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A FEASIBILITY STUDY ON 'HIGHWAY DUMMY SIGNAL' POWERED BY SOLAR ENERGY

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This report is being proposed as a
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Degree in Bachelor of Mechanical Engineering (Thermal-Fluids)

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MAY 2009

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"I hereby, declare this report is the result of my own research except as cited in the references"

Signatures :…….

Author's Name :…….

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For Beloved My Father and Mother

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ABSTRACT

Solar energy is a form of energy produced from the sunlight and it is a renewable while friendly to the environment. This solar energy can be converted to electrical energy through a photovoltaic process or also known as solar cells, which it is a device that made up from a semiconductor and capable to transform the sunlight to electrical energy in a form of direct current (DC). Therefore, realizing the advantages of this energy, many academicians and researchers has involved in elevating the technology of this energy and study the feasibility in daily life instead of creating various devices that use solar energy as the power sources. Thus, this report is made to study the feasibility and design a 'Highway Dummy Signal' as an alternative to the battery operated. This report is also contained the methodology to build the 'Highway Dummy Signal' based on solar energy system. Apart from that, this report has also studied the difference of total cost for the both systems and the time duration for capital returning when using solar energy system.

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ABSTRAK

Tenaga solar ialah satu bentuk tenaga yang terhasil daripada sinaran Matahari yang mana tenaga ini merupakan sumber tenaga yang boleh diperbaharui dan tidak mencemarkan alam sekitar. Tenaga solar yang terhasil ini dapat ditukar kepada tenaga elektrik melalui proses photovoltaic (PV) dan dikenali juga sebagai sel-sel solar, iaitu suatu alat yang diperbuat daripada semikonduktor yang berupaya menukar cahaya Matahari kepada tenaga elektrik dalam bentuk arus terus (DC). Oleh itu, menyedari akan kelebihan tenaga ini, ramai ahli akademik dan pengkaji melibatkan diri dalam meningkatkan lagi teknologi tenaga ini dan mengkaji kesesuaiannya dalam kegunaan seharian disamping mereka pelbagai alat yang menggunakan tenaga solar sebagai sumber tenaga elektrik. Justeru, laporan ini disediakan untuk mengkaji kebolehlaksanaan dan mereka bentuk sebuah ’ Highway Dummy Signal’ daripada menggunakan sistem bateri sebagai sumber tenaga elektrik kepada satu sistem yang berasaskan kepada tenaga solar. Kertas kajian ataupun laporan ini turut mengandungi metodologi untuk mereka bentuk ’Hihgway Dummy Signal’ berasaskan sistem tenaga solar. Disamping itu, laporan ini juga mengkaji perbezaan kos keseluruhan untuk kedua-dua sistem dan jangka masa pulangan modal apabila menggunakan sistem tenaga solar.

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CONTENT

CHAPTER	ITEM		PAGE
	DECLARATION		ii
	DEDICATION		iii
	ACKNOWLEDGEMENT		iv
	ABSTRACT		v
	ABSTRAK		vi
	CONTENT		vii
	LIST OF TABLE		xii
	LIST OF FIGURE		xii
	LIST OF SYMBOLS		xvii
	LIST OF UNITS		xx
	LIST OF APPENDICES		xxi
CHAPTER 1	**INTRODUCTION**		**1**
	1.1	Background	1
	1.2	Problem Statements	2
	1.3	Objectives	2
	1.4	Scope	3

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CHAPTER	ITEM			PAGE
CHAPTER 2	**LITERATURE REVIEW**			**4**
	2.1	Solar Energy		4
		2.1.1	Introduction to Solar Energy	4
			2.1.1.1 Passive solar	5
			2.1.1.2 Active solar heating	6
			2.1.1.3 Solar Photovoltaic (PV) Systems	7
	2.2	Historical of Solar Energy		8
	2.3	The Inventor of Photovoltaics		10
	2.4	Fundamentals of Photovoltaic Materials		12
		2.4.1	Photovoltaics and Photovoltaic Cells	12
	2.5	Equivalent Electrical Circuit		13
	2.6	Array Design		14
		2.6.1	The Sun Intensity	15
		2.6.2	The Sun Angle	16
		2.6.3	The Temperature Effect	17
CHAPTER 3	**METHODOLOGY**			**20**
	3.1	Flow Chart		21
	3.2	Highway Dummy Signal		22
		3.2.1	Working System	22
		3.2.2	Design of Dummy Structure using Software SolidWorks	22
		3.2.3	Torque and Moment Calculation of Dummy Structure	23
	3.3	Motor		23
		3.3.1	Power Source	23

