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جامعة تبوك
University of Tabuk

SDG 7: Affordable and Clean Energy

7 AFFORDABLE AND CLEAN ENERGY

U_Tabuk

The University of Tabuk is deeply committed to promoting sustainable energy solutions as part of its broader responsibility toward environmental stewardship and national development goals. Through research, innovation, and operational practices, the university actively contributes to the global transition toward affordable and clean energy. This includes advancing clean energy research, improving energy efficiency across its infrastructure, reducing carbon emissions, and supporting policies and technologies that facilitate a low-carbon future. Additionally, the university engages with the local community and industry to promote awareness, share expertise, and drive innovation in renewable energy and energy efficiency.The following provides an overview of the key initiatives and actions implemented by the University of Tabuk in support of clean, accessible, and sustainable energy for all.

7.1 Research on clean energy

The University of Tabuk has demonstrated a strong commitment to advancing research in the fields of energy and energy efficiency. This commitment is reflected in the university's growing portfolio of publications in high-impact, peer-reviewed journals. The research output addresses critical areas such as optical conductivity, advanced energy storage technologies, and sustainable waste-to-energy solutions—highlighting both the breadth and applied relevance of the university's scientific contributions.

Recent examples of this research include:

- **Semab et al. (2024)**: A theoretical investigation into symmetrical non-fullerene electron acceptor molecules based on BDTPT derivatives, aimed at enhancing the photovoltaic performance of organic solar cells (*Computational and Theoretical Chemistry*, 1241, p.114891).

- **Bouzgarrou et al. (2024)**: A study on the integrated transformation of biomass feedstocks into sustainable biohydrogen, oxygen, electricity, and heat within a poly-output system (*Process Safety and Environmental Protection*, 188, pp.177–192).

- **Abdelgaleel et al. (2024)**: An experimental and theoretical analysis of a modified solar distillation system utilizing various composite materials to improve performance (*Solar Energy*, 272, p.112469).

These research efforts underscore the University of Tabuk's role as an emerging center for clean energy innovation, contributing to both national priorities and global sustainable development goals

7.2 University measures towards affordable and clean energy

7.2.1 Energy-efficient renovation and build

As part of its commitment to environmental sustainability and in alignment with the goals of Saudi Vision 2030, the University of Tabuk has established an institutional policy for energy efficiency and clean energy, grounded in its partnership with the National Energy Services Company (Tarshid). This policy aims to enhance energy consumption efficiency across university facilities through the implementation of a comprehensive project covering 54 buildings

with a total area of 238,000 square meters. The project applies 12 technical standards, including the improvement of HVAC systems, replacement of traditional lighting with LED technology, and installation of smart sensors to control energy use. The project is expected to achieve a 19% reduction in annual electricity consumption and contribute to carbon emission reductions equivalent to planting over 136,000 trees annually. This policy reflects the university's broader strategy toward creating a sustainable campus environment and actively supporting the United Nations Sustainable Development Goals.

For details see page 12-13

Energy Efficiency and Clean Energy Policy

7.2.2 Upgrade buildings to higher energy efficiency

University of Tabuk Energy Conservation and Efficiency Plan

1. **Monitor the implementation of all directives and orders related to energy conservation,** including electricity and fuel consumption, to ensure full compliance with national and international standards.

2. **Accurately measure energy consumption levels** through systematic data collection and analysis, and develop a comprehensive action plan that identifies opportunities to reduce consumption, with continuous follow-up on implementation.

3. **Provide the Saudi Energy Efficiency Center (SEEC) with required data and reports,** and implement all relevant standards, programs, and guidelines issued by the center to align with national energy efficiency goals.

4. **Implement technical and operational measures to enhance energy efficiency across all university facilities,** including but not limited to:

- Improving the efficiency of air conditioning systems, which account for approximately 60–70% of electricity consumption.
- Adopting water-cooled chillers in place of older air-cooled systems, achieving annual energy savings of approximately 6 megawatts (equivalent to SAR 7 million).
- Installing Variable Frequency Drives (VFD) in heating, ventilation, and air conditioning (HVAC) systems to reduce motor energy consumption by over 50%.
- Incorporating high-efficiency thermal insulation in buildings to reduce cooling costs by up to 40%.
- Replacing conventional lighting systems with energy-efficient LED fixtures in academic, administrative, and residential buildings.

