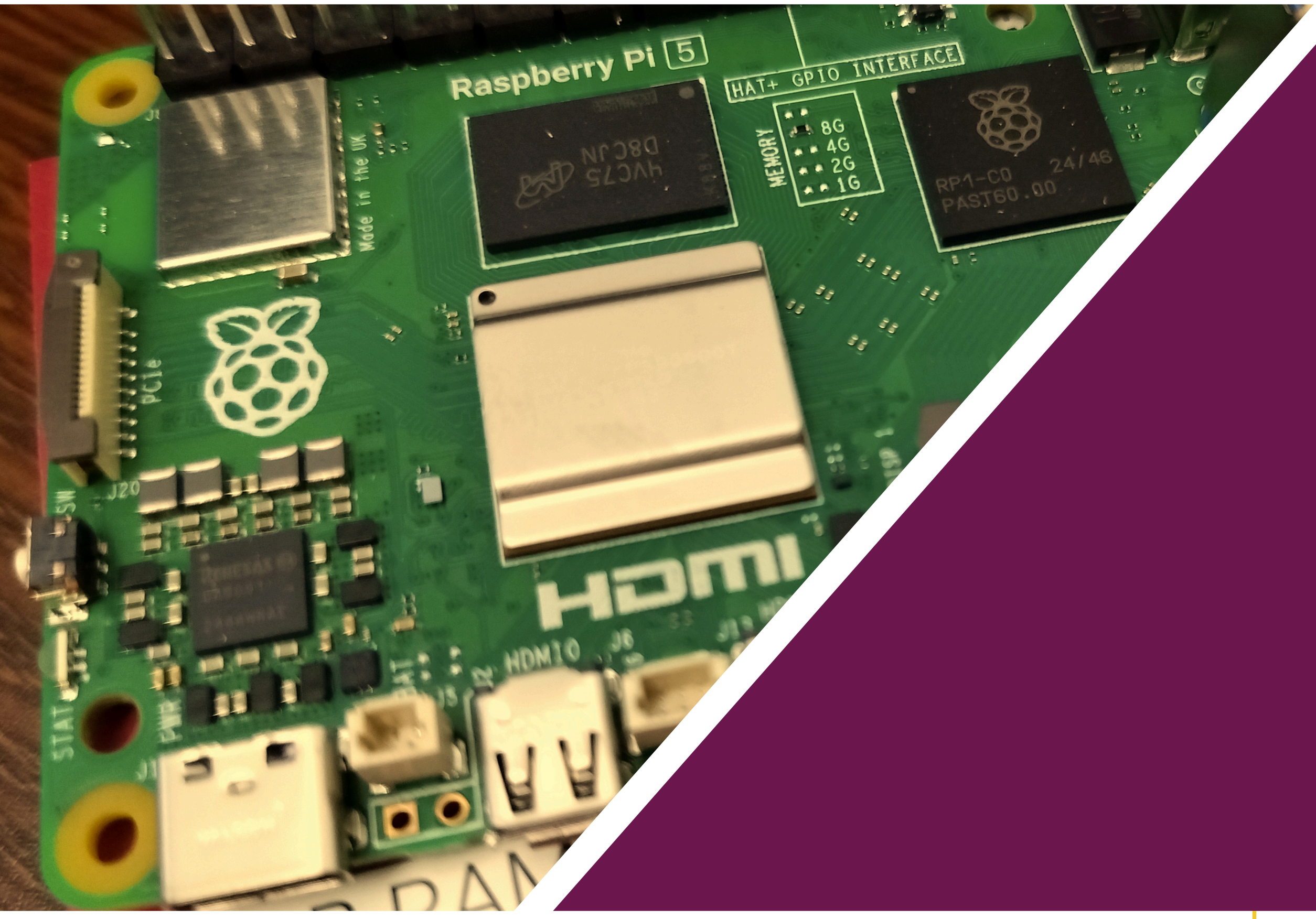
UNIVERSITI TEKNOLOGI MARA

EESEE 2025

10TH ELECTRICAL ELECTRONICS SYSTEMS ENGINEERING EXHIBITION 2025

VOLUME 1



FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
JOHOR BRANCH
PASIR GUDANG CAMPUS

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FOREWORD BY THE PROGRAM CHAIR

Greetings from the Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025).