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CHAPTER	ITEM			PAGE
	3.4	Solar panel		24
		3.4.1	Type of Material	24
			3.4.1.1 Polycrystalline Silicon	25
		3.4.2	Panel Size and Power Produce	25
		3.4.3	Position of Panels	26
	3.5	Storage Batteries		27
		3.5.1	Operation	27
		3.5.2	Type of Battery	28
			3.5.2.1 Lead-acid (Pb-acid)	29
	3.6	Circuit in Power Source		30
		3.6.1	Parallel Circuits	30
	3.7	Simulation of HOMER		30
		3.7.1	Power Output	30
		3.7.2	Cost of Solar System	31
CHAPTER 4	**ANALYSIS**			**32**
	4.1	Design of Highway Dummy Signal		32
		4.1.1	Overall Structure	32
		4.1.2	Handle	34
		4.1.3	Tyres	34
		4.1.4	Motor Wiper	35
		4.1.5	Solar Panel	36
		4.1.6	Battery	37
	4.2	Schematic Diagram of the PV System		39
	4.3	Calculation of Dummy Structure Design		41
		4.3.1	Torque	41
			4.3.1.1 Right Side Arm	41
			4.3.1.2 Left Side Arm	44

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CHAPTER	ITEM			PAGE
	4.3.2	Moment		46
	4.3.3	Basic Calculation for Design Solar System		50
		4.3.3.1	Calculation for Load	50
		4.3.3.2	Calculation for Minimum Capacity of Battery	50
	4.4	Solar System Simulation by Homer Software		51
	4.4.1	Materials and Method		51
		4.4.1.1	Photovoltaic (PV) system Components	52
		4.4.1.2	Electric Load	52
		4.4.1.3	Photovoltaic Array	53
		4.4.1.4	Battery Storage Unit	55
		4.4.1.5	Solar Energy Resource	55
		4.4.1.6	Economics and Constraints	56
		4.4.1.7	Sensitivity and Optimization	57
CHAPTER 5	**RESULT AND DISCUSSION**			**58**
	5.1	Results of Simulation by HOMER Tool		58
	5.1.1	Optimization Result		58
	5.1.2	Cost Comparison by Components Type		59
	5.1.3	Cost Comparison by Components Type within 25 years		60
	5.1.4	Nominal Cash Flow Comparison by Components Type within 25 years		61
	5.1.5	Electricity Production by PV Array		62
	5.1.6	PV Output		63
	5.1.7	Battery Bank State of Charge		64
	5.2	Payback Cost Period Study		65

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CHAPTER	ITEM	PAGE
CHAPTER 6	**CONCLUSION AND RECOMMENDATION**	**70**
	6.1 Conclusion	70
	6.2 Recommendation	71
	REFERENCES	**72**
	BIBLIOGRAPHY	**74**
	APPENDICES	**75**

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LIST OF TABLE

NUMBER	TITLE	PAGE
2.1	The Kelley Cosine Values of the Photocurrent in Silicon Cells (Source: Mukund R. Patel, 1999)	17
3.1	Average Cell Voltage during Discharge in Various Rechargeable Batteries (Source: Johnny Wiess, 2004)	28
4.1	Period and amounts of load was used	53
4.2	Search space alternative and highlighted is the winner size	57
5.1	Comparison of payback cost period according to system	65
5.2	Comparison of total cost for every system according to year	68

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LIST OF FIGURE

NUMBER	TITLE	PAGE
2.1	Elements of passive solar design, shown in a direct gain application (Source: http://en.wikipedia.org/wiki/Passive_solar _building_design, 2008)	5
2.2	Solar Flat Plate Collector for Liquid Source (Source: Systems and Equipment Handbook ASHRAE, Inc., 1996)	6
2.3	Photovoltaic panels produce electricity directly from sunlight (Source: http://en.wikipedia.org/wiki/Photovoltaics, 2008)	7
2.4	Kilowatt Peak Photovoltaic Rooftop National Fuel Cell Research Center, University of California Irvine (Source: http://www.geocities.com/Eureka/1905/, 2008)	11
2.5	Equivalent electrical circuit of the battery showing internal voltage and resistance (Source: Johnny Wiess, 2004)	13

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2.6	Battery source line intersecting with load line at the operating point (Source: Johnny Wiess, 2004)	13
2.7	I-v characteristic of PV module shifts down at lower sun intensity, with small reduction in voltage (Source: Mukund R. Patel, 1999)	15
2.8	Photoconversion efficiency versus solar radiation. The efficiency is practically constant over a wide range of radiation (Source: Mukund R. Patel, 1999)	16
2.9	Kelley cosine curve for PV cell at sun angles from 0^o to 90° (Source: Mukund R. Patel, 1999)	16
2.10	Effect of temperature on the i-v characteristic. The cell produces less current but greater voltage, with net gain in the power output at cold temperature (Source: Mukund R. Patel, 1999)	17
2.11	Effect of temperature on the p-v characteristic. The cell produces more power at cold temperature (Source: Mukund R. Patel, 1999)	19
3.1	Flow chart of research procedure	21
3.2	Figure 3.2: The sample of dummy signal (Source: http://www.larsoa.org.uk/uploads/ CAMBS_DUMMY_POLICE.jpg, 2008)	22