5. **Prepare and submit periodic detailed reports on energy costs and consumption to senior management,** including recommendations for performance improvements and cost reductions.

6. **Raise awareness and provide environmental education for university staff and students** about the importance of energy conservation and methods to improve efficiency through targeted

campaigns, training sessions, and awareness activities.

7. **Conduct regular energy audits within facilities** to identify major sources of energy waste and develop effective mitigation strategies.

For details see:

Tabuk University's plan for energy conservation and efficiency

It was announced through the Saudi Press Agency that "Tarshid" has completed the energy efficiency improvement project at the University of Tabuk, achieving an estimated energy savings of around 24%.

https://www.spa.gov.sa/N2191965

This plan ensures effective implementation of the University of Tabuk's overall energy policy and reflects its commitment to supporting Saudi Vision 2030 and environmental sustainability.

7.2.3 Carbon reduction and emission reduction process

The University of Tabuk has established a comprehensive process for carbon management and the reduction of carbon dioxide (CO_2) emissions across its operations.

This process is driven by strategic partnerships, institutional research, community engagement, and capacity-building initiatives that support the Kingdom's Vision 2030 and its commitment to environmental sustainability.

1. Strategic Partnership and Innovation Initiatives

A cornerstone of this effort is the university's leadership in launching the NetZero Innovation Centre, in partnership with NEOM, Red Sea Global, and Teesside University. This national alliance aims to:

- Develop technologies for carbon removal.
- Promote low-emission and alternative energy sources such as hydrogen and wind.
- Foster circular carbon economy systems to reduce waste and carbon intensity.
- Build on existing funded research in collaboration with key national projects.

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2. International Collaboration

The university has also hosted a high-level delegation from Japan, including representatives from the Japanese Ministry of Trade and Industry, the Energy Efficiency Center of Japan, and Rich Consultancy. The visit aimed to explore partnerships that promote sustainable technologies and carbon-reduction solutions through knowledge exchange and joint initiatives.

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3. Training and Capacity Building

Through the Institute for Research and Consultation and the Renewable Energy and Environmental Technology Center, the university offers specialized training programs such as:

“Design of Medium and Small-Scale Solar Energy Systems (1 kW – 2 MW) Connected to Distribution Networks,” aimed at upskilling professionals in clean energy system design and integration.

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4. Workshops and Sector Collaboration

The Innovation and Entrepreneurship Center organized a workshop titled "Innovation in Energy Systems and Cybersecurity Challenges," highlighting:

- Energy efficiency improvement
- Smart grid security
- Digital transformation in energy sectors

with participation from national entities such as the Royal Saudi Air Force (King Faisal Air Base), the Saudi Electricity Company, and BAE Systems.

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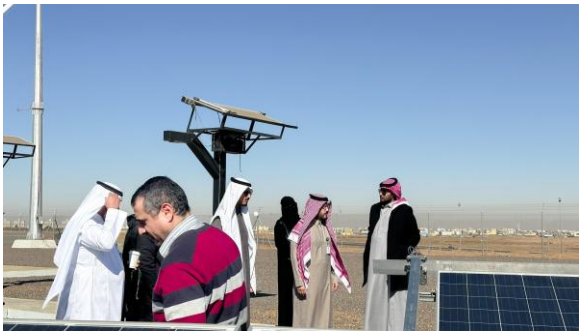
5. Consultancy and Knowledge Transfer

The university continues to strengthen its applied role in carbon management through collaborative work between the Institute for Research and Consultation and the Renewable Energy Center, offering advisory and training services to public and private sectors to support energy transition strategies.



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6. Afforestation and Green Campus Initiative

As part of its carbon offset strategy, the University of Tabuk has launched a campus-wide afforestation initiative, managed by a dedicated committee responsible for expanding green spaces across the university. The project aims to absorb atmospheric CO_2, improve air quality, and create a more sustainable and climate-resilient campus. The initiative is integrated into the university's environmental policy and reflects its long-term commitment to sustainability and biodiversity.

