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SEWERAGE BOARD LIMASSOL - AMATHUS

Green Energy strategy at the sewage treatment plant

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SEWERAGE BOARD OF LIMASSOL – AMATHUS (SBLA)

April 2016

Green Policy

- Reuse of treated wastewater
- **Biogas utilization for the production of heat and electricity**
- **Solar energy for the production of electricity**
- **Energy performance of SBLA offices**
- Reuse of Treated Sludge
- Sustainable Storm water Management Systems

CHP Generator

Photovoltaic

INTRODUCTION

Combined Heat and Power (CHP) is a powerful technology to convert fuels in the most efficient way into electricity and useful heat, helping to meet energy demand with reduced primary energy consumption and less CO_2 emissions.

Sewerage Board of Limassol- Amathus (SBLA) is a leader in Cyprus on the use of Biogas as a renewable green energy sources. Moni-Limassol wastewater treatment plant is the first plant in Cyprus which in addition of the reuse of the treated water and biosolids, has started since October 2008 to utilizing the produced biogas as a renewable green energy source for the production of heat and electricity, contributing to achieve the targets set by EU Directive on energy production and contribute in the reduction of greenhouse emissions.

LIMASSOL WASTEWATER TREATMENT PLANT

BIOGAS PRODUCTION

In the urban area of Limassol the wastewater treatment plant located at Moni village, has the capability to treat daily sewage quantities up to 40,000m^3 daily with a total organic load of 16.320 $kgBOD_5/d$, which corresponds to 272.000 PE. During the wastewater treatment process, solids from primary and secondary treatment are collected and further processed, via digesters to stabilize and reduce the volume of the sludge.

Biogas is produced from the anaerobic digestion. The digestion is performed in mesophilic conditions at a temperature of 35^oC and retention time not less than 18 days. Biogas typically refers to a gas produced by the biological breakdown of organic matter in absence of oxygen. Biogas is composed primarily of methane (CH_4), carbon dioxide (CO_2) and various other gases. The typical composition of anaerobic digestion raw biogas is:

Methane CH_4:	50% - 80%, ≈ 65% at WWTP Limassol
Carbon dioxide CO_2:	20% -50%
Ammonia NH_3:	0-300 ppm
Hydrogen Sulphide H_2S:	50-5000 ppm, ≈ 50- 100 ppm at WWTP Limassol
Nitrogen N_2:	1-4%
Oxygen O_2:	< 1%
Water vapours H_2O Saturated:	2-5% (mass)

COMBINED HEAT AND POWER (CHP) UNIT

- Electricity Power Generation through Gas Generators
- Exploitation (Reuse) of Hot Water and Air produced during the Operation of the Generators Cooling System

Savings
in Electricity Power needed for the operation of the Wastewater Treatment Plant
and
Thermal Energy for Heating the Anaerobic Digesters

ANAEROBIC DIGESTER AREA

SEWERAGE TREATMENT PROCESS

Treated Effluent

Reused for Agricultural and other Irrigation purposes

Biosolids

Anaerobic Digesters (Digestion and stabilization)

Methane (=65%)

Biogas reused as renewable Energy Source "Green Energy". Environmentally Friendly Energy used as a fuel by the CHP Unit (Combined Heat and Power Unit) for the production of Electricity and Thermal Energy.

PRIMARY ENERGY SAVINGS (PES)

According to ANEX III of the CHP directive 2004/8/EC, a CHP installation will only be recognized as being "high-efficiency" if the calculation method proposed in the Directive leads to the result that this installation reduces primary energy use by at least 10% when compared to the set reference scenario.

The definition of efficiency values for the separate production of heat and electricity is only to some extent a matter of scientific insight. There is also an important element of credibility, arbitrariness of a decision and thus of political choice.

