ASU
جامعة العلوم التطبيقية
APPLIED SCIENCE UNIVERSITY

SUSTAINABLE DEVELOPMENT GOALS

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SDG 7: AFFORDABLE AND CLEAN ENERGY

Table of contents

SDG 7: AFFORDABLE AND CLEAN ENERGY

Applied Science University (Bahrain) – SDG 7: Affordable and Clean Energy Report

Applied Science University (ASU) in Bahrain is strongly committed to **Sustainable Development Goal 7 (Affordable and Clean Energy)**, integrating clean energy principles across its campus operations, academic programs, community initiatives, and partnerships. This report outlines ASU's efforts and achievements in promoting affordable, reliable, and modern energy, structured in line with Times Higher Education Impact Rankings criteria.

On-Campus Energy Infrastructure and Systems

ASU's campus was designed and is continually upgraded with **energy-efficient infrastructure** to reduce its environmental footprint. Key features of the campus energy systems include:

◆ Green Building Design

The university campus incorporates environment-friendly design principles and materials that promote sustainability [1]. Buildings feature double-glazed windows and proper insulation where possible to improve thermal performance [2]. These design choices minimize cooling loads in Bahrain's hot climate. Notably, the campus uses high-efficiency HVAC systems – for example, modern Daikin air-conditioning units with an Energy Efficiency Ratio (EER) of 5, well above standard efficiency, are installed to cool academic buildings [2].

ASU campus including the building technology (the case study).

◆ Solar Energy and Smart Metering

ASU is exploring on-site renewable energy generation to harness Bahrain's abundant sunshine. The university has assessed rooftop and carport **solar panel installations** as part of its strategy to increase clean energy use on campus, in alignment with Bahrain's push for 5% renewable energy by 2025 [3]. While large-scale solar projects are being implemented at national universities (e.g. a 44 MW solar plant at University of Bahrain) [3], ASU aims to contribute on a smaller scale by installing photovoltaic panels on campus buildings in the near future. **Smart energy meters** are used to monitor electricity consumption in campus facilities, providing real-time data to facilities management. This data-driven approach allows ASU to identify opportunities for conservation and ensure efficient operation of systems.

Bahrain launches tender for 44 MW solar plant

◆ Energy-Efficient Lighting

One of ASU's notable campus initiatives is the provision of **energy-efficient lighting systems**. The university has retrofitted campus lighting with LED bulbs, significantly reducing electricity use for lighting [4]. These LED installations consume far less power than traditional lamps and have lower maintenance needs. They are often paired with motion sensors and automated timers to avoid unnecessary lighting in unoccupied spaces. By switching to LEDs, institutions can cut lighting energy consumption by around 6% and achieve very high cost-benefit ratios [5] – a benefit that ASU is actively realizing through its campus-wide LED rollout. Additionally, outdoor lighting has been optimized to use efficient fixtures and controllers, enhancing safety while minimizing energy waste.

Smart HVAC Controls

The campus buildings leverage modern building management systems to optimize air conditioning schedules and temperatures. Cooling – the largest energy consumer in Bahrain – is carefully regulated. For example, thermostats are centrally set to efficient standards (around 22–24°C during occupancy) and some lecture halls and offices are equipped with occupancy sensors to adjust cooling and ventilation when rooms are empty. These measures prevent energy wastage from over-cooling and ensure comfort is balanced with conservation. ASU's continuous monitoring of HVAC performance is part of a broader smart-campus approach to energy management.

Through these infrastructure measures, ASU provides a living laboratory of clean energy in action. The campus's efficient design and systems contributed to ASU's strong performance in the **UI GreenMetric World University Ranking**, which assesses universities on criteria like infrastructure and energy use. In 2020, ASU was recognized as one of the top private universities in Bahrain for its green campus efforts [1].

Energy Efficiency Projects and Initiatives

Beyond built-in efficiency, ASU has implemented targeted projects to further **improve energy efficiency** in its operations. These initiatives demonstrate ASU's proactive approach to reducing energy consumption and carbon emissions on campus:

Lighting Retrofits

As noted, ASU undertook an extensive project to replace older fluorescent and CFL lighting with **LED lighting** across all its facilities. This multi-year retrofit covered classrooms, offices, libraries, laboratories, and outdoor areas. The new LED fixtures cut power demand per bulb by more than 50% and have longer lifespans, leading to substantial energy savings and reduced replacement costs. The university reports that this transition to energy-efficient lighting has measurably lowered campus electricity use and contributed to greenhouse gas reduction goals [4]. By providing brighter light at lower wattage, the LED project not only improves energy efficiency but also enhances the quality of campus illumination.