As the Program Chairs, it is our great pleasure to present this compilation of extended abstracts, showcasing the remarkable projects developed by our final-semester students from the Diploma in Electrical Engineering (Power) and Diploma in Electrical Engineering (Electronics) programs at Universiti Teknologi MARA, Cawangan Johor, Pasir Gudang Campus.

This exhibition marks a significant milestone in our students' academic journey, representing the culmination of years of dedication, perseverance, and learning. It also serves as an essential step toward the successful completion of their diploma studies. The projects featured this year are centered on the theme *Engineering Excellence: Bridging Technology and Life*, reflecting current trends and innovations in the engineering field.

This extended abstract book highlights not only the students' technical expertise but also their creativity, problem-solving skills, and ability to engage meaningfully with peers and industry professionals. Within these pages, you will find a diverse range of projects that embody a unique blend of knowledge, innovation, and practical application.

We warmly invite you to explore this collection, which celebrates the achievements of our aspiring engineers. Welcome once again to the Electrical, Electronics, and Systems Engineering Exhibition 2025. May the insights shared here inspire and pave the way for the next generation of innovative engineers.

Warm regards,

Dr. Fatimah Khairiah binti Abd Hamid
Dr. Atiqah Hamizah binti Mohd Nordin
Program Chairs
Electrical, Electronics, and Systems Engineering Exhibition 2025 (EESEE 2025)

Residential Grid-Connected Photovoltaic System Tool for Different Module Technologies Using Pvsyst and Matlab App Designer

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ABSTRACT

This project developed a user-friendly residential grid-connected photovoltaic (PV) system using PVsyst and MATLAB App Designer with different module technologies. Existing tools like PVsyst require technical expertise, making them inaccessible to non- engineering users. The tool development comprises of two parts: i) PV systems are first modeled in PVsyst to gather essential performance data, such as energy generation and efficiency, ii) then, the results from the first part are utilized to develop MATLAB-based GUI tool. The tool enables users to input key parameters, including module type, location, and solar irradiation and to simulate, analyze the systems to enhance understanding on PV system performance. Results demonstrate that the developed tool successfully outputs the expected system performance based on the inputs defined, hence showing the tool's ability to simplify system design. The developed tool provide user-friendly environment suitable to promotes PV educational.

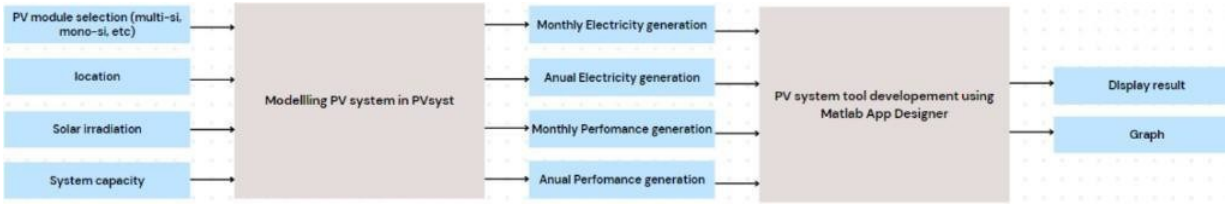
KEYWORDS: Photovoltaic System, Grid-Connected, Performance Analysis,GUI