CALCULATION OF PRIMARY ENERGY SAVINGS

$$\mathbf{PES} = \left\{ 1 - \frac{1}{\left| (\mathbf{CHP\ H}_{\eta} / \mathbf{Ref\ H}_{\eta}) + (\mathbf{CHP\ E}_{\eta} / \mathbf{Ref\ E}_{\eta}) \right|} \right\}$$

Where,

PES = Primary Energy Savings

CHP H_{η} = Heat efficiency of the CHP production

Ref H_{η} = Efficiency reference value for separate heat production

CHP E_{η} = Electrical efficiency of the CHP production

Ref E_{η} = Efficiency reference value for separate electricity production

Heat efficiency of the CHP production from the manufacturer manual	**CHP H_{η} = 49.1%**
Efficiency reference value for separate heat production from the manufacturer manual	**Ref H_{η} = 85.3%**
Electrical efficiency of the CHP production from the manufacturer manual	**CHP E_{η} = 36.2%**
Efficiency reference value for separate electricity production adjusted	**Ref E_{η} = 38.39 %**

From the electricity table values of the guidelines for the implementation of the CHP directive 2004/8/EC, the reference value for electricity for Biogas 2006-2010 is: Ref E_n = 42%

Reference value is based on standard ISO conditions (15°C ambient temperature, 1.013 bar, 60% relative humidity). Correction has to be made for ambient temperature (0.1% point efficiency loss/gain for every degree above/below 15 °C) and avoided grid losses.

Daily Average Temperature for Limassol is 20 °C

Ref E_η = 42% - (5 °C x 0.1 %) = 41.5 % adjusted due to temperature

All produced power is used on site so the Grid loss correction factor: 0.925

$$PES = \left\{ 1 - \frac{1}{\left| (CHP\ H_\eta / Ref\ H_{\eta)} + (CHP\ E_\eta / Ref\ E_\eta) \right|} \right\}$$

$$PES = \left\{ 1 - \frac{1}{\left| (49.1\ \% \ / \ 85.3\ \%) + (36.2\ \% \ / \ 38.39\ \%) \right|} \right\}$$

Ref E_η = 0,925 x 41.5 = 38.39 % adjusted due to grid losses

$$PES = 34.2\ \% \geq 10\%$$

The CHP installation at WWTP Limassol has very high efficiency

BIOGAS GENERATOR DEUTZ TCG 2016 V8K

HEAT BALANCE, WINTER / SUMMER

Total biogas production	5.066Nm³d
Energy content in 1Nm³ with 65% CH_4: 0,716 kg/Nm³ x 0,65 x 50.070 kJ/Nm³	23.302 kJ/Nm³
Energy production = 5066 Nm³ x 23302 kJ/Nm³ / (24h x 3600sec)	**1.366 kW**

Energy for heating of sludge, Es

Total sludge production	478 m³/d
Incoming sludge temperature winter/summer	18 °C / 30 °C
Temperature in digesters	36 °C
Earth temperature	19 °C
Air temperature (min)	8 °C
Es = m x Cp *ΔT = (478/24) x 1,16 x (36-18) Winter	**416 kW**
Es = m x Cp *ΔT = (478/24) x 1,16 x (36-30) Summer	**139 kW**

Heat loss digesters, E_R

Total volume of digesters (2500m³ old + 6400m³ new)	8900 m³
Heat loss, E_R = (vol $^{2/3}$ /1000) x (3 x Tdig - Tair - Tearth) = [(2500+6400)$^{2/3}$ / 1000] x (3 x 36-8-19)	**54 kW**

Evaporation loss, E_F

$Pdm = 3{,}88 \times 10^{-12} \times (Tgas - 177)^{7{,}16}$ 5.917 Pa

Tgas = Gas temperature out of digesters 273 + 36 °C

Pgas = 1,013 x 105 x 0,99988h

h = level above see = 80 m 100.396 Pa

Difference pressure in digester ≈ 3000 Pa = ΔP

Water content in gas = Pdm / (Pgas + ΔP) 0.06

Total water per hour (5066/24) x 0,06 12,67 Nm/h

$g_{NH20} = Pgas0 / (T_0 \times R_{CH4}) = 1{,}013\ 10^5 / (273 \times 461{,}5)$ 0,804 kg/Nm^3

Mass flow M per sec = V x g = 12,67 x 0,804 / 3600 sec 2,830x10^{-3}kg/sec

Heat content by Evaporation J at 36 °C ≈ 2.350 kJ/kg

Evaporation loss E_F = J x M = 2.350 x 2.830x10^{-3} **7 kW**

Transmission loss in pipe E_T

E = Q x c x Δt

Δt = 20 °C (in - out, 90°C - 70 °C) ≈ 30 m^3/h

Transm. of energy from gas motors at max gas prod.685 kW

Q = E / (c x Δt) = 685 / (1,16 x 20)

