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Advancements in Solar Energy Systems: Innovations in Photovoltaic (PV) and Floating PV Technologies for Decentralized Energy Generation

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***Abstract*— Solar energy has seen remarkable technological advancements with photovoltaic (PV) and floating PV (FPV) technologies leading the way in decentralized power solutions. These technologies not only enhance solar efficiency and affordability but also enable intelligent integration into smart grids, hence enhancing the sustainability and scalability of clean power. This essay delves into next-generation technologies driving the revolution of PV and floating PV systems, their economic viability, environmental-friendliness, and capacity to alter the global energy landscape. The theme of policy incentives and education as drivers of deployment will be shown, and their importance in the future of sustainable energy generation will be emphasized.**

Keywords*— PV systems, floating PV, decentralized energy, sustainability, renewable energy, grid integration, Energy Storage.

I. INTRODUCTION

The world is massively turning to renewable energy sources (RES) as part of the global effort to combat climate change and reduce the use of fossil fuels. Faced with the need to combat global warming and mitigate its effects, clean energy technologies are gaining popularity. Renewable energies such as solar, wind, hydro, and biomass can help meet the planet's growing energy needs while reducing greenhouse gas emissions. The global transition to renewable energy [1], [2], [3] places a significant emphasis on solar energy. This is due to the considerable advances in photovoltaic (PV) systems. The main objective of solar technologies is to use sunlight more efficiently while controlling costs. Floating photovoltaic (FPV) systems are one such new technology that could be a game changer. This is especially true in regions where land is scarce or unavailable. These systems allow solar energy to be used in lakes, reservoirs, and along coastlines, among other places. It's a win-win situation, as they produce reusable energy and free up land for other uses.

Solar PV technologies have evolved considerably in a short time. Floating solar farms are a new type of versatile photovoltaic system that offers higher performance than conventional photovoltaic systems. They also help solve land-use problems. They perform better in warm weather because the water cools them automatically. Furthermore, they do not have to compete with farms or cities for access to land. Recent research has shown that solar energy is becoming an important component of global energy plans aimed at reducing carbon footprints and ensuring energy security [4]. Solar energy, particularly through photovoltaic (PV) systems, is an essential technology for accessing cleaner energy. Photovoltaic systems are an excellent way to meet the energy needs of many industrial sectors and can be scaled up or down as needed [5], [6]. They convert sunlight directly into electricity. In this case, floating photovoltaic (FPV) systems are generating significant interest because they are a new and rapidly expanding technology. FPV systems are more efficient because they can be used on lakes, reservoirs, and coastal areas, all of which are bodies of water. FPV can solve problem of land shortages in densely populated areas. Water also improves the operation of these systems by cooling them. As a result, they are ideal for hot regions or areas with limited land area [7]. The use of renewable energy technologies is primarily aimed at reducing emissions, but also at stabilizing the economy, creating new jobs, and ensuring the country's energy dependence. In the face of global warming, which is leading to rising temperatures, extreme weather events, and harming ecosystems, we must more than ever switch to renewable energy.

Floating PV (FPV) systems are gaining recognition as an innovative alternative to traditional ground-mounted solar plants, particularly in regions where land availability is limited or highly competitive [8]. By utilizing the surface of lakes, reservoirs, and other water bodies, FPV technology helps overcome the constraints associated with terrestrial installations while simultaneously offering performance and environmental benefits [9, 10]. A significant recent advancement in solar energy is the emergence of floating PV (FPV) systems. Beyond delivering high conversion efficiency, these installations provide the additional benefit of limiting water loss through evaporation, making them particularly attractive for reservoirs and other aquatic environments. The study by [11] aims to conduct an experimental comparison between floating photovoltaic (FPV) installations and conventional land-based photovoltaic (LPV) systems under Mediterranean climatic conditions. The analysis evaluates both configurations across multiple dimensions, including electrical output, thermal behavior, potential for reducing water evaporation, as well as environmental and economic implications. Performance is further assessed at different module inclination angles (10°, 15°, 20°, and 30°) to determine the influence of tilt on system efficiency and overall viability. The study by [12] offers a comprehensive examination of the present status of floating photovoltaic (FPV) technologies and pilot engineering projects. It discusses the main advantages and limitations of various FPV designs, while also highlighting the prospects for large-scale deployment. In particular, the work projects significant

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opportunities for FPV expansion along China's coastal zones and considers how these systems could be effectively combined with other forms of offshore infrastructure.

The study in [13] also show that PV systems can operate and be controlled in networks not connected to the main grid. This means they can be used in remote locations. Solar energy, particularly PV systems, is a good way to achieve these goals because it provides us with a large amount of clean energy with a low environmental impact [14]. Numerous studies have examined the environmental and economic effects of PV systems, as well as new technologies. For example, the study by [4] examines the potential environmental effects of these systems and lists their advantages and disadvantages. Similarly, [7] discusses the need to monitor and manage floating solar power plants. It emphasizes the importance of efficient technologies for their proper operation.

II. Innovations in Floating PV Systems

A. Technological Advancements in PV Materials

In PV technology has come a long way in the last few years. Monocrystalline cells have an efficiency of 20–22%, and polycrystalline cells have an efficiency of 15–17%. This makes silicon-based PV systems more efficient. Perovskite solar cells, quantum dots, and organic photovoltaics (OPVs) are some of the new materials that are changing things by making them even more efficient and less expensive.

• Perovskite Solar Cells: These materials have come a long way in terms of getting more efficient (up to 25% in the lab) and less expensive to make. They are also light, bendable, and can be made into a lot of different shapes, which makes them great for solar applications that aren't common.

• Quantum Dot Solar Cells: Quantum dots can help solar cells work better by letting them absorb more light. This could lead to higher efficiencies than what is possible with regular silicon cells.

TABLE I. Comparison of Efficiency and Cost of Different Photovoltaic Materials [15]

Material Type	Efficiency (%)	Cost (USD/W)	Market Status
Monocrystalline Silicon	20-22	0.30 - 0.50	Widely adopted
Polycrystalline Silicon	15-17	0.25 - 0.45	Common
Perovskite Cells	20-25	0.10 - 0.30	Emerging
Quantum Dots	25+	0.20 - 0.40	Research Phase

B. Floating Photovoltaic (FPV) Systems

Floating solar photovoltaics (FPV) is the use of solar panels on floating platforms that are anchored to the surface of the water. These platforms are usually attached to the bottom or sides of the water body to keep them stable. FPV systems need extra structural parts and changes to deal with the problems that come up in water environments, unlike solar systems that are on land. This section gives an overview of the parts, structural design, and layout of FPV systems, focusing on their growth and benefits.

C. The Origins of Floating Solar Photovoltaics

FPV have been around for more than a century, starting with the U.S. warship Jacona during World War I. In the 1930s, England turned the ship into a power generation plant. This was the first time anyone had ever used a body of water to make electricity. The formal name and idea of FPV didn't come about until much later, when two Japanese companies, Mitsui Engineering & Shipbuilding Co. Ltd. and Mitsui Zosen KK, got a patent for the technology. Making Japan a leader in new FPV technology. In 2007, the country made even more progress by putting in place the first FPV system. Since then, the USA, South Korea, China, India, Brazil, and a number of European countries have done the same. A report from a European conference in 2008 that showed how solar panels work better in water helped the technology gain a lot of traction. This event was a major turning point in the growth of FPV. By 2021, the world's installed capacity of FPV power plants had grown to over 3 GW, a huge jump from just 100 MW in 2016. In the future, FPV technology is expected to grow by 22.5% each year, reaching new heights by 2030. Ciel et Terre, Sungrow, the Solar Energy Research Institute of Singapore, the Florida Solar Energy Center, and Cranfield University are just a few of the research institutions and companies that are leading the way in FPV research and development.