PRODUCT DESCRIPTION

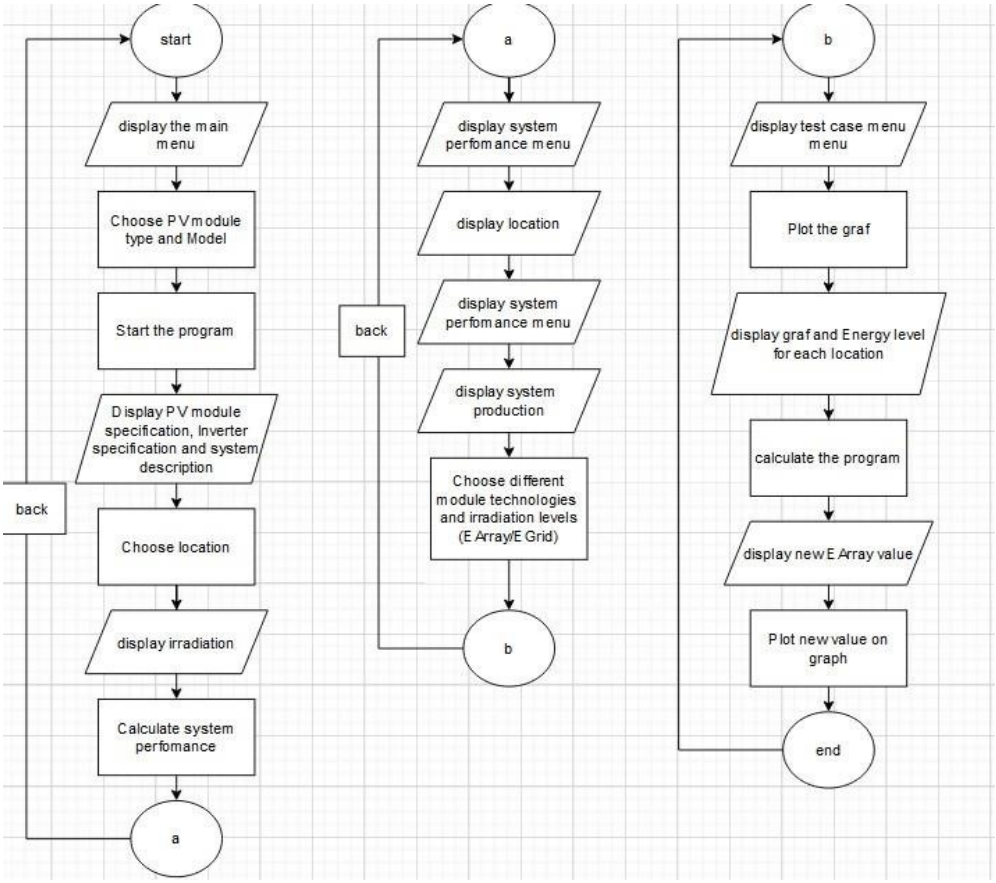
The Residential Grid-Connected Photovoltaic System Tool is an innovative software application designed to simplify the design and performance analysis of PV systems for residential use. Developed using MATLAB App Designer and integrated with PVsyst, a renowned software for solar energy simulation, the tool enables accurate modeling and assessment of PV system performance under various conditions. Users can compare monocrystalline (Si-Mono) and polycrystalline (Si-Poly) PV module technologies by analyzing the performance, power generation, and characteristics.