A = π x D x l 125,6 m^2, l = 200m, D = 0,2 m, λ ≈ 0,04 W/m°C

Thickness of isolation is 40 mm 1 W/m°C

$\lambda_1 = \lambda / t = 0{,}04 / 0{,}04$

$E_T = A \times \lambda_1 \times \Delta_{t1} x10^{-3}$ (kW) = 125,6 x 1,0 x 71x10^{-3} **≈ 9 kW**

Δt_1, difference between temp. in gas motor and earth temp.
Δt_1, [90°C - 19 °C] = 71 °C

Total heat loss winter

$\sum E_{TAB} = E_S + E_R + E_F + E_T = 416+54+7+9$ **486 kW**

Total heat loss summer

$\sum E_{TAB} = E_S + E_R + E_F + E_T = 139+54+7+9$ **209 kW**

Heat and power balance winter / summer

49,1 % of the total Energy production at 1366 kW can be utilized as heat

Production of heat = E_P = 1366 x 0,491 **670 kW**

Total heat surplus winter $\sum E_{TAB}$= 670-486 kW **184 kW**
Heat production winter [(184 x 100) / 670] **27%**

Total heat surplus summer $\sum E_{TAB}$= 670-209 kW **461 kW**
Heat production summer [(461 x 100) / 670] **69%**

36,2 % of the total Energy production (1.366 kW) can be utilized as electricity

Electricity production **494 kW**

COST OF THERMAL ENERGY

BIOGAS PRODUCTION							
YEAR	2009	2010	2011	2012	2013	2014	2015
GAS PRODUCTION (Nm^3)	833.783	810.020	732.663	766.330	773.796	794.482	810.622
DAILY GAS PRODUCTION (Nm^3)	2.284	2.219	2.007	2.093	2.120	2177	2221

Energy content for 1 Nm^3 with 65%CH_4 is:
0,716kg/Nm^3 x0,65 x 50.070 kJ/Nm^3=23.302 kJ/Nm^3

COST OF THERMAL ENERGY

Total thermal energy content in biogas: production of biogas x 23.302 kJ/Nm^3

TOTAL THERMAL ENERGY CONTENT IN BIOGAS							
YEAR	2009	2010	2011	2012	2013	2014	2015
TOTAL THERMAL ENERGY CONTENT IN BIOGAS (kWh)	5.396.892	5.243.079	4.742.365	4.960.284	5.008.610	5.142.505	5.246.976

The average thermal energy savings for 2009 – 2015 at the wastewater treatment plant of Moni - Limassol was 5.105.816 kWh per year. The thermal energy should have to be produced with an alternative method (diesel boiler) if the CHP system was not into operation.

COST OF EQUIVALENT ENERGY BY A DIESEL

Thermal energy saving = Total thermal energy content in biogas x 49.1% (thermal efficiency)

Liters of diesel needed by a diesel boiler for the production of the thermal energy = Thermal energy saving / (Typical efficiency of diesel boiler/10)

Cost of equivalent energy by a diesel boiler = Liters of diesel x Average cost of 1 lt of diesel

Typical efficiency of diesel boiler 0.85 .The lower heating value of 1 lt of diesel (kwh) is 10

COST OF EQUIVALENT ENERGY BY A DIESEL BOILER							
YEAR	2009	2010	2011	2012	2013	2014	2015
TOTAL THERMAL ENERGY CONTENT IN BIOGAS (kWh)	5.396.892	5.243.079	4.742.365	4.960.284	5.008.610	5.142.505	5.246.976
THERMAL ENERGY SAVING (kWh)	2.649.874	2.574.352	2.328.501	2.435.550	2.459.228	2.524.970	2.576.265
LITERS OF DIESEL NEEDED BY A DIESEL BOILER	311.750	302.865	273.941	286.321	289.321	297.055	303.090
AVERAGE COST OF 1 lt OF DIESEL	0.621	0.757	0.965	1.056	1.035	0.976	0.78
COST OF EQUIVALENT ENERGY BY A DIESEL BOILER (€)	139.873	165.647	190.996	218.615	216.350	289.926	236.410

CHP BUILDING

EQUIVALENT PRODUCTION OF THERMAL POWER

Combined heat and power (CHP) systems offer considerable benefits when compared with purchased electricity and onsite-generated heat. By capturing and utilizing heat that would otherwise be wasted from the production of electricity, CHP systems require less fuel than equivalent separate heat and power systems to produce the same amount of energy.

