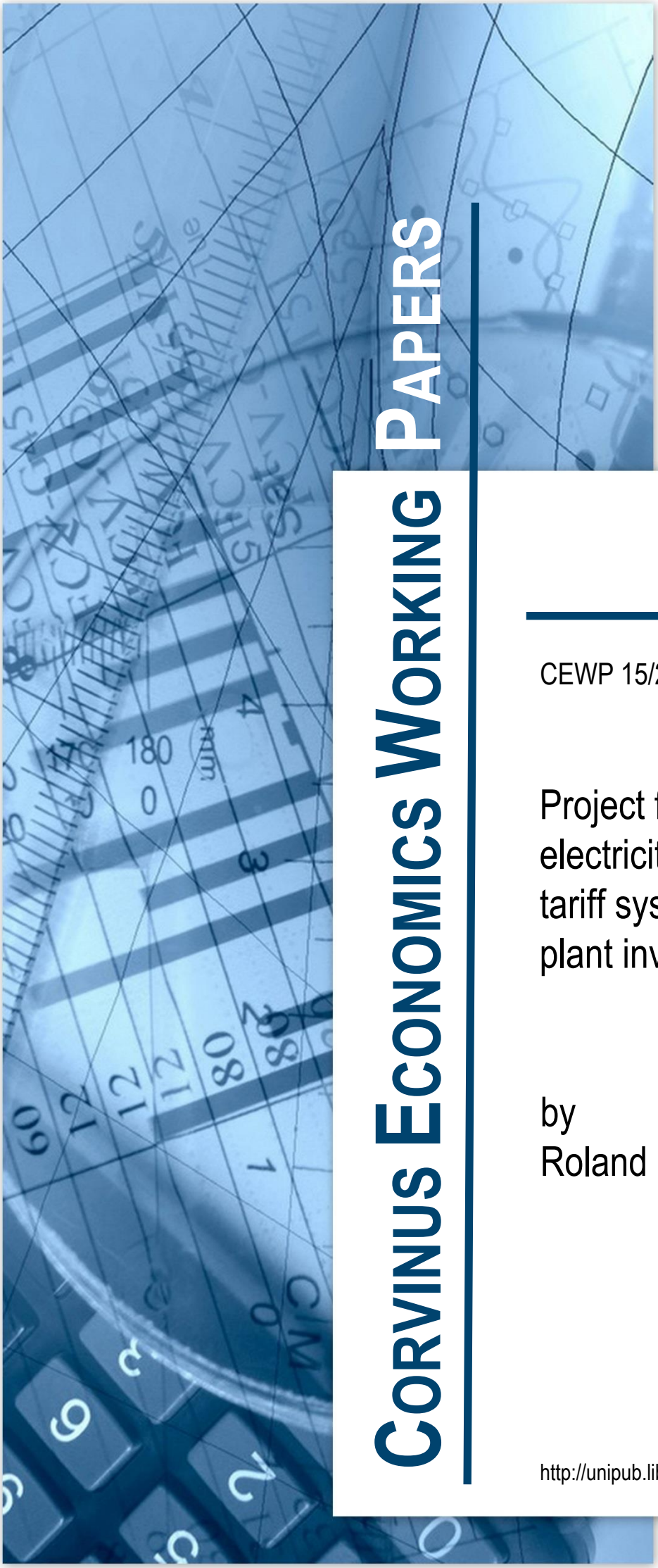

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