Permanent Committee for Afforestation and Landscaping Strategy

7. Community Engagement and Awareness

The university promotes awareness campaigns and training programs aimed at educating staff, students, and faculty about carbon footprint reduction and sustainable environmental practices. These efforts foster a culture of environmental responsibility and align with the university's role in leading climate-conscious change within the region.

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8. Innovative Solar Monitoring System Contributing to Carbon Reduction

As part of its commitment to sustainability and energy efficiency, the Renewable Energy & Energy Efficiency Center at the University of Tabuk has developed a wireless sensor network system for solar panels. This innovative system is designed to monitor performance metrics and automate the cleaning of solar panels, ensuring optimal energy output and long-term system reliability.

By maintaining high operational efficiency of solar energy systems, the technology contributes directly to reducing carbon emissions. Cleaner, more consistent energy output from solar panels means a decreased reliance on fossil fuels, thereby supporting Saudi Arabia's transition to low-carbon energy sources. The automated nature of the system also reduces the need for frequent manual inspections or transport-based maintenance, cutting down on emissions related to human intervention and logistics.

Furthermore, the system has the potential to be integrated into smart grid and IoT-based energy management frameworks, enabling more efficient load distribution and further minimizing energy waste. This type of smart technology not only enhances the lifecycle performance of renewable infrastructure but also aligns with broader national and institutional carbon reduction goals.

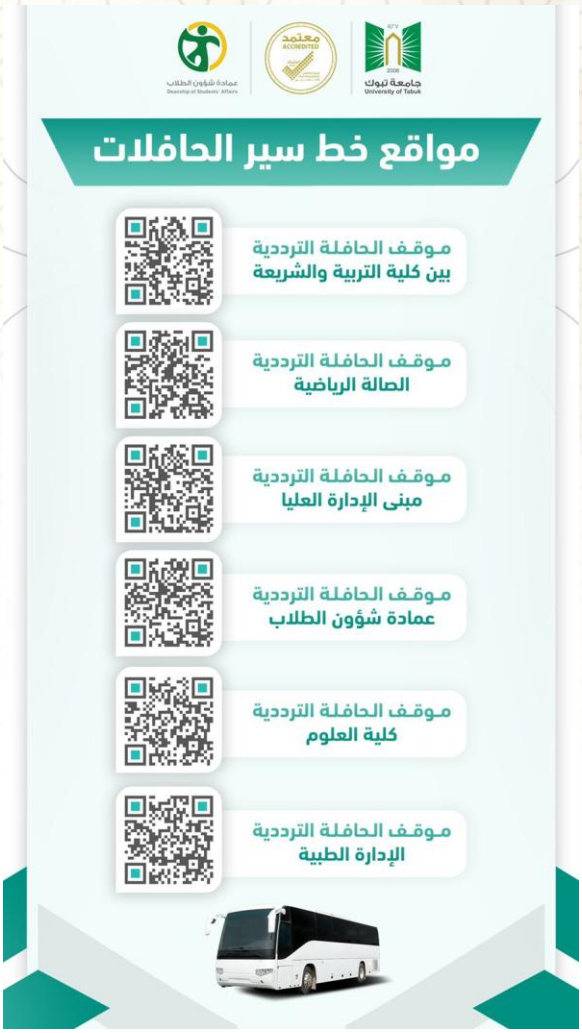
The project reflects the University of Tabuk's role in developing practical, research-driven solutions that promote environmental stewardship and innovation in clean energy technologies.