ENVIRONMENTAL BENEFITS

The produced electricity is used as a Renewable Energy “Green Energy”, used for the operation of the wastewater treatment plant covering 37 – 50 % of the power needs , currently provided by the Electricity Authority of Cyprus**.**

ELECTRICITY BALANCE KWH							
YEAR	2009	2010	2011	2012	2013	2014	2015
ANNUAL ELECTRICITY PRODUCTION FROM CHP KWH	1.571.314	1.570.674	1.418.722	1.539.604	1.548.405	1.549.081	1.676.104
AVERAGE DAILY ELECTRICITY PRODUCTION KWH	4305	4303	3887	4207	4242	4244	4592
ELECTRICITY FROM EAC KWH	2.834.184	2.625.872	2.270.830	2.457.649	2.677.425	3.105.233	3.522.947
RATIO OF ELECTRICITY PRODUSED/ ELECTRICITY FROM EAC	45%	40%	38%	37%	42%	50%	48%

ENVIRONMENTAL BENEFITS

THERMAL POWER PRODUCTION							
YEAR	2009	2010	2011	2012	2013	2014	2015
THERMAL POWER SAVINGS FROM CHP (KW)	2.649.874	2.574.352	2.328.501	2.435.550	2.459.228	2.524.970	2.576.265
HOURLY THERMAL POWER SAVINGS FROM CHP (KW/h)	302.5	293.9	265.8	278.0	280.7	288.2	294.1
HOURLY THERMAL POWER SAVINGS FROM CHP (KJ/h)	1.089.000	1.058.040	956.880	1.000.800	1.010.520	1.037.659	1.058.739

The thermal power production from Generators was used as alternative source to heat the digesters. 1 KW/h = 3600KJ/h

GAS EMISSIONS

Gas Emissions from the Generators do not exceed the allowable limits of:

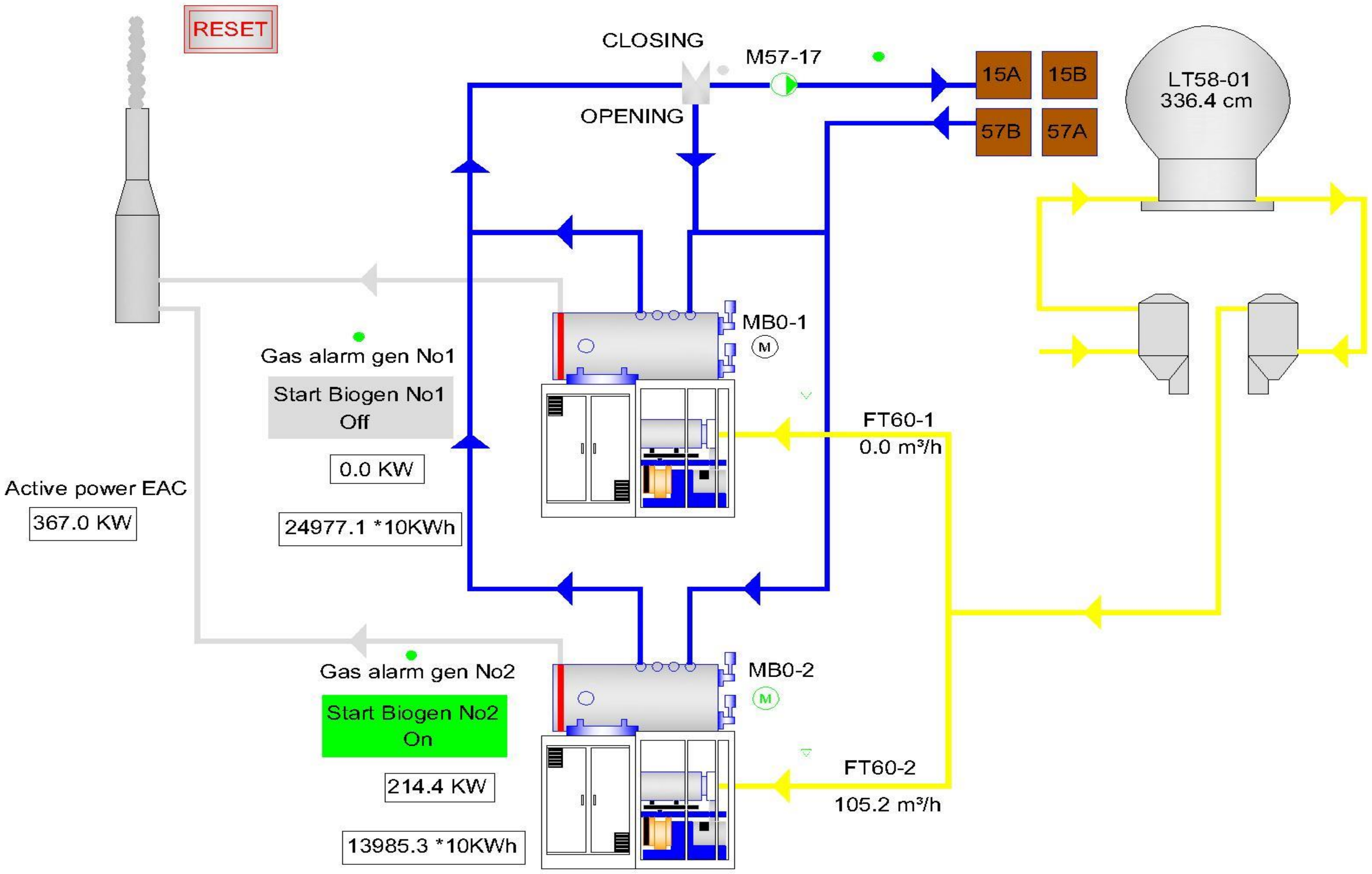
Carbon monoxide (CO): 1.000 mg/Nm^3
Nitrogen oxides (NO_x): 500 mg/Nm^3