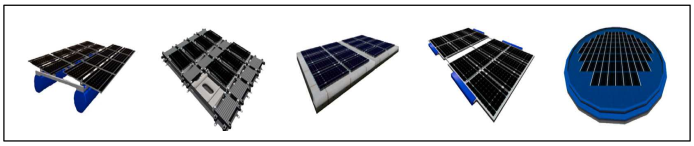
D. Structure and Installation of Floating Solar Photovoltaics

The fundamental structure of an FPV system is composed of two primary elements:

(1) the photovoltaic panels along with their supporting electrical components, and

(2) the buoyant body structure, which consists of floats, mooring systems, waterproof materials, and components designed to provide buoyant force.

The PV panels are attached to a network of interconnected floats that are securely anchored and moored so they won't move. These floats are usually made of light materials like high-density polyethylene (HDPE), hydro-elastic membranes, polystyrene foam, ferrocements, or fiber-reinforced plastics mixed with aluminum or steel rafts. Polyurethane or thermoset rubber are two examples of water-resistant materials that are often used to cover the electrical wires in FPV systems. Rubber mats are often used to protect the structure and make sure it lasts in the harsh aquatic environment..



(a) (b) (c) (d) (e)

Fig. 1. Category of FPV (a) Type 1, (b) Type 2, (c) Type 3, (d) Type 4, (e) Type 5 [6].

Fig. 1 presents five distinct structural configurations of Floating Photovoltaic (FPV) systems, each with its unique design features.

- *Type 1* (pontoon structure) is characterized by the use of parallel HDPE cylinders as floats, which are combined with supporting structures to form rafts.
- *Type 2* (pontoon structure) involves numerous individual panels, each mounted on separate floats and secured by built-in rails, but lacks a supporting structure.
- *Type 3* (pontoon structure) depicts a large floating platform resembling an island, which accommodates

the PV modules, leaving space between them for movement.

- *Type 4* (Superficial rigid structure) describes a partially submerged floating structure that holds the PV modules and has the ability to rise and fall with the water surface.
- *Type 5* (Superficial flexible structure) features a flexible setup designed specifically for thin-film modules, utilizing neoprene sheets and surrounding floats to create a buoyant platform.

Floating PV systems have become a game-changer in regions where land is scarce or expensive. By deploying solar panels on water bodies, floating PV systems avoid land competition and offer several advantages:

- Higher Efficiency: The cooling effect of water significantly increases the efficiency of solar panels, reducing temperature-related losses in performance.
- Reduced Land Use: Floating PV systems do not occupy valuable agricultural or residential land, making them ideal for densely populated regions.
- Waterbody Utilization: FPV systems can be installed on lakes, reservoirs, and even offshore environments, using space that is often underutilized.

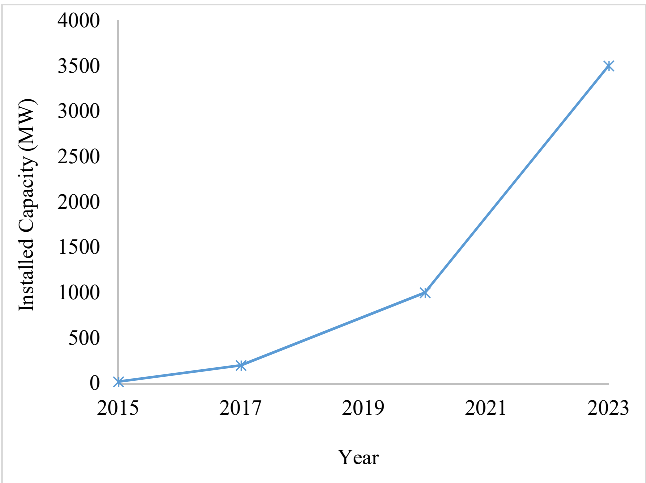


Fig. 2. Growth of Floating PV Installations Globally (2015-2023)

As shown in Fig. 2, FPV systems have been deployed in countries such as China, Japan, and Brazil, with the global capacity reaching over 3 500 MW in 2023. Major projects like The Anhui Floating PV Project in China and the Brazilian Floating Solar Plant are paving the way for large-scale floating PV adoption.

The standalone system depicted in Fig. 3, as well as hybrid FPV setups, are renewable energy solutions where solar panels are mounted on water instead of traditional rooftops or land. In addition to generating electricity from renewable sources, FPV offers a range of additional benefits, making it an attractive option beyond just its role in energy production.

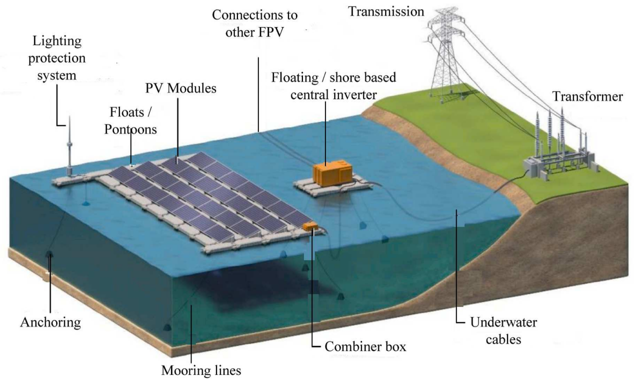


Fig. 3. Large-scale FPV configuration [5].

Table II showcases some of the most significant floating solar projects worldwide, highlighting their key characteristics such as rated capacity, geographical locations, and cost. These projects represent advancements in floating photovoltaic (PV) technology, demonstrating how floating solar farms are becoming an innovative solution for renewable energy generation in water-abundant yet land-constrained regions.

III. Solar Energy Systems Integration

A. *Decentralized Energy Generation with PV*

One of the best things about PV energy is that it can be used to make power in many places. Decentralized systems such as PV rooftop and community PV projects make the power grid more reliable and reduce transmission losses by allowing energy to be generated at or near the point of use. Decentralization is important for making energy more available in remote or underserved areas, especially when it is combined with new technologies like micro-grids and smart grids.

Smart grid technologies make it easier to manage and share PV energy. Smart inverters and demand response systems are two examples of these technologies. They help balance the supply and demand for energy and make it easier to connect RES to the grid.

Benefits of Decentralized PV Systems:

- Lower Transmission Losses: Decentralized systems lower transmission energy loss by producing power closer to points of consumption [16].
- Grid Resilience: Distributed generation makes the grid more resilient to interruptions and outages [16].
- Cost-Effectiveness: Decentralized systems eliminate the need for large infrastructure expenditures that centralized plants normally require.

TABLE II. Benefits of Decentralized Solar Energy Systems

Benefit	Description
Reduced Transmission Losses	Power is generated closer to consumption points.
Grid Resilience	Distributed systems improve grid robustness.
Cost-Effectiveness	Lower infrastructure costs compared to centralized plants.

B. *Integration of Energy Storage for Stability and Reliability*

The intermittency of solar power remains a key challenge for widespread adoption. Advances in energy storage technologies, such as lithium-ion batteries, flow batteries, and pumped hydro storage, are critical to overcoming this issue.

Battery Storage Systems: Storage technologies allow excess solar energy to be stored during peak sunlight hours and used during low sunlight periods, ensuring a constant and reliable power supply. The decrease in the cost of lithium-ion batteries has significantly improved the economic feasibility of solar energy with integrated storage.

TABLE IV. SOLAR ENERGY WITH BATTERY STORAGE VS. CONVENTIONAL GRID SYSTEMS [15]

System Type	Energy Output (kWh/day)	Storage Capacity (kWh)	Cost (USD)
Solar + Battery	25	20	8,000
Traditional Grid	30	N/A	10,000

IV. ECONOMIC AND ENVIRONMENTAL IMPACT OF SOLAR ENERGY

A. *Economic Benefits of Solar Energy Systems*

The economics of solar energy have changed a lot, and now it's one of the cheapest ways to make energy. In the last ten years, the price of solar technology has dropped by more than 70%. This is because of new materials, better manufacturing methods, and larger production runs. This large decrease in price has made PV energy a best choice for both individuals and businesses that need electrical energy.