9. Sustainable Transport Services

To further reduce its carbon footprint, the University of Tabuk provides free shuttle transport services for students and staff, minimizing the number of private vehicles entering the campus. This initiative contributes directly to the reduction of CO_2 emissions and supports the university's sustainable mobility goals.

https://www.ut.edu.sa/campus-life/student-services-and-support

The President of the University of Tabuk, Prof. Dr. Abdulaziz Al-Ghamdi, and the Secretary of Tabuk Municipality, Eng. Hossam Al-Yousef, inaugurated the new Public Transport Station on campus to enhance infrastructure and ease mobility for students and staff. https://x.com/u_tabuk/status/1965052927434711198?s=48



10. Research Group on Renewable Energy and Power Conversion Technologies

The University of Tabuk hosts a dedicated research group on Renewable Energy and Power Conversion Technologies, contributing actively to the United Nations Sustainable Development Goals (SDGs). The group conducts both fundamental and applied research in areas such as:

- Smart grid technologies
- Flexible AC transmission systems (FACTS)

- Power electronics
- Thermal systems and energy management
- Integration of wind farms into energy networks
- Grid frequency dynamics and hybrid renewable systems
- Hydrogen production and future energy storage systems
- Fuel cell applications

This research group supports the university's carbon reduction mission by advancing technological innovation in clean energy systems and enabling the transition toward a low-carbon energy future.

https://www.ut.edu.sa/research/research-groups-areas

7.2.4 Plan to reduce energy consumption

The University of Tabuk has implemented a structured energy efficiency plan aimed at reducing overall energy consumption across its campus infrastructure.

This plan is guided by the university's commitment to sustainability and aligned with the goals of Saudi Arabia's Vision 2030 and the standards set by the Saudi Energy Efficiency Center (SEEC). A formal partnership with the **National Energy Services Company (Tarshid)** supports this strategy by delivering large-scale retrofitting and optimization projects.

Key components of the plan include:

- **Upgrading HVAC systems** to high-efficiency, energy-saving models.
- **Adoption of LED lighting** across all academic, administrative, and residential buildings.
- **Integration of smart motion and lighting sensors** to minimize unnecessary consumption.
- **Thermal insulation improvements** to reduce cooling loads in buildings.
- **Implementation of water-cooled chillers** and variable frequency drives (VFDs) in ventilation systems to reduce power consumption.
- **Regular energy audits and performance tracking** to identify and address areas of energy waste.
- **Application of the Saudi Building Code and Saudi Green Building Guidelines** in all new construction and renovations.
- **Awareness campaigns and training** to promote responsible energy behavior among staff and students.

In collaboration with Tarshid, the university has retrofitted **54 buildings** covering over **238,000 m²**, achieving an expected reduction of nearly **19%** in annual electricity consumption, equivalent to savings of more than **15 million kWh** per year.

Furthermore, the University of Tabuk takes pride in being recognized by the Saudi Energy Efficiency Center for its outstanding role in improving energy efficiency. The

university achieved a **100% score on the Energy Efficiency Performance Card for two consecutive years (2023-2024)**. This accolade demonstrates the effectiveness and success of the university's energy efficiency initiatives, underscoring its commitment to sustainable energy management in alignment with national standards and the objectives of Vision 2030.

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This comprehensive energy efficiency strategy confirms the university's institutional commitment to resource conservation, carbon footprint reduction, and sustainable campus operations.

For details see:

Tabuk University's plan for energy conservation and efficiency

Report of the NetZero Innovation Centre

Digital Transformation Plan

It was announced through the Saudi Press Agency that "Tarshid" has completed the energy efficiency improvement project at the University of Tabuk, achieving an estimated energy savings of around 24%.

https://www.spa.gov.sa/N2191965

7.2.5 Energy wastage identification

The University of Tabuk regularly conducts comprehensive energy reviews as part of its sustainability strategy and its commitment to achieving national energy efficiency objectives. These reviews are undertaken in collaboration with internal departments and relevant national agencies to analyze energy consumption patterns and identify areas with the highest potential for energy savings.

As a result of these efforts, the university was recognized by the Saudi Energy Efficiency Center for achieving a 100% score in the Energy Efficiency Performance Scorecard for both 2023 and 2024. This recognition highlights the university's structured approach to energy monitoring, auditing, and the implementation of targeted corrective actions.

Energy reviews are data-driven and focus on key infrastructure systems, including HVAC, lighting, and building insulation. Based on audit findings, the university has implemented a range of energy-saving measures, such as retrofitting outdated systems, installing high-efficiency technologies, and launching campus-wide awareness initiatives to promote energy-conscious behaviors.