The average CO_2 emissions (last 5 years) for electricity generation from the "Vassiliko Electricity Power Plant" were 0,790 kg/kWh and from the Vassiliko Cement Factory was 0,770 kg/kWh.

The CO_2 average emissions from the CHP Unit at the WWTP were just 0,354 kg CO_2/kWh.

Properly Controlled Biogas Production results in Reduction of Pollutant Emissions. Because less fuel is combusted, greenhouse gas emissions, such as carbon dioxide (CO_2), as well as other air pollutants like nitrogen oxides (NOx) are less.

CHP GENERAL LAYOUT



TECHNO ECONOMIC ANALYSIS

The initial capital cost of **the CHP Unit investment is € 2.380.000 (incl. tax),** that includes buildings and installation of the gensets engines and equipment. **The government grant equals to € 320.000**. The net capital expenditure (CAPEX) of the CHP is € 2.060.000.The whole CHP unit consist of:

1 Biogas storage tank, 2 Gas motors including generator, Gensets Deutz Power Systems TCG 2016 V08K with Power output (Elec.) 311 kW and thermal output 423 kW each, monitor and automation systems (TEM), piping, 2 Gas Control units, 2 Exhaust Gas Heat Exchangers, 2 Exhaust Air Baffles, 2 Supply Air Baffles, 2 Ventilation Fans.

Based on the current levels of operation of the plant, **the savings exceed €15.000 per month**, whereas after the extension of the sewer networks by 2018 the expected savings will exceed **€ 30.000 per month**, always depending on the average unit cost of electricity.

The operating cost of the CHP unit which includes maintenance and repairs is estimated approximately to € 10.000 – € 130.000 per year.

Economic Analysis of CHP Unit investment.

	2008	2009	2010	2011	2012	2013	2014	2015
	4 months							
Annual treated water cubic m	1,783,000	5,825,384	6,629,929	6,884,910	7,474704	7,327,340	7.275.916	7.636.050
kWh needed for the operation of the plant (Total)	1,420,000	4,407,498	4,196,546	3,689,352	3,997,253	4,225,830	4.654.314	5.199.051
Total cost of Electricity for the operation	260,000	623,000	738,540	649,823	881,305	808,574	790.334	666.582
kWh Produced from CHP	409,000	1,571,314	1,570,674	1,418,722	1,539,604	1,548,405	1.549.081	1.676.104
Cost of kWh produced - CHP	73,650	226,168	274,468	249,335	337,253	295,776	261.708	213.600
Cost of equivalent thermal energy produced	6,500	193.597	229.269	264.353	302.581	299.447	289.926	236.410
Maintenance costs	10,000	24,000	49,000	85,000	33,000	29,000	129.000	18.000
Net savings	70,150	395.765	454.737	428.688	606.834	566.223	422.634	431.600
Annual Return On Investment	3,4%	19.21%	22.07%	20.81%	29.46%	27.49%	20.52%	20.95
CAPEX	2.060.000	2.060.000	2.060.000	2.060.000	2.060.000	2.060.000	2.060.000	2.060.000
Payback Period	1,989,850	1,594,085	1,139,348	710,660	103,826	**+462,397**	**+885,031**	**+1.316.631**