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3.3	Figure 3.3: Car wiper motor (Source: http://www.allproducts.com/ee/hcmotor/72-wiper_motor.jpg, 2008)	24
3.4	Dimension of photovoltaic panels model KC40T (Source: Kyocera Corporation, 2004)	26
3.5	Panel positioning in 45^{o} (Source: www.solar-power-grid-for-sale.com/images/1.jpg, 2008)	27
3.6	Cut-away of a standard lead-acid battery cell (Source: Johnny Wiess, 2004)	29
3.7	PV modules in parallel (Source: Johnny Wiess, 2004)	30
4.1	Overall structure of highway dummy signal	33
4.2	Location and design of handle	34
4.3	Tyres at the bottom structure of highway dummy signal	34
4.4	Motor wiper with bracket jointed with screw	35
4.5	Solar panel at the back of highway dummy signal in angle of 45^{0}	36
4.6	Car battery located on rack	37

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4.7	Schematic diagram of PV system of Highway Dummy Signal	39
4.8	Stand-alone photovoltaic power system	40
4.9	Dimension of right and left side arm	41
4.10	Dimension of right side connector	42
4.11	Dimension of left side connector	45
4.12	Side view of structure highway dummy signal	49
4.13	HOMER implementation of the photovoltaic energy System	52
4.14	Photovoltaic unit costs	54
4.15	Costs of battery unit	55
4.16	Average daily radiation and clearness index	56
5.1	Optimization results different amount of power produced by PV	58
5.2	Bar chart of cash flow summary for the period annualized cost	59
5.3	Cash flow summary for Net Present Cost	60
5.4	Nominal cash flow within 25 years	61

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5.5	Monthly average electric production	62
5.6	PV output for hour of day in 1 year	63
5.7	State of charge of battery bank for hour of day in 1 year	64
5.8	Graph total cost comparison for each system in 5 years	69

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LIST OF SYMBOLS

PV	=	Photovoltaic
%	=	Percent
$	=	Dollar
VAC	=	Voltage alternating current
RPM	=	Revolution per minute
a-Si	=	Amorphous Silicon
+/-	=	Plus minus
Pb-acid	=	Lead-acid
NiCd	=	Nickel-cadmium
NiMH	=	Nickel-metal hydride
Li-ion	=	lithium-ion
Li-poly	=	lithium-polymer
E_i	=	Voltage input
Q_d	=	Ah of discharge
R_i	=	Internal resistance
E_o	=	Voltage output
R_o	=	Resistance output
K_1, K_2	=	Constant
I^2R_L	=	External load resistance
I^2R_i	=	Internal loss
η	=	Efficiency
I	=	Output current
I_0	=	Current with normal sun

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Θ	=	Angle of the sunline
T	=	Reference temperature
α, β	=	Temperature coefficient
3D	=	Three dimension
DC	=	Direct current
ρ	=	Density
v	=	Volume
m	=	Mass
T	=	Torque
F	=	Force
d	=	Distance
W	=	Weight
N	=	North
E	=	East
O&M	=	Operation and Maintenance
NPC	=	Net Present Cost
hr	=	Hour
RM	=	Ringgit Malaysia

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LIST OF UNITS

mm^3	=	Milimeter cubic
kWh/day	=	kilowatt-hour per day
kW	=	kilowatt
MJ/m^2	=	Mega joule per meter square
ZJ	=	Zettajoule
W/m^2	=	Watt per meter square
Ah	=	Ampere-hour
W	=	Watt
V	=	Voltage
Amp	=	Ampere
m	=	Meter
cm	=	Centimeter
mm	=	Millimeter
Nm	=	Newton.meter
kg	=	Kilogram
Wh	=	Watt-hour
°C	=	Degree Celcius
$/kWh	=	Dollar per kilowatt-hour

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LIST OF APPENDICES

NUMBER	TITLE	PAGE
A	Gantt Chart	76
B	Bill of Materials	77
C	Specification of Equipments	80
D	Drawing Sheets of Highway Dummy Signal Structure	84

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CHAPTER 1

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Solar energy is the radiant light and heat from the Sun that has been harnessed by humans since ancient times using a range of ever-evolving technologies. This energy is produced when the insulation surface in solar cell such as silicon is affected. This beam will charge ions in this silicon and produced a power namely electricity or fondly known as solar energy. Realizing the advantages and goodness of using solar energy, a study is made to replace battery consumption as source of electricity supply to system solar. Medium use to this study is highway dummy signal because this tool is customary expended at construction site such as on highways where there is no electricity supply from grid. Furthermore, highway dummy signal nowadays uses battery as main source to supply electricity to move motor. Like those known, battery should always being charged to ensure energy produce is enough and battery need neat care to extend life span of the battery. So, this study is aimed to compare suitability and advantages in using solar system in highway dummy signal with battery consumption.

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