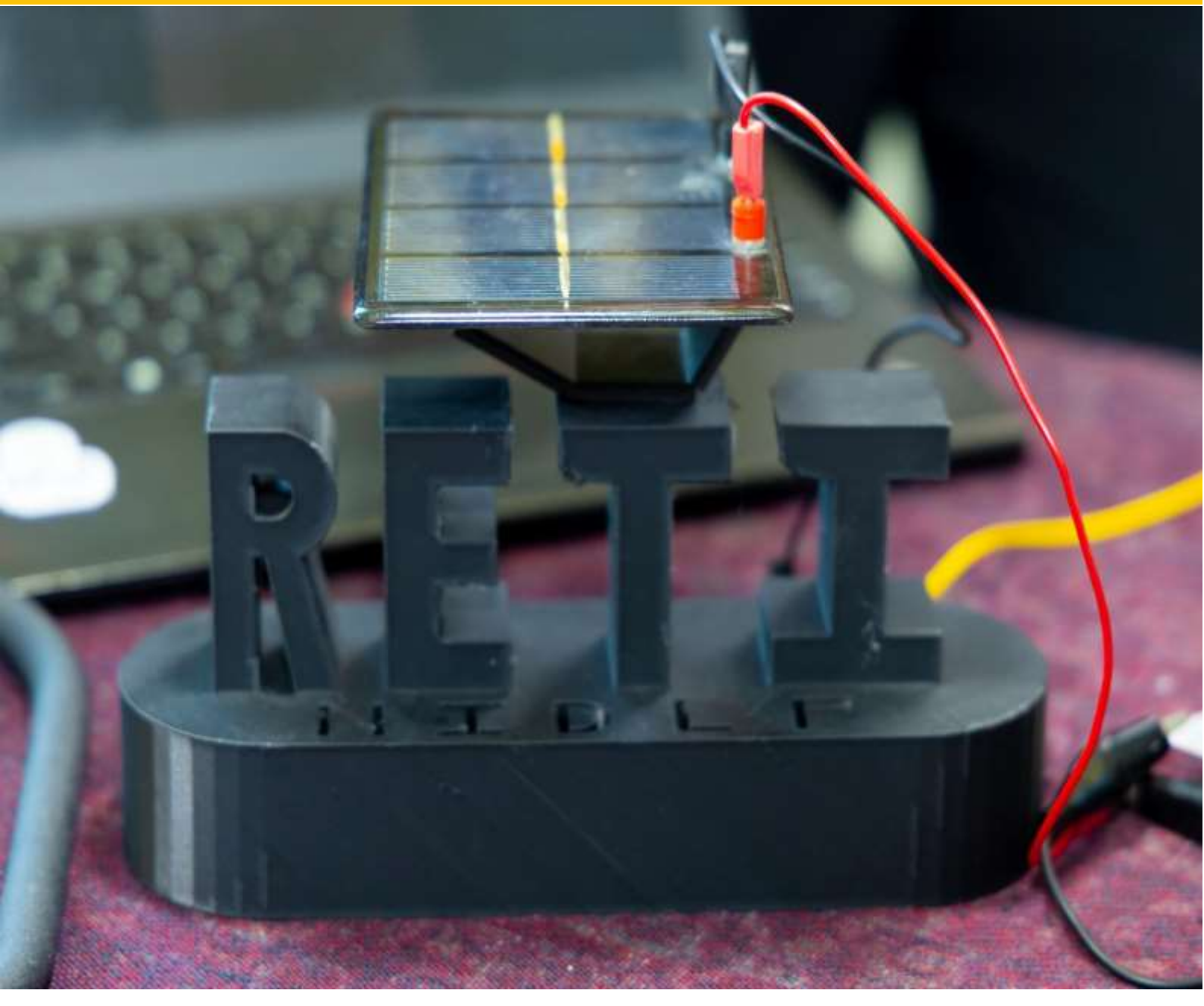
أهداف التنمية المستدامة

KFUPM

King Fahd University of Petroleum & Minerals

Environmental Sustainability Strategy: Energy



Energy enables human life. This Environmental Sustainability Strategy responds to major challenges and opportunities for energy being available and affordable to all, as well as being clean to ensure that future development can be sustainable. It comprehends actions, processes and policies to address energy consumption, energy efficiency, energy wastage, clean energy technologies, carbon and emission reduction as well as community engagement in the framework of environmental compliance and due diligence.

The strategy is overseen by Interdisciplinary Research Center for Renewable Energy and Power Systems, Projects and Maintenance Department.