ENVIRONMENTAL AWARD FOR BUSINESSES TO SBLA

βραβεία
περιβάλλοντος

ΠΕΡΙΒΑΛΛΟΝΤΙΚΑ
ΒΡΑΒΕΙΑ
ΓΙΑ ΕΠΙΧΕΙΡΗΣΕΙΣ
2009

2ο ΒΡΑΒΕΙΟ
ΤΕΧΝΟΛΟΓΙΑΣ Ή
ΠΑΡΑΓΩΓΙΚΗΣ ΔΙΑΔΙΚΑΣΙΑΣ

ΣΥΜΒΟΥΛΙΟ ΑΠΟΧΕΤΕΥΣΕΩΝ
ΛΕΜΕΣΟΥ/ΑΜΑΘΟΥΝΤΑΣ

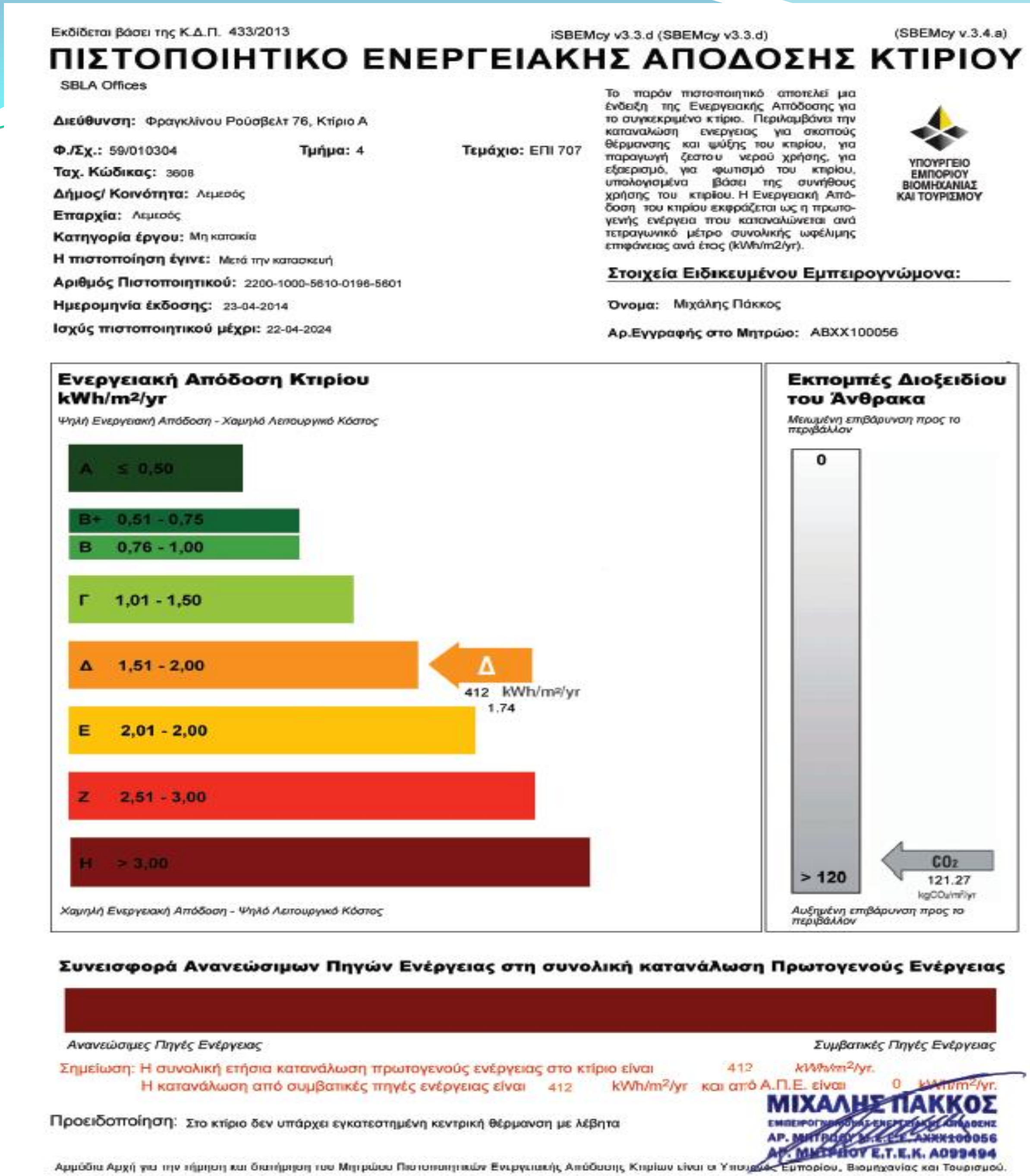
Μιχάλης Πολυνείκης
Υπουργός Γεωργίας, Φυσικών Πόρων και Περιβάλλοντος