- Cost Savings: The levelized cost of electricity (LCOE) from PV energy has deceased a lot, making it competitive with conventional fossil fuel, even without the help of the government. It is expected that costs will go down even more as PV materials and manufacturing processes continue to improve.
- Job Creation: The solar industry has become a major source of jobs, from making solar panels to putting them up and keeping them running. [15] says that the global solar industry employed more than 12 million people in 2023. This number is expected to grow as more solar panels are installed.

• Energy Independence: Solar energy gives countries a chance to rely less on imported fuels, which makes their energy supply more secure. PV energy can help countries that get a lot of sun depend less on fossil fuel markets that change rapidly.

B. *Environmental Impact and Sustainability*

Solar energy is one of the cleanest sources of energy because it does not pollute the air when it makes electricity. Floating PV systems are better for the environment than other types of solar panels, especially when they are put on water bodies.

- Water Conservation: Floating PV systems help keep water from evaporating from lakes and reservoirs. This is especially important in places where water is hard to come by. These systems help save water by putting solar panels on big areas of water, which keeps the water from getting lost.
- Protecting biodiversity: Floating PV systems protect natural habitats by not competing with other land uses. This keeps ecosystems from being disturbed. Floating solar installations can live with natural bodies of water, unlike land-based installations that often have to cut down trees or destroy habitats.
- Helping to cut down on carbon: Solar energy cuts down on the need for electricity that comes from fossil fuels by a lot. As countries try to reach their climate goals and lower their carbon footprints, solar energy is a key part of the move to a low-carbon economy.

Solar energy is an important part of the world's efforts to stop climate change because it is good for the environment, especially when used in floating PV systems. As more businesses and governments switch to solar power, protecting natural resources and cutting down on greenhouse gas emissions are becoming more and more important parts of the move to renewable energy.

Table V shows how many jobs the solar industry has made in different parts of the world. As more and more people use solar energy technologies, especially photovoltaic and floating solar systems, the solar industry has become a major source of jobs. The growth rates shown show how solar energy is becoming more important for economic development, especially in places where solar policies are in place and investments in renewable energy projects are on the rise.

TABLE V. GLOBAL SOLAR INDUSTRY EMPLOYMENT (2023) [15]

Region	Number of Jobs (Million)	Growth Rate (Annual)
North America	1.5	12%
Europe	2.3	8%
Asia-Pacific	7.8	14%
Latin America	0.5	10%
Middle East & Africa	0.2	15%
Total	12.3	10%

V. POLICY, REGULATION, AND THE FUTURE OF PV ENERGY

A. *Policy Incentives for PV Energy Development*

The policies of government also have a key function in widespread application of PV technologies. In most places, there are subsidies, tax rebates, and other incentives needed to enable people and institutions to switch to PV energy.

•Tax credits and subsidies: Programs like the US Investment Tax Credit (ITC) and similar programs across the globe have helped speed up the deployment of solar systems. The motivation reduce initial investment costs, which makes it easier for people for installing solar panels.

• Feed-in Tariffs (FiTs) and Power Purchase Agreements (PPAs): Fixed-price long-term contracts ensure price certainty for the sale of electricity, thereby maintaining the financial environment stable for solar projects. They give developers reliable streams of revenue, making large PV projects possible.

TABLE III. KEY GLOBAL FLOATING SOLAR PROJECTS - KEY INFORMATION AND STATUS [4]

Project Name	Country	Location	Rated Capacity (MW)	Approx. Area (km²)	Approx. Cost (US$)	Status at Time of Writing	Key Features & Impact
Saemangeum Floating Solar Energy Project	South Korea	Reclaimed estuarine tidal flat near Saemangeum	2100	30	$3.96 billion	Under development	World's largest floating solar project; boosts renewable capacity in coastal areas.
Omkareshwar Dam Floating Solar Farm	India	Narmada river, Madhya Pradesh	600	20	$409 million	Under development	Significant floating PV development in India; addresses water-scarcity issues.
Wenzhou Taihan Solar PV Park	P.R. China	Zhejiang province	550	4.9	N/A	Completed	Key milestone in floating PV technology in China; highly efficient installation.
Hangzhou Fengling Electricity Solar Farm	P.R. China	Changhe and Zhouxiang reservoirs, Zhejiang province	320	3	$260 million	Completed	Uses reservoirs for PV deployment; supports regional clean energy goals.
Three Gorges New Energy Floating Solar Farm	P.R. China	Artificial lake near Huainan City, Anhui province	150	3	$151 million	Completed	Part of China's broader renewable energy strategy; promotes energy security.
Cirata Reservoir Floating PV Power Project	Indonesia	Cirata reservoir, West Java	145	2.5	$95 million	Completed	Demonstrates floating PV in tropical environments; supports Indonesia's renewable push.
NTPC Ramagundam Solar Power Plant	India	Ramagundam reservoir, Telangana	100	1.8	$56 million	Completed	Integrates floating PV to supplement India's power grid, addressing demand gaps.
NTPC Kayamkulam Floating Solar Project	India	Kayamkulam reservoir, Kerala	92	4	$58 million	Completed	Key project for India's renewable transition, enabling grid stability.
CECEP Floating Solar Farm Project	P.R. China	Artificial lake near Shuzou city, Anhui province	70	1.4	N/A	Completed	Strategic project supporting renewable diversification in China's energy mix.
Sembcorp Tengeh Reservoir Floating Solar Farm	Singapore	Tengeh reservoir, Tuas district	60	0.5	N/A	Completed	First large-scale floating PV project in Singapore; reduces land use for energy.
Sirindhorn Dam Floating Solar Farm	Thailand	Lam Dom Noi River, Ubon Ratchatani province	45	0.5	$34 million	Completed	Demonstrates floating solar potential in Southeast Asia's hydroelectric regions.
Hapcheon Dam Floating PV Power Plant	South Korea	Hapcheon Dam artificial lake, South Gyeongsang province	41	2.5	$65 million	Completed	Contributes to South Korea's renewable goals; boosts energy efficiency with water cooling.

• Floating PV Regulations: As floating PV systems use bodies of water, they have to be approved by the government. Japan and China, for example, already have specific plans in place for installing floating solar systems on lakes and reservoirs. They include the environmental and legal regulations to follow in order to ensure that the installations are safe and effective.

TABLE VI. KEY SOLAR ENERGY POLICY INCENTIVES BY REGION [15]

Region	Key Policy Incentive	Impact
North America	Investment Tax Credit (ITC)	Increased affordability for residential and commercial projects
Europe	Feed-in Tariffs (FiTs)	Stable revenue for solar projects, boosting long-term investments
Asia-Pacific	Renewable Energy Purchase Agreements (REPAs)	Encourages private sector involvement in large-scale solar projects
Latin America	Tax Exemptions on Solar Equipment	Reduction in upfront costs for installations, accelerating adoption
Middle East & Africa	Subsidies for Floating PV	Boosts floating PV systems in water-scarce regions

Table VI shows the main incentives of solar energy policies in place in different parts of the world. These incentives are extremely important to make more people use PV energy and lower the cost of solar schemes. Every region has restructured its approach towards developing solar energy as per its own requirements and availability. Some of the frequent ways of encouraging investment in residential and business solar systems involve subsidies, tax credit, feed-in tariffs, and power purchase agreement (PPA).

B. Challenges in Scaling PV Energy Adoption

Even though solar technology has come a long way, there are still a lot of problems with scaling solar energy systems around the world:

- Solar power is not always available: The sun doesn't always shine, which makes it hard to keep the grid stable. But new types of energy storage, like lithium-ion and flow batteries, are helping to solve this problem.
- High Initial Capital Costs: Even though the price of solar has gone down a lot, the initial installation costs for PV systems, especially floating PV, can still be too high for some countries and people. PV leasing and power purchase agreements are two examples of new ways to finance projects that are helping to solve these problems.
- Lack of workers and skills: The solar industry is growing so quickly that there aren't enough skilled workers to install and maintain it. To develop a capable workforce to install and maintain solar systems at large, it becomes requisite to fulfill training and educational requirements.