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Subsequent sections address the following key themes:

- Energy efficiency: buildings
- Energy efficiency: services for industry
- Energy efficiency: community outreach
- Energy consumption
- Energy wastage
- Carbon and emission reduction
- Clean energy technology

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Affordable and Clean Energy

KFUPM acknowledges that conserving energy and utilizing modern technologies with minimal negative environmental effects are crucial for maintaining the planet. The university has taken several initiatives to include this goal in its academic and research activities, even though striking a balance between clean and affordable energy is a major challenge. Energy providers must bear often contradictory pressures to reduce costs, increase innovation and sustainability, and meet changing consumer demands – all while dealing with increased system complexity.

Important research output:

- International Journal of Hydrogen Energy; Ogunlakin N.O., Toor I.U., Sorour A.A., Djukic M.B.
- Chemistry – An Asian Journal; Um-e-Habiba, Ahmed I., Alqahtani M., Asif M., Khalid M.
- Energy Conversion and Management; Lawal D.U., Usman J., Abba S.I., Thuyavan Yogarathinam L., Usman A.G., Antar M.A., Aljundi I.H., Zubair S.M.
- Energy Strategy Reviews; Um-e-Habiba, Ahmed I., Alqahtani M., Asif M., Khalid M.
- Journal of Energy Storage; Al Miaari A., Ali H.M.
- Battery Energy; Bhat Z.M., Furquan M., Sial M.A.Z.G., Alam U., Hamid I.A.A., Alzahrani A.S., Qamar M.
- Energy and Fuels; Ul Hassan I., Hussen S.A., Sathyamurthy R., Zahid U., Ahmed U., Reddy V.M., Abdul Jameel A.G.

KFUPM Research Centers

- KFUPM's Center of Excellence in Energy Efficiency (CEEE) aspires to be an interdisciplinary research institute committed to increasing energy efficiency. The CEEE was established with a noble grant from the King Abdulaziz City for Science and Technology (KACST), as an initiative under the Saudi Energy Efficiency Center (SEEC) and Saudi Energy Efficiency Program (SEEP), and is the first university-based energy efficiency center in the Kingdom of Saudi Arabia to focus on the dissemination of knowledge and transfer of energy efficient technology into the marketplace.
  Website: Center of Excellence in Energy Efficiency

- KACARE Energy Research and Innovation Center (ERIC) provides scientists and emerging experts with opportunities to expand their skills in renewable and sustainable energy research and technology fellowships.
  Website: KACARE Energy Research and Innovation Center

- KFUPM launched its Interdisciplinary Research Center for Hydrogen and Energy Storage (IRC-HES) to contribute to creating an economic and environmental impact through basic and applied research. The center aims to focus on grand national and strategic challenges related to Hydrogen, Carbon Capture & Conversion, and Energy Storage.
  Website: IRC for Hydrogen Technologies and Carbon Management

- Interdisciplinary Research Center for Renewable Energy and Power Systems (IRC-REPS) is a unique, fully integrated industrial and academic research entity able to bring all engineering disciplines and technological research capabilities under one umbrella.
  Website: Interdisciplinary Research Center for Sustainable Energy Systems - King Fahd University of Petroleum & Minerals

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University measures towards clean energy

Policy	Created	Implemented	Reviewed
Energy Policy	2020	2020	2026

Energy-efficient renovation and building

KFUPM has a policy in place to demonstrate its commitment to the United Nations Sustainable Development Goals (SDG), acknowledging that conserving energy and utilizing modern technologies with minimal negative environmental effects are crucial for maintaining the planet.

This policy applies to all operations and activities of the institution, including new buildings, renovations and upgrades of existing buildings.

The Energy policy mandates all new buildings as well as all renovated and upgraded buildings be designed, constructed and equipped in a way that:

- ensures the application of energy efficiency standards and features
- ensures and improves energy conservation
- reduces energy consumption
- utilizes renewable energy sources

KFUPM's policy entails the Saudi Building Code (SBC) on all works of buildings and construction. In particular, KFUPM is committed to applying the Saudi Green Building Code, which emphasizes energy efficiency.

Objectives and contributions:

- To install LED Lighting and / or other energy-saving devices on campus.
- To replace all campus lights with Solar powered LED.

- To upgrade existing buildings to higher energy-efficiency.