Evidence:

- **Official recognition** from the Saudi Energy Efficiency Center (2023–2024):

  https://x.com/u_tabuk/status/1938166595714527676?s=48

- **Energy audit reports and implementation plans**:

Energy Audit and Monitoring Report and Implementation Plans

Tabuk University's plan for energy conservation and efficiency

7.2.6 Divestment policy

The University of Tabuk affirms its commitment to environmental responsibility and sustainable development through a responsible investment approach. Currently, the university holds no investments in carbon-intensive extractive industries such as coal and oil, and it conducts regular reviews to maintain this position. This policy establishes a foundation for future investment decisions aligned with environmental, social, and governance (ESG) standards, emphasizing transparency, accountability, and support for the national transition toward a green economy and a cleaner environment. To learn more about the policy, please see the link below.

For details see page 14

Sustainable Investment Policy

7.4 Energy and the community

7.4.1 Local community outreach for energy efficiency

The University of Tabuk is actively engaged in community education and capacity building on energy efficiency and clean energy technologies as part of its third strategic plan. The university offers a range of programs, workshops, and seminars that involve students, faculty, and the wider local community to promote sustainable energy awareness and skills.

The Career Office within the Deanship of Student Affairs collaborates with partners such as NEOM Green Hydrogen Company to provide entry-level training programs designed to prepare the national workforce for careers in energy, water, and related sectors.

The College of Engineering's Club hosted a workshop led by Dr. Hussam Samakri to introduce renewable energy concepts and dispel common myths about clean energy.

The Innovation and Entrepreneurship Center organized a workshop on "Innovation in Energy Systems and Cybersecurity Challenges," which addressed topics like digital transformation in the energy sector, smart grid security, and energy efficiency, with participation from key government bodies including King Faisal Air Base and the Saudi Electricity Company.

The Research and Consulting Institute, in cooperation with the Renewable Energy and Environmental Technology Center, recently offered a specialized training course on designing solar energy systems ranging from 1 kW to 2 MW, integrated with distribution networks, enhancing practical skills in solar energy deployment.

Furthermore, the Deanship of Graduate Studies and Research hosted a scientific seminar by the university's Energy Storage Group in partnership with the University of Nottingham, highlighting cutting-edge research and developments in energy storage technologies.

In addition, the university's Green Sustainable Solar Cells Research Group held a public seminar to present advances in clean solar energy solutions, further contributing to community awareness and innovation in renewable energy technologies.

Together, these initiatives strengthen the local community's understanding and capabilities in energy efficiency and clean energy, supporting Saudi Arabia's green transition.

For more details, see:

NEOM Training Program

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Renewable Energy Workshop

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Innovation in Energy Systems Workshop

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Solar Energy Systems Training

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Energy Storage Seminar

Energy Storage Seminar

Also, the University of Tabuk regularly disseminates awareness messages on energy conservation across campus facilities and through its digital platforms. These

messages aim to raise awareness among students, faculty, staff, and the local community about the importance of adopting energy-efficient practices in daily life.

7.4.2 100% renewable energy pledge

While the University of Tabuk has not yet published a formal institutional pledge toward achieving 100% renewable energy, it actively promotes awareness, dialogue, and capacity building on clean energy across the broader community. These efforts are in line with Saudi Arabia's Vision 2030 and contribute meaningfully to public understanding and support for sustainable energy transition.

1. Training Programs for the Community in Collaboration with NEOM Green Hydrogen Company

As part of its third strategic plan, the University of Tabuk—through the Career Office at the Deanship of Student Affairs—organized a training and employment program in collaboration with NEOM Green Hydrogen Company. The program provided interviews and onboarding opportunities for local youth, aiming to qualify national talents to work in energy, water, and related industrial sectors. This effort not only addresses workforce development but also raises community awareness of future clean energy jobs.

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2. Public Awareness Workshop on Renewable Energy Concepts

The College of Engineering at the University of Tabuk hosted a workshop titled **"Renewable Energy"**, led by Dr. Hussam Samakri (Assistant Professor in the Department of Electrical Engineering). The workshop was designed to educate students and community participants about the fundamentals of renewable energy and to correct common misconceptions.