As we move into the RES-powered future, laws and regulations will continue to play an important role in motivating individuals to use solar power. To drive the development of solar power, governments must offer long-term incentives and create mechanisms that can make it possible to use solar power on a colossal level, especially for new technology such as FPV.

VI. Conclusion

PV energy, and especially advances in PV and FPV technology, will be the linchpin of the world's transition to decentralized and sustainable energy networks. The integration of these technologies with existing grids, supported by high-efficiency energy storage devices, reduces the problems of intermittency, energy access, and land use. FPV systems in particular offer a new frontier for RES and a sustainable alternative to land scarcity with improved energy yield and efficiency owing to the cooling effect of water.

The economic and environmental advantages of PV power are unquestionable. considering the creation of jobs, lowering costs, and steep declines in greenhouse gas emissions, PV energy is a valuable force for economic development and environmental conservation. Still, obstacles persist, specifically in terms of financing, regulatory policies, and worker training. Overcoming of these obstacles through ongoing innovation and favorable policy environments will guarantee the long-term growth and efficiency of PV energy systems.

The future of energy is promising, and solar energy is at the forefront of the drive towards a more sustainable, decentralized, and robust global energy system.

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Ministry of Higher Education and Scientific Research
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International Conference on Artificial Intelligence,
Embedded Systems, and Renewable Energy

15-17 December 2025

AIESRE 2025

PROGRAM

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Program Layout

Day			
1ST DAY - 15 DECEMBER	Registration (8:00- 8:30)		
	Opening Ceremony (8:30 – 9:00)		
	Keynote 1 (9:00 – 9:45) PROF. TEDJANI MESBAHI Smart Battery and Hybrid Energy Storage Systems for Electric Vehicles and Drones: Advanced Energy Management Strategies and Applications		
	Coffee break (9:45 – 10:15)		
	Keynote 2 (10:15 – 11:00) DR. HACIB BEN AISSA Energy Transition and Industry Decarbonisation: Emerging Pathways and Technologies		
	Oral Session 1 (11:00 – 12:00)		
	Track 1	Track 5	Track 6
	Lunch (12:00 – 13:00)		
	Keynote 3 (13:00 – 13:45) MR. DANIEL COOK Energy Management and Storage with Bio-Based Phase Change Materials		
	Oral Session 2 (13:45 – 14:45)		
	Track 1	Track 5	Track 6
	Poster Session & Coffee break (14:45 – 15:30)		
	Online Session (15:30 – 17:30)		
	Track 1	Track 5	Track 6
2ND DAY- 16 DECEMBER	Keynote 1 (9:00 – 9:45) PROF. HAMID LAGA Efficient Deep Learning for 3D/4D Shape Analysis: From Medical Applications to Generative AI		
	Coffee break (9:45 – 10:15)		
	Keynote 2 (10:15 – 11:00) PROF. FREDE BLAABJERG Challenges of Renewable Energy Integration in Clean Energy Systems		
	Oral Session 1 (11:00 – 12:00)		
	Track 1	Track 2	Track 3&4
	Lunch (12:00 – 13:00)		

2ND DAY- 16 DECEMBER	**Keynote 3 (13:00 – 13:45)** **DR. KAMAL HADIDI** **Innovating Chemical Manufacturing: Low-Temperature Solutions for Energy Efficiency and Emissions Reduction**
	Oral Session 2 (13:45 – 14:45) **Track 1** **Track 2** **Track 3&4**
	Poster Session & Coffee break (14:45 – 15:30)
	Online Session (15:30 – 17:30) **Track 1** **Track 2** **Track 3&4**
3RD DAY- 17 DECEMBER	
	Panel Discussion 1 (8:30 – 9:30) **Policy, Regulation and Standards in Renewable Energy** **Energy Transition and Decarbonization Strategies**
	Coffee Break (9:30 – 10:00)
	Panel Discussion 2 (10:00 – 11:00) **Energy Education and Training for the Future Workforce** **Stakeholder Collaboration and Economic Benefits of Renewable Energy**
	Award & Closing Ceremony (11:00 – 12:00)
	Historic Tizi Ouzou and Surroundings **(Starting at 12:00)** **Guided Tour (Lunch Included)**

Presentation – Duration & Format

Keynote: Each presentation is 30 minutes, followed by 10 minutes of Q&A

Oral Presentation: Each presentation is 10 minutes, followed by 5 minutes of Q&A

Note: Accepted file formats for all presentations are PDF and PPT

Zoom Information

Room#	Zoom
Mammeri Room01	https://uva-live.zoom.us/j/62109557560?pwd=16u7zKQ2Vnvp7tHKrvbZ3bvTgett1O.1 Meeting ID: 621 0955 7560 Passcode: 497195
Mammeri Room02	https://zoom.us/j/95191075939?pwd=dZj4V18csPyDXZoNhdEjWOLztURIpX.1 Meeting ID: 951 9107 5939 Passcode: 054356
Mammeri Room03	https://us02web.zoom.us/j/84885459983?pwd=c2FqbWdGSkdwRVRZWmcyYURFSllxQT09 Meeting ID: 848 8545 9983 Passcode: 063890

Track Room Assignments

Track#	Title	Room
Track 1	Harnessing Renewable Energy: Advances and Innovations	Mammeri Room01
Track 2	Innovations in Embedded Systems for Renewable Energy Management	Mammeri Room02
Track 3	Green Computing (ML/AI) for Renewable Energy Integration	Mammeri Room03
Track 4	Advancing Hybrid Energy Systems for Sustainable Infrastructure	Mammeri Room03
Track 5	Energy Management and Storage	Mammeri Room02
Track 6	Innovations in Precision Agriculture and Sustainable Water Management	Mammeri Room03
Panel Discussion	Renewable Energy Policy and Regulation, Education and Training, and Stakeholder Collaboration	Mammeri Room01

Session Schedule

Day 1: Monday – December 15, 2025 / Oral Session 1

Session Code:		**Track 1**
Session Title:		**Renewable Energy Innovation, Control, and Optimization**
Session Time:		*11:00 – 12:00*
Session Room:		**Mammeri_Room01**
Session Chairs:		**MEZIANE HAMEL & SAID AISSOU**
ID	**Starts at**	**Title & Authors**
67	**11:00**	**Sustainable Power Generation via Olive Solid Waste Gasification in the Tizi Ouzou Region.** Abdenour Elias and Abderrezak Kennas
71	**11:15**	**Analysis of Long-Term Performance Degradation in Photovoltaic Modules** Amar Hadj Arab, Bilal Taghezouit, Fatah Mehareb, Smail Semaoui, Kamel Abdeladim, Ismail Bendaas, Abdelhak Razagui, Kada Bouchouicha, Saliha Boulahchiche and Fella Tobbal
77	**11:30**	**Sensorless Voltage-Oriented Control of Modular Multilevel Converters for Wind Power Systems** Mustapha Asnoun, Adel Rahoui, Koussaila Mesbah, Boussad Boukais, Noumidia Amoura and Seddik Bacha
130	**11:45**	**Improved Funnel Control Strategy with PI Regulation for Wind Energy Systems for Maximum Power Point Tracking** Zaina Ait Chekdhidh, Aghiles Ardjal and Maamar Bettayeb