Motion Sensors & Smart Controls

To complement the lighting upgrade, ASU installed motion sensors in many classrooms, lecture halls, and restrooms. These sensors automatically turn lights off when spaces are unoccupied, ensuring that lights are not left on unnecessarily. Similarly, air conditioning systems in select areas have been fitted with smart thermostats and occupancy sensors that scale back cooling when rooms are empty. Such automation prevents energy waste and has been credited with additional energy savings each year. ASU's classrooms now typically shut

off lights and adjust AC within minutes of the end of classes, a simple change that yields significant conservation over time.

◆ Building Energy Audits and Retrofits

ASU conducts regular **energy audits** of its buildings to identify further opportunities for efficiency improvements. These audits, often carried out by engineering faculty and students as practical projects, examine factors like thermal insulation, air leakage, and appliance efficiency. Audit findings have led to retrofit actions – for example, adding weather stripping to doors/windows to improve insulation, upgrading to more efficient chillers in the central cooling plant, and installing variable-frequency drives (VFDs) on large motors (like those in air handling units and water pumps) to reduce their energy draw. In older buildings, ASU has considered installing window films or external shading to reduce solar heat gain. These retrofit measures support a low-carbon campus by **reducing energy demand** at the source.

◆ Efficient IT and Equipment Use

The University also targets energy efficiency in its equipment and IT infrastructure. ASU's ICT department implemented power management settings on computers (automatic sleep modes) and uses energy-efficient servers in its data center. The data center has been consolidated and optimized for cooling efficiency. Additionally, office equipment procurement favors Energy Star-rated devices. The cumulative effect of these small changes in daily operations contributes to an energy-conscious campus culture.

◆ Awareness Campaigns for Conservation

Hand-in-hand with technical measures, ASU runs awareness campaigns to encourage faculty, staff, and students to conserve energy. "Switch Off" reminders are posted in classrooms and offices, urging people to turn off lights and devices when not in use. The Facilities Directorate provides periodic reports on energy usage by building, fostering a sense of accountability. Through competitions and pledges (such as challenges to departments to reduce electricity use by a certain percentage), ASU nurtures behavioral change toward efficiency. This informal initiative complements the formal policies and showcases that everyone on campus has a role in saving energy.

Collectively, these projects and initiatives reflect **ASU's university-wide policy** of energy conservation. The University's strategic plan explicitly prioritizes efficient energy use and **continuous monitoring** of consumption as key performance indicators [1]. By pursuing lighting and HVAC upgrades, building retrofits, and community awareness, ASU has created a culture of sustainability where energy efficiency is ingrained in campus operations.

Energy Conservation Policies and Monitoring Programs

ASU's commitment to clean energy is codified in its **policies and monitoring programs** that govern campus operations. The university has established frameworks to ensure that energy goals are met and regularly evaluated:

◆ Sustainability and Energy Policy

ASU has a formal sustainability policy that encompasses energy conservation and climate action. This policy aligns with Bahrain's national sustainability strategies and the UN SDGs. It sets out objectives such as increasing the share of renewable energy in campus consumption, reducing overall energy use per campus user, and minimizing greenhouse gas emissions. The policy mandates integrating sustainability into decision-making for campus development and procurement. For example, any new building or major renovation at ASU must incorporate green building standards and energy-efficient technologies by policy. Likewise, when purchasing equipment or appliances, energy efficiency ratings are a key criterion. The policy also outlines roles and responsibilities – a sustainability committee oversees progress, while the facilities management team implements technical measures. This high-level commitment ensures a unified approach to achieving SDG 7 on campus [1].

◆ Energy Monitoring and Target-Setting

A cornerstone of ASU's program is its **energy monitoring system**. The facilities department tracks electricity and water consumption for all buildings on a monthly (and in some cases, daily) basis. Smart meters and sub-meters are installed in various campus facilities to gather detailed data on usage patterns. This data is analyzed to identify unusual spikes or inefficiencies. ASU sets annual targets for energy reduction, often aiming for a few percentage points lower than the previous year's consumption after adjusting for campus growth. Progress towards these targets is monitored quarterly. If a building is not on track, energy audits are triggered to diagnose issues. This systematic monitoring has yielded results – ASU has achieved steady reductions in energy use intensity over the past few years, even as enrollment and campus activities expanded.