PICTURES/ SCHEMATIC DIAGRAMS/ FLOW CHARTS/SCREENSHOTS/ GRAPHS AND OTHER RELATED VISUALS

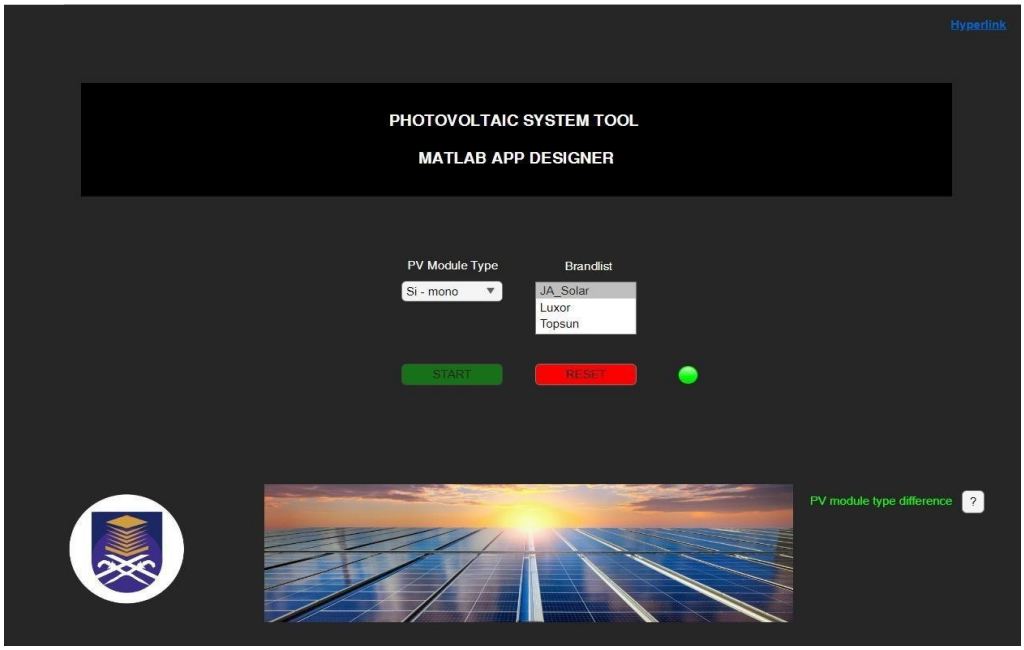
1. Block Diagram

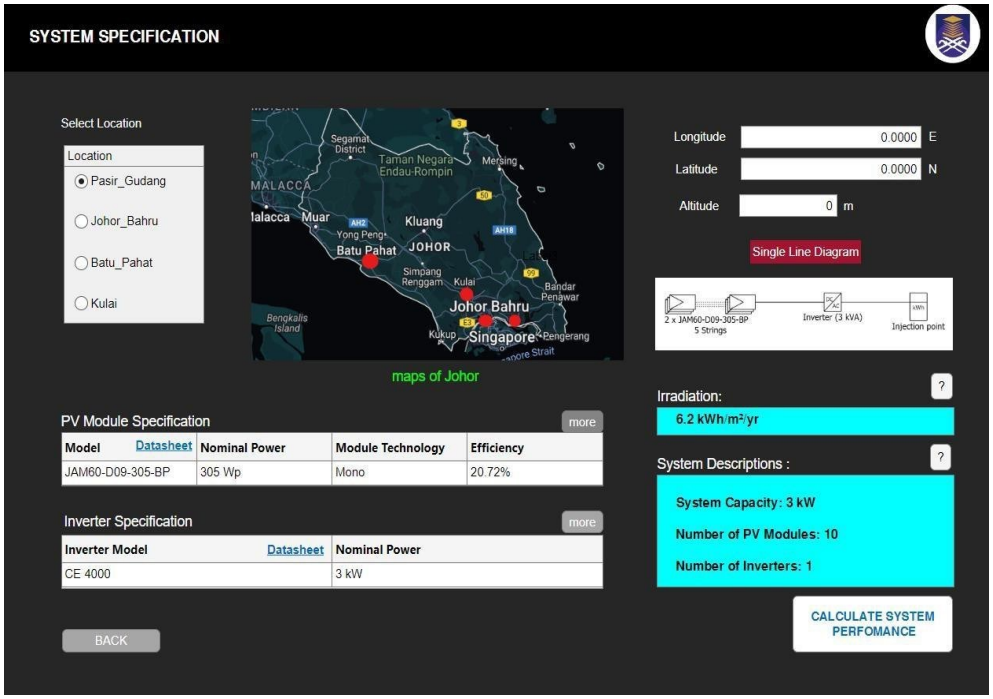


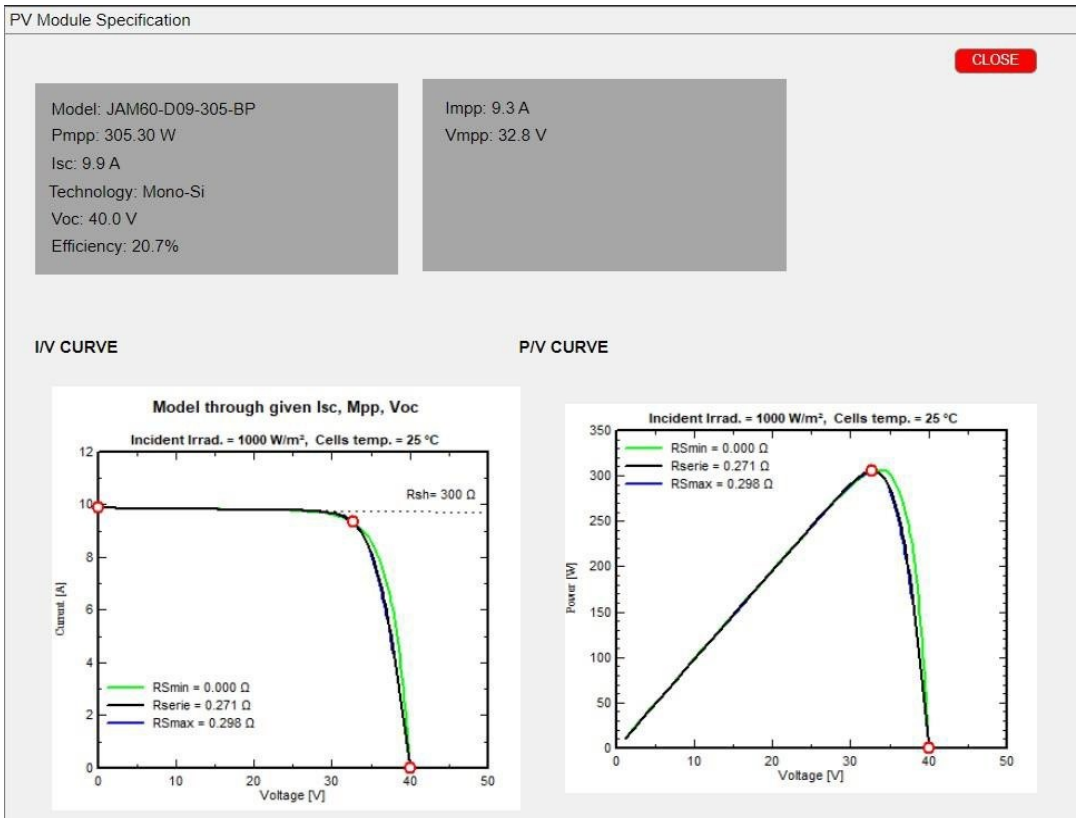
2. Main result simulation in PVsyst



3. Residential Grid-Connected Photovoltaic System Tool layout




SYSTEM SPECIFICATION
Select Location
Location
Pasir_Gudang
Johor_Bahru
Batu_Pahat
Kulai
Segamat District
Tanjung Negara Endau-Rompin
Mersing
MALACCA
Muar
Yong Peng
Kluang
Batu Pahat
JOHOR
Simpang Renggam
Kulai
Bandar Penawar
Johor Bahru
Bengkalis Island
Kukup
Singapore
Pengerang
maps of Johor
Longitude 0.0000 E
Latitude 0.0000 N
Altitude 0 m
Single Line Diagram
2 x JAM60-D09-305-BP 5 Strings
Inverter (3 kVA)
Injection point
Irradiation:
6.2 kWh/m²/yr
System Descriptions :
System Capacity: 3 kW
Number of PV Modules: 10
Number of Inverters: 1
CALCULATE SYSTEM PERFOMANCE
PV Module Specification
more
Model Datasheet
Nominal Power
Module Technology
Efficiency
JAM60-D09-305-BP
305 Wp
Mono
20.72%
Inverter Specification
more
Inverter Model Datasheet
Nominal Power
CE 4000
3 kW
BACK


PV Module Specification
CLOSE
Model: JAM60-D09-305-BP
Pmpp: 305.30 W
Isc: 9.9 A
Technology: Mono-Si
Voc: 40.0 V
Efficiency: 20.7%
Impp: 9.3 A
Vmpp: 32.8 V
I/V CURVE
P/V CURVE
Model through given Isc, Mpp, Voc
Incident Irrad. = 1000 W/m², Cells temp. = 25 °C
Rsh= 300 Ω
RSmin = 0.000 Ω
Rserie = 0.271 Ω
RSmax = 0.298 Ω
Current [A]
Voltage [V]
Incident Irrad. = 1000 W/m², Cells temp. = 25 °C
RSmin = 0.000 Ω
Rserie = 0.271 Ω
RSmax = 0.298 Ω
Power [W]
Voltage [V]