ΥΠΟΥΡΓΕΙΟ ΓΕΩΡΓΙΑΣ ΦΥΣΙΚΩΝ ΠΟΡΩΝ ΚΑΙ ΠΕΡΙΒΑΛΛΟΝΤΟΣ * ΚΥΠΡΟΥ

ΥΠΟΥΡΓΕΙΟ ΓΕΩΡΓΙΑΣ,
ΦΥΣΙΚΩΝ ΠΟΡΩΝ ΚΑΙ ΠΕΡΙΒΑΛΛΟΝΤΟΣ
ΤΜΗΜΑ ΠΕΡΙΒΑΛΛΟΝΤΟΣ

ENERGY POLICY AT SBLA OFFICES

The energy savings at the SBLA offices are archived mainly because of the information and awareness of the employees regarding the management programs for energy savings the scopes and targets as well as their contribution to the programs.



Εκδίδεται βάσει της Κ.Δ.Π. 433/2013 iSBEMcy v3.3.d (SBEMcy v3.3.d) (SBEMcy v.3.4.a)

ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΕΝΕΡΓΕΙΑΚΗΣ ΑΠΟΔΟΣΗΣ ΚΤΙΡΙΟΥ

SBLA Offices

Διεύθυνση: Φραγκλίνου Ρούσβελτ 76, Κτίριο Α

Φ./Σχ.: 59/010304 **Τμήμα:** 4 **Τεμάχιο:** ΕΠΙ 707

Ταχ. Κώδικας: 3608

Δήμος/ Κοινότητα: Λεμεσός

Επαρχία: Λεμεσός

Κατηγορία έργου: Μη κατοικία

Η πιστοποίηση έγινε: Μετά την κατασκευή

Αριθμός Πιστοποιητικού: 2200-1000-5610-0196-5601

Ημερομηνία έκδοσης: 23-04-2014

Ισχύς πιστοποιητικού μέχρι: 22-04-2024

Το παρόν πιστοποιητικό αποτελεί μια ένδειξη της Ενεργειακής Απόδοσης για το συγκεκριμένο κτίριο. Περιλαμβάνει την καταναλώση ενεργειας για σκοπούς θέρμανσης και ψύξης του κτιρίου, για παραγωγή ζεστου νερού χρήσης, για εξαερισμό, για φωτισμό του κτιρίου, υπολογισμένα βάσει της συνήθους χρήσης του κτιρίου. Η Ενεργειακή Απόδοση του κτιρίου εκφράζεται ως η πρωτογενής ενέργεια που καταναλώνεται ανά τετραγωνικό μέτριο συνολικής ωφέλιμης επιφάνειας ανά έτος (kWh/m2/yr).

ΥΠΟΥΡΓΕΙΟ ΕΜΠΟΡΙΟΥ ΒΙΟΜΗΧΑΝΙΑΣ ΚΑΙ ΤΟΥΡΙΣΜΟΥ

Στοιχεία Ειδικευμένου Εμπειρογνώμονα:

Όνομα: Μιχάλης Πάκκος

Αρ.Εγγραφής στο Μητρώο: ABXX100056

Ενεργειακή Απόδοση Κτιρίου kWh/m²/yr

Ψηλή Ενεργειακή Απόδοση - Χαμηλό Λειτουργικό Κόστος

Α ≤ 0,50

Β+ 0,51 - 0,75

Β 0,76 - 1,00

Γ 1,01 - 1,50

Δ 1,51 - 2,00

Ε 2,01 - 2,00

Ζ 2,51 - 3,00

Η > 3,00

Δ 412 kWh/m²/yr 1.74

Χαμηλή Ενεργειακή Απόδοση - Ψηλό Λειτουργικό Κόστος

Εκπομπές Διοξειδίου του Άνθρακα

Μειωμένη επιβάρυνση προς το περιβάλλον

0

> 120

CO_2 121.27 $kgCO_2/m^2/yr$

Αυξημένη επιβάρυνση προς το περιβάλλον

Συνεισφορά Ανανεώσιμων Πηγών Ενέργειας στη συνολική κατανάλωση Πρωτογενούς Ενέργειας