Day 1: Monday – December 15, 2025 / Oral Session 1

Session Code:		**Track 5**
Session Title:		**Advanced Control, Optimization, and Sustainable Technologies for Renewable Energy Systems**
Session Time:		**11:00 – 12:00**
Session Room:		**Mammeri_Room02**
Session Chairs:		**AREZKI FEKIK & MOHAMED LAMINE HAMIDA**
ID	**Starts at**	**Title & Authors**
33	**11:00**	**Solar Inverter Performance Prediction Using Double Exponential Curve Fitting** Lyazid Kaci, Amar Hadj Arab and Rachid Zirmi
44	**11:15**	**Robust Generalized Predictive Speed with Direct Torque Control for Multiphase Wind Generators under Parametric Uncertainty** Kamel Ouari, Amel Kasri, Youcef Belkhier and Zoubir Boudries
58	**11:30**	**Energy-Efficient and Sustainable Approaches to AS/RS Design and Control: A Comprehensive Review** Omar Bahmid, Sihem Kouloughil and Bendiouis Amaria
97	**11:45**	**Equivalent Consumption Minimization Strategy for Energy Management in Unmanned Aerial Vehicle** Haroune Aouzellag and Sabrina Nacef

Day 1: Monday – December 15, 2025 / Oral Session 1

Session Code:		**Track 6**
Session Title:		**AI-Driven Automation and Robotics for Precision Agriculture**
Session Time:		**11:00 – 12:00**
Session Room:		**Mammeri_Room03**
Session Chairs:		**KHALED BOUNAR & DRISS NEHARI**
ID	**Starts at**	**Title & Authors**
92	**11:00**	**Using a UAV Crop Monitoring System for Early Tomato Disease Detection and Decision Support** Dimosthenis Minas, Theodosios Chronopoulos and Michalis Xenos
105	**11:15**	**Sensor-Driven Real-Time Obstacle Detection for Agricultural Drone Spraying Systems** Ahmed Lallal, Sabrina Mokrani, Tassadit Sadoun and Mehammed Daoui
112	**11:30**	**Fruit Anomaly Detection and Manipulation Using a Vision-Guided Autonomous Aerial Manipulator** Bidjad Souier, Choukri Bensalah, Rida Mokhtari, Amal Choukchou Braham and Mohamed Abderrahim

Day 1: Monday – December 15, 2025 / Oral Session 2

Session Code:		**Track 1**
Session Title:		**Innovations in Renewable Energy Conversion, Optimization, and Integration**
Session Time:		**13:45 – 14:45**
Session Room:		**Mammeri_Room01**
Session Chairs:		**FATMA LOUNNAS & KAHINA LAGHA**
ID	**Starts at**	**Title & Authors**
27	**13:45**	**Performance and Emission Analysis of LPG-Hydrogen Dual Fuel Engines** Hassina Ghodbane, Fouad Khaldi and Bahloul Derradji
55	**14:00**	**Comparative Study of the Different Structures of Multi-Level Inverters for the Connection of PV Systems to the Power Grid** Amina Benabda and Amina Azizi
83	**14:15**	**Hippopotamus Optimization Algorithm-Based Robust Tilt-FOID Control Design for Linear Time-Invariant Systems in Renewable Energy Applications** Elouahab Bouguenna, Samir Ladaci, and Akila Djoudi Gherbi
107	**14:30**	**Coupled Magneto-Mechanical Modeling of a Marine Wave Energy Recovery System** Bachir Ouartal, Meziane Hamel, Mustapha Zaouia, Ratiba Fellag, Riad Moualek and Ahmed Nait Ouslimane

Day 1: Monday – December 15, 2025 / Oral Session 2

Session Code:	**Track 5**
Session Title:	**Advanced Forecasting, Control, and Energy Harvesting**
Session Time:	**13:45 – 14:45**
Session Room:	**Mammeri_Room02**
Session Chairs:	**MOURAD LAGHROUCHE & FATEH KRIM**

ID	Starts at	Title & Authors
138	13:45	**Design and Development of a Piezoelectric Shoe Using Lead-Free Composite Materials for Mechanical Energy Harvesting** Zakia Chelli, Massine Gana, Hakim Achour, Abdel Madjid Djidda, Yacine Baghdadi, Malika Saidi, Mourad Laghrouche and Ahcène Chaouchi
140	14:00	**Energy Management of a Smart District Using the Neural Predictions and Predictive Control Model (MPC)** Zoulikha Ouchefoun, Mourad Hasni and Lakhdar Guenfaf
173	14:15	**Enhanced Battery Health Forecasting with Dynamic Thresholds Using Multi Input LSTM Networks** Rafik Saddaoui, Karim Oudiai, Mhenna Nachef, Hamid Hamiche, Rachid Zirmi and Mourad Laghrouche
185	14:30	**Predictive Control of DFIG in a Hybrid PV/DFIG/Batt System Supplying a Water Pumping System** Tarek Boudjerda, Sofia Lalouni Belaid and Salah Tamalouzt

Day 1: Monday – December 15, 2025 / Oral Session 2

Session Code:	**Track 6**
Session Title:	**Intelligent Sensing and Prediction for Agricultural Systems**
Session Time:	**13:45 – 14:45**
Session Room:	**Mammeri_Room03**
Session Chairs:	**NABIL KHERBACHE & SALAH HADDAD**

ID	Starts at	Title & Authors
134	13:45	**Prediction of a Tunnel Greenhouse Relative Humidity Using Artificial Neural Network** Salah Bezari, Asma Adda and Sidi Mohamed El Amine Bekkouche
161	14:00	**Review of Smart Systems in Aquaculture and Aquaponics** Elarbi Kacemi, Khelifa Benahmed and Tariq Benahmed
178	14:15	**Comparative Analysis of YOLOv8, YOLOv11, and Faster R-CNN for Multi-Crop Plant Disease Detection** Rim Gasmi, Marwa Chander and Mohamed Amine Badache

Day 1: Monday – December 15, 2025 / Poster Session

Session Code:	**Track 1, 5 & 6**
Session Title:	**Smart Energy, Machine Learning, and Power Materials Reliability**
Session Time:	**14:45 – 15:30**
Session Room:	**Mammeri_Hall**
Session Chairs:	**MUSTAPHA MOUDOUD & SAID DJENNOUNE**

ID	Starts at	Title & Authors
72	**14:45**	**Smart Energy Control in PV-Battery Systems Using Three-Level Boost Converters with DC-Link Voltage Regulation via Genetic Algorithm** Ahmed Bahri, Nabil Mezhoud, Bilel Ayachi, Abdelkrim Thameur, Farouk Boukhenoufa and Abderrahmane Bellaouar
85	**14:45**	**Bio-Inspired Method for Optimal Energy Management and Efficiency Improvement of Microgrids** Nabil Mezhoud, Ahmed Bahri, Farouk Boukhenoufa, Bilel Ayachi, Lakhdar Bouras and Ilham Ahmed Hazila
131	**14:45**	**Thermal Aging Effects on the Electrical, Mechanical and Physicochemical Properties of LDPE Power Cables Insulation** Ferhat Slimani, Abdallah Hedir, Mustapha Moudoud, Omar Lamrous, Soraya Nait Larbi and Sébastien Rondot
142	**14:45**	**Comparative Numerical Study of Multilayer Walls with and without Phase Change Materials for Enhanced Thermal Performance** Asma Bouterfif and Farid Mechighel
146	**14:45**	**Design and Implementation of a Modular Cold Storage System** Bouchra Lahlou, Latefa Ghomri and Mohammed Sari
151	**14:45**	**Performance Assessment of ANN and MLR Models for Predicting NF/RO Desalination System** Asma Adda, Salah Bezari and Salah Hanini
163	**14:45**	**Heart Beat IoT: Real-Time Cardiac Monitoring** Saliha Rabehi, Malika Saidi, Hayat Hammouche, Nadia Serkhane, Hakim Achour, Ahcéne Chaouchi, Mourad Laghrouche, Nouara Lamrani, Mohamed Rguiti, Christian Courtois, Yannick Lorgouilloux and Mohamed Aymen Ben Achour
177	**14:45**	**Effect of Critical Current Density Dependence on the Internal Magnetic Field Penetration in an HTC Superconducting Bulk** Asma Azzouza, Hicham Allag and Jean-Paul Yonnet
183	**14:45**	**Machine Learning for Predictive Maintenance of Electrical Machines: A Review** Taher Amraoui, Samir Merad and Ahmed Amrane
184	**14:45**	**Hydrothermal Degradation Impacts on the Properties Of PVC Cables Insulation** Hassene Ait Ouazzou, Ferhat Slimani and Mustapha Moudoud
191	**14:45**	**Ultraviolet Aging Effects on the Dielectric Properties of PVC/Al_2O_3 Nanocomposites Cables Insulation** Sabrina Amraoui, Abdallah Hedir, Ferhat Slimani, Mustapha Moudoud, Omar Lamrous and Ali Durmus