Inverter specification

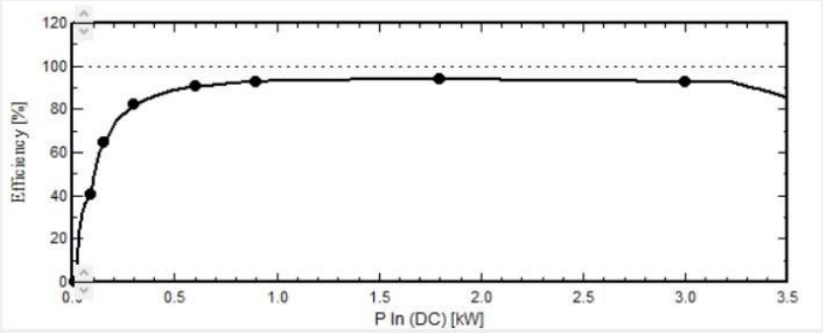
CLOSE

Manufacturer: Connect Energy
Inverter Model: CE 4000

Input side
Minimum MPP Voltage: 55.00 V
Maximum MPP Voltage: 77.00 V
Absolutemax PV Voltage: 100.00 V

Output side
Nomimnal AC Power: 3.00 kVA
Maximum Ac Power: 3.00 kVA
Nominal AC Current: 12.50 A
Maximum AC Current: 13.00 A

EFFICIENCY CURVE



SYSTEM PERFOMANCE

Maps of Location

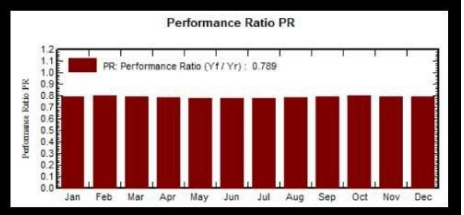
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	146.5	78.65	27.17	159.6	155.9	418.3	387.6	0.796
February	147.7	80.82	27.66	151.5	147.7	397.2	368.9	0.798
March	157.7	84.65	28.16	147.0	142.3	383.3	354.4	0.790
April	139.9	76.27	28.21	118.8	113.7	309.6	284.4	0.785
May	137.7	77.55	28.99	106.2	100.6	276.0	251.7	0.777
June	131.2	74.83	28.38	97.6	91.6	253.6	231.0	0.776
July	136.1	71.96	28.43	102.7	96.8	266.7	243.1	0.776
August	138.7	76.85	28.36	112.5	107.2	294.4	269.7	0.786
September	136.0	76.67	27.90	123.0	118.4	322.2	296.2	0.790
October	134.9	91.12	28.27	131.5	127.7	347.3	320.5	0.799
November	118.4	69.36	27.30	124.6	121.4	326.6	300.2	0.790
December	120.5	72.35	27.38	130.1	126.9	340.8	313.5	0.790
Year	1645.1	931.08	28.02	1505.2	1450.3	3935.9	3621.0	0.789

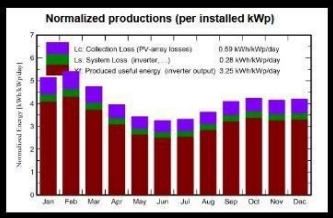
GlobHor Global horizontal irradiation
DiffHor Horizontal diffuse irradiation
T_Amb Ambient Temprature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Perfomance Ratio