Ανανεώσιμες Πηγές Ενέργειας *Συμβατικές Πηγές Ενέργειας*

Σημείωση: Η συνολική ετήσια κατανάλωση πρωτογενούς ενέργειας στο κτίριο είναι 412 kWh/m²/yr.
Η κατανάλωση από συμβατικές πηγές ενέργειας είναι 412 kWh/m²/yr και από Α.Π.Ε. είναι 0 kWh/m²/yr.

Προειδοποίηση: Στο κτίριο δεν υπάρχει εγκατεστημένη κεντρική θέρμανση με λέβητα

ΜΙΧΑΛΗΣ ΠΑΚΚΟΣ

Αρμόδια Αρχή για την τήρηση και διατήρηση του Μητρώου Πιστοποιητικών Ενεργειακής Απόδοσης Κτιρίων είναι ο Υπουργός Εμπορίου, Βιομηχανίας και Τουρισμού.

Certificate of Energy performance of SBLA offices

SOLAR ENERGY

An alternative green power source is the production of energy from the photovoltaic installed at the roof of the chemical storage shed at Moni WWTP. The produced power is about 40kw and is connected to the grid.

PHOTOVOLTAICS AT THE ROOF OF THE SHED

SBLA IS GOING TO BE MORE GREEN

SBLA is planning to install during 2016 a new 120 kw photovoltaic park at the Sewage Treatment Plant at Moni. The produced green power is going to be used for the needs of the plant operation

ECONOMIC BENEFITS

Combined heat and power (CHP) can offer a variety of economic benefits for large energy users. The economic benefits of CHP include :

Reduced energy costs: The high efficiency of CHP technology can result in energy savings when compared to conventional, separately purchased power and onsite thermal energy systems. Energy savings can result also from Solar power production.

Offset capital costs: CHP can be installed in place of boilers or chillers in new construction projects, or when major heating, ventilation, and air conditioning (HVAC) equipment needs to be replaced or updated.

Protection of revenue streams: Through onsite generation and improved reliability, CHP and Photovoltaic can allow businesses and critical infrastructure to remain online in the event of a disaster or major power outage

Hedge against volatile energy prices: CHP and Photovoltaic can provide a hedge against unstable energy prices by allowing the end user to supply its own power during times when prices for electricity are very high. In addition, these systems can be configured to accept a variety of feedstocks (e.g., natural gas, biogas, coal, biomass) for fuel; therefore, a facility could build in fuel switching capabilities to hedge against high fuel prices.

SOCIAL BENEFITS OF ENERGY SAVINGS

A financial resources savings in resources **provide additional competitiveness in the industry, while electricity and heat are supplied at more affordable prices.**

This contributes to the reduction of the operating costs of the plant and as a result to this, **it lowers the electricity service fee**. A production of heat and power by CHP and Photovoltaic units **promotes and decentralized power generation solutions,** whereas these plants **are designed to meet the needs of local consumers.**

It provides high efficiency**, avoiding transmission and distribution losses** and increases the flexibility of the grid system, including **reduction of peak demand**.

The safety of a CHP and Solar electricity producer can **reduce the possibility that consumers are left without electricity and / or heat.**

CHP and Solar power minimizes the needs of using fossil fuels and the dependency on fuel imports. The reduction of fuel imports **saves government expenditures in foreign currency**, improves the economy of the country, gives the opportunity to increase the diversity of plants and **creates competition in electricity production**.

It also **increases the employment** opportunities, since the development of cogeneration systems is **creating new job positions**

CONCLUSIONS

Combined heat and power (CHP) is an efficient and clean approach to generating power and thermal energy from a single fuel source.

SBLA utilizes biogas as a renewable green energy source for the production of heat and electricity and Solar power for the production of electricity contributing to meet the targets set by EU Directive on energy production and to the reduction of greenhouse gas emissions.

Utilizing biogas and solar energy potential yields multiple benefits related to energy, thermal savings, environmental, economical and social benefits.

Awareness from everybody is a key to energy saving.

THANK YOU
FOR YOUR ATTENTION