Day 1: Monday – December 15, 2025 / Online Session

Session Code:	**Track 1**
Session Title:	**Advanced Renewable Energy Systems: Design, Monitoring, and Control**
Session Time:	**15:30 – 17:30**
Session Room:	**Mammeri_Room01**
Session Chairs:	**AGHILAS ARDJAL & YACINE TRIKI**

ID	Starts at	Title & Authors
136	**15:30**	**Study and Development of Methodology for Dimensioning Photovoltaic Systems (PVS)** Leonardo Kunen, André Tavares, Breno Carvalho and Franciele Ronchi
153	**15:45**	**Daily Energy Production Patterns in Medium-Scale Hydroelectric Operations: a Longitudinal Descriptive Study** Elmer Arellanos-Tafur and Marcelo Damas-Niño
156	**16:00**	**Design and Implementation of a Low-Cost Automatic Weather Station Based on the Internet of Things** Sefia Attia, Abdelkader Mechernene and Mourad Loucif
158	**16:15**	**From Grid Following to Grid Forming in PV Grid Tied Single Phase Inverter** Mourad Zebboudj, Syphax Ihammouchen, Toufik Rekioua, Djamila Rekioua, Ali Chebabhi and Mohammed Said Ouahabi
167	**16:30**	**Overshoot-Free Speed Control in PMSG Wind Turbines Using a Smooth Sliding Mode Controller** Wassila Hattab, Abdelhamid Benakcha, Seddik Tabet, Amira Slimani, Ahmed Marouane Ghodbane
84	**16:45**	**Modeling High-Performance $Cs_{0.05}(FA_{0.77}MA_{0.23})_{0.95}Pb(I_{0.77}Br_{0.23})_3$ Perovskite Solar Cells via SCAPS-1D Simulation** Belkacem Hanafi, Abderrahim Yousfi, Rabah Boubaaya, Okba Saidani, Mokhtar Djendel, Sara Bendib, Rafik Zouache
179	**17:00**	***Numerical Investigation of CsSnCI3 Perovskite Solar Cells Utilizing WS2 and CuSbS2 Transport Layers for Enhanced Efficiency beyond 24%*** Ahmed Benameur, Abderrahim Yousfi, Okba Saidani
186	**17:30**	**Seasonal Variability and Performance Optimization of Wind Power Generation: A Comprehensive Study of ENGIE Operations** Elmer Arellanos-Tafur and Marcelo Damas-Niño

Day 1: Monday – December 15, 2025 / Online Session

Session Code:	**Track 5**
Session Title:	**Metaheuristic Optimization and Control Strategies for Hybrid Systems**
Session Time:	**15:30 – 17:30**
Session Room:	**Mammeri_Room02**
Session Chairs:	**TEDJANI MESBAHI & SMAIL SEMAOUI**

ID	Starts at	Title & Authors
28	**15:30**	**PSO Algorithm for Optimal of Fuzzy Logic Controller for A DC-DC Buck Converter** Ahmed Bennaoui, Aissa Ameur, Ameur Bennaoui and Salah Benzian
64	**15:45**	**Two-Level Hierarchical Control of a PV-Battery Hybrid Energy System Using Differential Flatness-Based Strategy and MShOA-Tuned FOPID Controller** Hadjer Chabana, Ilyes Tegani, Hamza Afghoul and Soumia Merah
73	**16:00**	**Comparative Optimal Dispatch Control Strategies for a Hybrid Renewable Energy System** Mourad Zebboudj, Djamila Rekioua and Toufik Rekioua
115	**16:15**	**Energy Management of a PEMFC/Battery Electric Vehicle Using a State Machine Strategy** Khoudir Kakouche, Toufik Rekioua, Djamila Rekioua, Amira Slimani, Zahra Mokrani and Mohammed Amine Soumeur
149	**16:30**	**Optimization of Energy Management in a PV–Wind–Battery Microgrid Using PSO in MATLAB** Meziane Kaci, Hassane Ezziane, Slim Rouabah, Zakaria Layate, Hakim Ait Said and Hamou Nouri
154	**16:45**	**Statistical Assessment of Commercial Electric Service Quality: A Case Study of ENEL Distribution Company in Peru** Marcelo Damas-Niño and Elmer Arellanos-Tafur
162	**17:00**	**Optimal Distribution Network Reconfiguration for Minimizing Energy Losses and Enhancing Reliability Using Metaheuristics** Anes Bouhanik, Samir Bouslimani, Ahmed Salhi, Djemai Naimi, Younes Zahraoui and Saad Mekhilef

Day 1: Monday – December 15, 2025 / Online Session

Session Code:	**Track 6**
Session Title:	**Machine Intelligence and Sensing Technologies for Precision Agriculture and Water Management**
Session Time:	**15:30 – 17:30**
Session Room:	**Mammeri_Room03**
Session Chairs:	**MOHAMMED RACHEDINE & ADAM BELLOUM**

ID	Starts at	Title & Authors
30	**15:30**	**Hybrid WCA-HS Based Control for Autonomous Quadrotor Navigation in Precision Agriculture** Nesrine Tenniche, Boubekeur Mendil, Farid Ghilas and Lamine Brikh
40	**15:45**	**Advancing Infiltration Modeling with Deep Learning: A Superior Alternative to Empirical Approaches in the Mitidja Plain** Amina Mazighi, Mohamed Meddi and Hind Meddi
91	**16:00**	**Advancing Agricultural Robotics: AI Control Strategies for Delta Robots** Issam Kessira, Ali Chabane, Nawel Ghazi, Khaled Benfriha and Samir Meradi
98	**16:15**	**Early-Season Water Use Patterns in Wheat and Barley under Semi-Arid Conditions: A Lysimetric Approach** Omar Bouziane, Mohamed Meddi and Amina Mazighi
147	**16:30**	**IoT-Based Climatic Environment Monitoring System Design for a Cattle Breeding Buildings** Sihem Souiki, Mourad Hadjila, Reda Yagoub, Abdelillah Boudjella and Oussama Ahed Messaoud
157	**16:45**	**Integrated Geophysical Approach for Groundwater Prospecting** Doria Kutrubes and Khaled Bounar

Day 2: Tuesday – December 16, 2025 / Oral Session 1

Session Code:	**Track 1**
Session Title:	**Advanced Photovoltaic Materials and Solar Forecasting**
Session Time:	**11:00 – 12:00**
Session Room:	**Mammeri_Room01**
Session Chairs:	**NACEREDDINE BENAMROUCHE & MOHAMMED KAOUANE**