◆ Green Metric and Reporting

ASU actively participates in international sustainability assessments such as the **UI GreenMetric World University Ranking** and THE Impact Rankings, using them as a benchmarking tool for its energy and climate performance. In the **GreenMetric 2021 report**, ASU improved its global ranking to 461 (up from 484 the year prior) by advancing in criteria like energy efficiency and greenhouse gas reduction [6]. The GreenMetric evaluation specifically looks at energy usage per building, the existence of renewable energy sources, carbon footprint, etc. – areas where ASU showed significant progress. The University

collected **5,150 points** in the GreenMetric criteria covering infrastructure, energy and climate change, waste, water, transport, and education [1]. ASU's internal monitoring data feeds into these reports, ensuring transparency and enabling the university to identify where it stands relative to peers. The **annual sustainability report** (often included in ASU's Annual Report) details energy performance and is shared with stakeholders for accountability.

◆ Climate Action Plan

In line with Bahrain's climate commitments, ASU is formulating a campus Climate Action Plan that will include specific strategies for decarbonizing its energy usage. This plan (under development by the sustainability committee and faculty experts) is expected to set a **carbon emissions baseline** for the university and outline measures to reach carbon neutrality in the long term. Anticipated elements include increasing on-site renewable energy generation (solar PV installations), purchasing green energy or certificates, improving building energy efficiency further (with possible deep retrofits and smart-building technologies), and engaging in carbon offset projects for any remaining emissions. The plan also incorporates **climate resilience**, ensuring the campus energy infrastructure can adapt to rising temperatures and other climate impacts. By taking a planned approach, ASU demonstrates foresight in managing its energy future.

◆ Compliance and Standards

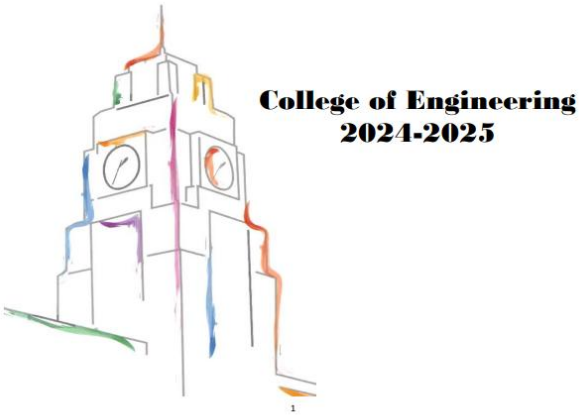
ASU complies with all national regulations on energy and water efficiency. Bahrain has been introducing technical regulations for lighting and appliances to improve efficiency [7]; ASU has preemptively met these standards by its early adoption of LED lighting and efficient AC systems. The University also aligns with ISO 50001 energy management system standards principles, emphasizing continuous improvement (though formal certification is under exploration). Regular internal audits ensure that practices – from lab equipment usage to campus vehicle fuel efficiency – adhere to ASU's conservation ethos.

Through these policies and programs, ASU ensures that energy conservation is **institutionalized**. The commitment starts from the top leadership and cascades down to operational procedures. By monitoring performance and reporting transparently, the university creates a feedback loop that drives further improvement in its clean energy journey.

Academic Offerings and Research in Clean Energy

ASU leverages its academic core to advance SDG 7 through **formal and informal education, as well as research** focused on sustainable energy. The university recognizes that educating future leaders and driving innovation are key to long-term impact:

◆ Sustainability in Curriculum



ASU has **embedded sustainability and clean energy topics across its academic programs**, especially in the College of Engineering. In 2019, ASU launched dual-award Bachelor's degree programs with London South Bank University (LSBU) in disciplines such as Civil, Mechanical, Architectural, and Electrical & Electronic Engineering [8]. These programs were expressly designed to include modern sustainable engineering content. The engineering curriculum has been updated to equip students with skills to design **smart, decarbonized cities** and infrastructure for a green future [8]. Courses cover renewable energy technologies (solar PV, wind turbines), energy storage, green building design, and efficient transportation systems. For instance, a module on *Energy Conservation in Buildings* trains students to quantify available renewable energy (solar, wind, etc.) and design buildings for minimal energy use [9]. Another course introduces **photovoltaics and sustainable power systems**, reflecting the latest trends in clean energy integration [8]. Even non-engineering programs incorporate sustainability – business students learn about sustainable operations and finance for green projects, and law students study environmental law and energy policy frameworks. This interdisciplinary approach ensures all ASU graduates have awareness of energy and sustainability challenges.