The university's design requirements mandate LED lighting fixtures in all buildings. Appendix E (Technical Requirements) of the Policy on KFUPM Design Criteria sets this out: all lighting fixtures are to be LED type, lighting is to be controlled by energy-saving optical sensors or timers integrated with the Building Management System, and all equipment is to have a separate disconnect switch. Full document: Policy on KFUPM Design Criteria (2020), Appendix E

All new buildings constructed after 2011 feature LED lights, and those built after 2008 are equipped with motion detectors. The Projects Department maintains a record of the buildings where LED lighting has been installed, giving the status and cost of each project. Full list: KFUPM buildings with LED lighting installed

Planned activities:

- Enhance energy efficiency of Air Conditioning which represents 60–70% of electricity consumption.
- Adoption of water-cooled chillers in place of earlier air-cooled chillers. (So far, this has resulted in annual saving of 6 Megawatts, equivalent to SAR 7,008,000 per year.)
- Implementation of Variable Frequency Drive (VFD) in heating, ventilation, and air conditioning (HVAC) systems to match electrical current with demand. (This reduces motor consumption by more than 50%)
- Incorporation of high-efficiency thermal insulation in buildings, leading to a 40% reduction in air conditioning costs.
- Replacing conventional lighting lamps with LED fixtures in existing buildings, including B21, B22, B24, B42, B61, Student Dorms (8 Buildings), and 175 houses in Ferdouse. This initiative is ongoing. (Total cost amounts to SAR 2,531,936. LED lighting reduces lighting costs by 40% when replacing CFL lamps and over 60% when upgrading from older types of lamps.)
- To have an energy efficiency plan in place to reduce overall energy consumption.
- Undergo energy reviews to identify areas where energy waste is highest.

Carbon reduction and emission reduction process

KFUPM demonstrates its strong commitment to carbon reduction and emission reduction through its subscription to Hopon, the first Saudi-owned micro-mobility company. By supporting initiatives like this, the university actively contributes to making cities more livable, reducing car usage, easing traffic congestion, and curbing carbon emissions. In addition, we have the KFUPM Climate Action Plan that includes the steps and process for reducing carbon dioxide emissions.



Energy consumption on campus

Environmental Sustainability Strategy: Energy

KFUPM's President has instituted an active committee dedicated to driving power-saving initiatives and practices. The Environmental Sustainability Strategy: Energy is an integral part of it and was designed as a plan with the aim to reduce energy consumption by monitoring and reducing energy waste in buildings and facilities as well as outlining goals, objectives and concrete actions that can help save money and protect the environment. In addition, KFUPM created the Climate Action Plan as an important tool for inspiring action and joined the Race to Zero campaign as a Signatory.

Goals:

- Emissions reduction by switching energy systems from fossil fuels to renewables like solar or wind power
- Complete transition to LED lights
- Reduce electricity demand during peak times
- Drive adoption of energy-efficient technologies
- Have a sustainable campus by 2060
- Taking simple steps to save energy: walking, cycling, using Hopon

Further actions:

- **Assess the current carbon footprint of the university**: Includes measuring energy consumption, greenhouse gas emissions, and water usage. (This data will help identify the areas that require immediate attention and prioritizing.)
- **Adopt energy-efficient practices.**
- **Monitor and promote progress:** Regularly monitor and report progress towards goals to track success and identify areas that need further attention.

KFUPM's Center of Excellence in Energy Efficiency (CEEE) Energy Audit

At KFUPM, we are dedicated to optimizing our energy consumption through the Center of Excellence in Energy Efficiency (CEEE). Our primary focus is on enhancing energy efficiency across campus. This is in line with The Kingdom's Vision 2030, helping to reduce the environmental impact of carbon, while also making a positive economic impact on KSA. The CEEE conducts comprehensive energy audits and initiates various projects aimed at sustainable energy practices. These audits provide valuable insights into our energy usage patterns and help identify areas for improvement.

Main activities:

- Completed the energy auditing and assessment of student dormitories at KFUPM, covering Building 820 (conventional) and Building 841 (renovated). Measurements were taken and analysed by two part-time undergraduate students supervised by the CEEE team. Estimated annual savings are 107,689 kWh, about 80,676 kg of CO_2 and SAR 58,461 per year, bringing Energy Use Intensity down to 50.8 and 82.8 kWh/m² per year for the two buildings respectively. Reported on pages 19–21 of CEEE Annual Progress Report 8

- Sustainable mobility study was conducted at KFUPM introducing an optimization framework to guide the transition of KFUPM's bus fleet from diesel to battery electric power over a 20-year horizon (published under the title "Towards Sustainable Campus Mobility: Optimal Transition Planning for Battery Electric Bus Fleets").

- The KFUPM Net-Zero Building Living Lab was established to address the lack of a dedicated real-world environment for demonstrating energy-efficiency and sustainability technologies.