BACK

SYSTEM PRODUCTION

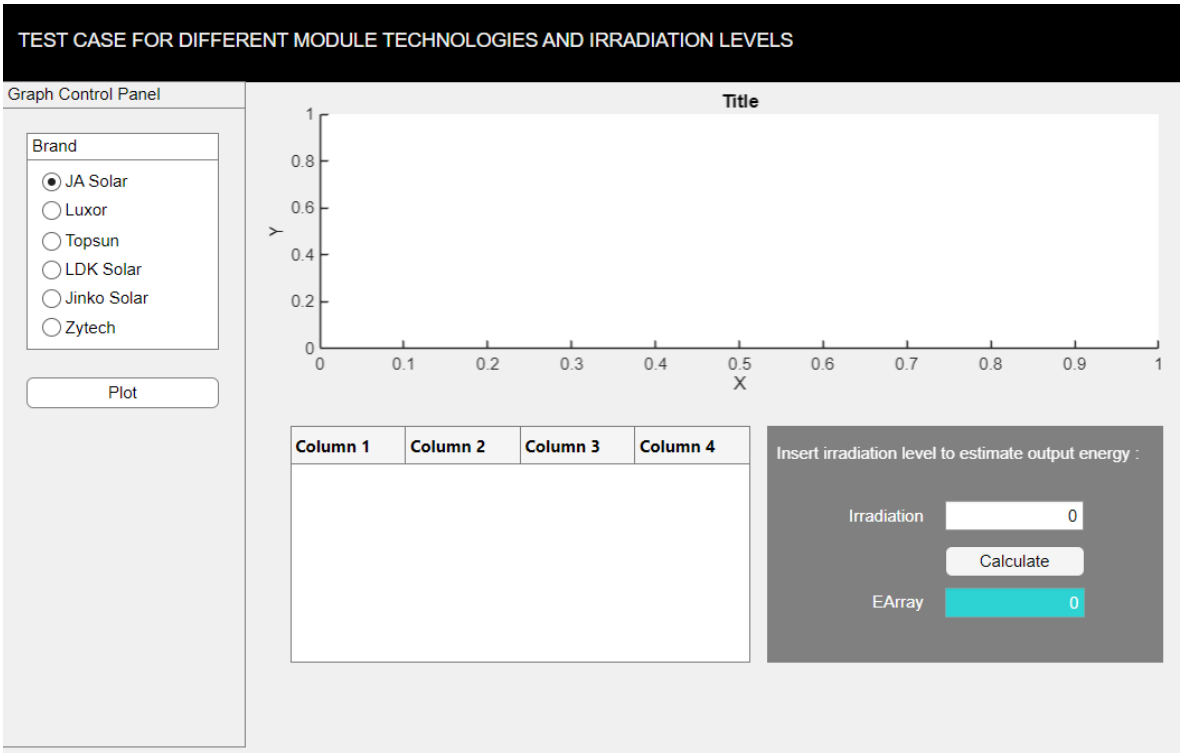
Produced Energy: 3621.00 kWh/yr
Specific Production: 1187.00 kWh/kWp/yr
Performance Ratio: 0.79





DIFFERENT MODULE TECHNOLOGIES AND IRRADIATION LEVELS

EArray EGrid



NOVELTY AND UNIQUENESS

The novelty and uniqueness of the Grid-Connected PV System Tool lies in its integration of PVsyst and MATLAB App Designer for comprehensive and user-friendly simulation of photovoltaic systems under varying irradiation conditions. A unique platform that enables both real-time data comparison and in-depth performance analysis is ensured by the combination of MATLAB's interactive GUI and PVsyst's accurate energy modeling capabilities. In contrast to traditional tools, this system makes it easy to customize and visualize grid-connected photovoltaic operations, allowing for accurate forecasts despite its simplicity. This application offers a unique method for supporting experiential learning in PV education.

BENEFIT TO MANKIND

The Grid-Connected PV System Tool benefits educational sector by offering user-friendly tool for enhancing understanding of PV behavior to irradiation through GUI environment with interactive features.

COMMERCIALIZATION POTENTIAL

The Grid-Connected PV System Tool's novel features and intuitive design make it a promising product for commercialization. It provides a practical platform for teaching and learning about renewable energy ideas, making it the perfect instructional tool for college students and instructors. Universities, technical colleges, and solar photovoltaic villages are important markets. Future feature additions to the system may be commercialized to energy management firms and solar system developers who want to increase the efficiency and design of PV systems.

CONCLUSION

This project has strong potential for practical applications, particularly in addressing the growing interest in renewable energy solutions among residential users. Photovoltaic (PV) systems are environmentally friendly and reliable, playing a crucial role in green energy generation. This tool provides students, educators, and entry-level engineers with a user- friendly and cost-effective

platform to design and analyze grid-connected photovoltaic systems. As the global shift towards clean energy accelerates, the tool's intuitive interface and simulation capabilities make it ideal for use in academic settings, workshops, and training programs. Its ability to accommodate various PV module brands and locations enhances its appeal for research and learning purposes. Additionally, the tool could serve as a foundation for collaborations with solar energy companies or further development into more advanced applications for commercial and industrial PV system design.

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