◆ Practical Projects and Student Competitions

ASU emphasizes hands-on learning in clean energy. Engineering students undertake capstone projects that often focus on renewable energy or efficiency innovations. These projects have garnered external recognition: students in the LSBU dual-degree engineering program recently won the **Best Graduation Project in Civil Engineering** from the Bahrain Society of

Engineers, thanks to a project centered on sustainable construction and energy efficiency [8]. Other student projects have explored topics like solar-powered water desalination, wind energy potential in Bahrain, and smart grids for campuses. ASU regularly encourages and sponsors student teams to participate in sustainability competitions, such as solar decathlons or energy hackathons, to apply their knowledge in real-world scenarios. These experiences not only enrich student learning but also contribute ideas and prototypes that could be scaled up for campus or community benefit.

◆ Research and Innovation

Clean energy is a strategic research area at ASU. The university's research centre highlights **Energy** as a priority, with topics including integration of renewables into the grid, energy storage technologies, energy efficiency in buildings/industries, hydrogen energy, and green energy policy frameworks [10]. Faculty and graduate students are engaged in research projects that address local and regional energy needs. For example, ASU researchers are studying **solar energy optimization** for Bahrain's climate – investigating the best panel orientations and cleaning techniques to maximize output in dusty conditions. Another ongoing research project is examining **thermal comfort and AC efficiency** in Gulf buildings, aiming to recommend settings that save power without compromising comfort. ASU also collaborates with government bodies on applied research; notably, some faculty have worked with Bahrain's Sustainable Energy Authority on feasibility studies for renewable integration and with the Electricity & Water Authority on smart meter data analytics. The university hosts an **International Conference on Emerging Technologies for Sustainability and Intelligent Systems**, where renewable energy and smart energy management are key themes [11]. By fostering research in these areas, ASU contributes new knowledge and innovations to drive the clean energy transition.

◆ Informal Education and Student Activities

Outside the classroom, ASU provides numerous opportunities for students to deepen their sustainability competencies. The **Environmental Club** (a student-led club) organizes activities like tree-planting, recycling drives, and seminars on energy saving tips. The College of Engineering holds an annual *Renewable Energy Day* where students showcase solar gadgets, wind turbine models, and energy apps they have developed. In one recent event, engineering students demonstrated a prototype solar-powered mobile charger and an IoT-based smart thermostat – underscoring creativity in applying classroom concepts. ASU also invites industry experts for guest lectures: for instance, engineers from Bahrain's electricity authority have given talks on the national renewable energy plan, and entrepreneurs from local solar companies have spoken about green startups. Such co-curricular offerings ensure students remain engaged with the latest developments in clean energy and see pathways to turn their knowledge into practice.

Overall, ASU's academic and research initiatives are **molding the next generation of energy leaders**. Dr. Mohamed Salama, Dean of Engineering, emphasizes that embedding sustainability in education is paramount to tackling climate challenges, and ASU's graduates will be equipped to "design smart, decarbonized cities" and lead the transition to renewable energy solutions [8]. The university's focus on clean energy academics has dual benefits: enriching student learning and advancing Bahrain's human capital in sustainable energy.

Community Outreach and Energy Awareness Programs

ASU extends its impact beyond the campus by engaging with the community through outreach and training programs that promote energy awareness and sustainable practices. These efforts help spread the culture of clean energy to society at large:

◆ Public Awareness Events

On the *International Day of Clean Energy* (observed annually in October), ASU holds public events and seminars to raise awareness about the importance of renewable energy. For example, on Clean Energy Day 2025, ASU reaffirmed its commitment to sustainability and hosted a forum where faculty experts explained the concept of Net Zero emissions by 2050 and the urgent need to cut greenhouse gas emissions [8]. This event, open to students, staff, and external visitors, included interactive discussions on how individuals and organizations in Bahrain can adopt solar power, improve energy efficiency, and reduce their carbon footprint. By aligning with international observances, ASU leverages global momentum to educate the local community on clean energy topics.

◆ Workshops and Training Courses

Through its **Training and Continuing Education Centre**, ASU offers short courses and workshops that often cover sustainability and energy. Recent offerings have included a **Renewable Energy Basics** workshop for the general public, where participants learned about solar panel installation, home energy-saving tips, and Bahrain's net metering program. Another specialized training was provided for school teachers on how to incorporate energy efficiency awareness into their curriculum, thus multiplying ASU's outreach impact. These trainings are frequently organized in collaboration with national bodies; for instance, ASU faculty partnered with the Sustainable Energy Authority (SEA) to deliver a seminar series on energy efficiency in buildings for municipal engineers and building inspectors. By providing education beyond its student body, ASU serves as a resource center for upskilling the broader community in sustainability skills.