ID	Starts at	Title & Authors
22	**11:00**	**Comparative Analysis of Pure ZnO, Ag-Mn Codoped ZnO, and Mn:ZnO/Ag/Mn:ZnO Multilayer Transparent Conductive Oxides for Photovoltaic Applications** Fouaz Lekoui, Khaoula Settara, Rachid Amrani, Elyes Garoudja, Walid Filali, Slimane Oussalah, Driss Dergham and Salim Hassani
41	**11:15**	**Characterization of EVA/phase change material blend embedded with zinc oxide (ZnO) nanomaterial as nanocomposite for photovoltaic module encapsulation process** Kamel Agroui, Lyes Maifi, Ouided Hioual, Aicha Ayadi and Abdelhamid Chari
70	**11:30**	**Surpassing 16% Efficiency in Cd-Free CZTS Solar Cells via Si Back-Contact Engineering and IR Harvesting** Lynda Metref, Essaid Mansouri, Mahfoud Abderrezek and Samira Sali
171	**11:45**	**A Hybrid Electrical and Environmental LSTM Approach for Short-Term Solar Power Forecasting in Algeria** Rafik Saddaoui, Samir Aoughlis, Karim Oudiai, Nachef Mhenna, Hamiche Hamid and Mourad Laghrouche

Day 2: Tuesday – December 16, 2025 / Oral Session 1

Session Code:	**Track 2**
Session Title:	**Edge AI and Intelligent Monitoring for Energy Systems**
Session Time:	**11:00 – 12:00**
Session Room:	**Mammeri_Room02**
Session Chairs:	**NADHIR DJEFFAL & RACHID ZIRMI**

ID	Starts at	Title & Authors
26	**11:00**	**Recent Advances in the Application of TinyML and Edge Devices in Solar Photovoltaic Systems: Bridging the Gap Between Laboratory Research and Industry** Adel Mellit and Marco Zennaro
49	**11:15**	**An Embedded AI Model for Defect Detection in Photovoltaic Modules Using a Jetson Nano-Powered Unmanned Aerial Vehicle** Nouamane Kellil, Adel Mellit, Toufik Benkherouf and Maamar Bettayeb
125	**11:30**	**Unbalance fault detection in an IoT-Connected Motor Network Using Artificial Neural Networks** Massine Gana, Zakia Chelli, Rafik Saddaoui, Hakim Achour and Mourad Laghrouche

Day 2: Tuesday – December 16, 2025 / Oral Session 1

Session Code:	**Track 3&4**
Session Title:	**Data-Driven Modeling and Optimization in Power Systems**
Session Time:	**11:00 – 12:00**
Session Room:	**Mammeri_Room03**
Session Chairs:	**ADAM BELLOUM & FERHAT SLIMANI**

ID	Starts at	Title & Authors
36	**11:00**	**Advanced Polynomial and Gaussian Regression Frameworks for Predictive Modeling of Tangential Discharge Phenomena in High-Voltage Insulation Systems** Nabila Saim
80	**11:15**	**Data-Driven Based Sparse Identification of Nonlinear Dynamics for Stability Analysis of Mixed Grid-Following and Grid-Forming Inverters** Houssam Deboucha, Bessam Deboucha, Elyazid Amirouche, Said Aissou, Ali Berboucha, Kaci Ghedamsi and Saad Mekhilef
121	**11:30**	**Formal Concept Analysis for Knowledge Extraction and Optimal Configuration Selection in Photovoltaic Installations** Zina Ait Yakoub, Ali Bechouche and Djaffar Ould Abdeslam
170	**11:45**	**Study of a Hybrid PV/Fuel Cell System Dedicated to an Electric Vehicle Charging Station** Mohamed Lamine Hamida, Damya Iamrache, Sarah Maouche, Hakim Denoun, Arezki Fekik, Dyhia Kais and Zoulikha Tebri

Day 2: Tuesday – December 16, 2025 / Oral Session 2

Session Code:	**Track 1**
Session Title:	**Intelligent Control and Fault Diagnosis in Photovoltaic Systems**
Session Time:	**13:45 – 14:45**
Session Room:	**Mammeri_Room01**
Session Chairs:	**KARIM KEMIH & MOUNIR AMIR**

ID	Starts at	Title & Authors
59	**13:45**	**A Novel Linguistic Hedge-Based Fuzzy Logic Controller for Enhanced MPPT in PV Systems** Chellali Benachaiba
61	**14:00**	**Tuning of a Neutrosophic Fuzzy Controller for DC Motor Using the Novel Qudwa Metaheuristic** Chellali Benachaiba
87	**14:15**	**Experimental Study of Solar Water Pump Control by Arduino** Amina Azizi and Amina Benabda
93	**14:30**	**Open-Circuit Fault Diagnosis of a Three-Level Boost Converter for Photovoltaic Applications** Abdeldjabar Benrabah, Mouaad Belguedri, Mohamed-Amine Yahiaoui, Fayçal Benyamina and Mohamed Benbouzid

Day 2: Tuesday – December 16, 2025 / Oral Session 2

Session Code:	**Track 2**
Session Title:	**Control and Security in Modern Renewable Energy Systems**
Session Time:	**13:45 – 14:45**
Session Room:	**Mammeri_Room02**
Session Chairs:	**ADEL MELLIT & MASSINE GANA**

ID	Starts at	Title & Authors
53	**13:45**	**Security of Grid-Connected Photovoltaic Plants A Mini-Review and Future Directions** Nassiha Boutana, Rokia Chekirou, Adel Mellit and Maamar Bettayeb
141	**14:00**	**Direct Power Control Technique for Wind Power Generation System based on a Double Stator Induction Generator (DSIG)** Fatma Lounnas
190	**14:15**	**Development and Design of an Intelligent Energy Router** Rachid ZIRMI, Belkacem Zouak, Nadhir Djeffal, Abderrahmane Alem, Massinissa Kloul and Hakim Achour

Day 2: Tuesday – December 16, 2025 / Oral Session 2

Session Code:	**Track 3&4**
Session Title:	**Intelligent Control and Optimization in Renewable Energy Systems**
Session Time:	**13:45 – 14:45**
Session Room:	**Mammeri_Room03**
Session Chairs:	**GHANIA BELKACEM & BILAL ATTALLAH**

ID	Starts at	Title & Authors
123	**13:45**	**Improving the Performance of a Wind Turbine PID Controller Using GWO Optimization and Fuzzy Logic** Houari Habiba and Noureddine Zerhouni
128	**14:00**	**Stabilizing Photovoltaic Output Using a Controlled Ćuk Converter Topology** Mohamed Kaouane, Nidhal Cherrat and Akkila Boukhelifa
188	**14:15**	**Anomaly Detection in Datacenter Energy Consumption Using an Autoencoder** Karima Oukfif
194	**14:30**	**Optimizing Batteries Charging Time Inside an Autonomous Photovoltaic System Installed on a House's Roof** Salah Tamalouzt, Kamel Djermouni, Ali Berboucha, Kaci Ghedamsi and Djamal Aouzellag

Day 2: Tuesday – December 16, 2025 / Poster Session

Session Code:	**Track 1, 2, 3 & 4**
Session Title:	**Smart Sensing, and Intelligent Control in Energy and IoT Systems**
Session Time:	**14:45 – 15:30**
Session Room:	**Mammeri_Hall**
Session Chairs:	**MUSTAPHA MOUDOUD & SAID DJENNOUNE**