  Source for the activities above: CEEE Annual Progress Report 8 (May 2026), pages 19–24, covering institutional leadership, the student dormitory energy audit, the Net-Zero Building Living Lab and the Center's key performance indicators to May 2026. CEEE Annual Progress Report 8

- Completed the energy auditing and assessments of two chiller plants at KFUPM, which measured and assessed their chiller performances and electric energy consumption.

  Reported in CEEE Annual Progress Report 7 (May 2026), which sets out the measured chiller performance and electric energy consumption for the two plants. CEEE Annual Progress Report 7

Energy and the community

KFUPM is dedicated to a comprehensive approach toward sustainable energy practices and environmental awareness. This commitment is reflected in the recently published Energy Consumption Report for the period **2018–2022**, where the university meticulously analyzed changes in its consumption patterns, identified areas with substantial electricity demand, and outlined policies and efforts to curtail energy usage. The overarching objective is to achieve complete campus sustainability by 2060, with a commitment to utilizing 100% renewable energy.

The university's commitment extends beyond its campus, reaching into the wider community. Here is an overview of KFUPM's initiatives focusing on energy efficiency, outreach, and partnership endeavors.

1. Educational and Training Initiatives:

- **Awareness Programs:** the **Renewable Energy Technical Incubator (RETI)** at KFUPM conducts training, awareness programs, and energy efficiency workshops for both university students and external institutions.[1] Most of the trainees were undergraduate students from various Saudi universities, institutes, and companies. Energy Saving Campaigns are also running continuously to encourage people to save energy and reduce carbon emissions at home and on the move.

- **Educational Programs:** KFUPM offers multidisciplinary master's programs in Sustainable and Renewable Energy, preparing professionals to navigate the complexities of the energy sector's transformation:



  - Multidisciplinary Master's program (MX) in Sustainable and Renewable Energy.[2]
  - Master of Engineering Program in Sustainable and Renewable Energy.[3]

- **Educational Course:** Integration of sustainability into ME441: Energy and the Environment at KFUPM. The course connects engineering fundamentals with environmental impact assessment, renewable energy, and mitigation strategies. Teaching materials incorporate energy-consumption data and Saudi Arabian examples of renewable energy. A dedicated assignment asks students to examine Saudi Vision 2030 objectives and relate them to the United Nations Sustainable Development Goals. The initiative supports sustainability literacy and the application of engineering knowledge to environmental challenges. [4]

[1] RETI report (p. 19)

[2] MX in Sustainable and Renewable Energy

[3] M.Eng in Sustainable and Renewable Energy

[4] ME 441 lecture slides, Chapter 1

2. Policy Development and Services:

KFUPM actively contributes to local, regional, national, and global initiatives and policies in clean energy and energy-efficient technology, including the **Nationally Determined Contributions, National Communication** (NC) and the **Biennial Update Report** (BUR), addressing vital aspects like greenhouse gas emissions, climate change research, and public awareness. In most of these reports, the support of KFUPM was acknowledged. Several past and current employees were the main contributing authors of all Saudi NCs and the BUR. The name and role of the KFUPM employees are mentioned in the reports:

- First National Communication of Saudi Arabia (2005): https://unfccc.int/documents/81604
- Second National Communication of Saudi Arabia (2011): https://unfccc.int/documents/81605
- Third National Communication of Saudi Arabia (2016): https://unfccc.int/documents/81607
- First Biennial Update Report of Saudi Arabia (2018): https://unfccc.int/documents/65418
- Fourth National Communication of Saudi Arabia (2022): https://unfccc.int/documents/461529
- 2024 Biennial Transparency Report (BTR) of Saudi Arabia: https://unfccc.int/documents/646153
- Nationally Determined Contributions of Saudi Arabia (2025): https://unfccc.int/documents/497886

Energy Efficiency Services: energy efficiency assessments and workshops, and research on renewable energy options are delivered on a paid or free basis to international and local organizations and governments. Fundamentals of Energy Efficiency is one of the free courses including energy conservation, efficiency, and renewable energy, along with their role in global energy trends and decarbonization.

3. Collaborative Partnerships and Research:

Consortiums: KFUPM hosts consortiums like the Consortium for Hydrogen Future, dedicated to acceleration of the energy transition to a carbon-neutral hydrogen economy, and the Consortium for a Sustainable Future, fostering collaboration between academia, industry, and government for sustainable solutions.

Industry Collaborations: Collaborative research agreements have been established with industry giants like Schneider Electric and Yokogawa, showcasing KFUPM's dedication to innovation and technology transfer. KFUPM's Innovation & Technology Transfer office expresses its aspiration to be among the world's most visible technology transfer offices.
Websites:
Dhahran Techno Valley interactive map of companies and partners based at the valley: https://dtv.sa/interactive-map. IRC-SES list of research collaborators: https://ri.kfupm.edu.sa/irc-ses/about-us/collaborators.