◆ Community Projects and Partnerships

ASU faculty and students participate in community service projects that bring clean energy benefits to society. One notable initiative involved an **"Energy Audit Clinic"** where engineering students, under faculty supervision, offered free energy audits for local non-profits and small businesses. They would visit a charity, for example, and assess how it could reduce electricity use (through better lighting, AC tuning, etc.), then provide a report with recommendations. This not only gave students practical experience but also helped community organizations save on energy bills – a social and economic win. ASU has also been involved in awareness campaigns such as neighborhood **"Eco Days"** in Al-Ekir (the area around campus), where student volunteers distribute leaflets on energy-saving tips in Arabic and English and demonstrate solar gadgets to spark interest among residents. These grassroots engagements help instill an energy-conscious mindset in the public.

◆ Forums and Conferences with Public Involvement

In January 2024, ASU organized a high-profile forum titled **"Smart Thinking Energy Management" (STEM 2024)** in collaboration with the **Institute of Electrical and Electronics Engineers (IEEE) Bahrain**. This forum brought together industry professionals, government representatives, students, and interested citizens to discuss smart energy management and sustainability. It fostered knowledge exchange on topics like intelligent energy monitoring, smart grids, and IoT solutions for saving energy in urban settings. By hosting such events (often open to public registration), ASU acts as a convenor in the national conversation on energy. Attendees gain insights into both policy and technology aspects of clean energy, bridging the gap between experts and the community. According to event summaries, the STEM 2024 forum successfully **promoted collaborative learning** and showcased local innovations in energy management, reinforcing ASU's role in community education.

◆ Media and Publications

ASU also contributes to public awareness via media. University experts frequently appear in local media (newspapers, TV) to talk about sustainable energy. For example, ASU academics have written op-eds in Bahraini newspapers about the benefits of solar energy adoption for households and the importance of energy conservation to achieve national goals. The university's social media channels share energy-saving tips, highlights of student projects in renewable energy, and global SDG 7 news to educate its followers. In 2025, ASU launched a **"Sustainability Newsletter"** section on its website featuring articles on campus initiatives and general advice on topics like reducing one's carbon footprint. This content, freely accessible, extends ASU's educational mission to anyone online interested in sustainability.

Through these outreach strategies, ASU ensures that its impact is **felt beyond campus boundaries**. The university is not only greening its own operations but also actively inspiring

and informing the community about clean energy. These efforts align with Bahrain's broader push for sustainability awareness and empower citizens with knowledge to take action in their own homes and workplaces.

Partnerships and Collaborations on Energy Initiatives

ASU recognizes that achieving sustainable energy goals requires collaboration. The university has forged **partnerships with government agencies, NGOs, industry, and other institutions** to advance research and implementation of clean energy solutions:

◆ Government Collaborations

ASU works closely with Bahraini government bodies on energy and sustainability projects. While ASU is a private university, it has signed Memoranda of Understanding (MoUs) with various ministries to align educational and research efforts with national development plans. In 2025, ASU signed an MoU with the **Ministry of Works**, which oversees public works and infrastructure, to enhance student training and jointly explore areas like sustainable construction and infrastructure development [12]. This partnership provides ASU students with access to major project sites (bridges, wastewater treatment plants, green building projects) for internships, where energy efficiency and environmental standards are critical aspects [12]. Similarly, ASU faculty contribute their expertise to governmental committees and studies – for instance, ASU researchers have been involved in the **National Renewable Energy Action Plan** consultations via the Sustainable Energy Authority. By aligning with government initiatives (such as Bahrain's 5% renewable energy target by 2025 and 700 MW renewable capacity by 2030 [3]), ASU ensures its campus and curriculum support the country's vision. These ties also mean ASU can pilot government-backed programs, such as hosting demonstration solar panels funded through public grants or participating in national energy awareness campaigns.

◆ Industry Partnerships (Energy Sector)

ASU actively partners with energy companies and industry leaders to bridge theory and practice. A shining example is ASU's collaboration with **Solartecc Green Energy Factory**, Bahrain's first solar panel manufacturing facility. In November 2022, ASU's College of Engineering arranged an industrial visit for students to the Solartecc factory [13]. During this visit – supervised by engineering faculty – students learned firsthand about solar panel production processes, from manufacturing to installation and maintenance [13]. They also interacted with Solartecc's engineers and leadership, notably the factory CEO (an ASU alumnus), gaining insight into Bahrain's renewable energy industry [13]. Such partnerships provide invaluable learning and often lead to internships or job placements for students in the clean energy sector. In addition, ASU has relationships with utilities and companies like

Bahrain's Electricity and Water Authority (EWA) and **Bapco Energies** (the national energy company's renewable arm). These include collaborative research on energy efficiency solutions and inviting industry experts to co-supervise student research projects. By working with energy suppliers and solution providers, ASU stays at the cutting edge of technology and helps accelerate the implementation of new energy technologies on campus and in the community.