ID	Starts at	Title & Authors
38	**14:45**	**Determination of the Minimum Capacitance for Self-Excitation of a SEIG, Taking Into Account the Speed Ramp Up** Madjid Si Brahim, Rabah Rouas, Rahma Kachenoura and Salah Haddad
57	**14:45**	**Comparative Analysis of MPPT Algorithms for Photovoltaic Systems Under Partial Shading: A MATLAB/Simscape-Based Study** Ahmed Chebri, Fatima Zohra Boukahil, Assala Mouffouk and Boubekeur Azoui
90	**14:45**	**Transformer Fault Diagnosis Using HHO-Enhanced XGBoost and Liquid Dielectric Signal Analysis** Tarek Bouguettaya, Abderrahim Reffas, Mohammed Adaika, Hicham Talhaoui, Oualid Aissa and Sherif S. M. Ghoneim
110	**14:45**	**Graph-Based Semi-Supervised Learning for Fault Clustering in Grid-connected PV Systems** Nassim Sabri
114	**14:45**	**Detection of Silicone Oil Concentration Using a Two-Dimensional Photonic Crystal Sensor** Sarra Bendib, Saidani Okba, Abderrahim Yousfi and Nadhir Djeffal
120	**14:45**	**AI-Enabled Wearable IoT Device for Facial Recognition in Student Transportation Systems** Dhai Eddine Salhi, Majdi Rawashdeh, Mohamed Tahar Bennai, Awny Alnusair and Ali Karime
135	**14:45**	**Dynamic Performance Evaluation of a Dual-Star Induction Machine Fed by an Indirect Matrix Converter** Sifoura Mezhoud, Celia Mehanaoui and Ahmed Azib
159	**14:45**	**A Low-Cost and Eco-Friendly Humidity Sensor Based on Keratin Thin Film** Hayat Hammouche, Rachida Douani, Ahcène Chaouchi, Saliha Rabhi, Nouara Lamrani and Mourad Laghrouche
172	**14:45**	**Wearable Low-Energy RFID-Integrated Vibration Tag for Silent, Long-Term Sleep Apnea Monitoring and Posture Sensing** Rafik Saddaoui, Samir Aoughlis, Karim Oudiai, Mhenna Nachef, Hamid Hamiche and Mourad Laghrouche
175	**14:45**	**Low Power Energy and Real-Time Localization of Prisoners Inside Correctional Facilities Using Inertial Sensors and Particle Filtering: A Dead Reckoning Approach** Samir Aoughlis, Rafik Saddaoui, Karim Oudiai, Hamid Hamiche, Brahim Achour and Mourad Laghrouche

Day 2: Tuesday – December 16, 2025 / Online Session

Session Code:	**Track 1**
Session Title:	**Innovations and Optimization in Wind, Solar, and Hybrid Renewable Systems**
Session Time:	**15:30 – 17:30**
Session Room:	**Mammeri_Room01**
Session Chairs:	**MEZIANE HAMEL & KOUSSAILA MESBAH**

ID	Starts at	Title & Authors
68	**15:30**	**A Heuristic Optimization Approach for Wind Turbine Dimensions to Enhance Energy Capture and Reduce Costs** Mourad Naidji, Mohamed Ilyas Rahal, Alla Eddine Toubal Maamar, Aicha Aissa-Bokhtache, Maamar Latroch and Radu-Florin Porumb
75	**15:45**	**Advancements in Solar Energy Systems: Innovations in Photovoltaic (PV) and Floating PV Technologies for Decentralized Energy Production** Mourad Naidji
103	**16:00**	**Current Sensor Fault Diagnosis of Wind Power System Based on DFIG** Chaima Gherari, Farid Berrezzek, Hicham Zaimen and Khaled Khelil
106	**16:15**	**Cold plasma-Based Methane Dry Reforming for Hydrogen Production** Abir Azara and Khadidja Khodja
122	**16:30**	**Recent Advancements in Energy Management for Hybrid Renewable Energy Systems** Fayçal Hassaini, Said Aissou, Ali Berboucha, Elyazid Amirouche, Yanis Hamoudi, Houssam Deboucha and Abdelhakim Belkaid
152	**16:45**	**Renewable Energy Deployment Efficiency: Analyzing Algeria's Achievement Gap and Optimization Strategies** Elmer Arellanos-Tafur and Marcelo Damas-Niño
126	**17:00**	***Ultra Wideband Hybrid-Shaped Dielectric Resonator Antenna Using (RE-BaTiO$_3$) for Modern Wireless Communication Applications*** Chelghoum Rachid, Brahimi Abdelhalim, Bourouba Nacerdine, Juan Pablo Martínez Jiménez, Bouzit Nacerdine, Zerrougui Raouf, Yousfi Abderrahim, Saidani Okba

Day 2: Tuesday – December 16, 2025 / Online Session

Session Code:		**Track 2**
Session Title:		**Advanced Control and Modeling for Wind and PV Energy Systems**
Session Time:		**15:30 – 17:30**
Session Room:		**Mammeri_Room02**
Session Chairs:		**RATIBA FELLAG & NIDAL CHERRAT**
ID	**Starts at**	**Title & Authors**
43	**15:30**	**Real-Time Sensorless Control for PMSG Wind Generators Using Step-by-Step Sliding Mode Observer on STM32** Sofiane Benabit, Hocine Khati, Arezki Fekik and Malek Ghanes
52	**15:45**	**Two Step Ahead Finite Set Predictive Torque Control Using Improved Sliding Mode Control for Three Phase Induction Motor** Sofiane Brahami, Kaci Ghedamsi, Yanis Hamoudi and Abdelyazid Achour
78	**16:00**	**A Prototype Design of Smart DC Power Device for Solar System Application** Khadar Saad, Larbi Brahimi, Mohamed Elbar, Meriem Ghezal, Aya Mebarki and Sif Eddine Souadia
117	**16:15**	**Co-Simulation and Modeling of WT-AFPMSG Based on Ansys Software and MATLAB/Simulink for Wind Energy Application** Lina Bouhafs, Salah Tamalouzt, Mustafa Ergin Şahin and Ahcene Bouzida
118	**16:30**	**Enhanced Fault-Tolerant Harmonic Compensation in Grid-Connected PV Systems: A Comparative Study of Analog Filters for Cascaded Multilevel Inverter Control** Sabrina Nacef, Haroune Aouzellag, Bessam Amrouche, Rabah Babouri and Kaci Ghedamsi
119	**16:45**	**Enhanced Direct Current Control in Grid-Following Inverters Using Open-Loop Synchronization and PR Regulator for Renewable Energy Integration** Lakhder Ayhar, Ahmed Safa, Abdelmadjid Gouichiche and Fayssal Elyamani Benmohamed
129	**17:00**	**A Space Vector Modulation Scheme for Five-Phase to Three-Phase Indirect Matrix Converter for a Wind Power Application** Celia Mehanaoui, Sifoura Mezhoud, Ahmed Azib and Nabil Taib

Day 2: Tuesday – December 16, 2025 / Online Session

Session Code:	**Track 3 & 4**
Session Title:	**Advanced AI, Forecasting, and Control Strategies in Modern Energy Systems**
Session Time:	**15:30 – 17:30**
Session Room:	**Mammeri_Room03**
Session Chairs:	**KARIMA OUKFIF & MEHAMMED DAOUI**

ID	Starts at	Title & Authors
31	**15:30**	**Fault Diagnosis of Induction Motors Using Convolutional Neural Networks** Benyamine Arroul, Farid Tafinine and Farid Ghilas
101	**15:45**	**Autonomous Photovoltaic/Thermal Solar Solution for Resilient Isolated Habitats** Djamila Rekioua, Nabil Mezzai, Toufik Rekioua, Zahra Mokrani, Khoudir Kakouche, Adel Oubelaid and Chokri Ben Salah
109	**16:00**	**Intelligent Hysteresis Current Control Based on Support Vector Machine for SAPF Integrated PV System Under Nonstationary Harmonics** Mustapha Meraouah, Faiza Kaddari, Said Hassaine, Youcef Mihoub and Sandrine Moreau
145	**16:15**	**Forecasting Electrical Outages in Adrar, Algeria: Towards a Smart Energy Management System** Samia Bentaieb, Driss Nehari, Ammar Neçaibia and Messaoud Hamouda
155	**16:30**	**A Multidisciplinary Systems Engineering Approach to Hybrid Energy Systems Development** Khaled Bounar and Salah Badjou
168	**16:45**	**A LADRC-Based Robust Speed Controller for PMSMs in Electric Vehicles With External Disturbance Rejection** Amira Slimani, Amor Bourek, Abdelkarim Ammar, Khoudir Kakouche, Wassila Hattab and Samira Heroual
182	**17:00**	**Emerging AI Methodologies in the Renewable Energy Ecosystem: Successes, Challenges, and Future Research Directions (v2)** Temitope Bobola and Temitayo Fagbola