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3. Seminar on Innovation in Energy Systems and Cybersecurity

Through the Innovation and Entrepreneurship Center, the university organized a workshop entitled "Innovation in Energy Systems and Cybersecurity Challenges". It highlighted key topics such as digital transformation in the energy industry, smart grid security, and energy efficiency improvements. Participants included government entities such as the Saudi Electricity Company, King Faisal Air Base, and BAE Systems. The event served as a platform for multi-sector dialogue and community learning.

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4. Specialized Training Course on Solar System Design

The Research and Consulting Institute, in partnership with the Renewable Energy and Environmental Technology Center, conducted a hands-on training course titled: "Design of Medium and Small Solar Energy Systems (1 kW – 2 MW) Integrated with Distribution Networks." This course was targeted at both university members and external participants, including engineers and technical staff in the region, contributing to real-world applications of clean energy.

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5. Scientific Seminar on Energy Storage Technologies

The Deanship of Graduate Studies and Scientific Research hosted a scientific seminar presented by the Energy Storage Research Group in collaboration with the University of Nottingham (UK). The seminar, open to researchers and the public, focused on advancements in energy storage systems, which are a core component of renewable energy integration.

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6. Green Sustainable Solar Cells Seminar

As part of its ongoing efforts in sustainable energy, the university also held a scientific seminar for its Green Sustainable Solar Cells Research Group. The session covered clean and environmentally friendly photovoltaic innovations and was aimed at promoting solar energy technology to the university community and the public. https://x.com/ut_dgs/status/1924854677104968112?s=48

7. Awareness Messages on Energy Conservation

In parallel with these events, the University of Tabuk disseminates regular awareness messages across its campus and digital platforms to promote energy-saving practices among the community. These messages cover practical tips on reducing electricity consumption, using efficient appliances, and adopting sustainable behaviors in daily life.

8. National Recognition in Energy Efficiency (Supports Outreach Credibility)

Further underscoring its leadership in sustainability, the University of Tabuk was recognized by the Saudi Energy Efficiency Center for achieving a 100% score on the Energy Efficiency Performance Card for two consecutive years (2023 and 2024). While

this recognition reflects internal performance, it enhances the university's credibility in promoting broader public energy efficiency values and responsible energy use. https://x.com/u_tabuk/status/1938166595714527676?s=48

9. Advanced Research in Renewable Energy and Energy Conversion Technologies

The University of Tabuk further strengthens its commitment to renewable energy through its dedicated Renewable Energy and Energy Conversion Research Group. This group conducts both fundamental and applied research aimed at supporting the United Nations Sustainable Development Goals. Their work spans smart grid technologies, flexible AC transmission systems, power electronics, clean energy, thermal systems, energy conversion and management. The research also includes integrating and expanding wind farms in energy systems, studying grid frequency dynamics, hybrid renewable energy systems (both off-grid and grid-connected), future energy storage technologies including hydrogen production, and fuel cell applications. This advanced research underpins UT's leadership in innovation and sustainable energy, contributing substantially to both local and national clean energy initiatives.

https://www.ut.edu.sa/research/research-groups-areas

10. Leadership in NetZero Innovation Centre

A cornerstone of the University of Tabuk's commitment to sustainability and renewable energy is its leadership role in launching the NetZero Innovation Centre, in partnership with NEOM, Red Sea Global, and Teesside University. This national alliance focuses on developing cutting-edge technologies for carbon removal, promoting low-emission and alternative energy sources such as hydrogen and wind, and fostering circular carbon economy systems aimed at reducing waste and carbon intensity. The Centre builds upon existing funded research and collaborates closely with key national projects, positioning UT at the forefront of Saudi Arabia's clean energy transition.

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12. Renewable Energy Implementation on Campus

The University of Tabuk is actively transitioning its campus operations toward renewable energy solutions, including the installation of solar panels and the adoption of energy-efficient systems. These tangible steps demonstrate the university's commitment to sustainability and serve as a model for other institutions.