4. Student Involvement and Entrepreneurship:

- **Student Innovations:** KFUPM encourages student-led initiatives in renewable energy. Competitions and support from the **Entrepreneurship Institute** (EI) from idea to impact have led to the establishment of student ventures promoting energy-efficient solutions. One example is **MyCorr** — a company, established by a KFUPM student, which offers engineering solutions for energy in buildings using automation and solar energy. **Fhm of Things** in Dhahran Techno Valley, KFUPM, is another startup for IoT/smart-building providing HVAC automation, energy optimization, predictive analytics and integrated facility-control systems having advanced algorithms to minimize energy consumption while maintaining optimal comfort levels.[5]

- **Leadership Recognition:** KFUPM alumni hold key positions in the renewable energy sector,[6] reflecting the university's role in nurturing future leaders in the field.

- **Research Incubation:** IRC-REPS is actively working on the establishment of a Renewable Energy Technical Incubator (RETI).[7] This initiative aims to support research, development, and innovation (RDI) projects in renewable energy, energy efficiency, and Industry 4.0 applications in the energy sector. The Incubator administers five programs to support research at different Technology Readiness Levels, attracting researchers and entrepreneurs from undergraduate students at KFUPM and other universities in KSA to start-up enthusiasts.

5. Future Outlook and Partnerships:

- **NEOM Green Hydrogen Company:** KFUPM's alumnus, Wesam Y. Alghamdi, stepping into a leadership role at the company signifies recognition of the university's impact and potential for future collaborations.

- **Student Engagement:** KFUPM students actively engage in discussions on the Kingdom's progress in renewable energy, emphasizing the importance of technological innovation and overcoming challenges. Numerous graduate students, researchers, and professors participated in a collaborative initiative between KFUPM and the King Abdullah City for Atomic and Renewable Energy (K.A.CARE), dedicated to advancing science, technology, education, and industrial development in the realm of renewable energy, particularly emphasizing solar energy research to realize the objectives of KSA's Vision 2030.[8] Annual Conference (SAS-CI 2026)[9] featured keynote speeches by well-known researchers and workshops on energy-saving policies in including Energy Voice Debate program[10].

[5] Fhm of Things: https://fhmofthings.com

[6] NEOM Green Hydrogen Company names new CEO. https://www.arabnews.com/business/neom-green-hydrogen-co-announces-leadership-change-with-new-ceo-2398146

[7] IRC-REPS — NIDLP's Renewable Energy Technology Incubator (RETI): https://ri.kfupm.edu.sa/irc-ses/reti

[8] https://www.arabnews.com/node/1586631/saudi-arabia

[9] 16th Saudi Arabian Section of the Combustion Institute Annual Conference: https://sas-ci26.com/en

[10] Annual Conference agenda: https://sas-ci26.com/en/conference-agenda

KFUPM's commitment to pioneering sustainable energy practices echoes far and wide, making headlines both locally and internationally. Below quotes from news stories featuring our esteemed alumni and talented students are presented:

Arab News. https://www.arabnews.com/node/2398146/business-economy

> NEOM Green Hydrogen Company (NGHC) Chairman Nadhmi Al Nasr, has announced that its CEO David Edmondson will be succeeded by Wesam Y. Alghamdi. An alumnus of KFUPM, Wesam Y. Alghamdi has a strong track record of performance anchored in strategic planning and technical execution, which will be pivotal in leading the company's next era of growth.

15 Agreements Broaden KFUPM's Horizons: https://www.moenergy.gov.sa/en/media-center/news/15-agreements-broaden-kfupms-horizons

> KFUPM signed a Memorandum of Understanding with King Abdullah City for Atomic and Renewable Energy. The aim is to enhance the development of technologies in the fields of renewable energy, nuclear energy, hydrogen, and artificial intelligence applications. The memorandum includes efforts to build human capacities to support the energy sector and its various applications by developing educational programs, offering scholarships, and launching specialized training programs for entrepreneurs and technology incubators. This initiative seeks to promote innovation and support sustainable development.

King Fahd University of Petroleum and Minerals stands at the forefront of sustainable energy education, research, and outreach. Through its innovative programs, collaborative and community efforts, and commitment to nurturing future pioneers, KFUPM aspires to serve as a driving force in shaping a sustainable energy future for the Kingdom and beyond.



Dr. Atif AlZahrani
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Pure Profile



جامعة الملك فهد للبترول والمعادن

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