◆ Academic and NGO Networks

On the academic front, ASU's dual-degree partnership with **London South Bank University (UK)** is a form of collaboration that enriches its clean energy initiatives. LSBU, known for its sustainable engineering expertise, provides curriculum input and joint research opportunities that elevate ASU's capacity in areas like photovoltaic systems and smart grid research [8]. Beyond LSBU, ASU is an active member of international associations such as the **United Nations Sustainable Development Solutions Network (SDSN)** and the **International Association of Universities (IAU) HESD** (Higher Education for Sustainable Development) network [14]. Through these, ASU collaborates with global peers on research projects and knowledge exchange relating to SDG 7. For example, ASU participated in an Arab-region university workshop on renewable energy integration, sharing its campus experiences and learning from others (like successes in solar water heating at a university in Jordan, or wind energy trials in Oman). Locally, ASU partners with NGOs like the **Bahrain Clean Energy Association** and the **Green Bahrain Initiative**, supporting their programs. ASU students and staff often volunteer in NGO-led drives, such as installing solar lanterns in underprivileged communities or providing energy-saving consultations to households. These academic and civil society partnerships amplify ASU's impact and create a larger coalition working toward affordable, clean energy for all.

◆ Professional Bodies and Forums

ASU's collaboration with professional societies further strengthens its role in the energy ecosystem. The earlier-mentioned **IEEE Bahrain Section** partnership for the STEM 2024 Energy Management Forum is one such case. Likewise, ASU has ties with the **Bahrain Society of Engineers (BSE)** – faculty have led seminars at BSE events on topics like sustainable electrical systems. The university hosted the **Gulf Engineering Innovation Forum** in 2023, where one theme was renewable energy projects in the GCC, in cooperation with the Federation of Engineering Institutions. These engagements ensure that ASU is not working in isolation; rather, it is contributing to and drawing from the collective expertise of professionals dedicated to clean energy. They also increase the visibility of ASU's own initiatives, attracting potential partners and funding.

Through its network of **partnerships**, ASU gains access to resources, expertise, and platforms that significantly enhance its SDG 7 performance. In turn, the university contributes research

findings, skilled graduates, and pilot sites that benefit partners – a symbiotic relationship. ASU's leadership often highlights that such collaborations are critical: "Academia plays a key role in addressing the global climate crisis while inspiring engineers to lead the transition to clean energy solutions" [8]. By uniting with government, industry, and global partners, ASU multiplies the reach and effectiveness of its affordable clean energy initiatives.

Impact and Measurable Outcomes

ASU's comprehensive approach to sustainable energy has yielded **tangible, measurable impacts** in terms of energy savings, cost reduction, and recognition. The following are key indicators of ASU's progress:

◆ Reduced Energy Consumption

Through efficiency upgrades and conservation programs, ASU has successfully lowered its campus energy usage on a per-student and per-building basis. Internal reports show a steady year-on-year reduction in electricity consumption (kWh) despite growth in campus facilities. The switch to LED lighting alone cut the university's total electricity use by an estimated few percentage points. For example, studies indicate that LED retrofits can save around 6% of building energy [5], and ASU's data reflects similar gains from its campus-wide lighting project. Likewise, improved HVAC controls and higher efficiency chillers have reduced peak demand during Bahrain's hot summer months. These energy savings translate directly into cost savings on utility bills, allowing ASU to reinvest funds into further sustainability projects and educational initiatives.

◆ Carbon Footprint Reduction

By lowering fossil-fuel-based electricity consumption, ASU has reduced its carbon dioxide (CO_2) emissions associated with campus operations. Based on Bahrain's grid emission factor, ASU estimates that its initiatives (LED lighting, AC efficiency, etc.) are cutting roughly **hundreds of tons of CO_2** per year compared to baseline. Every kilowatt-hour saved means less natural gas is burned for power generation nationally. While ASU's current renewable

energy generation on campus is still limited, its efficiency measures alone contribute to climate change mitigation. The university plans to formally calculate and publish its carbon footprint annually as part of its Climate Action Plan, aiming for a verified reduction trajectory aligned with national and global targets.