12. Official Accreditation for Renewable Energy Training

The King Abdullah City for Atomic and Renewable Energy has officially approved the Renewable Energy and Energy Efficiency Center at the University of Tabuk as an accredited center to offer specialized training courses in solar energy system design. This accreditation supports the university's strategic focus on developing its scientific centers and advancing renewable energy expertise.

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Although the University of Tabuk has not formally signed a public pledge toward 100% renewable energy, it actively promotes this goal through strategic partnerships, technical training, public seminars, and awareness activities involving community stakeholders. These efforts directly support national sustainability targets and help cultivate a well-informed society ready to adopt and advocate for renewable energy solutions.

7.4.3 Energy efficiency services for industry

The University of Tabuk actively provides direct services to local industry aimed at improving energy efficiency and advancing clean energy technologies. Through its specialized centers, research groups, and national collaborations, the university supports local and regional entities in transitioning toward sustainable energy practices.

Renewable Energy and Energy Efficiency Center

UT's Renewable Energy and Energy Efficiency Center plays a pivotal role in serving local industries through:

- Technical training and consulting in solar energy system design
- Workshops on renewable energy and smart grid applications
- Capacity building in energy management and efficiency

The center has been officially accredited by King Abdullah City for Atomic and Renewable Energy (K.A.CARE) to deliver certified training programs in the design of solar energy systems (1 kW – 2 MW), reinforcing its role as a national provider of clean energy education and technical capacity building.

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Collaborative Industry Engagement and Applied Research

UT collaborates with several national partners on clean energy research and innovation projects:

In partnership with **NEOM, Red Sea Global, and Teesside University**, UT co-leads the **NetZero Innovation Centre**, which supports:

- Carbon removal technologies
- Low-emission energy (e.g., hydrogen and wind)
- Circular carbon economy solutions
- Integration of clean technologies in national projects

This platform strengthens UT's role in delivering research and technology that directly supports energy transition in Saudi industries.

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Hosting National Energy Monitoring Infrastructure

The university has signed a memorandum of understanding with King Abdullah City for Atomic and Renewable Energy to host solar and wind energy resource monitoring stations. This partnership provides high-quality data for industrial and governmental

stakeholders planning renewable energy deployment in the region.

Achievement File – Renewable Energy and Environmental Technology Center

Industrial Solar Energy Solutions and Automation Support

A signed agreement with the Saline Water Conversion Corporation (SWCC) involved the university in installing a solar panel monitoring and automated cleaning system at the Khafji solar energy station. UT contributed to the integration of energy-efficient technologies in real-world operations.

Achievement File – Renewable Energy and Environmental Technology Center

Innovation and Knowledge Transfer Activities

UT hosts a variety of public workshops and seminars that benefit both academia and industry:

Workshop: Innovation in Energy Systems and Cybersecurity – addressed energy efficiency, smart grid protection, and digital transformation in energy sectors, with participation from:
King Faisal Air Base
Saudi Electricity Company
BAE Systems

https://x.com/event_ut/status/1853480596011708635?s=48

Training Workshop: Solar Energy Design and Grid Integration – provided technical know-how for industry engineers and developers.

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Through its research centers, national partnerships, accredited training programs, and industrial collaborations, the University of Tabuk delivers a wide range of direct services that support energy efficiency and clean energy adoption in the Kingdom of Saudi Arabia. These efforts are fully aligned with Vision 2030 and contribute to building a sustainable, knowledge-based economy.

7.4.4 Policy development for clean energy technology

The University of Tabuk actively supports government efforts in developing policies related to clean energy and energy-efficient technologies. The university contributes through multidisciplinary research, technical consultations, capacity-building programs, and strategic partnerships, providing evidence-based insights and innovative solutions that help shape effective and sustainable national energy policies.

For example, the university's research group on Renewable Energy and Energy Conversion Technologies conducts fundamental and applied research in critical policy areas such as smart grid technologies, flexible AC transmission systems, power electronics, energy storage including hydrogen production, and integration of renewable energy sources like wind farms.

https://www.ut.edu.sa/research/research-groups-areas

Additionally, the Institute for Research and Consultation, in collaboration with the Renewable Energy and Environmental Technology Center, offers specialized training programs such as *"Design of Small*

and Medium Solar Energy Systems (1 kW–2 MW) integrated with distribution networks." These programs build technical capacity among professionals and stakeholders to support the implementation of clean energy policies.