◆ Financial Savings

Energy efficiency not only helps the planet but also improves the university's finances. ASU's finance department has noted a significant drop in electricity expenditures after implementation of conservation projects. For instance, the LED lighting retrofit has a quick payback period due to energy cost savings, and thereafter saves money each subsequent year. Similarly, smarter cooling strategies have trimmed the peak demand charges that ASU pays to the utility. In aggregate, ASU's sustainability office reports tens of thousands of Bahraini Dinars saved per year from the reduced energy bills. These savings free up budget that can be allocated to academic programs, scholarships, or further sustainability investments, demonstrating the economic win-win of clean energy action.

◆ Recognition and Rankings

The impact of ASU's efforts is reflected in its rising standings in global sustainability rankings and the accolades it has received. In the **Times Higher Education (THE) University Impact Rankings 2021**, ASU was ranked in the **401+ band globally for SDG 7 and overall impact**, making it one of the leading institutions in Bahrain on implementing the SDGs [6]. This ranking takes into account metrics like campus energy initiatives, renewable energy outputs, and research on clean energy – all areas where ASU excelled. Moreover, ASU's performance in the **UI GreenMetric Ranking** improved consistently: it moved up to 37th in the Arab world and 461st globally in 2021 [6], with particularly strong scores in **Energy & Climate Change** criteria. These achievements underscore ASU's role as a sustainability leader among universities in the region. Locally, ASU has been acknowledged by Bahrain's Supreme Council for Environment for its campus sustainability model, and it remains the **top-ranked private university in Bahrain** in GreenMetric results [1]. Such recognition not only validates the effectiveness of ASU's initiatives but also enhances the university's reputation, attracting students and faculty who value sustainability.

◆ Student and Community Impact

Another measurable outcome is the increased engagement and competence of students and community members in clean energy topics. ASU surveys indicate that a growing percentage of its students are aware of and participate in sustainability programs – for example, a majority of students reported adopting at least one energy-saving habit (like shutting down computers or using stairs instead of elevators) after campus awareness campaigns. The success of student projects and competition wins (such as the award-winning civil engineering

project on sustainability [8]) reflects the quality of education and passion being instilled. In the community, ASU's outreach has led to tangible actions: several businesses that received student-led energy audits implemented recommendations and saw their utility costs drop, while attendees of ASU's public workshops often pledge to install solar panels or efficient appliances at home. These stories, though individual, add up to meaningful impact beyond the campus metrics.

ASU continually gathers data on these impacts to drive a cycle of improvement. The evidence so far shows that ASU's commitment to SDG 7 is not just on paper – it is delivering real **energy savings, emission cuts, and educational benefits**. The university's leadership touts these results in annual reports and uses them to set even more ambitious goals for the future, confident that measurable progress will continue [1].

Future Strategies and Commitments

Looking ahead, ASU is dedicated to **scaling up its use of clean energy and further reducing reliance on non-renewable sources**, in line with global climate goals and national aspirations. The university's future strategy for SDG 7 includes several key commitments:

◆ Increasing Renewable Energy Usage

ASU aims to dramatically increase the share of its energy that comes from renewable sources in the coming years. A flagship goal under consideration is to power at least **20% of campus electricity needs via on-site solar photovoltaics** within the next 5 years. To achieve this, ASU is planning phased installations of solar panels – starting with covered parking structures and rooftops of academic buildings. Feasibility studies are underway to determine optimal locations and system sizes. ASU will likely adopt a **grid-tied solar PV system** so that excess generation (especially on weekends or holidays) can be fed back into the national grid under Bahrain's Net Metering policy. By generating clean solar power on campus, ASU will directly reduce its draw of grid electricity and cut carbon emissions. This move also aligns with Bahrain's national renewable energy targets and will make ASU a visible example of solar adoption in the education sector. In the long term, the university is even exploring the integration of **wind energy** (given Bahrain's modest wind resources, this might involve small vertical-axis turbines on campus as demonstration units) and the use of **solar thermal** technology for hot water in dormitories or cafeterias. These projects reinforce ASU's trajectory toward a renewable-powered campus.

◆ Toward Carbon Neutrality (Net Zero)

ASU embraces the concept of **Net Zero emissions by 2050**, echoing global climate objectives [8]. The university is developing a roadmap to carbon neutrality which includes not only

reducing energy consumption and switching to renewables, but also addressing other emission sources. In the coming decade, ASU commits to electrifying its vehicle fleet (e.g. campus security vehicles, maintenance carts) and installing EV charging stations for campus and public use – thereby promoting electric mobility powered by clean energy. Additionally, ASU will implement more aggressive energy-saving technologies: for instance, **smart building systems** with AI-driven controls to optimize energy use in real-time, and advanced insulating materials or coatings for its building envelopes to cut cooling loads. The net-zero plan may involve **carbon offsetting** for emissions that are infeasible to eliminate (such as certain lab equipment or backup generators), possibly through tree-planting initiatives or investing in local renewable energy projects. Interim targets are being set (e.g. 50% reduction in campus CO_2 emissions by 2030) to ensure steady progress. Dr. Mohamed Salama of ASU highlights that achieving Net Zero "necessitates innovative measures, such as harnessing renewable energy [and] enhancing energy storage technologies" along with raising awareness and embedding sustainability throughout operations [8]. This vision will guide ASU's investments and innovations moving forward.

Pioneering Sustainability : Applied Science University Promotes Initiatives In Engineering Education To Help Fight Global Warming

◆ Smart Energy Management and Innovation

In the future, ASU will build upon its successful **Smart Campus** initiatives. The university plans to implement a centralized **Energy Management System (EMS)** that uses IoT sensors and predictive analytics to manage energy supply and demand dynamically. This system could, for example, dim lighting and slightly adjust AC settings during peak load times to shave off demand (a practice known as demand response), or automatically turn on backup solar-battery systems if grid power falters. By 2025, ASU is considering installing a pilot **battery storage system** on campus to store solar energy and provide backup power, improving resilience and making better use of generated renewables. This would also serve as a hands-on research and training facility for engineering students interested in energy storage technologies. Moreover, ASU intends to continue fostering a culture of innovation: supporting faculty and student research into emerging energy solutions, such as **hydrogen fuel use** on campus (perhaps powering lab equipment or a fuel-cell demonstration car) and

testing **new efficiency technologies** (like smart glass or advanced cooling cycles) in campus buildings. By acting as an innovation test-bed, ASU will stay ahead of the curve in adopting effective clean energy strategies.

◆ Expanded Education and Engagement

ASU's strategy also commits to expanding its **educational offerings and outreach** in the realm of sustainable energy. This includes possibly launching new academic programs, such as a **Master's degree in Sustainable Energy or Energy Management**, to produce specialized graduates who can lead the energy transition in Bahrain and globally. Short-term certification courses on solar PV installation, energy auditing, and sustainability management are being planned for professionals and alumni, tapping into the growing green jobs market. On the community side, ASU will continue to grow its partnerships – for example, working with schools to incorporate SDG 7 topics in their science curricula, and with local municipalities to host joint events like "Energy Efficiency Week" targeting household energy use. The university has expressed interest in establishing an **"Energy Innovation Hub"** on campus, which would be a collaborative space (possibly in partnership with an industry sponsor) where entrepreneurs, students, and researchers can develop and prototype clean energy solutions. Such a hub could accelerate the commercialization of ideas born at ASU, from more efficient solar panel cleaning systems to energy-efficient cooling technologies tailored for desert climates.

◆ Continuous Improvement and Reporting

Finally, ASU commits to **transparent reporting and continuous improvement** in its sustainability journey. The university will publish an annual **Sustainability Report** (as part of or alongside its Annual Report) detailing progress on energy and other SDGs, including quantitative metrics and whether targets were met. This will keep the university accountable to stakeholders and provide data that can inform further action. ASU also intends to maintain or improve its standings in sustainability rankings, not for the sake of rankings per se, but as a reflection of genuine progress. By benchmarking against global best practices, ASU can identify new measures to implement each year. The University's leadership considers the pursuit of sustainability as a core tenet of its mission – as evidenced by statements from the President that consolidating the concept of sustainability and green architecture is central to ASU's development plans [1]. This ethos will ensure that SDG 7 remains a priority in future strategies.

Conclusion

ASU (Bahrain) has made significant strides in promoting affordable and clean energy through its campus initiatives, academic programs, community outreach, and partnerships. The **evidence of success – from reduced energy usage and awards won** [8]**, to improved sustainability rankings** [6] **–** showcases ASU's impact and leadership in this domain. With robust future commitments to expand renewable energy and innovate further, ASU is well-positioned to continue advancing SDG 7 and to serve as a model for sustainable development in higher education, in Bahrain and beyond. **The University's journey demonstrates that through dedication, innovation, and collaboration, a sustainable and clean energy future is achievable on campus and in the wider community** [8]**.**

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