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Moreover, the Renewable Energy and Energy Efficiency Center at the University of Tabuk has been officially accredited by King Abdullah City for Atomic and Renewable Energy (K.A.CARE) as a certified training provider for specialized courses in solar energy system design. This accreditation underscores the university's commitment to national capacity-building efforts aligned with government energy strategies.

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The Renewable Energy and Environmental Technology Center is also one of the recipients of competitive grants from the Kingdom's Research, Development, and Innovation Authority. This recognition highlights the center's excellence in research and its ability to support national policies through innovation and scientific advancement.

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On the international front, the University of Tabuk, represented by the College of Engineering, hosted a delegation from Japan, including representatives from the Japanese Ministry of Economy, Trade and Industry, the Japan Energy Efficiency Center, and Rich Consulting Company. The delegation toured the university's facilities and laboratories, and discussions were held on potential cooperation, partnerships, and exchange of expertise to advance sustainable technologies and solutions in the energy sector. This international collaboration strengthens the university's role in supporting government policies through knowledge transfer and the adoption of global best practices.

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Furthermore, the university participates in high-impact national projects, including the launch of the **NetZero Innovation Center** in partnership with NEOM, Red Sea Global, and Teesside University during the EDGEX International Education Exhibition. This initiative aims to develop sustainable environmental solutions, promote advanced clean technologies, and facilitate industrial transition toward net-zero carbon emissions by 2060.

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Through these comprehensive efforts, the University of Tabuk significantly contributes to the formulation, refinement, and implementation of government policies that promote clean energy and energy efficiency, aligned with Saudi Arabia's Vision 2030 and global sustainable development goals.

7.4.5 Assistance to low-carbon innovation

The UT actively contributes to the advancement of a low-carbon economy by supporting innovation, applied research, capacity building, and strategic partnerships in clean energy and sustainable technologies.

While the university does not currently operate a dedicated start-up incubator for green technologies, it plays a strategic enabling role by fostering collaborations, providing technical training, and engaging in real-world projects that support the growth of low-carbon solutions.

Examples include:

- A signed agreement with the **Saline Water Conversion Corporation (SWCC)** to install a solar panel monitoring and automated cleaning system at the **Khafji solar energy station**, integrating energy-efficient technologies into national infrastructure.

Achievement File – Renewable Energy and Environmental Technology Center

- A memorandum of understanding with **King Abdullah City for Atomic and Renewable Energy (K.A.CARE)** to host **solar and wind energy resource monitoring stations**, providing high-quality data to support renewable energy planning. Achievement File – Renewable Energy and Environmental Technology Center

- A collaborative training initiative with **NEOM Green Hydrogen Company**, offering a **train-to-hire program** that equips students for careers in clean energy and water sectors.

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- The university's **Innovation and Entrepreneurship Center** hosted a workshop titled *"Innovation in Energy Systems and Cybersecurity Challenges,"* focusing on smart grid security, energy efficiency, and digital innovation in the energy sector.

  https://x.com/event_ut/status/1853480596011708635?s=48

- Specialized technical courses such as *"Design of Small and Medium Solar Energy Systems (1 kW–2 MW),"* offered by the Renewable Energy and Environmental Technology Center.

  https://x.com/event_ut/status/1841761489935278127?s=48

- Furthermore, the University of Tabuk launched, in partnership with **NEOM, Red Sea Global, and Teesside University**, the national alliance project **NetZero Innovation Center** during the **EDGEX International Education Exhibition**. This initiative aims to develop sustainable environmental solutions by adopting advanced technologies and facilitating the industrial transition to achieve net-zero carbon emissions by 2060. https://x.com/u_tabuk/status/1912222065647812613?s=48

Through these initiatives, the University of Tabuk demonstrates its institutional commitment to environmental sustainability and its active role in enabling an ecosystem that supports low-carbon technologies and the potential growth of start-ups in this field.